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<http://www.sirc.org/messenger>

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Section 1

Introduction and background

1.1 Preface

The MESSENGER project has been completed in a little over 12 months. During that relatively short time we have met and consulted with nearly two hundred actors and stakeholders across Europe, seeking their advice with a view to developing the original Guidelines on Science and Health Communication developed by the Social Issues Research Centre (SIRC)¹ in association with the Royal Institution (RI) and the Royal Society (RS). The aim has been to ensure that advice given to European scientists on how to communicate more effectively with the media fully takes into account the various stakeholder perspectives and builds on existing knowledge and expertise.

Communicating with citizens via the popular media is part of the wider process of dialogue and engagement between the science communities and civil society – a necessary and desirable process to maintain and foster trust in science and technology in Europe. It is, therefore, essential to get it right.

The MESSENGER project has also undertaken two types of media analysis to inform scientists, press officers and others engaged in the interface with journalists about both cross-national differences in the roles and styles of the news media and the ways in which various actors and stakeholders feature in reports. While we do not claim that this has provided a definitive account of the complexities of media reporting across all science disciplines and across all EU member states, it has established a basic framework with the potential for further development.

This project report is inevitably a lengthy document, covering as it does all aspects of the work conducted. The specific outputs of MESSENGER, however, including the European Guidelines for scientists and resources for journalists, are posted separately in a more digestible form on the project web site at www.messenger-europe.org. This site will be maintained by SIRC over the coming years. In addition to ensuring the accessibility of the documents it will hopefully attract feedback and further contributions from interested parties. The results of the various media analyses are also available from the site, together with copies of this report.

The response to draft versions of the Guidelines has been very encouraging. A number of leading organisations within both the journalism and science communities have offered to help us disseminate them amongst wide audiences across Europe, and we will continue this process well beyond the time scale of the project to ensure that they have an enduring impact.

Our sincere thanks to all those who have contributed to MESSENGER and for the support and patience of DG Research in Brussels.

1 These can be found at http://www.sirc.org/publik/revised_guidelines.shtml

1.2 Structure of the report

This report covers the two main components of the MESSENGER project – extensive consultation with key actors and stakeholders, and analyses of media coverage of science and scientific advice. These were aimed at providing the basis for the development of guidelines on the communication of science and scientific advice through the media.

In this first section of the report, in the Introduction on page 4, we provide the background to the project – its rationale, objectives and outputs.

The consultation part of the project is described in Section 2, beginning at page 17. Section 2.1 covers the work of the Social Issues Research Centre (SIRC) in this context while Section 2.2, beginning at page 61, describes the contribution of the Amsterdam School of Communications Research (ASCoR). The ASCoR interviews were focused, at least in part, on the issues of Universal Mobile Telecommunication Systems (UMTS) and fine particle pollution (FPP), media coverage of which was analysed by ASCoR and reported in Section 3.9. The SIRC consultation was more wide-ranging and lacked a specific focus on particular fields of science and technology.

The media analyses, described in Section 3 starting on page 73, were conducted to provide indications of how media coverage of science and scientific advice varies across the European Community and how the coverage of specific science and technology issues represents, or fails to represent, the views of various groups of actors and stakeholders.

The main outputs of MESSENGER are presented in Section 4, including Guidelines for Scientists on Communicating with the Media, resources and training materials for journalists and a short guide for the layperson on interpreting science and health news.

1.3 Introduction

1.3.1 The general objectives of MESSENGER:

1. To facilitate and improve the quality of dissemination of scientific information and advice through the mass media in Europe.
2. To improve the engagement of relevant stakeholders and actors in the governance of scientific research and its applications in Europe.
3. To contribute to the informed debate among scientists, journalists and representatives of civil society concerning the production of science, technology and health news, and the communication of risk in this context, with a focus on the more controversial life sciences, nanotechnologies and biotechnologies.
4. To determine perceptions of scientific reporting among the science, technology and health communities in a representative sample of EU countries.
5. To generate specific outputs of practical value in improving the transmission of scientific information and advice.

1.3.2 The specific objectives of MESSENGER:

1. To develop the SIRC/RI/RS Guidelines to ensure their relevance and applicability to media reporting and communication of science, technology and health across Europe.
2. To determine, through consultation with relevant actors and stakeholders, perceptions of science media coverage across Europe – particularly the communication and discussion of risks and benefits arising from research.
3. To develop a comprehensive methodological approach for analysing the production and coverage of science, technology and health news.
4. To examine the various roles and styles of the print and broadcast media in a representative sample of EU countries.
5. To establish how communication of risk and discussion of risk-related issues impacts on perceptions of scientific enterprise in EU countries.
6. To develop relevant products for the briefing and training of EC-funded scientists in the dissemination of their work, based on consultation with all groups of relevant actors and stakeholders.
7. To develop materials based on the Guidelines to assist the training of journalists.
8. To develop materials of relevance to 'consumers' of science news to aid their discernment of critical issues and to encourage further dialogue between scientists, journalists and representatives of civil society.

9. To ensure, through exploitation, dissemination and outreach activities, that the Guidelines and other outputs become established documents for informing the manner of science and technology reporting across Europe.

1.3.3 These objectives have been achieved through:

1. Europe-wide consultation with representatives within the science, technology and health communities, journalism organisations and representatives of civil society. A detailed, qualitative analysis of the consultation has been conducted and the outputs embedded in the *Guidelines for scientists on communicating with the media*. Specific issues addressed have included perceptions of the frequency and extent of science coverage, the style and technical level of reporting, the extent to which science issues are editorialised or subject to wider ethical and social debate, perceptions of inaccuracy or distortion, levels of perceived 'hype' associated with science stories, etc.
2. Media analysis of science, technology and health issues across Europe to assess the cultures, roles and styles of the media in communicating science. Detailed qualitative and quantitative analyses have been conducted of media coverage in six EU member states. Outputs have been incorporated into the Guidelines and into support materials.
3. Dissemination and exploitation of the results via the establishment of overlapping networks involving journalists, broadcasters, teachers of science journalism, representatives of the various scientific disciplines and representatives of civil society groups. In liaison with central members of these networks, MESSENGER is disseminating the Guidelines and associated materials and seeking their endorsement by leading European scientific and journalist institutions, NGOs and other relevant bodies.

Conducting the MESSENGER project at the European level has allowed the development of Guidelines with a genuinely European provenance and applicability and thereby contributes centrally to the aims of the Science in Society Action Plan and Work Programme.

1.3.4 Relevance to the objectives of Science and Society

Attention is increasingly being paid in Europe and elsewhere to the role of civil society in governance and scientific advice – particularly that which relates to emerging and novel technologies.

The former Research Commissioner, Phillipe Busquin, stressed the need to promote scientific culture and public participation in order to achieve good scientific governance at a conference on life sciences¹. He said:

¹ Cited from speech: *Life sciences in society today: modern biology and visions of humanity* – EGLS. March 2004.

"Science has been the main spring of European development. It still is. It is also at the heart of European integration. To promote scientific culture means participating in the development of European citizenship. Promoting scientific culture is part of a good 'democratic hygiene'. It is indispensable to allowing the public to understand and direct progress."

Objective 4.3.1 of the Science and Society Work Programme is:

"To create conditions under which policy decisions in multi-level governance are more effective in meeting society's needs, more soundly based on science and, at the same time, through inclusive participation, take account of the relationship between technological innovation and social change, as well as the aspirations and concerns of civil society."

It is quite clear that the media play a critical role in shaping the process of scientific governance. The manner in which issues arising from scientific research are communicated is a significant determinant of the public's acceptance or otherwise of innovation and, consequently, decision-making processes in these areas at all levels of government.

The Science and Society Work Plan, also noted the need:

"... through inclusive participation, [to] help take better account of the relationship between technological innovation and social change, as well as the aspirations and concerns of civil society".

The Work Plan also stressed that:

"In a knowledge-based society, both policy makers and citizens should be equipped to make informed choices from the ever-growing range of options thrown up by scientific and technological progress."

In the Science and Society Action Plan it was noted under 'Action 2' that:

"Relations between science and the media can sometimes be polemic. In some countries, guidelines for relations between the media and the scientific community, and vice versa, have been proposed. Journalists and scientists who make a particular effort in this area deserve encouragement."

Action 2 continues:

"Representatives of the scientific community and the media will be brought together in a forum at European level to encourage and support the development of guidelines for a more fruitful interaction and mutual understanding of the two."

Action 10 of the Action Plan also states that:

"Because of their knowledge, researchers, research organisations and industry have a particular responsibility vis-à-vis society in terms of providing scientific and technological information to Europe's citizens. Communication of scientific and technological progress should be stepped up, in particular the progress

flowing from the Research and Technological Development Framework Programme."

The above considerations have been embedded from the start in the development of the Guidelines on Science and Health Communication, developed by SIRC in partnership with the Royal Society and the Royal Institution of Great Britain. The guiding principle has been that in a genuine democracy citizens have the right to have access to accurate and balanced reporting of science and technology innovation and research, on the basis of which they can make informed choices about how they lead their lives. The manner in which the risks and benefits of innovation are communicated is particularly crucial in enabling not only proper understanding of the issues but also the ability to participate effectively in debate and contribute meaningfully to governance of the scientific enterprise.

The SIRC Guidelines have been formally endorsed by the UK Press Complaints Commission (PCC) who see them as playing a valuable role in amplifying their own Code in the context of science, technology and health reporting. They have also been endorsed by, for example, the Royal College of Surgeons, the Royal Society of Medicine, Royal College of General Practitioners, the Institute of Electrical Engineers and the Nuffield Council on Bioethics. In their report on the ethical context of genetics and human behaviour the Nuffield Council's first recommendation was:

*"We consider that researchers and those who report research have a duty to communicate findings in a responsible manner. We welcome the Guidelines on Science and Health Communication published by the Social Issues Research Centre, the Royal Society and the Royal Institution of Great Britain and recommend that further initiatives in this area should be encouraged."*²

The Guidelines are included in a number of documents providing advice to health communicators in national and regional health services (see, for example, the Cambridgeshire NHS guide on health communication)³. The Guidelines are also being increasingly included in journalism training courses in various parts of the world (see, for example, the recently developed ENSCOT media studies module)⁴.

A summary of the Guidelines was presented in the final session of the Scientific Advice, Crisis Management and Media (SACRIMM) conference in Athens, June 2003⁵. In open and private discussions there was a clear consensus regarding the positive role that such guidelines could play throughout Europe in providing a basis for improved communication between scientists and the public through the media and in encouraging more responsible and balanced coverage of science and technology innovation. It was felt that through proper consultation with relevant stakeholders and actors, including a number of those present at the SACRIMM

2 Hepple, B. et al. (2002) *Genetics and Human Behaviour: the ethical context*, p xxii. The Nuffield Council on Bioethics.

3 Communications and Patient Participation Strategy (2002).

4 Trench, B. et al (2003) *European Science Communication Module*. European Network of Science Communication Teachers.

5 A copy of the PowerPoint of this presentation is available from:
<http://www.communicatingrisk.org/topics.php?DB=powerpoints&ID=1>

conference, real progress in this area could be made by extending SIRC's development activities in this manner. The MESSENGER project has built on the networking opportunities that the event provided.

The issue of the role of civil society in governance of scientific enterprise has recently been addressed by Bantien, Jaspers and Renner (2003), who show that participation of this nature is far from a simple, one-dimensional process. They note, for example, that:

*"Civil society participation goes beyond civil society consultation. Participation is about mutual learning. It is interactive."*⁶

The media, together with politicians, scientists and citizens, are seen as having a key role to play in such interaction.

Bantien et al also note the existence of a number of advisory bodies that facilitate interaction between DG Research and other stakeholder groups – one of significant relevance in this context being the Comité pour la Recherche Scientifique et Technique (CREST). This has among its 8 clusters of activity not only Dialogue and Participation, inherent in the MESSENGER programme, but also the Science, Technology, Innovation and Media (STIM) initiative. While STIM focuses primarily on the role of television in communicating science and health information, the thrust of the initiative is very relevant to the work that we have conducted during MESSENGER. The STIM 'blueprint', for example, notes the tensions that exist between programme makers and the scientific community and seeks ways of remedying areas of mistrust and incompatible perceptions. It also notes the lack of both Europe-wide and national policies regarding science and technology in the media, observing that only in Austria, Belgium and Greece do such policies exist. In the UK, however, as the blueprint observes, intermediary organisations have taken on responsibility for formulating such policies, through guidelines and other means. STIM specifically recognises the role of the SIRC/RS/RI Guidelines in this context.

The relevance of the MESSENGER programme has been further demonstrated in the report of the working group Democratising Expertise and Establishing Scientific Reference Systems⁷. The report concluded:

"... the role of the mass media is of great importance in connecting expertise, policy making and public debate. The media can be seen as a vehicle of communication between different views, knowledge sources and interests, as well as providers of expertise ... When taking into account that freedom of information is a basic guarantee of pluralism and democratic debate, it becomes obvious that improved communication between mass media, experts and policy makers is very important in 'democratising expertise' in the context of democratic governance."

6 Bantien, H. et al (2003) *Governance of the European Research Area: The role of civil society*. Bensheim. pp. 93.

7 European Commission (2001) *White Paper on Governance – Work area 1 – Broadening and enriching public debate on European matters*.

Such a philosophy has been embedded in the MESSENGER programme. The recommendation of the working group that 'intermediate platforms to facilitate the interaction between experts, public, policy makers and the media' should be established is also very consistent with the aims of MESSENGER.

A report prepared by the Evaluation Partnership⁸ in conjunction with other organisations is also of relevance here. It confirms the central role played by the media in the communication of scientific advice and in contributing to informed dialogue. While this study was primarily concerned with scientific advice on bio-terrorism issues, the results are generalisable to other science and technology fields. The various groups of stakeholders consulted were divided into 'producers of scientific advice', 'users of that advice', 'media', and 'civil society' representatives. There was a clear pattern of agreement among stakeholders and actors in the producers, users and society groups that the most important part played by the media in this context was through summarising scientific advice, reporting on current advice issues and safeguarding the interests of the public, as well as producing interesting articles and features on science and technology issues.

The authors of the report also noted that:

"The main deficits in the scientific advice process seem to be in communications, in particular between scientists and the media, where there are perceptions of sensationalism by the media from the producer side and lack of ability of scientists to communicate results from the media side."

The study noted the relevance of the SIRC Guidelines in this context.

The report concluded that although there were some cross-national differences in the importance attached to media and inter-institutional cooperation, the differences were greater between the groups of actors. On the basis of this "actions can be taken at a cross-national level for specific actors (especially societal organisations)." This confirmed the viability of establishing guidelines, which take full account of the perspectives held by the various groups, on a Europe-wide basis.

The objectives of the MESSENGER programme have aligned well with the specific recommendations in the report of the bio-terrorism study – e.g. initiatives to train scientists and policy makers in the effective management of media communications; training scientists in the communication of risk; encouraging a more proactive approach to media relations by producers of scientific advice; development of a code of ethical and professional practice which covers responsible communication of scientific advice.

The central role of the media in communicating scientific advice has also been illustrated in a recent Eurobarometer⁹ survey. This shows clearly that throughout the EU people largely learn about scientific innovation and its consequences through the popular media of television and newspapers. A significant proportion

8 Evaluation Partnership et al. (2003) *A methodological approach to monitoring and assessing scientific advice provision and impact: A test case analysis of the mechanism by which scientific advice catalyses interactions among societal actors*. Final Report.

9 Eurobarometer. (December 2001) *Europeans, science and society*. 55.2.

of the population, however, believes that such developments are portrayed too negatively and that many journalists reporting on science issues do not have the requisite skills to do so. In the absence of properly balanced, objective information about science and technology, communicated in an appropriate manner, members of civil society are ill-equipped to participate fully in areas of advice and governance.

It is also the case, as noted in the bio-terrorism study, that scientists themselves are often equally ill-equipped to convey the fruits of their work to a wider public. This point has been stressed by Gregorio Medrano, Head of Unit 'Public Awareness of Science; Young People and Science' at DG Research. In an interview for the Cordis web site, he commented:¹⁰

"The problem arises when scientists, who are very dedicated to their research, do not have the time to disseminate the information or the appropriate communication skills to reach out to non-specialists. To overcome this problem, special vocational training should be available for scientists ... Communicating science cannot be a sideline activity, performed by amateurs. Policy makers have to motivate scientists to communicate in order to improve the public awareness of science."

The opening section of the Science and Society Action Plan – 'Promoting scientific education and culture in Europe' – also noted:

"If scientific and technological progress is to meet the needs of Europe's citizens and regain their support, they will need to have information that is understandable and of a high quality ..."

The Action Plan further acknowledged the pivotal role played by the media and scientists in the dissemination of scientific information to the public, noting that these actors:

" must be capable of communicating and engaging in debate on scientific issues in a rigorous and comprehensible professional manner, as well as explaining frankly the benefits and limitations of scientific progress."

A specific aim of the MESSENGER project has been to develop materials, based on research and consultation, that will be of considerable benefit to all EC-funded scientists in acquiring the skills needed to communicate effectively with journalists and broadcasters. These highlight not only common issues throughout the EU but also specific national variations in the roles, cultures and styles of the popular media. Other resources have been identified that have relevance in the training of journalists in science and technology reporting. This will contribute directly to Action 1 of the Science and Society Action Plan which noted:

"It is important to develop thematic, multilingual scientific training modules aimed at journalists in the written and audio-visual media."

10 <http://www.cordis.lu/greece/press12.htm>

There are, of course, a number of research programmes that have focused on obtaining a clearer picture of the public's interests in, and attitudes towards, science in order to determine how best to involve various actors and stakeholders in the science debate. There have been major initiatives undertaken in Europe and worldwide to promote the public understanding of science and to encourage more effective communication of science, health and technology issues (e.g. the dissemination of ENSCOT, OPUS, etc.). There are also a number of valuable programmes to facilitate more dynamic interaction between journalists and broadcasters and the science, technology and health communities (e.g. AlphaGalileo, European Science Week, Euroscience, etc.).

The MESSENGER project was designed to cross-cut these initiatives and has addressed the central issues and concerns of Science in Society, from both the standpoint of the need for civil society to participate in the governance of science and technology in an informed manner, and the specific requirements of the scientific community to ensure that their work is communicated effectively and accurately. Within this framework, the project has provided an additional and, in our view, essential dimension – a detailed analysis of variations in the cultures, roles and styles of the media in communicating science issues and advice in the different EU member states. If more effective dialogue between the EU science communities and the media is to be established, the diverse media cultures in various parts of Europe need to be more fully understood.

Richard Holliman and his colleagues of ENSCOT¹¹ note that while the study of science reporting in European news media has been an active field for many years, very little systematic examination of cross-cultural variations has been undertaken. Their own study consisted of a modest, but very worthwhile, 'snap shot' of science reporting over a four-day period in 5 EU countries. They were able to demonstrate that while many similarities existed in the genres of reporting across cultures, significant variations in both the extent and style of science coverage were also evident. In many cases these variations could be attributed to differences in political, moral and legal frameworks and the influence of local non-governmental bodies and institutions.

A European Federation of Biotechnology report,¹² funded by DG Research, also noted that:

" the salience of the various concerns and issues about biotechnology differs considerably between EU countries. The ways in which religion and cuisine are held vary vastly, with considerable consequences for biotechnology-related issues. Journalism and the media work differently and have different impacts in different European countries. Differences in scientific cultures between countries lead to variations in the preparedness of scientists to be active in public communication and engagement."

11 Holliman, R. et al. (December 2002). *Science in the news: a cross-cultural study of newspapers in five European countries*. PCST Conference, Cape Town.

12 *Who should communicate with the public and how?* (2003) European Federation of Biotechnology Task Group on Public Perceptions of Biotechnology. Report of the Focus Workshop.

An earlier study by Brian Trench¹³ similarly demonstrated the need to take into account the cultural differences surrounding science reporting. He concluded:

"The study of science communication is moving away slowly from hierarchical models of communication and circular forms of analysis. To do so more confidently it should embrace cross-cultural comparison. It may be that we can say of science communication, as Lévy-Leblond says of science, that 'we are either polyglot or we are struck dumb'."

The MESSENGER programme has addressed these and related issues and has provided a sound basis for consideration of cross-cultural variations in all of its outputs.

13 Trench, B. (1998) *Science Reporting in Europe: From comparison to critique*. Science Without Frontiers. PCST Conference, Berlin.

1.4 Dissemination and outreach

1.4.1 Existing channels

The consortium began preparation for the dissemination and outreach activities at an early stage of the project. Like many of the work elements involved in MESSENGER, dissemination and outreach were integrated with other activities and workpackages. The identification of relevant actors for dissemination and outreach began with the development of contact lists and background research at the beginning of MESSENGER and will continue beyond the project end date.

A first draft of the guidelines for scientists on communicating with the media has been disseminated to over 120 individuals and organisations who had contributed to the MESSENGER project. The purpose of this exercise was to obtain feedback on the document's content and style and to secure opportunities for its take-up. A substantial amount of comment was received, the overwhelming majority of which was very positive and encouraging. There has been a high level of enthusiasm expressed for the guidelines and a number of offers have already been made by organisations and individuals to help disseminate the document further through their existing networks. Currently, both the Association of British Science Writers (ABSW) and SciDev.Net, for example, are among the prestigious organisations that have already offered their support in this context. Further support will be sought among the contributors to MESSENGER upon publication of this report. These include representatives from major science and research establishments, journalism organisations and civil society groups across Europe.

The Voice of Young Science network, facilitated by Sense About Science, have also indicated their intention to include the guidelines in materials for young science communicators. Further opportunities of this nature are expected once the materials are posted on the MESSENGER website.

1.4.2 MESSENGER website

The MESSENGER website at www.messenger-europe.org is one of the primary methods by which the results of the project will be disseminated. The report will be uploaded on to the site once consent has been obtained from the Commission. The full report will be made available for download as a complete document and also split into more 'manageable' sections with the guidelines and resource materials published as stand alone resources.

The interactive section of the MESSENGER site will be maintained, allowing visitors to contribute comments on the report and other materials. These will be moderated and posted to the site on an on-going basis. The intention at the time of writing is to maintain the MESSENGER site for the foreseeable future, exact timings and the resource implications will be discussed fully with DG Research.

Comments from UK government departments have indicated that embedding the guidelines into all higher science degree programmes is not only desirable but could contribute to 'capturing and outlining best practice in communication skills at an early stage in a scientist's life'. Discussions will be held with DG Research on developing this further.

1.4.3 Press releases

On approval of the report, press releases outlining the results of the MESSENGER project will be posted through AlphaGalileo, SINAPSE and CORDIS. The original online consultation for MESSENGER was promoted through other portals such as EurActiv, Xplora, World Science Forum and the AAAS's *Science Magazine*. It is anticipated that these sites will continue to provide their support for dissemination activities.

1.4.4 SIRC/MESSENGER – existing networks

Dissemination of the guidelines will be achieved through existing networks established by SIRC in addition to the contacts that have been developed through the MESSENGER project.

1.4.4.1 Communiqué SIRC has forged strong links with the Communiqué initiative – a European project seeking to raise the profile of press officers in the communication of European research. There was a consensus expressed during the consultation that the press officer role is one that is both under-utilised and under-resourced. There were further suggestions, however, that the quality of outputs is variable. The guidelines for communicating with the media will be embedded in the Communiqué initiative to ensure that press releases generated by participating intermediaries are mindful of quality issues. SIRC is a member of the Communiqué Steering Group.

1.4.4.2 SIRC website SIRC currently has approximately 5,000 subscribers consisting of journalists and broadcasters, members of science institutions and decision makers in both government departments and industry. The site receives up to 10,000 hits per day. The MESSENGER outputs will be actively promoted through these channels.

The UK Guidelines have already been formally endorsed by bodies such as the Nuffield Council on Bioethics, the Royal College of Medicine, Institute of Electrical Engineers, Royal College of Surgeons, etc. Similar endorsement of the European Guidelines will be actively sought internationally.

1.4.4.3 Press councils Other targets for dissemination and outreach will be the Press Councils in various EU states, together with their associated networks. A preliminary meeting with the UK Press Complaints Commission (PCC) has indicated that an opportunity will arise to disseminate the outputs of MESSENGER through the Alliance of Independent Press Councils.

1.4.4.4 Academic journals Opportunities for outreach and dissemination were also identified at the desk research stage. A recent edition of the journal *Science Communication*, for example, included a number of articles on media framing in the context of nanotechnologies – issues of particular relevance to MESSENGER. Discussions have already taken place between the partners of the consortium regarding the preparation of materials suitable for publication in academic journals. Other suitable resources to be targeted will include the *Journal of Science Communication* and the *Public Understanding of Science*.

1.4.4.5 Conferences and Events European conferences and events also represent an opportunity to extend the reach of the MESSENGER project. Members of the project's consortium attended the Communication European Research conference in November 2005 which proved a valuable exercise in terms of both information gathering and networking.

Pending approval from the Commission, SIRC/ASCoR will make an application to present the MESSENGER findings at the next CER event.

Further opportunities to extend MESSENGER's outreach will be through European events facilitated by European media actors. Peter Marsh of SIRC, for example, has presented an outline of the UK Guidelines and associated issues at workshops for trainee journalists and communication professionals at the European Journalism Centre. Similarly, Peter Vasterman also frequently runs workshops on risk communication. In preliminary discussions with representatives from the EJC, the possibility of extending these opportunities has been mooted.

Section 2

Consultation

2.1 The SIRC consultation

2.1.1 Introduction

The SIRC contribution to the MESSENGER consultation exercise began in May 2005 and continued for approximately 11 months. For the project to succeed and deliver its outputs it was essential that this aspect not only included an appropriate balance of consultees but was also transparent and seen to represent the diverse standpoints in an accurate and balanced manner. The outputs of the process have been embedded fully in the development of the *Guidelines for scientists on communicating with the media* presented in Section 4.1 and elsewhere in the outputs.

2.1.2 Methods and sample

A relevant and useful typology of actors has been provided by the team led by the Evaluation Partnership in their report on scientific advice provision in the area of bio-terrorism¹. The study involved monitoring the role of the media in this context. The authors identified four main groups of actors:

1. Producers – Scientists who produce scientific advice
2. Users – Decision makers
3. Media – Opinion formers
4. Society – Civil groups and organisations, citizens, etc.

There is, of course, some overlap in the context of the MESSENGER project between Users and Society groups. Individual citizens use media coverage of science and technology as a major source of information in their own decision making processes – e.g. in choices of food or whether or not to have their child vaccinated. There is some further overlap between users and producers in the case of organisations that act as 'gatekeepers' for scientific communication and advice – e.g. SINAPSE, AlphaGalileo, etc. The framework, however, has served as a useful basis for ensuring that the consultation process was balanced and fair and seen to be so. It also enabled areas of consensus and variation, both between and within groups, to be identified.

Further consultees were identified through ongoing referral processes. All consultees were invited to nominate other organisations and individuals who could add value to the consultation process. This approach was found to be of significant value in a SIRC programme of research and consultation conducted for the UK Department for the Environment, Food and Rural Affairs (Defra). By this method groups that did not constitute what are colloquially known as the 'usual suspects' were able to make substantial and informative contributions.

¹ Watson, J. et al (2003) *A methodological approach to monitoring and assessing scientific advice provision and impact: A test case analysis of the mechanism by which scientific advice catalyses interaction among societal actors*. Report to DG Research – Directorate C – ERA: Science and Society.

A further opportunity to improve the consultation process and extend its range and depth was provided by the MESSENGER website. Relevant stakeholders were invited to submit comments through an online questionnaire. Facilities also existed to allow participants to submit feedback in the form of free text.

A list of all consultees in this part of the MESSENGER project is provided in the Appendices in Section 6.8.

The conduct of the consultation process was guided by the European Commission document *Towards a reinforced culture of consultation and dialogue – General principles and minimum standards for consultation of interested parties by the Commission*. The overall aim of this document is to ensure that all relevant parties are properly consulted and to establish general principles for such consultation. It stresses the importance of involving civil society organisations in the process. Consultation methods included face to face interviews, telephone interviews, e-mail and contributions to the web site. All of these methods shared the same basic structure and protocols in order to obtain comparable and consistent data. A sample protocol is provided in the Appendices in Section 6.9.

The protocols were developed at an early stage of the MESSENGER programme, although a degree of flexibility was built in to allow for additional areas of focus. Specific issues addressed include perceptions of the frequency and extent of science coverage, the style and technical level of reporting, the balance of actors and stakeholders mentioned in the coverage, the extent to which science issues are editorialised or subject to wider ethical and social debate, perceptions of inaccuracy or distortion, levels of 'hype' associated with science stories, etc. Further areas of focus included the reporting of risk and benefits, public engagement and participation, roles of science communicators, etc.

Face-to-face and telephone interviews were, where feasible, recorded and transcribed. Where recording was inappropriate or impractical, contemporaneous notes were taken. Summaries of the discussions and the main points arising from the consultations were returned to the participants for comments and corrections.

Consultations were conducted with approximately 150 individuals from 20 countries, representing all four groups of actors. A qualitative analysis of the consultations was undertaken with the main output being embodied in the Guidelines, see Section 4.1.

2.1.3 The role of the media

The central role of the media in communicating scientific advice has been illustrated in the *Eurobarometer* survey (52.2)². This showed clearly that throughout the EU people largely learn about scientific innovation and its consequences through the popular media of television and newspapers. More recent *Eurobarometer* findings³ indicate that the majority (59%) of European

2 *Eurobarometer* (December 2003) Europeans, science and technology. 55.2.
http://ec.europa.eu/public_opinion/archives/ebs/ebs_154_en.pdf

3 *Eurobarometer* (June 2005) Europeans, science and technology. 63.1.

citizens regularly (19%) or occasionally (40%) read articles on science in newspapers, magazines or on the Internet.

Perceptions of the way in which science is represented in the media, however, reveal strong divisions of opinion. When asked to agree or disagree with the statement 'scientific and technological development are presented too negatively in the media', 32% agreed, 31% disagree and 30% neither agreed nor disagreed. Data from the same Eurobarometer⁴ also indicated that 82% of European citizens believe that newspaper and magazine reporting of science and technology has a positive effect on society and 86% believe that the same can be said for television and radio reporting of science and technology.

There is a common misperception across many EU member states that the press is the 'enemy' of the science community – always looking for an opportunity to criticise the work of researchers and to hold them accountable for many of our societies' current ills. While such a perception has surfaced during the MESSENGER consultations it is, fortunately, very much a minority view. The more general consensus is that the popular media play a vital role in communicating science to the European publics and are critical to the wider process of dialogue and engagement.

While, as to be expected when seeking the views of such a broad range of stakeholders, there were divergences of opinion, significant areas of consensus were also expressed. The following summary of the consultation highlights these areas.

2.1.3.1 Media on the media – the 'opinion formers'

Remit Impressions of the precise remit of the media, as one might expect, differed considerably between the different actors who contributed to the consultations. While some communication specialists suggested that it is naïve to expect the media to fulfil a broader educative function, some contributors from the journalist community viewed their role as precisely that.

Media contributors were quick to recognise that they play a valuable role in providing citizens with information on scientific research. Furthermore, the accuracy of that reporting was seen as vital to equipping citizens with the knowledge they need to make informed choices. Within this framework, however, representatives of the media community were keen to stress that there should be some onus on citizens to take personal responsibility for the actions they may take as a result of the information with which they have been provided.

"It's perhaps not just the science or the reporting of science that we should question, but may be we should question ourselves. Why should we blame a scientist or the Daily Mail if we choose to get involved with the latest fad diet?"

A frequently cited view was that journalism has a vital role to play in enhancing open debate and public understanding. In this context the communication of scientific research should be viewed not as just a one-way process of information travelling between expert and the public, but as a two-way process in which citizens are then encouraged to question scientists on the basis of the information that they are given.

4 Eurobarometer. (June 2005) Social values, science and technology. 63.1.
http://ec.europa.eu/public_opinion/archives/ebs/ebs_225_report_en.pdf

For many participants in the consultation the media were regarded as 'the method' by which citizens' access to scientific knowledge and advice can be most effectively broadened. Traditionally, it was suggested, some sections of the science community have viewed the popular media with both suspicion and animosity, but the development of more complementary partnerships and meaningful dialogue was cited as a method by which both parties, and citizens at large, could benefit. Rather than being viewed with hostility, journalists, it was suggested, can help scientists distil their research into forms more easily 'digestible' by civil society. There was an appreciation among the media representatives that while many 'brilliant' (science) communicators exist, they are the exception rather than the norm.

"How else are scientists going to communicate with the public? They are not going to do it as part of their regular daily routine. They don't have the time to distil complicated information into a form that most of us find acceptable. Not saying there aren't some brilliant communicators. I know many."

The case of science There was a common perception that while the intention to report scientific news is apparent throughout Europe, this had to be viewed in the context that science is just one in a large number of topics of interest to society as a whole. The European Newspaper Publishers' Association, for example, surveyed its members on behalf of MESSENGER and found broad enthusiasm for science journalism and a belief that science reporting was an important part of their work.

There was concern among some members of the media that implicit within the European drive towards engagement, wider consultation and the promotion of scientific endeavour, is a notion that science is 'a special case'. It was suggested that addressing citizens' knowledge 'deficits' in other areas may arguably be of more tangible benefit than prioritising science.

"There are other subjects which the public are just as ignorant about as science - and it would do them a lot more good to know about; how the State functions for example, how the legal system works...it would make them much better citizens if they knew about how those things work, and I would put them ahead of science."

Accuracy and balance The issues of accuracy and balance in the media's reporting of science and health are hotly contested. There is a consensus that inaccuracies do occur, but there is some division of opinion as to where the primary responsibility for these inaccuracies resides and the frequency with which they happen. There is broad agreement, however, that the potential for inaccuracies is heightened when science stories are covered by non science journalists. This situation is particularly likely to occur when science moves from the 'science' sections of the papers and into the 'news'.

It was recognised that further potential for distortions can arise when science stories are covered by correspondents who specialise in areas outside of science and where the concern with science becomes subsidiary to political, moral or social discussions. Environmental journalists came in for particular criticism in this context.

"The most damaging reporting about science is not done by science reporters, but by environmental reporters. They often appear unconcerned with scientific accuracy. If something is damaging to the environment that fits into the

criterion of what makes a good headline so they apply a set of filters or they evaluate the strength of the story very differently to the way a scientist will evaluate the same story."

The demarcation between experts, pundits and journalists, it was suggested, is becoming less clearly defined as newspapers become increasingly a "hybrid of features, opinion and reportage", leaving the reader a little unclear as to the status of the author. There was some further suggestion that the media is becoming more homogenised across Europe and that this 'massification' is having a negative impact on quality. While some of the views expressed on this subject could plausibly be considered as a little nostalgic-- "it was different in my day" -- there was a perception among some members of the journalist community that a 'cut and paste' ethos exists in modern journalism that does little to inspire confidence amongst citizens or ensure accuracy.

"I come from a print past. Newsrooms with many people. It's a big issue. Fewer people [while at the same time] the newspapers are getting more and more 'massified'. There is a homogenisation of news. This is exactly what a quality newspaper should fight against -- do you want to copy, paste, answer and going home at 7:00 or do you want to stay until midnight and do it a good way? To a certain extent there has always been an element of this but then we shouldn't complain if people are not reading anymore because what are we offering?"

To others, greater access to news was seen as actually improving aspects of accuracy within journalism. There was some indication that a 24 hour news culture has the potential to expose misreporting in a way in which it was impossible to do so in the past. A poignant illustration of this was provided by one participant of the consultation. According to the contributor, when the Titanic sank, The Times initially reported that the ship had struck an iceberg and had beached with no loss of life.

"It took the Times four days to get the story right. That situation is inconceivable now. The stories are now accurate within minutes, certainly hours. You couldn't possibly be wrong for four days."

For some participants within the media, accusations of inaccuracy and imbalance, although familiar, were viewed as largely unfounded. From the perspective of one publisher, accurate reporting of a science story, or indeed any story, is extremely important and the image of the 'brand' can be dependent on it. To some, the provision of information on which citizens can rely was perceived to be an issue of corporate social responsibility. It was suggested that knowingly producing falsehoods would also be commercially unsustainable.

'Duty' Despite there being some scepticism about the application of terms such as 'duty' and 'responsibility' in the world of journalism, journalists and science journalists in particular, frequently used these words when describing their own profession. Inherent in these discussions were the issues of communicating science in an accurate and balanced manner.

"Science journalists must be objective and they have a duty (to) illustrate the results of science but also to explain scientific method / process. Science often proceeds incrementally, continuing step by step. Science always has questions."

If one scientist solves a problem another one will immediately come up with another problem. These problems lead to new questions which may incur new risks. Science may have advantages, but not only advantages."

"[Our] duty is not necessarily to evaluate, but to understand and transfer scientific knowledge. The rule of [our] members is to try to understand, to report objectively as possible and to avoid exaggeration. "

A common perception expressed by participants from the media community was that 'good science journalists' do not necessarily have to have science backgrounds. They do not necessarily have to be 'experts' in particular fields but they do, however, have to be 'expert communicators'.

"They should be good at asking questions and then communicating the answers."

"The question for journalists, whether they are reporting science or international relations, is mastering and understanding the nuances of whatever specialist language they are reporting. You do not have to be a scientist to be a science journalist."

Shared responsibility There was also wide recognition that the practice of scientists 'over-hyping' research results can lead to the generation of 'sensational' reporting. While the media is often criticised for its coverage of science, participants stressed that the responsibility for accurate and balanced reporting lies not only with journalists, but with scientists and intermediaries. Although there are numerous examples of how the media may have hyped science stories and generated unnecessary anxieties in the absence of empirical evidence, respondents cited occasions when controversies or misunderstandings have been generated by scientists.

"Inaccuracies usually occur when journalists shoot from the hip, but scientists can be as guilty of this as journalists. When there is something that is potentially controversial - the stories of science that have been most wrong have not been because of journalistic misinterpretation but have come from the scientists themselves e.g. forensic expert involved in the SIDS court cases."

"The duty of a science journalist is to try and keep the 'real meaning' of the research. Sometimes science researchers can over-emphasise the importance of their findings. This is understandable. They are often enthusiastic about their research but they also need to generate interest in their work to secure future funding."

Journalistic practice and process There are a number of specific journalistic techniques, including the promotion of the dissenting view, issue framing, editorial stance, etc. that were felt to impact significantly on the way in which science is reported across Europe. Communication specialists, however, stressed that these practices are common to many other types of reporting and berating the media for its reporting of science in such ways is unlikely to produce change.

Among representatives of the media, and indeed communication specialists, it was suggested that one of the reasons some science journalists are weary of the 'science communication debate' is that some of the stakeholders involved have a limited

understanding of what journalists do and how they achieve it. Throughout the consultation the notion that scientists needed to become more familiar with the processes of media production is a recurrent theme and that knowing the media is a crucial step in being able to work with it effectively.

Among representatives of the media it was suggested that a deep-rooted suspicion or fear of the media exists and, as a consequence, scientists and many other sections of society do little to engage with it. To work effectively with the media it is necessary to gain a better understanding of its processes.

The following is a selection of comments from media representatives on a variety of journalistic processes.

Differing disciplines. Some respondents suggested that journalism, in many respects, can be viewed as the antithesis of scientific endeavour with vastly differing methodologies, audiences and agendas.

"One of the problems that the scientific community has with the media is that it will make its judgment on the basis of each piece. Academic research details methodology, facts and figures and the conclusion at the end. Journalism works in totally the opposite way. It's a way of communicating information while being aware that people stop reading or have a limited attention span. You lose a tenth of your readership each paragraph. You're putting the information forward at the beginning. In these first paragraphs you are not going to include all the whys and wherefores. They just wouldn't get read. Academic papers do not get read by a wide audience."

Comments were also made that scientists are in some ways more susceptible to misrepresentations or having the intricacies of their work summarised in such a manner; their 'search for truth' being far removed from what they see as the methods and motivations of some journalists.

Language. Among media representatives there was an awareness of the inherent difficulties in translating the specialised language of science into a form that is comprehensible to a lay public. Scientific papers are prepared for a specialist audience, a relatively small community with knowledge of a particular scientific vocabulary. It was suggested by a number of communication specialists that in some instances science can be understood only in its own terms – the 'language' of mathematics, for example.

Interestingly, while some participants regarded this issue as insurmountable, representatives of the media tended to view it as challenging, but not intractable.

"The challenge is bridging the gap between the way the expert writes and what the non-expert can understand. This is hard to achieve and resource intensive; you need people who are trained in communication and sub-editing skills, who are comfortable with heavy scientific material and who are able to translate it into an accessible form."

Time constraints – deadline syndrome. The time constraint on journalists was seen as an issue that few other professions experience and, as some of the media representatives suggested, few are aware. As one source said, journalists rarely have the luxury of preparing articles days in advance, let alone weeks. There was some

appreciation among the participants that time pressures may not always allow 'rigorous' fact-checking and that on occasion this can lead to inaccuracies. It was felt, however, that a greater appreciation by scientists of journalists' working conditions in this context could be very beneficial in helping to reduce the potential for misrepresentation. By releasing scientific information in a controlled manner, for example, using briefings and embargoes, journalists would have more time to contact the source or press office for any necessary clarification.

Headlines. Headlines were perceived by all groups of consultees to be extremely influential on the public's perception of a story. A difficulty arises for headline writers, who are usually not the journalists responsible for the article but sub-editors, when trying to balance the need to generate interest in the story while simultaneously providing an accurate indication of its content. The headline is the 'window' on a story and can often determine whether the reader proceeds any further. Again, an understanding of this process was thought to be beneficial in helping to counter inappropriate headlines.

"It would be wrong to deny that perhaps headlines on occasion might push the conclusions too far. The headline, in the end, is a précis – the ultimate précis. It would be useful for scientists to indicate/consider some of the headlines they might wish to avoid."

"Misunderstandings can occur between the title of papers, their contents, and news which can then result in headlines like; 'new drug for cancer.'"

Similarly, the sub-editor's role can also extend to providing captions for illustrations and graphics. There was some indication that an awareness of this aspect of their role would also be beneficial when providing journalists with accompanying materials.

Editorial. Those more familiar with journalistic practice recognised the significant role that editors play in determining the style and message of a science story. Editorial policy, it was suggested can 'set the agenda'. While it may not necessarily dictate to citizens what they should think, there was a perception that the editorial process may exert an influence on what citizens think about.

From within the journalist community there was an implicit understanding that editorial process and policy play a crucial role in getting accurate information 'into the hands' of people so they can make better, informed decisions. There was, however, recognition that the 'news value' of a story may be determined by criteria which do not wholly support this outcome. The newsworthiness of a given issue, it was suggested, can be subject to fashion. This not only influences the prominence of a particular topic, but also the manner in which it is reported.

"At the moment you can find pages and pages on diet and exercise. The editors at some stage are going to have to decide - are we going to have the latest statistics on diet and weight as a straightforward news item, or are we going to cross reference to pieces about diabetes and other diseases across the ages."

Media participants suggested that while many sections of society are quick to criticise the editorial 'choice' exercised by some sections of the media, these choices are rarely made without considerable thought.

"The relationship between society and the media is paradoxical – as a society we are quick to criticise the media, but often it functions as our primary source of information. Editors rarely make decisions without considerable thought."

Sources. As a number of participants suggested, the need to thoroughly check one's sources is not a rule that is confined to science reporting, but one that should apply to all journalism. It was perceived to be relatively straightforward to check the status of scientific sources – whether the research has been peer reviewed for example – but this sometimes escapes the attention of a journalist unfamiliar with the process.

"I think that the journalists need to be aware of the different status of the sources that they are using. For example, when [non peer reviewed] science comes out pushed by the sponsors Scientists of course appreciate the difference between peer reviewed and non peer reviewed science, but it might be a little bit much for the general journalist. How exactly are they to question it...unless someone has told them that they need to ask?"

There was a perceived need for journalists to evaluate their sources in terms of scientific evidence. Outside of the journalism community there exists a substantial body of criticism, from scientists, policy makers and some representatives of civil society organisations, that the media give disproportionate weight to particular viewpoints. An awareness of how scientific evidence is created is an important concept for all science journalists.

"In the GM debate there are those who are intellectually honest and prepared to work within the lines of argument which are compatible with the scientific evidence and there are those who will appear to ignore the scientific evidence and build up their own hypothesis. In this situation it is important that science journalists have some concept of how scientific evidence is created."

A number of journalists suggested that for the majority of European science writers two 'bibles' or 'global sources' exist – *Science* and *Nature*. There was a concern that one of the consequences of this is that European science is under-represented in the European media when compared to coverage of American research. News agencies are, it was suggested, becoming increasingly important as a source for European science journalist.

Opportunities. It was a common perception that across Europe permanent posts for specialist science journalists are relatively rare. This has a number of consequences that can potentially affect the coverage of science reporting. Smaller, regional publications are less likely to employ dedicated science correspondents. This can result in science reports being generated by non-specialist practitioners or journalists that are, as a matter of course, required to write on a broad range of topics. The lack of permanent opportunities has also resulted in many science journalists in Europe having to work on a freelance basis. There was some suggestion that the nature of this type work with its inherent need to 'sell' stories may increase the pressure on freelancers to produce the 'spectacular'.

Competition. There was a perception among some media producers that citizens' access to accurate information is becoming increasingly compromised with the rise in popularity of new media. While checks and balances exist within publishing

organisations, large internet organisations are providing access to news, opinion and science over which they exercise little editorial control.

"On the one hand you have an edited selection of news and information from publishers and, on the other, entry into a vast array of information which has not been necessarily checked for accuracy. In broadsheet newspapers you will be given detail and context and readers will usually read more than three paragraphs; in television news you get a story without any deep degree of analysis and if you only read Google headlines you're only ever going to see the top line spin."

Advice. There was a perception among non-media participants that journalists do not always consider the impact their reports may have on citizens. One piece of advice emanating from the profession itself was that there is a need for journalists to address precisely this issue. Again, contained within in this advice, was the caveat that existing scientific evidence should exist to support the position taken in an article.

"When reporting, journalists have to ask themselves how their reporting will impact on people's lives. What is written has got to be compatible with the current state of scientific knowledge. If you say something could be a cure for cancer there has to be reasonable grounds for thinking that and it's not just one scientist saying it."

Initiatives. The working practices of scientists and journalists, as one consultee suggested, 'couldn't be more different'. Widespread support was expressed for initiatives that bring journalists and scientists together, particularly those aiming to instil a greater understanding of each other's working environments and disciplines. The following examples were referred to during the course of the consultation exercise.

- ▶ One of the *Unione Gionalisti Italiani Scientifici's* (UGIS) most important roles is connecting people in the science community with young researchers. UGIS has links with the European Journalism Centre (EJC) and the Joint Research Centre (JRC). It strives to facilitate discussions and exchanges of opinion between scientists, journalists and researchers. In the last year UGIS has awarded 20 grants to young Italian journalists. It organises and funds study trips abroad, with groups of 15-20 science journalists visiting the US, Israel, France, Sweden, Finland, and joint research centres in Europe. Annually it funds two science journalists to travel to Harvard Medical School (in collaboration with the Giovanni Armenise Harvard Foundation) allowing them to 'get fully immersed' in science communication.
- ▶ In France an exchange scheme is organised by the Association for Scientific Journalists for the Press (AJSPI) between researchers and journalists. The initiative, which has the support of the French Research Ministry, attempts to foster a greater understanding between researchers and journalists. Participants of the programme spend a week in an 'alien' environment - journalists in laboratories, scientists in media organisations - promoting an appreciation of each others working processes and environments.
www.ajspi.com/echanges2005.htm

- ▶ In the UK the British Association for the Advancement of Science (BA) has been running Media Fellowship Schemes since 1987 allowing researchers to gain first hand experience of the workings of the media through summer placements with print, broadcast and online news producers e.g. Nature, BBC News Online and BBC Television.
www.the-ba.net/the-ba/ScienceinSociety/_Schemes_and_awards/MediaFellowships/
- ▶ In Portugal, the daily publication *Público* has recently introduced an initiative inspired by the BA's scheme which introduces scientists to the rationale, culture, skills and methods of scientific news production. It is envisaged that through a series of 12-week secondments the enterprise will not only help to improve the quality of science communication but also help to promote the profile of research. www.cientistas.publico.pt
- ▶ In Germany, the European Initiative for Communicators of Science (EICOS) offers journalists and science communicators the opportunity to participate in laboratory research with the aim of facilitating dialogue: "...in which on the one hand journalists might gain a deeper understanding of the scientific endeavour and attitudes of scientists, while scientists on the other hand learn how science is reported and what influences and constraints shape the media content."
www.eicos.mpg.de
- ▶ In the UK, the Science Media Centre holds News Media Events. The purpose of these is to provide a 'beginners guide' to the way the news media works and is aimed at scientist who are considering doing media interviews. Contributors to the sessions include journalists, scientists and press officers.
<http://www.sciencemediacentre.org/>

2.1.3.2 Other actors on the media **Journalistic practice and process** The actors from outside the media were in broad agreement with their journalist counterparts that the most significant potential for inaccuracies arise when science is covered by non science journalists. There was a suggestion that it is the 'un-researched and un-measured' approach to the production of science stories that is of most concern. There were, however, significant differences of opinion as to the potential impact that non specialist reporting could incur.

Some actors, most notably decision makers and producers, perceived lack of scientific knowledge inherent in non specialist reporting as being extremely problematic on a number of levels. Firstly, a lack of scientific knowledge can affect the accuracy of scientific reporting – superficial understanding of the scientific research and method resulting in perfunctory coverage and a limited level of analysis. Secondly, and perhaps of more concern in the context of impact, was the suggestion that scientific knowledge deficits among non science correspondents are often disguised by moralism and ethical conjecture. In both instances, citizens' access to accurate information was felt to be compromised.

There was also a perception among this group of actors that non specialist journalists are less likely to distinguish between their sources, whether these are independent, governmental, non-governmental or others. Furthermore, it was proffered that they are also less inclined to validate or verify their sources; a pre-requisite of 'good science journalism practice' cited by respondents in the previous section.

There was also a considerable amount of support among the other actors for the notion that 'over hyped' press releases from scientists and press offices compound the potential for inaccurate reporting of science issues. While there was a perception among some producers that scientists are 'used' by the media and often fall foul of it, other actors were keen to point out that this process 'works both ways'. Scientists also use the media for public relations and sometimes this can be to the detriment of scientific accuracy. One source cited a statement made by the head of the American National Cancer Institute in which a 'promise' was made to find a cure for cancer by 2015. This coincided with a request for a twofold increase in its budget.

"This is politics and has nothing to do with reality."

Extra-media participants also empathised with journalists' view that adapting the language of science into more accessible forms can be problematic. As noted in the previous section, however, actors from outside the media were more likely to view this issue as insurmountable.

Time constraints. From outside the media community there was also some recognition of the time pressures on journalists and a concurrence that these have a potential to significantly impact on the provision of accurate scientific advice. Once again it was deemed essential that the science producers are aware of these constraints and are able to adapt accordingly.

"People need to understand how a news room works and how a story gets into print/ broadcast. You can never underestimate the speed at which this needs to happen and the pressure that people are under to get copy."

Headlines. Headlines were perceived by all groups of actors as being extremely influential on the public perception of a story, in line with the views of journalists themselves noted above. While journalists recognised that on occasion headlines might push the conclusions a little 'too far', opinions from actors outside the media were significantly more critical. There was a perception that the use of pejorative language further has the potential to mislead or misinform the public. Terms used by journalists when discussing headlines included 'précis' and 'synopsis'; terms used by other actors included 'lurid' and 'screaming'.

"For as long as the breadth of any argument gets subsumed into a few screaming headlines, then it is difficult to have a balanced discussion. The complete issue is not explored."

One perception was that while some justification may exist for even 'some of the more sensational' headlines, these impact on wider debates of moral and ethical implications, risks and benefits.

"Regarding some of the more sensational headlines that appear in the press. Some of them actually are not as silly as you might think, but they don't necessarily help the debate to be a mature one. The press itself has an obligation to take a more responsible approach to its role in producing a 'risk-mature society'."

The most notable divergence of opinion between media and non media participants regarding the processes and practices of journalism was with the issue of polarised reporting.

Polarised scientific reporting One of the main criticisms of the media that was cited by the participants outside of the journalist community is the frequency with which the media constructs polarised arguments in its coverage of scientific research. There was concern that too often scientific reporting, particularly of the emerging sciences, is prone to presenting the extremes of scientific fact to enhance the appeal of a story, but as a result the public's view of the scientific debate can become distorted. This sentiment was expressed most by decision makers and scientists themselves.

"We have become increasingly aware over the recent years, particularly with the growth of the more controversial areas of science, such as biotechnology, nanotechnology, stem cell research, nuclear energy etc., of the divergences between scientific fact, as posited within the scientific arena and scientific fiction as suggested by the press and non-governmental organisations."

There was a perception that when covering science issues journalists tend to work within quite rigid frameworks – presenting science in the context of either 'the great march of scientific progress' or 'science out of control'. Little middle ground was perceived to exist.

"The media tend to present scientific findings at two extremes; either it's a miracle cure or the end of civilisation as we know it."

There was a perception that the media's construction of these absolutes make discussions in the media, particular in the context of the more controversial technologies, quite challenging. There was an impression that what makes good media doesn't necessarily make good communication.

"Take GMO as an example, there are undoubtedly risks associated with GM crops, but there are also significant benefits to be had. Its not that all GM is good or bad; some of it is good and some is bad and some of it we don't know yet. But it seems that you can't have that kind of discussion in the public domain through the media very easily."

Among both media representatives and communication specialists there was some recognition that producers need to break free of these constructs; they can, it was suggested, be quite limiting for journalists. Scientists' attempts to communicate the less remarkable findings are not always compatible with the media's commercial agenda.

"It would be great if we could deal with issues which are not always at the catastrophe or eureka level, but instead those with more modest achievements. However this just doesn't sell newspapers."

The manufacture of a polarised debate, it was felt, presents further difficulties by often providing a platform from which the views of 'mavericks' can not only be aired but also given equal weight with existing scientific consensus.

"The tradition is to seek out dissenting views on every issue. Unfortunately, this technique often creates the misleading impression that minority views have the same weight as the prevailing view."

The promotion of the dissenting view, however, is not confined to science. As communication specialists noted, it is a familiar journalistic practice and is often used in the coverage of politics, religion and even sport. While familiar, however, some producers suggested that this style of 'adversarial journalism' is not the 'best approach' to science journalism and in some respects is incompatible with the provision of accurate information on which citizens can then make informed choices.

This position, however, was strongly countered by other actors who argued that it is perhaps unwise and unhelpful for producers to expect the media to grant science any special dispensation in this context. The media is not, and neither should it be expected to be, a PR machine for scientists. Complaining that the maverick view point is likely to receive undue attention, as one contributor noted, is rather missing the point, and missing the argument:

"If scientists and the holders of the orthodoxy continue to wring their hands about how mavericks get this kind of attention, they are simply going to miss the argument. They have to actually engage with the argument"

Accuracy and balance. There was some support for the notion that aims to 'fix' the media are perhaps politically misguided. Purveyors of specialist knowledge, it was suggested, could learn much from the successes that the media have in engaging the public. Citizens' suspicion, and in some cases rejection, of scientific innovation may have less to do with their distrust of science per se but may be more indicative of broader failures in communication.

"Within the world of science communication and perceived problems of accuracy and balanced reporting, it is important to determine who is misunderstanding who among the scientists and journalists. It would be hugely beneficial for press officers and scientists to understand the media and to recognize that they're not going to be treated any differently to anybody else. We need to convince scientists of that, we need to convince scientists that just because some people don't like some issue in science, they aren't necessarily anti science."

Media influence Many consultees were of the opinion that the media plays a significant role in shaping a civil society that is often wary of scientific innovations, particularly in the more controversial fields of science. Consistent with the view expressed by journalists, extra-media actors also recognised that while complaints concerning the media are common, broader understanding of its processes is limited. It was repeatedly recommended that scientists would benefit greatly from developing an awareness of some of the intricacies of the media production including the ways in which stories are selected, filtered and prioritised.

While a consensus existed that the media have an impact on citizens' attitudes to science and technology there was some divergence of opinion as to how much influence they actually exert. Other factors undoubtedly come in to play. There was a perceived need, for example, to consider the pre-existing levels of knowledge among the population before making generalisations about the impact of the media

on public attitudes. It is rather patronising, perhaps, to suggest that citizens simply believe what they read. A variety of other factors were cited by the participants that have the potential to impact on public's perception and acceptance of scientific innovation and advice.

Others actors suggested that while citizens' perception and acceptance of science and technology can be influenced by their own personal experiences, the media may have the power to override this.

"A good example is an analysis of the [UK] National Health Service which showed public perceptions to be based less on personal experience and more on the tone of media coverage. People do not necessarily take their own experience as being typical, but more what the media portray as typical."

Levels of acceptance can depend on the particular area of science being reported. Certain sections of civil society, it was suggested, are more susceptible to specific 'triggers'.

"The mass media have a very important role in connecting the public with scientific expertise. They are a focal point for the public's receipt of science news. Health is the main area that concerns people and where people are arguably the most susceptible to misinformation."

A number of actors suggested that citizens may actually remember very little of what they read in the media. There is a perception that a process of distillation occurs whereby publics condense complex information into simple 'good/bad, yes/no' scenarios. Judgements may be made on the basis of prior knowledge and the affect of this process can be cumulative.

"People with inherent concerns about their health may be more vulnerable and liable to act on the basis of stories in the mass media."

The potential for the media to be a source of misinformation, misunderstanding and 'dis-education' was recognised by some actors. This was felt to be particularly the case in the context of reports on food, health and diet. The provision of partial information in this context was perceived as being as potentially damaging as scientific inaccuracies.

The issues of nutrition and diet-related disease were cited quite extensively during the consultation process. There was a consensus that the prominence of these topics in the media has increased considerably in the recent years. While some actors suggested that the increase in coverage is media-led, others were of the opinion that it reflects a broader societal awareness of diet, health and nutrition.

Policy. There were a number of issues that arose in the consultations with extra-media actors that surfaced less in discussion with journalists and publishers. Among these was the issue of the media's influence on policy. It was suggested that politicians start to pay attention when science makes the news; the media drives public scientific debates, and the ensuing public debates then drive the political ones. This is a view shared by some decision makers. Moral deliberations, in particular, played out in the media may affect policies put in place by governing bodies that may be swayed more by ethics than the science itself.

"In this respect there is a need for balanced science journalism."

Accountability. The issue of the media's accountability, or perceived lack of it, surfaced in discussion with stakeholders. While checks and balances exist within the science community, most notably peer review, there was a perceived lack of opportunity to redress inaccurate or distorted reporting. Means of redress do exist but they were felt to be significantly under-used.

A list of European Press Councils, who can advise on how to seek redress is provided in the Appendices in Section 6.11.

Advice. Various pieces of advice for journalists were offered by the participants to address some of the issues raised above.

"In the training of journalists, emphasis should be placed on the large proportion of non-specialist journalists who have to deal with science-based risk issues when they are not science specialists. They are a more important target group and should be engaged in the discussions about how to deal with risk percentages or proportions etc."

"University and other research institutes are producing an endless stream of press releases to hype their work and justify their funding. Journalists need to be able to distinguish between what is good accurate research and what is not. More information does not necessarily lead to better communication."

"The scientific maverick with an alternative opinion will always be heard by journalists. It is important that these opinions are validated, but the time pressure under which journalists work does not usually allow this. Journalists need to check their sources. In this sense, science stories are no different from any other field."

"Journalists should make clear the information sources they have used in reporting. A discerning public needs to be able to distinguish between sources to enable informed choices regarding scientific outcomes."

2.1.4 Science

Throughout the consultation there was a consensus that top down approaches to the communication of science and scientific advice are no longer tenable. The notion of 'Science in Society' which is at the heart of the European Commission's science policy was fully supported by the contributors to the MESSENGER project. Participants expressed the need for 'joined up' initiatives that seek to promote connections and networks.

"Science, media, politics and industry are increasingly looking to make connections and coalitions. There is a growing understanding amongst these groups that increased public understanding and acceptance will rely on 'joined-up' PR and communication initiatives."

There was a consensus among the science community about the inherent need to participate in two-way communication strategies involving dialogue and debate. Implicit within these models of communication are considerations of not only

applications of research but also its implications. As part of this process, however, it was felt that some scientists needed to become more reflexive and receptive.

"The scientific community can be un-reflexive and defensive against institutional changes wrought from outside. There is a tendency to try to subdue critics, in order to maintain their own autonomy. This "Republic of Science" does little to help the communication of science."

Large science institutions were generally perceived to be the drivers in this process, having both the requisite funds and motivation. While there was an increasing awareness of the need to address social and ethical frames surrounding discussions of scientific research, there was still felt to be some resistance to engaging with the public on these issues.

During the consultation there were suggestions that citizens still perceive the domain of science as being somehow aloof from society with scientists residing 'in their towers'. One of the consequences of this was perceived to be the exacerbation of fear and mistrust among the public. The 'overarching paradox of a growing reflexive' civil society, as one participant remarked, is increasing scepticism and mistrust of traditional voices of authority. While Europeans' faith in science remains high, it is not unconditional. Along with a high level of public trust in science, it was suggested, there is also a:

" concurrent unwillingness to accept the risks of the application of science in modern technology."

"You cannot divorce public attitudes to science and technology from the way in which people have become generally more mistrustful of all forms of authority and authority figures."

Furthermore, there was a belief that the majority of public opinion still considers science to be 'owned' by scientists and universities. There is a need, as one contributor suggested

"To try and shift the ownership of science to society at large."

2.1.4.1 Barriers to communication

There was a widespread perception among the participants in the consultation that antipathies continue to exist in some sections of the scientific community towards communicating with the media. This aversion stems from a suspicion of the media and unfamiliarity with its processes, but also from the legacy of a previous era in which science 'popularisation' was regarded as contrary to the prescribed 'standards of conduct' (Nelkin 1995).⁵ The consensus, however, was that this situation is changing and, indeed, has to change further if we are to progress towards meaningful participation and engagement.

"The attitude of scientists toward communication is changing. The majority of scientists do not realise how important these issues are, and few structures exist

5 Nelkin, D. (1995) *Selling science, how the press covers science and technology*. W.H. Freeman and Co. pp. 150.

in Italy, at present, to help scientists to communicate. There has been an historical precedent that communication with the media was a negative thing and even gaining qualifications and doing courses in this area was also frowned upon. Scepticism existed that if scientists were spending more time with the media they were spending less time on their research or have some other agenda. This is changing - but slowly."

"Addressing that kind of mind set where there isn't time and space for social, political, ethical or other kinds of issues to be discussed within conventional science education, is a big challenge."

The reluctance on the part of some scientists to communicate to wider publics, it was felt, necessitates the involvement of third parties in the process. These intermediaries can play a critical role in the dissemination of scientific knowledge. For further opinions on this issue see section 2.1.5.

"Most scientists, when communicating their work are not necessarily interested in the public; they are communicating science to scientists. Few of them are interested in communicating their work outside their field. So in a sense what is required is another intermediary who will communicate this scientific knowledge to the public to provide them with accurate information on which they can make informed decisions."

For some contributors, the notion that scientists should engage in the wider aspects of science communication including the social, political and ethical aspects of their work is problematic. Although there is a need to address these issues it was suggested that perhaps scientists may not be the best placed, or qualified to do so.

"It is not legitimate to expect scientists to address the full implications of their work, and particularly to the express their views on those implications to the public. They don't necessarily have the competencies to do so."

While scientists may not always have the requisite skills to engage on broader issues of ethics, morality and controversy, the notion that they are unaware of these was perceived, by some, to be naïve. One of the challenges of science communication in the new era of dialogue, it was suggested, is to make scientists aware that they need to engage and be prepared to listen to the views of non 'experts'. While perhaps lacking specialist knowledge these voices are none the less legitimate.

"It's totally implausible that scientists are completely unaware of the potential complicated and controversial issues related to a topic when they embark on a piece of research. It is important however to engage research scientists with the notion that these kinds of questions are legitimately part of what the public will expect them to be able to deal with."

2.1.4.2 Science communication and the media

Communicating with the media was largely perceived to be a two-way process and one that benefited greatly from a clear understanding of the requirements of both parties involved. From the scientists' perspective it was felt necessary to establish a clear and concise message with the aim of providing accurate and balanced perspectives on scientific news, enabling readers to make informed choices regarding scientific outcomes.

"In the world today you have to be media friendly to be able to communicate to journalists, ordinary citizens and politicians."

"The aim is to strike a balance between overwhelming readers with complex detail, to which they cannot readily relate, and providing insufficient facts to enable a story to be sensible and accurate."

For some of the contributors, this 'balance' was seen to be extremely hard to achieve. Reconciling the fundamental differences between the dialogue of science and everyday language used by citizens was felt to be immensely challenging.

"Scientists work and express themselves in a different language to other experts. It is not the case that you can adapt the language of science to newspapers."

One of the most frequently cited motivations for the communication of science through the media was to provide citizens with accurate information. There were concerns, however, that when attempting to 'attract' the media it is often difficult to strike the right balance between the provision of "scientific fact and turning it into an uninformative event". There was a suggestion that while scientists should work with the media, they should not necessarily 'bend over backwards' for them.

"Training researchers/ scientists to communicate is now on the Danish political agenda. Its not enough to tell people to disseminate, to use the media, and be willing, the problem is that you have to be trained to communicate, without compromising the work."

As noted in the previous sections there was a consensus that fundamental to the development of meaningful dialogue between scientists and the media was the need for scientists to gain a better understanding and knowledge of its nuances.

2.1.4.3 Advice A significant amount of advice on communicating with the media was proffered to scientists from all groups of actors. Some contributors, for example, suggested adopting 'media tricks' like using word play in press releases.

"Plays on words are always effective, for example a story on the falling numbers of bumblebees was entitled "Plight of the Bumblebee." This got national TV news coverage. The story was sold on a catchy headline, but the science behind it was good science."

There was a popular consensus among the science community that the ways in which scientific information was 'packaged' has a significant impact on its public reception. In the context of the media's reporting of scientific innovation and advice there was a belief that well presented information, clear messages and the provision of context play a role 'in counteracting scientific scare stories found in the media'. Furthermore there was a perception that journalists were 'more willing' to follow science stories when scientists are able to communicate in an 'understandable way'. This was felt to be particularly relevant when dealing with statistics.

The importance of 'knowing the media' was stressed on numerous occasions. By simply reading the papers, it was felt, scientists would be better placed to identify and target the most appropriate outlet for their work; whether a particular publication or specific correspondent. Some science institutions even tailored press

briefings for particular publications, wording the releases in a way that was seen to be compatible with the 'house style'.

There was some suggestion from media contributors that specialist science journalists are 'desperate to hear from the scientists'. Like other journalists, they too have to work to deadlines and frequently have to compile regular columns. As one media representative suggested, however, it is important to be regarded as a reliable source. Nurturing relationships and networks was felt to be critical to the wider process of promoting dialogue and trust between journalists and scientists. Participants provided a number of examples at local, national and international levels, where these connections have resulted in fruitful and enduring relationships.

The majority of scientists, it was suggested, have never been involved in writing to weekly deadlines in the same way that journalists are required to do. It was felt to be important for scientists be aware of the 'deadline syndrome' and also the fact that different media work to different deadlines. Releasing scientific information in a controlled manner – briefings and embargoes – was recommended as an effective method of communication which gave journalists time to check facts and ask questions and was thought to be a useful way to avert inaccuracies.

There was a perceived need for science to develop a more personable and human approach. There was a suggestion that the scientific establishment is still regarded by some citizens as being unapproachable and austere, perpetuating the notion of science residing 'outside' of society. This 'detachment', it was suggested, did little to foster trust. Within the science community there was also some recognition that more personal methods of communication and engagement can be extremely 'powerful'.

"A scientist talking to the public and communicating his/her enthusiasm for science and research is a far more powerful medium than even the most informative website."

- 2.1.4.4 Media 'savvy'** While there was a consensus that there is a need to foster media 'savvy' among scientists, there were divergences of opinion as to what that entailed. Some participants suggested that it is relatively straightforward to 'media train' scientists, particularly those with existing presentation skills and lecturing experience. Removing the barriers and removing 'fear of the media' were, perhaps, the only hurdles to overcome. For other participants, however, the new era of dialogue and debate warranted a considerably different approach, involving an awareness of social as well as epistemological considerations. Training scientists in media savvy in this context, it was suggested, involved more than just knowing how to write a press release or how to be interviewed.
- 2.1.4.5 Continuous dialogue** It was stressed by a number of participants that the dialogue between scientists and other actors has to be continuous. It was deemed no longer appropriate for scientists to only communicate with the media 'when called upon to do so' as a 'fire-fighting' exercise – when things go wrong or simply as a means of self- or institutional-promotion.
- 2.1.4.6 Quality and quantity** A number of contributors from the science community expressed concerns about the perceived European 'communication drive' and its 'preoccupation' with increasing the profile of science in the media. It was suggested that the belief that:

'if you don't make the papers you don't exist' was perceived by some actors as being misguided. Caution has to be exercised, it was suggested, and the success of communications strategies should not be assessed on quantity without regard for quality.

Rather than being concerned with the quantity of coverage, it was also suggested that scientists should focus on targeting the 'right kind of audience' for the story. An awareness of the media in this context is essential – familiarity will help ensure that a particular piece of research will appear in the most appropriate publication.

2.1.4.7 Young people and science

A frequently cited fact is the decline of interest amongst European 'youth' in studying science. Addressing this issue was perceived to be one of the main reasons why scientists should engage with civil society. There was a suggestion that the science sections of newspapers are increasingly being perceived as a kind of ghetto." Knowing and working with the media, and being identified with the appropriate channel of dissemination, was seen to be crucial to engaging younger generations with science.

"Press officers should be concerned with targeting the right kind of audience for the story. For example 9 seconds on the commercial radio station could actually be a lot more important than the five minutes on Radio Four because may be getting the youth market."

There was a perceived danger of developing a science communication 'elite'. While the 'publish or perish' ethos remains in some sections of the science community, increasingly there is a small group of scientists who have a monopoly on communicating with the media. There was a suggestion that these 'usual suspects' were often senior representatives of academic institutions or research organisations and were perhaps not best placed to engage with young people. There was a need not only to encourage younger generations to become involved in science but also to be involved in communication, dialogue and debate.

2.1.4.8 Commercial Agenda

There was a common perception that science has become increasingly commercial. This impacts on both the ways in which science is conducted and on areas of research interest. An increasing commercial agenda was also felt to have a negative effect on openness and transparency and impacted on the 'philosophy of science'.

"Much science is done for commercial reasons and on the commercial side in the context of a commercial agenda. This has meant a considerable loss of free flow of information among scientists which was supposed to be one of the strengths of science"

"There is an element of conflict between different 'scientific actors' that can hinder science communication. Scientists working at academic institutions, working to produce knowledge under the rubric of public good and open access, are now increasingly having to secure funds, influence policy and demonstrate commercial applications. In short they are having to produce economically valuable knowledge. This works against the philosophy of open (free) access for all to the products of scientific research. Capitalism and 'marketisation' have meant that everything is now assessed by its potential commercial value."

"The notion that science is an uninhibited search for truth is still held too dearly by many in the scientific profession, but is also totally unrealistic and precisely because the competition for funding has become more and more intense. People are choosing to do certain kinds of research because the opportunities are greater in a particular field."

2.1.5 The role of press officers

There was broad consensus about the significance of the role played by press officers and intermediaries in the communication of science. A frequently voiced opinion was that the best scientists were rarely the most effective communicators.

Many press officers have journalism or public relations backgrounds and often have useful insights into the way in which the media operate. The press officer role, however, was perceived to be under-used and under-resourced throughout European research institutes and academic departments. It is a role that was perceived to be growing in significance, influenced in part by the American model of science dissemination which is heavily reliant on public relations.

"The ideal solution would be for science organisations (departments, research institutes, etc.) to set aside money for really good, well staffed and well prepared communication officers. For example, the Max Planck Genetic Research Institute has a good communication department, but it is not nearly large enough to cope with the volume of research being conducted".

To achieve this status there is a perceived need for a more strategic use of communication funds by research departments.

"Many university departments do not spend their communication budgets strategically, with the result that much of that funding is wasted."

"It annoys me because they get all this money and they don't spend it. Or they do a couple of lectures at a local school or something and call it public dissemination."

It was suggested that aggregation of funds could be achieved through better dialogue between the science departments of universities and the institutions' press offices. There was a perception that a lack of trust in press officers exists among science researchers and only through more constructive engagement can this trust can be nurtured. An essential element of a press officer's work, particularly within publicly funded institutions, should be to promote internally, to the scientists, an awareness of their skills and the services they provide.

"To tackle this issue of engagement, press officers visit university departments from time to time to have informal chats with scientists. This often results in stories that the scientists did not regard as being newsworthy."

A common perception was expressed during the consultation that scientists are not always the best placed to judge the newsworthiness of their research. In this context press officers can play a valuable role; perhaps helping scientists to explain technical terms and focus on the potential impact rather than methodological minutiae.

"Well-trained media and press officers are vitally important in promoting accurate and balanced coverage of science stories. A well resourced, experienced press officer can perceive the way in which a story first drafted by a scientist or administrator might play out."

"Scientists are not thinking 'what are we trying to do, what are the scientific outputs here, how do we translate an academic journal into journalese'. This is something press officers can do and are actually willing to do."

There was a concern, however, that the current quality of outputs from press officers are variable and in some instances 'poor'. There was a consensus among all stakeholders that over hyped press releases emanating from intermediaries - within both the public and private sectors - had a detrimental impact on the perceived standard of science coverage in Europe. Furthermore, there was a common perception that European research, when compared to research generated in the US, was under-represented in European media. As one respondent remarked

"As a [European] science journalist, I know more about NASA than I do about ESA."

A number of these issues are currently being addressed by the Communiqué initiative which seeks to encourage the development of the press officer role in science departments and institutions across Europe. This has been welcomed by the European Commissioner Janez Potocnik as a "valuable input towards improving communication on science in Europe." SIRC is part of the Communiqué development group, which will enable further dissemination of the outputs of MESSENGER and assist in its enduring impact.

2.1.6 Engagement

Among the contributors there was a perceived need for a more collective approach to scientific policy making, involving all relevant stakeholders. A more democratic model of science, embracing public engagement and participation was felt to empower citizens to make choices and decisions based on knowledge.

"There are some basic structures which could be put in place in order to enable the relations between civil society, the scientific community, the press and the political arena to become less unilateral, fragmented and instead more dialogical, transparent and fluid."

While there is a drive towards more engagement across Europe, it was suggested that areas exist where the communication between scientists, journalists and the public on scientific issues could be enhanced though this process, particularly in the the more controversial and emerging areas of science – stem cell research, biotechnology, etc.,

2.1.6.1

When to engage

What stage of the research process There was a consensus among the participants that engagement with the public should take place early in the development of a scientific process. Early engagement and communication strategies were seen as critical, not only to the wider dissemination of science but crucially to its credibility in the eyes of the public. Delaying engagement, it was widely felt, could increase mistrust or generate false expectations. There were some

divergences of opinion, however, as to exactly how early dialogues with citizens should begin.

"Public engagement in the scientific process should not begin until the applications of the science are being debated."

"The point at which the public should become involved in research and development is when genuinely 'blue skies' research begins to crystallise around particular possibilities and aspirations and visions of how it is going to be used."

"In terms of new scientific developments, engagement with the public should begin almost before the research starts."

"There is no right point at which a scientist can think well I have sufficient knowledge and information to be ready for the public domain, because that encourages a climate of secrecy and false expectations."

There was a perception that previous failures by scientists to engage with civil society had created a climate of suspicion. Biotechnologies were frequently cited in this context.

"It is clear that some of the prejudice that society has towards science – GMOs which might be correct – typically there is some rationality behind this. Some fear that new technologies might lead to change that is irreversible. Much of this is the fault of the scientists. You cannot pretend to communicate the product of research after the research has been done, you need to start communicating before – after, you may no longer be credible in the eyes of the public."

A number of participants suggested that the approach in the United States towards engagement is, perhaps, more 'enlightened' than in some European member states and that mechanisms, both financial and institutional, are more developed in the US to facilitate this process.

"In the US grants for research, particularly in the life sciences, include budgets for communication at an early stage in the life of the project. This is very important. Scientists need to be taught the relevance of this issue and skills for interaction with the public. They have a duty to explain and alleviate public fears and concerns."

There was wide spread support, however, for the notion that the situation in Europe is improving in this regard; increasingly the more 'progressive scientific institutions' are recognising the need to promote public engagement and transparency.

"The issue should not be a question of whether or not public engagement takes place, but how it takes place and with whom."

While engagement with civil society from an early stage in the research was regarded by the overwhelming majority as essential, it was also felt that it was necessary to make the current status of that research clear. There was a consensus that making unsubstantiated claims too early in the life of the research can fuel both inaccuracy and unrealistic expectation.

Who defines the stage Identifying the right time for engagement was perceived to be difficult issue, but one in which scientists had a crucial role to play.

"They [scientists] are the first to see the potential applications and possibilities of any research. In a general sense they should be asking what visions of the future do we hold and how might this science become integrated."

Problems in identifying the stage In the field of emerging technologies there was felt to be a greater drive and enthusiasm for engagement and a preparedness to discuss ethical and social implications. Engaging with the public on emerging technologies, however, can be problematic and there was a suggestion that it is sometimes difficult to generate public interest in 'fledgling' science. It sometimes requires high profile public figures speaking out on a particular issue to get the wheels of dialogue in motion.

"The problem is that it is difficult to generate any interest in these technologies at this stage until Prince Charles denounces it."

While attempting to broaden citizens' access to science was felt to be a worthy and necessary aim, it has to be approached with the realisation that, as one respondent remarked:

"That science, in no derogatory sense, is an elite activity that will only ever interest some groups of society The science minister said that she was dreaming of people going into work on Monday morning discussing life science the way they discuss the weekend's football. This is a little utopian and it is doubtful whether this is a realistic or desirable goal."

Despite widespread criticism and a rejection of the deficit model, one communication specialist stressed that expert scientific knowledge does reside with scientists and as a society we have a certain reliance on that: "That's what they are paid for". There were also suggestions made that when it comes to particularly contentious fields of research, for example, areas of science and medicine that impact on the quality of human life, professional ethicists may perhaps be the most qualified to 'untangle' the issues. The move towards dialogue and debate, however, requires an understanding from those within the science community that 'lay expertise' should be taken into account and that:

"Expert scientific knowledge may not be the deciding factor in discussions about future directions for science and technology."

2.1.6.2 Civil society & representation

Citizens There were perceived to be a number of other difficulties associated with involving lay people in consultations or engagement processes, in situations where consultees have to be informed about a certain area of discussion. It can be difficult to maintain the balance between participants being informed enough to comment on the relevant area and being so informed that they no longer represent civil society.

There was also an acknowledgement that when genuinely attempting to engage citizens there is a need to go beyond the 'usual suspect' organisations.

"My worry is always, again, although you may not be engaging with the organisations, which have particular agendas, you are actually engaging with

people with political agendas. The very fact that they reply to "come along" makes them atypical. So even before you've started, you've got a sample. You're actually trying to get to the 99.9% of the people who don't come to your discussion."

As respondents frequently pointed out, public interest extends far beyond these actors. The challenge is to give civil society representatives that have an interest, but are not organised, access to the debate. This can be difficult to achieve.

"That's a slow, painstaking process. You need the media as allies at least for putting out the message that there is body interested in making the debate more accessible to those who have an interest. What we've done is organised those public events and slowly, through the stakeholder operations etc, found ways to get the message across."

NGOs There was a consensus that NGOs have a significant role to play within the engagement process, making stakeholders aware of the views of their members and / or supporters. There was, however, a general agreement that NGOs should not necessarily be perceived as representative of civil society; they too may be pursuing a particular agenda.

"As stakeholders, civil society groups are consulted by civil servants in an attempt to gather the wider views, although some civil servants may mistakenly regard this as gathering the views of ordinary people."

"It is in anti-nuclear campaigners' best interests to keep the issue of radioactive waste in the news as it serves their wider target of campaigning against nuclear power. These are cases where people are seemingly engaging on one issue in order to further a particular agenda on another issue."

One contributor stressed that a distinction should be made between pressure groups and organisations that represent the public. Some organisations, it was suggested, exercise their 'exclusion' from engagement as a sign of legitimacy. Engaging in dialogue with these actors may be difficult and perhaps undesirable.

"The non-elected representatives of the consumer are present in society and they have a role to play. Some of them are extremely good and you can engage in a fruitful dialogue with them. However, you also have extremist pressure groups whose agenda is different. No fruitful dialogue is possible with these people."

While they may not necessarily be truly representative, it was largely felt that NGOs play a crucial function in promoting views that lie outside of the 'dominant sources of information'.

"NGOs are a good counterbalance to what would be the dominant source of information outside government i.e. the corporate world."

"Civil society groups should exist to broadly marshal the information they believe will win the argument, using the best available evidence; to mobilize people to make representations and to make government and industry aware that the public are interested."

"History will look at the way campaign groups have shaped policy. They have been a benefit to us and a force for good in some ways. They provide a reality check and a short sharp shock and raise genuine concerns, but that's where their role should end."

A representative of a leading NGO, however, believed that public trust is not necessarily a belief in every position adopted by a particular NGO, but more a respect for that NGO in maintaining and providing an alternative, contrary voice. Reports from industry representatives perceived real value in engagement and dialogue with some consumer organisations which enabled them to illicit and act on the views of public.

"Industry knows that it cannot live and work any more in an ivory tower and that one way or another there is a necessity to talk to the people. This cannot be done directly but through groups who claim they are representative of consumers. These people are totally integrated in the legislative and consultative processes at the EU level. We meet and talk with them and exchange ideas. We don't have the same agenda, but our joint objectives are to put products on the market which will be accepted, so we listen to what they are saying and take this into account."

2.1.6.3 Responsibility of those involved

There was a perception that intrinsic to the involvement of civil society in participatory exercises is notion of responsibility on the part of those involved. It was felt that while there is a necessity to have transparent and robust discussions of scientific advances, it is also necessary to conduct these within rational frameworks. Citizens need to be aware of what is and what is not feasible and be familiar with the notion that scientific advances often proceed incrementally and not always at great speed.

"One of the problems with public engagement with biomedical science is that we no longer have a sense of how long things take. If there isn't a miracle cure within three months of discovering the gene then people start to say that genetics is a waste of time and money. There are expectations that science will produce the answers we are looking for more quickly than can possibly be the case."

"There is sometimes a tension created between new research findings and an appreciation of the ethical issues that arise as a result of them. That makes public debate even more important, but it has to be informed rather than irrational discussion."

2.1.6.4 Rules of engagement

There was a consensus that the methods used to engage the public were critical to acceptance of the outcomes of participation. Engagement exercises require from the outset a clearly defined purpose and structure within which open and honest dialogue can ensue. The parameters of the process also have to be stipulated. Participants must have a clear understanding of what their participation can and cannot achieve and the initiators must be prepared to "listen, exchange and act on what has been heard". It was felt that failure to address these core requirements not only rendered the exercise 'meaningless' but also counterproductive.

"It is essential that those involved have realistic expectations about what their participation can/will achieve. Raising people's expectations and then dashing them is a lot worse than not asking them in the first place."

This has serious implications for future engagement exercises. Participants with a negative experience, it was felt, were less likely to become involved in future participatory initiatives. From the perspective of all those involved in the exercises, there has to be an appreciation and acceptance of the outcomes. Participants must be "prepared to lose."

"Supporters of participatory mechanisms, whether scientists, government, industry or civil society representatives, must realise they might not always get the result they wish for. Are they prepared to lose?"

"In any public engagement activity, there will always be some representatives unhappy with the outcome. Part of the problem lies in the expectations of those involved."

It was felt to be essential that engagement is not undertaken for 'engagement's sake' and that it needs to be a continual process – the information gathered should be used to inform and initiate follow-up activities. One example cited was the reconvening of citizens in a Land Waste Consensus Conference to view how government policy had been developed as a result of the initial conference.

"Public engagement cannot just be a one-off blast. As the scientists move the research on and their work looks at different objectives, they need to take the public with them."

2.1.6.5 Shared mechanisms & understandings

It was the view of a number of contributors that engagement exercises, even if they did not result in consensus, initiated a respect for other view points and encouraged the parties involved to 'make their case'. When conducted appropriately there was a realisation that engagement mechanisms promoting connections and coalitions between stakeholders could generate 'shared understandings'. They were also perceived to prevent the formation of 'technocratic elites' and provide a counterbalance to commercial agendas relating to scientific research.

"One of the benefits of such consultations is that even if people have not come to a unanimous decision on an issue, they will typically respect each other's views more than they would have at the start of the process."

"It encourages the parties involved in debate to 'make their case' and 'to fight openly' against misrepresentations or inaccuracies."

"A lot of current biotechnological research brings with it complex discussion about the ethical implications of the work. Unfortunately, much of the comment and criticism that is raised on bioethical issues tends to focus on reasons why you should not do something, whereas for a lot of GIG members, the ethical imperative is to find ways of doing something."

"The Science Generation project is a very successful example of an attempt to address issues about public health and science communication in that it

generated dialogue, but also initiated the diffusion of information from the bottom up."

"What is often lost in discussions is a sense of respect for differing points of view. Scientists often project the feeling that if you knew what I know and were able to understand what I understand, then you would trust me. We have to try and understand differing points of view so that fears can be put in perspective."

Other contributors had less than satisfying experiences of participatory exercises which clearly failed to 'comply' with some of the fundamental rules of engagement.

"There has been a shift from running lectures to more dialogue-based events, but it's a dialogue that doesn't really go anywhere."

"Citizens Jury on GM - an exercise in public engagement which failed to take into account any findings which did not support government policy."

- 2.1.6.6 Status** It was felt that barriers still exist which hinder stakeholders' ability and motivation to become involved in engagement exercises. It was a frequently cited perception that sections of the science community still need to overcome their fear that "their scientific authority will be lost as a result of engaging with the public." This was perceived to apply not only to science researchers but to other professional groups. Furthermore, the consideration of wider social aspects of scientific research and a willingness to engage in open dialogue on these issues is still perceived by some scientists, to be outside their remit. One way of tackling this issue, it was suggested, is to embed communication modules or advice into science education courses to instil, at an early stage, an appreciation of social as well as epistemological accountability.
- "Addressing that kind of mind set where there isn't time and space for social, political, ethical or other kinds of issues to be discussed within conventional science education, is a big challenge."*
- 2.1.6.7 Enablement** For civil society organisations the move towards an era of dialogue and debate was felt by some contributors to impose an unrealistic burden on their resources. Increasingly they are being invited to participate in consultation exercises without the prerequisite funds. A suggestion was made that the provision of financial support – from the European Commission and/or national government sources – would aid more inclusive participation in both research and engagement activities.
- 2.1.6.8 Commercial interests** A frequently cited opinion during the consultation was that there was an increasingly commercial agenda inherent in scientific research. While there was a perceived need for public debate before 'the products of science' were readily available to consumers, there was some suggestion that commercial considerations may hamper this process. From industry perspectives, however, came a realisation that dialogue and engagement are crucial to the public acceptance or rejection of products. Access to the public through engagement with civil society organisations was felt to be both crucial in informing the citizens of progress in a particular area of science and the production of commercially viable goods.

- 2.1.6.9 Engagement techniques** There were varied opinions expressed about engagement methods and evaluation. There was some debate as to whether techniques such as citizens juries and consensus conferences were the most appropriate mechanisms for informing decisions and the role of science in society. The inclusiveness of participatory exercises, for example, was felt to be compromised by an over-reliance on consensus style events, which some suggested were open to 'hijack' by the articulate few. The representativeness of these events was further felt to be affected by a dialogue and debate agenda which was too policy focused. A number of participants recommended that participatory exercises should be more rigorously evaluated; articulating the need to both clarify the purpose of the exercise and also define criteria for judging the success of the outcomes.

These criticisms aside, wide spread enthusiasm for engagement, however imperfect the mechanisms are employed to achieve it, was expressed by the overwhelming majority of participants.

"As difficult and as flawed as many of the engagement mechanisms are, including 'Citizen's Juries', we as civil society, have to keep on trying."

During the consultation there was substantial support for engagement exercises conducted at the local level and the continuing need for these more informal science communication events was stressed. It was felt that it would be unfortunate if a focus on large scale consensus events acted to the detriment of local initiatives.

"There is still a significant role to be played by the more informal style science communication events, for instance science talks for science weeks and PhD students helping out in classrooms. (We) need to maintain the intimate contact between scientists and ordinary people. At a local level this means taking science to the people, for example 'Flowers on Wheels' in Portugal - taking a mobile laboratory to remote schools, involving local scientists, local teachers and local knowledge."

"The Minister of Science also went to supermarkets and talked to shoppers about the different ingredients in food and what they mean. So communicating science in this case was not a lecture it was a process of engaging with the public in their environments."

- 2.1.6.10 Media awareness and literacy** There was a perceived general need to improve the public's understanding of the scientific process, from school age children through to adulthood. Science should not be a subject which is feared through lack of understanding. Communicating this requires increasing public awareness to the relevance of science in everyday life.

"Communicating the scientific process should start at school age and novel ways need to be found to achieve this and to show that science need not be a difficult subject to grasp. eg physical matter such as molecules and atoms being likened to the action of billiard balls."

"The process of scientific research needs to be communicated more clearly to the public, how science works, how we arrive at using certain scientific applications."

"Science needs to sell itself in terms of relevance to society."

"Low levels of scientific literacy significantly affects a society's ability to engage in dialogue - It's hard to have meaningful debates about gene technology with audiences that don't know what a gene is."

Opinions on the role the media have to play in this process varied. For some, the media were regarded as the primary source of adults' life-long learning and as such have an educative function. Others, however, remained less convinced.

"Most journalists would laugh at you if you told them they served a public education function, They provide entertainment and a bit of information. Everyone else wants journalists to educate, but that's a different agenda, that's not the media agenda."

There was a consensus that materials designed to aid audiences in 'decoding' science stories would be beneficial. This was seen as particularly relevant in a climate of 'information overload' in which the proliferation of digital TV channels and web sources have increased citizens' access to scientific knowledge. Some concern exists that we may be moving towards "an informative society with illiterate people".

2.1.6.11 Citizenship and the democratic process

For many consultees, underpinning these issues of engagement were fundamental questions surrounding the democratic process, both on a national, European and global level. This confirms what a lot of science communication scholars have been suggesting for some time; that the interfaces involved in initiatives (and theories) designed to foster public engagement with science are in many ways emblematic; they are at the forefront of broader attempts to renew citizens connect with the democratic process.

"Why might we be interested in better communication of science? It is presumably because we think that citizens have a role to play, and have a right to information, in decision making around various scientific issues. You need mechanisms through which the choices available to the public can be expressed, other than the rather brutal exercise of a referendum or the choice of a particular political party in a crude governmental system. One idea is to incorporate science issues into political manifestos, so using the parliamentary process more to engage the public."

"...the proper democratic process means that it shouldn't be dominated entirely or even significantly by just a single factor ... there might be very simple cases where it should be, but on the whole it needs the bringing together of a whole series of factors and some of them quite soft... It's articulating that and being open and honest about them which I think then re-establishes this trust in people that there is some sort of proper process going on and somebody making decisions. They may not agree with the decision but they can at least see that due process has taken place."

The current 'active citizenship' agenda has significant overlap here, ⁶ and calls have been made for (newly) informed 'scientific citizens' to: *'participate in the task of deciding what constitute important opportunities and acceptable risks in the carrying out of science-based new combinations'*. ⁷

Some of the responsibility for improving public understanding of science in this case lies with the public themselves. A didactic Enlightenment model of the scientific elite versus the masses has been upturned by global communication technologies such as the internet, (the US-based Pew Internet & American Life project reports that citizens are increasingly using the web as their primary source for health and medical information and advice), and other examples such as the successful citizen-led advocacy surrounding AIDS research. The rise of the rights and trust-demanding 'consumer-citizen' should demand the attention of scientists, media professionals and policy-makers in the field of S&T.

At the same time there was some ambivalence towards deliberative engagement initiatives:

"I still think that what some people are doing is, under the guise of moving to a more participative form of decision making or at least decision informing, I think some people see this as a kind of reinvention of 'educate the ... public and then we won't have any problems any more.' (Deficit model).

Certainly as mentioned above, the efficacy of any such engagement initiatives: citizens juries, deliberative polling, consensus conferences, internet debates and the like, depend upon how well-informed, science-literate, media and politically savvy and equipped with the necessary polemical skills – or not – particular lay participants are. ⁸

In turn MPs seeking scientific advice from any combination of sources; scientists, business, their own advisors, the results of engagement activities or indeed the press itself are engaged themselves in party politics so that often it is, as one consultee suggested:

"...not a consensus which is sought; the MP seeks to locate his political position on a certain subject, of course taking into account his responsibilities as a politician."

The nuances of political philosophical models at work at the national level across Europe also has some salience here, as does the fundamental role of MPs as elected representatives of a citizenry. A French consultee suggested:

"...we are [...] a representative democracy, however we are aware that participatory democracy is in fact taking a strong hold and in fact is de-legitimising our MPs..."

6 See the European Commissions recent launch of a 'Citizens for Europe 2007 - 2013' initiative: http://ec.europa.eu/dgs/education_culture/activecitizenship/new_programme_en.htm

7 Elam & Bertilsson (2002) *Consuming, engaging and confronting science: the emerging dimensions of scientific citizenship*. STAGE. pp. 19

8 Stein (2003) *Science and citizenship in a constitutional Europe*. OPUS, University of Vienna.

This cautionary theme was present – albeit sometimes tacitly – across many of the government-level consultees. Many indicated the view that in fact the general public are frequently not that well-educated with regards scientific matters and tend to take for granted, unquestioningly, the erroneous information printed by the press:

"...once you have decided that a pen is blue, for example, you can bring all the scientists on earth to disprove this but you will still not believe me if I tell you that it is black. "

Pertinent here are public perception results from the *Eurobarometer* 2005. As AAAS CEO Alan Leshner identified at the 2005 Communicating European Research conference they indicated that whilst 52% of European citizens think that the benefits of science outweigh the harmful effects, there is also a significant degree of confusion over what citizens actually regard to qualify as a science; 41% considered astrology science, 34% history and 33% homeopathy.⁹

In this regard he cited the US chemist Norman Hackerman who suggested that:

"The more we push science forward, the more people believe in magic."

2.1.7 Governance

There was consensus that science research and development has become increasingly politicised. Consequently, politicians and policy-makers need to be better informed when making research and development policy decisions.

"The recent Danish parliamentary elections reflected this. It was really something that no Dane could avoid hearing about! There is perceived to be a long term economic need for increased investment in scientific research."

"There is a genuine need for policy makers to be better informed about science."

"Educating and informing the parliamentarians is a short cut to having an informed public, particularly in Third World countries. In many countries politicians are making policy decisions without being fully informed."

"It is really an engagement for our MPs, as they spend an awful lot of time doing this, sometimes at the expense of their electoral popularity as the time spent investigating into such scientific issue is not spent with those people who may vote for them so therefore it is really a question of personal engagement and conviction."

"As concerns stem cells, the MP generally surrounds himself with an expert committee, who give him advice on whom to visit regarding the topic, who to listen to, the most important points he should examine for the report."

9 Leshner, A. (14th November 2005) *The evolving context for science-society dialogues*. Speech to the Communicating European Research conference, Brussels.
http://ec.europa.eu/research/conferences/2005/cer2005/presentations/14/leshner_cer2005.pdf

"MPs [need to] understand the multiple aspects at play concerning scientific issues whether these are scientific, social, economic or political. MPs should ensure that they gain a holistic understanding of the subject matter rather than relying on external bodies for data."

There was a perception that policy makers are more likely to respond to information that is "easy to digest." As a result, lobby groups and think-tanks are increasingly being used as information sources for policy makers since they tend to produce succinct, user friendly reports. They can, however, carry political bias.

"Policy briefs have to be informed and accessible. Ideally it should be possible to put information on one side of paper saying this is the 'key' issue."

There was a belief that informed politicians are critical to citizens wider confidence in the parliamentary process.

"Informed MEPs also help to show European citizens that the work of parliament is not totally arbitrary and that political decisions are informed decisions."

"STOA holds an annual lecture to debate a topical scientific area. This is open to the public as well as MEPs. In this way the public can see how science enters the political debate. This year the subject will be on climate change."

As well as receiving research and development information in its various forms, it was stressed that policy-makers also need to be "asking the right questions" throughout the research process. This requires parliamentarians to have an understanding of the scientific process and for scientists to communicate in a language that is understandable to the lay person.

Across Europe many examples were given of schemes to educate and inform parliamentarians on scientific developments: The Swedish Association which brings together politicians, scientists, civil society and industry; the Finnish Committee for the Future; parliamentary evenings hosted by the Deutsche Forschungsgemeinschaft (DFG); STOA advising the European parliament on issues related to science and technology; the UK Parliamentary Office of Science and Technology (POST) and OPECST in France.

Various methods are used to inform politicians including study reports, policy briefs, workshops, annual lectures and briefings and engagement exercises.

"Parliamentary evenings are arranged for political decision makers and stakeholders to meet scientists and researchers. The DFG does not run specific events for NGOs but they are invited along to various science-related information events."

"You might just call it lobbying, but what we do in Berlin is try to talk to people, to MPs, but also to the committee as a whole and before decisions are made or before legal frameworks are being changed to learn what kind of consequences this might entail for science and research, for universities and I guess in the long run for economy."

"At our press conferences, members of the public as well as the media are invited to engage in dialogue with the MPs who are able to answer questions and justify the decisions they have made. Summaries and resumes are handed out to the press in order to ensure that they have an understanding of the focal issues."

Engaging with the public was perceived to be crucial for parliamentarians; providing them with not only the opportunity to explain the decisions that they had taken regarding science and research, but also to gain an understanding of public concerns. While these 'extra curricular' activities were perceived to have the potential to negatively impact on parliamentarians' popularity there were examples of substantial commitment to the process of engaging the public on issues of science research and policy.

"It is really an engagement for our MPs, as they spend an awful lot of time doing this, sometimes at the expense of their electoral popularity as the time spent investigating into such scientific issue is not spent with those people who may vote for them so therefore it is really a question of personal engagement and conviction."

The drive towards dialogue, debate and citizen involvement in the field of science was perceived to be part of a broader process in which civil society is exploring new ways of exercising its democratic voice.

"We shouldn't be terribly precious, thinking that we're going through a process which only impacts on science."

Political engagement was perceived to be a significant area of concern across Europe, particularly for parliamentarians and decision makers. Increasingly, it was suggested, citizens and particularly the 'disenchanted' youth using new media and other forums to engage in debate on a wide variety of issues, including science and research. These new forms of political involvement and/or protest using transnational networks were perceived to have the power to "bypass parliamentary democracy." While there was some suggestion that politicians were highly aware of this situation, some opined that these issues still clearly need to be addressed.

"On reflection, the outcome of the French referendum on the European Constitution was influenced by the debates taking place on the internet. Despite the majority of all the mass media organisations promoting a 'Yes' vote, the "disenfranchised" voting youth were being influenced by the internet. It was very interesting to see the political elite completely disconnected with their people. There was no lack of information it was just that politicians completely missed the point about where the debate was going on. Politicians need to be aware of current influential sources of information."

2.1.8 The communication of risks and benefits

A consensus emerged during the consultation process that the communication of risks and benefits is one of the most important, but also most difficult, aspects of science communication. A frequently stressed concern for scientists was how they can best tell people about potential risks and benefits identified in their research in a way that can be understood and put into a proper context.

The following is a selection of general points that were made by contributors to MESSENGER in this context.

- Risk is ineffectively articulated at all levels; by scientists, politicians and journalists
- The perils of risk communication shouldn't paralyse action
- There is a difference between communicating risks that are taken on behalf of people and communicating risks that people take on behalf of themselves
- Risk needs to be translated in meaningful ways and in such a way that they do not scaremonger
- Risk management is a lot more than just knowing about scientific uncertainty
- Quantifying risk or developing Richter scales for risk is difficult
- While risk comparisons can be useful, these must be undertaken with some caution

2.1.8.1 A balanced approach to the reporting of risk

Communication of risk should provide a balance in the representation of the benefits and risks associated with new scientific findings, without presenting extremes. It was suggested that research institutes should be prepared to communicate the risks and the potential problems attached to research from an early stage in the scientific process.

There were perceived to be societal differences in risk perception and the expectations associated with new scientific developments. The younger and more educated sections of European society were believed to be more risk aware and more likely to challenge reports of 'breakthrough research'. The communication of associated risks and benefits needs to take this into account.

"The younger generation all over Europe are very aware of the risks, not only the opportunities. Young people talk about risk, have a positive expectation toward the potential of new technology, but they want to know the risk potential, and are not persuaded easily."

"Don't talk too much about risk in the extreme way, but give a nuanced presentation of the risks and the benefits. A balanced approach; the better educated your audience, the more you have to use both pros and cons."

The communication of health-related risks was perceived to be particularly difficult and one most open to misinterpretation.

"Communicating risk, especially with regards to health, is a difficult issue. There will always be an element of risk in any new science and technological development, which needs to be balanced against the benefits gained."

"The idea that medicines are inherently dangerous is a nice image to project for some groups. Despite having a sophisticated regulatory system, it is not possible to prove perfect safety for everything. If that was necessary we'd still be living in caves being eaten by sabre toothed tigers. Although modern medicine and modern surgery is not without risk, we are living longer than we ever have done."

2.1.8.2 The communication of risk – a shared problem

There was a consensus that responsibility for communicating risk should be shared among all stakeholders including scientists, journalists, politicians, the business community and in some instances the public. However the onus was perceived to be on scientists and journalists to take the lead.

"There are always ways for improving the communication of risk. Politically and strategically it is better to look at it as a shared problem for scientists and journalists as distinct from one to be dealt with in a purely normative way."

"Risk must be 'shared' among the stakeholders i.e. business, scientists and the public. Part of the problem is that the public are no longer willing to 'take on' their share of the risk."

There was a perception that risk-based issues are increasingly becoming a driver in policy making and that government departments need more consistency and a greater understanding of risk-related issues.

"Risk is a really big thing in government at the moment, it's a hot topic. There are huge government programmes to encourage departments to be 'risk based' which is seen as being efficient, giving value for money and rational."

2.1.8.3 Risk and the media

The media was perceived to be the main source of information on risk for the public. There were suggestions that journalists need to understand the nuances of risk and statistics if they are to convey these accurately to the public.

"The press need to be made more responsible in the sense of recognising that they can either play a positive or a negative role in producing a kind of risk-mature society, having really good balanced debates about some things for which there are no black and white answers. I don't think there is an easy fix to that."

"Risk is easy to misinterpret and difficult to understand for a lay public that does not comprehend statistics. Therefore the subject usually gets misinterpreted when communicated in the media."

There was a general perception that current styles of reporting risk have led to an increasingly risk-averse society.

"There is a general shift towards nervousness about risk in society, which is fed to a certain extent by the media. Implications of this include a general feeling of people having lost the confidence and the competence to make their own judgements and stand by them. I think it's fed by the media, in the sense that the media provide the context to make people permanently nervous."

There was an understanding however that what makes good media does not necessarily make good communication.

"On issues of risk and certainty for example, asking for an absolute doesn't necessarily make rational and balanced discussion, or sophisticated understanding."

The form of media, whether print or broadcast was also perceived to influence how risk is communicated and interpreted.

"Communication of complex information around associations and causalities even in relation to the MMR vaccination (for example), is very difficult. It is even more difficult on a prime time television news programme, where the stories may run for a minute or a minute and a quarter, or in the Mail, Express or Daily Mirror in which the story may run for 200-300 words. They are genuinely difficult issues to convey and there is no good or best practice in risk communication."

2.1.8.4 The communication of certainty/uncertainty

Communicating risk in terms of certainty was perceived almost always, to be an inappropriate approach in risk reporting, whether the context is science, medicine or public policy.

"There are high profile examples in which trust in scientists and government has broken down and usually this has arisen because people have tried to give certainty instead of a nuanced message about risk."

"Greater openness about what is known and what remains uncertain is useful."

"The best scientific advice is based on the best understanding of different perspectives and the best understanding of what is and isn't known about a particular science."

There was a recommendation that communication of risk should include an explanation of the nature and significance of uncertainty.

"The problem with environmental risks in particular is that people disagree about whether they matter or not. What does it matter if we lose a few trees? That's more of an ethical problem. We have to confront this, as an agency we have to say actually we think it's important to have these fish in this river or whatever it is. If we want to talk to people about what risks are we have to distinguish between what we think the risks are and why we think they matter and we also have set out quite carefully what we're doing about those so they understand the context of what our remit is managing."

Estimates of probability alone were seen as providing no meaningful information regarding the consequences of risks.

2.1.8.5 Translation of risk

The language used to communicate risk was seen as an area of specific concern, particularly given the range of specialist views on the subject and their associated terminology. Risks need to be put into context, but there is a danger that if described in terms that are too simplistic, the result could be misleading.

"Scientists and journalists have a responsibility to start reporting risk in an understandable way, but care needs to be taken not to be over simplistic."

"People should know how risks are assessed and the context within which they lie. One perspective is the context of something being one in a million, for example. The other context is what other health/ medical choices exist for a person if they chose not to accept the risk."

The method used should also reflect the current public perspectives on an issue, including public expectation, perception and understanding.

"The main goal in risk assessment analysis is to develop a socially acceptable level of risk which is in line with broad public expectation and takes account of how the public perceives the risks on a qualitative and quantitative basis"

"If the overall aim of this is to make some change in public behaviour in order to minimise public health risk, then it is important to understand how the public are thinking about these things in the first place, so the science can disentangle what some of the issues are."

2.1.8.6 Perspectives on public perception of risk

There was a perception that the success of science had led the public to believe that the applications of science should be risk free.

"Reporting of risk is made more difficult because the society expects that we can organize communities such that risk will be eliminated. This is of course not true."

"The success of science is back firing because people now expect perfection in progress."

"There is less acceptance of risk among the public nowadays. If you drive you accept the risk, flying also. But it is impossible to control for everything. Previously industry had to prove that a product was safe, now we have to prove that there will never be a problem, which makes like difficult for the industry. There has to be more of a right balance."

A number of observations were made regarding the ways in which members of civil society perceive risks. First, it is suggested that the public respond more easily and readily to negative information than to positive information – the so-called 'negativity effect'. Secondly, there is a lack of equity between risks and benefits – there is a distinction between people's perception and understanding of risk associated with scientific applications that are seen as 'essential' to their daily lives and technologies that are not integrated in this way. Thirdly, the perception of a risk may be amplified when the potential consequences are perceived to be extreme or 'catastrophic' even though the probability of the event occurring is very small. Fourthly, and frequently mentioned, is the concept of voluntary and involuntary risks:

"I think one of the key things about risk communication is the difference between communicating risks that are taken on the behalf of people and communicating risks that people take on behalf of themselves. Driving your car what are the statistics that you're going to have an accident, eating beef, what are the chances you're going to contract the variant CJD, extremely low, but somebody has taken a risk on your behalf and you don't like that, whereas getting into your car, you're taking the risk on your behalf."

Public perception of risk was also seen as being dependent on its 'acceptability,' which can vary between individuals:

"You have to distinguish between two debates. There's a debate about what the risks actually are, meaning what the effects might be on the environment and health, for example, and then there's another debate about whether those are acceptable or not [...] The problem with environmental risks in particular is that people disagree about whether they matter or not."

- 2.1.8.7 Comparative risk** Expressing risk using comparisons is a method that should be approached with caution. What is deemed to be a reasonable comparison for one individual may not be for another. Scales of comparative risk require consideration of relevant social and cultural variables.

"There are various propositions about comparative risk, like telling people it is equivalent to or greater/less than the risk associated with crossing the road, but these are extremely difficult things to communicate and to be confident about the accuracy of such comparisons."

"I think some comparisons are clearly meaningful, if you compare one risk with itself you can say this risk has gone down and you can say but the context of which it's in has gone down and what that change means. The difficulty comes when you're comparing different types of risk, particularly risks in different contexts."

A degree of caution also needs to be exercised when making risk comparisons with 'every day' events. There is a danger that risk analogies of this type can appear glib or patronising. This will do little to address public concern.

- 2.1.8.8 Numerical risk** The communication of numerical risk is perceived to be hindered by a general inability among the public to interpret or understand statistics.

"Communication of numerical risk is very difficult because generally the public have difficulty interpreting large numbers."

A number of consultees suggested that journalists should avoid the use of percentages to express risk since they can be misleading for the layperson.

"Percentages are often misinterpreted. e.g. if a report states that consumption of a particular food increases your risk of cancer by 30%, many people will 'translate' that 30% as 'one in three people will get cancer if they eat x'. In reality, out of every 10,000 people, 80 will get cancer if they do nothing. An extra 24 people contracting the disease is indeed an increase of approximately 30% but if you are looking at the actual numbers 'it's nothing'."

"If they say there has been a 100% increase in this, that and the other but the 100% increase might be just one. I think this is really inaccurate and annoying and deceiving the public."

- 2.1.8.9 Risk Education** There was a strong consensus that the communication and interpretation of risk should be a central part of any future education initiatives, for scientists, journalists and the public.

For scientists, it was seen as crucial that they understand the difference between 'real' risk and 'perceived risk' and are able to communicate this clearly.

"Looking at the interplay between Danish researchers and journalists, the journalists are willing to follow stories if scientists can communicate in an understandable way. We have to train the scientists to communicate better. In particular to communicate statistics and figures more clearly."

For journalists, it was felt that their training should incorporate knowledge of the scientific process, numeracy skills and associated issues of risk.

A number of useful examples of risk communication were provided by the contributors to MESSENGER. Listed below are a small selection of these.

"It would be useful when reporting food scares to put them in a broader context. For example when reporting about acrylamide, how does this relate to concerns about dioxins or PCB's or to other carcinogens?"

"In communicating the risk of dying as a result of an asteroid impact with earth both of the following statements are relevant: 'The average citizen has the same chance of dying from it as they do dying in an aircraft crash', 'the likelihood of it occurring is once in ten million years'. The first of these is quite alarming because people are aware that deaths occur as a result of aircraft crashes. The second statement makes people think 'not in my lifetime' and is more reassuring."

"Some years ago, articles appeared in the Italian press which discussed the theoretical possibility that a 'black hole' could result from the experimental collision of sub atomic particles. The probability of this was 1 over 10 to the 58th power - which equates to two or three times the age of the universe. This probability was also associated with one among a large number of theoretical models. Obviously this was very newsworthy. On Italian television the scientist connected with the experiment was asked whether it was possible that a black hole could be created. He answered that it was very improbable, but theoretically possible. This created a sensation of risk. This is interesting. Scientists communicating with other scientists would understand what 1 over 10 to the 58th power means. Perhaps the correct answer to that question should have been 'no' thus avoiding the amplification of a risk that was infinitesimal."

2.1.9 Guidelines

Among all actors consulted during the MESSENGER project there was broad support for European guidelines on the communication of science and health research in the media. Below is a selection of comments made by participants that specifically address the issue of guidelines, why they are needed and to whom they should be targeted.

There was an over-riding perception that MESSENGER's outputs should focus on the need for scientists to improve their interaction with the media and that any guidelines would be welcome in this process.

"The European Commission are realising the need to improve the presentation of information. The Commission's interest in improving the communication skills of scientists is an important one."

A frequently cited opinion during the consultation was that scientists have an underlying suspicion of the media due to a lack of understanding of the processes involved in a story reaching print. Guidelines that aim to 'expose' the mysteries of the media and its workings were felt to be both desirable and beneficial.

"Scientists need to know the media and how it works. They need to be trained. There should be rules and guidelines for them and the aim should be for quality stories and representation."

The need for broad guidelines for European scientists was also acknowledged in response to the perception that their skills in the field of science communication are poorly developed compared to their counterparts in the US. The mechanisms for scientific research funding were seen as contributing further to exacerbate the problem.

"Europe is far behind the US in the field of science communication. European scientists need such guidelines because they are more conservative than their US colleagues in communicating science. This conservatism decreases as potential funding sources for scientists become more diverse."

"If you have a state funded science system where scientific funds are allocated through the government apparatus, then scientists often have no interest at all in communicating outside that system, it just becomes PR. In contrast, in countries such as the United States, scientists must compete openly for funding so it is in the scientists' interest to be good communicators."

As the European Community expands to include new member states with differing traditions in science communication and media reporting, the need for guidelines was deemed essential to act as a 'leveller' in the field of science communication.

"On Guidelines: we need them! Europe needs them, not the least the new European member states, as many of them come from a tradition where they are used to hiding problems and that can't go on."

There was a consensus that any guidance for journalists should focus on the non-specialist journalists – with little or no scientific training, but who are required to work on science based stories – or journalists in training or undergoing career development.

"Science journalists can look after themselves. They tend to be self-selecting, highly motivated and they have their own kind of prescriptions and norms. The most interesting output from the MESSENGER project would be for training journalists in general, not purely focused on science journalists; news reporters, consumer affairs reporters."

"Non-specialist journalists need to understand the language of science."

That said, there was a feeling shared by a number of participants that guidelines may have limited influence on mainstream news media, which functions primarily as a business and as such is extremely 'difficult to direct'.

The drive towards engagement, dialogue and debate was perceived to present scientists with a number of new challenges that required new approaches to

science communication; the guidelines, it was suggested, should reflect this. They should make scientists aware of the increasing need to consider the potential impact of their research and to make such considerations legitimate concerns.

"In any field of science and technology which has implications for society, it is important to inform the citizen about these issues including the facts, the options, and the consequences. All aspects of the arguments need to be clearly defined."

There was some suggestion that the guidelines, themselves should fit within the framework of dialogue and debate and should contribute to it.

"The guidelines should be contributing towards creating more open spaces for public debate."

The contributors to the consultation process made a number of specific recommendations concerning what should be included in guidelines for European scientists. Many of these have been very useful and have been incorporated into the *Guidelines for scientists on communicating with the media* in Section 4.1

2.2 Interviews with experts to explore evaluation criteria

Part of the ASCoR contribution to the MESSENGER project consisted of extensive consultation with key persons in the area of science, communication, media, government and opinion leaders. The goal of this series of 21 in-depth (face to face) interviews was to collect ideas and proposals for the evaluation of media-coverage on risk topics. This was directly related to exploring the relevance of the SIRC Guidelines on Science and Health Communication in a Europe-wide context and providing a basis for revision and refinement. By choosing people who are active in these different areas it becomes possible to look at the problems from completely different angles. For each interview a semi-structured protocol was used enabling the interviewee to talk about topics linked to their field of expertise.

A specific focus of the interviews was the current debate on problems arising from Universal Mobile Communications Systems (UMTS) and Fine Particle Pollution (FPP) in the Netherlands. Media coverage of these was the subject of a detailed analysis by ASCoR that is reported in Section 3.9.

The main angle for the interviews was the question 'how to improve communication on risk topics?' This was not restricted to communication generated by the media but also by the government and by scientists. There is often a gap between the scientific views on risk and the worries that people have. In contrast to scientists, lay persons, and often the media as well, define risk mainly in terms of involuntariness, injustice, scandal and blame. Sometimes an uncontrollable process of amplification develops which puts the government under great pressure to take drastic action, despite the fact that according to the scientific definitions the risks are extremely small, if not completely absent. The question is 'how to deal with situations like that?' How do the key persons analyse this problem and what kind of advice do they have for the media, scientists and the government?

2.2.1 Interview questions.

The general questions were formulated using the protocols of the consultation component of the MESSENGER project. General topics regarding risk communication were addressed, followed by more specific questions about UMTS and Fine Particle Pollution (FPP).

Media

- How do the media cover risk issues and science?
- Do you evaluate this coverage as reliable and accurate, especially regarding balancing of sources and the amount of attention paid to these topics?
- What is typical for the role of the media in the interaction between science, public and government? How do you explain the amplification of the issue in the UMTS case and the lack of this process in the area of FPP?

Science

- How do you evaluate the way scientists communicate about the result of their studies in the field of risk?

Audience

- Who are the most influential actors in the debate?
- How do you evaluate the role these actors play?

Government

- Which factors are decisive in government policy regarding controversial risk issues?
- How do you evaluate the response of the government to risk-related crises and controversies?
- Which changes are necessary in the policy of the government (in the interaction with science, media and the public)?

2.2.2 Selection of key persons

As a guide for the selection of the interviewees the same typology of actors was used as in the SIRC part of the consultation. Four main groups of actors are identified:

- Producers – Scientists who produce scientific advice
- Users – Decision makers
- Media – Opinion formers
- Society – Civil groups and organisations, citizens, etc.

Background research was used to identify the key persons within each of these groups of actors. This resulted in a list of 21 people with a broad range of actors from all the categories listed above – Section 6.10 in the Appendices.

All interviews were conducted face to face and transcribed completely which resulted in a total of 80 pages of interviews.

For the analysis two organizing principles were used:

- Which role of which actor is addressed (theme)?
- ... and by whom? Which actor is speaking?

In more than half of all the interviews the role of the media was the main topic, leaving the rest to the role of the 'producers', 'users' and 'society' in the UMTS and FPP cases (see Section 3.9 for details of the ASCoR study of media coverage of these issues). A small part was dedicated to the risks themselves, independent from any actors. During the interviews the different themes and actors tended to mix: people talked about the media but made links to the role of the government at the same time. Nevertheless, it made sense to separate the themes and the actors in the analysis of the data.

The distinction between the four actors was not always easy and sometimes there was some overlap. This applied first of all to 'users' and 'producers'. Someone who is working for an independent research institute is defined as 'producer', even if he or she takes a research assignment from the government. A researcher working for the government is described as 'user'; he or she is part of the administrative complex.

There was also some overlap between 'users' and 'society'. The most important 'decision maker' in UMTS and FPP was the government. In the interviews some interviewees considered the telecom operators also as a 'user'.

2.2.3 Analysis of the interviews

In this part of the report results of the interviews are presented by summarizing the statements of each actor regarding the role of the other actors. In each part, three topics are addressed: positive statements; criticism and advice.

2.2.3.1 The role of the media **Government decision makers** On the one hand there is strong criticism of news coverage of risk issues. On the other hand there is a lot of positive understanding of the role of the press in society, which is to report on events such as protesting residents who are worried about UMTS or Fine Particles, or to report controversies surrounding risk issues and contradictory scientific data.

Positive statements on the media

- The media report on what is going on
- Distrust against the government is basic attitude for the media
- Media have other interests than the government in the field of risk issues; there are adversaries
- A focus on health can be expected from the media, that is where the news is: is something going wrong here?
- The media bring a balanced mix of stories and the audience is capable of filtering relevant information
- Media-hype is the result of social unrest, not the trigger

Criticism

- Framing of issues
- The use of value-laden words such as 'radiation' or 'genetically manipulated'
- The media do not have enough 'eyes' for the interests and goals of their sources
- Media are part of the institutional establishment and hardly represent the citizens
- Media are incident focused and do not pay enough attention to the context behind the protest against UMTS which is essentially the result of the estrangement from the government
- Investigative journalism is disappearing, there is hardly enough time to do intensive research

Scientists This category of interviewees was, in the main, very critical of the media.

Positive understanding

- The media are not solely to blame – politicians are also under the spell of the daily hypes and there is too little attention paid to long-term problems.
- What people do with media messages cannot be predicted – sometimes a new dynamic occurs

- The Internet plays an important role nowadays in creating controversy on risk issues
- It is not surprising that media coverage is sometimes troublesome: this is a reflection of the division and contradictory messages from the scientific world
- The media reflect what is going on in society – you cannot blame them.
- Sources play a very important role – it is not the media who are to blame. It is easy to manipulate the media.
- The media do not have much impact on government policy, apart from exceptions (like the outrage over the NO₂ satellite map, mistakenly taken for an image of fine particle pollution)

Criticism

- The media are biased
- The use of emotional or value-laden words like radiation or genetically manipulated is leading to a biased coverage
- Media do not take responsibility for unnecessary fuelling of social unrest about risk
- Some newspapers simplify results of studies by putting 'black and white' statements in the headlines
- Media deny the probability approach in science and expect too much definite judgement
- The media should look more for the context – e.g. FPP in comparison to smoking
- Media are run by commercial interests and tend to make something threatening just to sell news
- Only science editors are capable of covering risk issues

Advice

- Try to place risks in broader context.
- Look into the interests of the stakeholders involved and the way their interests shape their arguments and positions
- Invest in background talks with journalists and counterparts
- Establish a watchdog for the media
- Media should explain better the concept of uncertainty and probability
- There should be more debate within the media on the role of the news media in these issues

Journalists

Positive understanding

- It is not possible to predict how an issue is going to work out in society and what will worry people
- It is not the task of the media per se to diminish the worries that people have
- Publish and be damned is still important: don't let yourself be influenced by the reactions from, e.g., the government.
- To publish is a journalistic duty – only when extreme negative consequences might occur is it to reconsider whether to publish

- In many cases the cause of 'bad' news coverage could be found in the press release from the PR officer.
- Media coverage does not cause the worries about UMTS
- When people are worried you have to publish the news regardless of the basis that people have for their worries
- When an important institute publishes a report you have to bring that to people's attention as news
- You have to work with concepts people understand and use – 'radiation' instead of 'electromagnetic fields'
- It is understandable why people worry about UMTS instead of fine particles – the media have to cover that.
- Simplification is inevitable in reporting of complex scientific matters

Criticism

- Media should be more critical of scientific studies on risk and the conclusions of that research
- There is too little attention in the media to the commercial interests behind a lot of research
- Don't play the results of a study too big when the results are limited or controversial
- Media have a considerable responsibility in the case of risk topics that might have impact on the audience

Advice

- Journalists should report critically on 'newspeak' such as 'magnetic imaging' rather than 'nuclear imaging'
- Tell readers that scientific results can never be definite answers
- Trust is very important – once people have lost your trust they will reject every new message
- Try to be neutral in the way you phrase the issue – do not adopt the words used by stakeholders
- Think twice and try to be precise when covering controversial risk issues
- Be critical about reports coming from action groups – don't treat them at the same level as scientific research from well-established institutes
- There should be more communication between the science editor and the general reporters

2.2.3.2 The role of the Government decision makers scientists

Criticism

- Scientists too often draw conclusions which are way beyond the scope of their study
- Studies are too narrow defined, which limits the usefulness of the results

Advice

- Scientists should pay more attention to the limitations of their study

Scientists

Positive understanding

- There is a tension between the complex science and the simplifying media but overall there is a good cooperation between researchers and science editors.

Criticism

- Researchers are under pressure to publish results, even if it is an interim-report
- Researchers keep talking in statistical terms (significant or not) while denying the social impact of the issues
- Scientists have no idea what the consequences are of the images they create in public opinion about their research
- Scientists are mainly focused on the scientific levels of their work – they try to be as careful as possible, which leads to quite vague statements

Advice

- Scientists should pay more attention to explaining the results of their research to the outside world – one cannot expect the media to do all of that
- Scientists should actively approach the media when they have the impression that the coverage is not correct – they have to play a role in the public debate
- Scientists should try to keep up to date about what is written in the media about their research
- Sometimes it is better to wait until the results are more 'mature' before they are published
- Scientists should be completely open, but you cannot talk solely using the vocabulary of science
- Instead of focusing in the mass media, scientists should pay more attention to publication targeted on specific groups like civil servants.

Journalists

Criticism

- Scientists should be more aware of the fact that some issues are very media-sensitive
- New technologies should be monitored by research, but funding this is a problem
- Too often premature results are published and subtle distinctions (e.g. between well-being and health) are forgotten once it is published.

Advice

- In the case of sensitive topics publicity should be well-organized

Stakeholders

Positive understanding

- Scientists play a positive role when they participate in the public debate and this helps journalists to get a broader view of the problem

2.2.3.3 The role of the government Government decision makers

Criticism

- Often the government is too slow with a response after an incident, which may trigger a crisis. This is important especially when people are worried
- There is lack of openness in crisis situation, which feeds distrust
- Communication too often takes places from the angle of the government instead of the angle of the citizen; this will not improve the image of the government
- In the case of UMTS the government was focused mainly on economical aspects, not the perception of the residents
- By letting the telecom operators build station without the regular licenses (that every resident needs when he wants to change his house), the government created an image of injustice. This triggers resistance
- The attitude of the media is not negative towards the government, but the government elicit a distrustful attitude by the way it communicates
- In the case of UMTS local politics are stuck between the national government and the worried residents without any real resources to change something.

Advice

- A quick response from the government may prevent media hype
- Pro-active communication about risks is necessary to establish trust in the government.
- Target communication – focus on early adopters of technology
- Show involvement and emotion in your communication – take emotions into account
- Be prepared to show vulnerability and take the citizens seriously
- Government officials get in a state of panic much easier than the public
- Try to change 'involuntary' to 'voluntary'
- Try to get people involved in decision-making in an early stage.

Scientists

Criticism

- Problems with UMTS are a result from a failed risk communication policy
- In the case of FPP the government was in state of denial for a long time – until court decisions stopped several building projects
- The government tries to escape (and change the rules instead of dealing with the problem)
- The government made the mistake not to differentiate between different kinds of fine particles – instead one policy was put forward
- The government follows the agenda of the media too often, which leads to thoughtless actions

Advice

- Try to communicate with specific target groups

- Try to be consistent in your policy instead of changing all the time
- Take into account the interests and the perceptions of the public
- Get a panel of experts together as soon as possible in a case of a crisis

Journalists

Criticism

- The government is a stakeholder in UMTS and this explains why people distrust any information on this topic from the government
- The government has to react to reports in the press about worried people, even if there is no reason to be worried.

Stakeholders

Criticism

- The government did not resist sufficiently the claims made by the media and the public
- Due to the elections the politicians paid too much attention to the public without challenging claims
- The government has a double role: participant in the UMTS technology and the representative of the people who are worried
- The government plays games by leaking only fragments of new plans

2.2.3.4 The role of the stakeholders Government decision makers

Criticism

- The communication from the government focuses too much on the technical risk aspects instead of the social aspects of perception

Scientists

Criticism

- Commercial stakeholders are distrusted because their commercial interests are involved – they are not in a position to communicate risk information
- Sometimes scientists are made a scapegoat by the commercial interest groups when the results are displeasing
- There was too much disagreement between the government and the telecom operators to get a quick response after the publication of the research about UMTS
- Environmental groups misuse the precautionary principle without any empirical basis

Journalists

Criticism

- It is wrong that commercial interest groups co-finance research projects on risk – this will lead to distrust and commercial pressure on the researchers

Stakeholders

Positive understanding

- Commercial parties are not in a position to provide information on risk
- There is too much at stake for the telecom operators

Criticism

- The telecom operators ignored the emotions of the worried residents
- They paid no attention to the response of the public when this new technology was introduced
- The operators created an image of secretly moving ahead with the network no matter what

2.2.4 Summary and discussion

"In the case of radiation by UMTS relay stations it is not right to blame the media for all of the controversy. The media cover the social agitation and consequently this process gets its own dynamic. But in the scientific area one can see contradicting positions, with scientists criticizing each other. That is a typical characteristic of risk issues. There is controversy and the media will focus on this." (Government official)

The most surprising result is the rather mild attitude of the interviewees towards the role of the press. Of course there is criticism, especially from some of the stakeholders who are quite dissatisfied with media coverage, but as a whole the key persons interviewed stressed that in many cases the media report what they have to report and when things go wrong it is more often the scientist or the government who is to blame.

When a researcher issues a rather strong statement about the results of his or her study into the effects of UMTS, it is hardly surprising to see strong headlines about the 'harm' of UMTS as a result. The same can be said of the role of the government: when its response to publications in the media or actions by worried citizens is not seen as adequate, negative coverage can be expected, despite the fact that risks involved may be very small. Media hype is the result of social unrest, one of the respondents said, not the trigger of unrest. In return, politicians quickly respond to the daily hypes, without keeping an eye on the long-term problems, thereby fanning the flames of the hype. Whether or not media hypes are triggered depends on the response of the government or a company to a crisis situation.

The media focus on conflicts of interest and controversial issues, regardless the tenability of the claims of the different stakeholders, be it the government or a citizens' website such as www.stopumts.nl. Distrust of official sources and powerful actors such as the government is a basic attitude within the media. The health angle is much more important for the audience, and therefore the media, than the probability perspective of scientific risk assessment. Some of the interviewees stressed the importance of the journalistic duty of publishing important facts, regardless of negative reactions from the government.

Nevertheless, in a lot of interviews the media faced strong criticism. The media were seen as framing the issues in a specific way – they use value-laden words and do not pay enough attention to the interests behind the various claims and

statements. There was a perceived difference between the science editor and the general reporter who is not able to place a specific risk in the broader context of other risks. By paying a lot of attention to a topic, the media make it important and frightening in the eyes of the public. Often the media want definite answers instead of statements on potential probabilities. And the media do not take responsibility for the social unrest as a result of their coverage. Some of the interviewees emphasized that the media can play the role of a catalytic agent in a process which, once triggered, cannot be stopped.

The key persons interviewed placed the performance of the media in the context of what other actors are doing: the scientist who publishes a report, the communication officer who issues a press release, the policy of the government, its response in crisis situations, etc. That is the environment in which the media were seen as operating and, in many cases, the media tended to reflect what their sources do and say.

The interviewees were critical of the scientists, who were seen as not paying enough attention to the way they publish results and who do not understand that the public may have a completely different perception of the results of the study. As one interviewee said:

"Scientists have no idea what the consequences are of the images they create in the public opinion regarding their research."

In trying to be as careful as possible (in terms of science and statistics) scientists were seen as making polysemic statements that could be interpreted by the media and, their audience, in different ways. Scientists were not sufficiently aware of the fact that some topics are very media-sensitive and could have significant resonance in society.

Media coverage is closely linked to government policy and communication. Slow responses, lack of openness from the side of the government, divisions and tensions between different levels of government (national, local); all these factors have impact on the way the media cover an issue. In some risk issues there may be a conflict of interest for the government: the state is participant in new technologies (makes money by selling UMTS frequencies), but at the same time the government has to care for its citizens. This conflict of interest leads almost by definition to a critical and distrustful press.

The stakeholders (corporate business, environmental groups, etc.) were also seen as playing an important role in the whole process and the media coverage. The commercial stakeholders said that they found it more difficult to get their message across than the action groups who seemed to have more instant access to the media. For commercial groups it was difficult to communicate on risk topics, because they met more distrust from the media. Critics on the other hand said that the corporations did not pay attention to the worries of the public when a new technology is introduced. They have a tendency to move forward, without communicating, which creates the impression of cover-up and secrecy with the media and the public.

Looking at the differences in the interviews it is interesting to see that there is unanimity on the issue of the role of the media except, perhaps, in the case of the commercial stakeholders who were much more critical of the media. For the

evaluation model it is important to notice this unanimity and to ground the model on the observation that the media operate in a social context in which other actors such as the government are active. Their performance has a strong impact on media coverage, but within this context the media have their own role and responsibility.

2.2.5 Conclusions and recommendations

2.2.5.1 The need for a new evaluation model News media are often criticized for the way they handle risk and science topics, but an elaborated model for evaluating the role of the media is lacking. Most critics do not take into account the fact that the media operate in different modes: reporting risk and science isn't limited to popularization of science, but also extends to coverage of conflicts and contradictory claims regarding the risk at stake. The media tend to focus on the activities of social actors in these issues, offering an arena for public debate. By doing this they may play an important role in the process that is known as the amplification of risk: in this process a risk topic can become the centre of (social and political) controversy, regardless the magnitude of the risk (compared to other risk topics). In this process the media try to connect to the lay persons perception of risk instead of the scientific perspective on risk. The result is that media coverage is often guided by frames linked to the public's perception of risk.

A new model for the evaluation of media coverage of risk is presented in Section 4.2. This model has strong implications for the ways in which journalists report on scientific topics involving risks and benefits and may be seen as constituting a useful resource in journalism education.

2.2.5.2 Training materials for journalists A selection of materials relevant for the training and development of journalists is provided in Section 4.3. These are also available from the MESSENGER web site at www.messenger-europe.org

Section 3

European media science coverage

3.1 Science reporting in Europe

3.1.1 Introduction

Two approaches to analysing media coverage of science and technology news have been undertaken. ASCoR have conducted detailed content analyses of two major issues featuring in the Dutch press while SIRC have undertaken a much more extensive, though far less fine-grained, analysis of general science coverage across Europe.

These studies have been of significant relevance to the broader aims of the MESSENGER project – facilitating improved science communication and advice through the popular media. They have also identified significant ‘frames’ in which coverage of scientific information advice is embedded and where risks and other factors are highlighted or stressed in the reporting. This, in turn, offers a contribution to designing more effective risk communication and scientific advice. As Gene Rowe and colleagues¹ have pointed out:

“To provide effective risk communication with the public, it is essential to fully understand the mechanisms that determine the selection and transmission of risk information by the media. Government-media interfaces can subsequently evolve from the perspective of understanding in what the media is interested, and how risk information is subsequently interpreted.”

The relationship between media reporting and public perceptions is, of course, complex. The relationship between individual perceptions and behaviour – how people act on the basis of what they read or watch – is equally complex. There are, however, a number of studies that have indicated a strong correlation between media reporting of science and risk issues and public opinion – e.g. Hans Kepplinger² in Germany and Anna Triandafyllidou³ in Italy.

The basis for this link may be due to the ‘agenda-setting’ role of the media - the notion that they do not directly determine what the public think, but rather shape perceptions by making certain issues more salient and significant. A simple measure of the quantity of coverage, for example, appears to be a reliable predictor of shifts towards negative opinions of scientific development in which risks are highlighted, independent of the nature of the risk reporting. ‘Cultivation theory’ also predicts that the level of fear of ‘hazards’ is directly proportional to the level of their media exposure.

Confirmation of these broad theoretical perspectives is provided by a number of studies which show, for example, that public concern about controversial technologies varies directly with the volume of reporting, even when the tone of

1 Rowe, G., Frewer, L. & Sjöberg, L. (2000) Newspaper reporting of hazards in the UK and Sweden. *Public Understanding of Science*. 9 (1): 59-78.

2 Kepplinger, H.M. (1995) Impacts upon press coverage about sciences. In: M. Bauer (ed) *Resistance to New Technology: Nuclear power, information technology and biotechnology*. Cambridge University Press.

3 Triandafyllidou, A. (1995) The Chernobyl accident in the Italian press. *Discourse and Society*. 6: 517-536.

reporting may be generally neutral or even positive - e.g. Smith, van Ravenswaay and Thompson (1988); ⁴ Wiegman et al (1989); ⁵ Mazur and Lee(1993).⁶

While the quantity of coverage of science issues can be a useful proxy for public opinion, the content of media reports is also clearly a significant determinant of understandings, beliefs and feelings. The ways in which journalists present scientific information and advice, together with the more polemical aspects inherent in most media stories, can have quite profound impacts. Reports which focus on disagreements among experts, for example, can generate more widespread distrust of the scientific enterprise in general, as Sharon Begley,⁷ the science editor at Newsweek, has noted.

The preference in much of the media for dramatic or sensational events, and the reduction of complex issues to simplistic paraphrasing is also well documented. This is especially the case in coverage of scientific and technological risk, where increases in relative risks, despite very small absolute risks, can serve to add interest to otherwise quite mundane stories - see, for example, Schanne and Meier (1992).⁸ Differential coverage of the views of relevant actors and stakeholders can introduce further distortions. One study has shown, for example, that opponents of genetic engineering in Germany were given four times as much coverage as those supporting the technology.⁹

While this part of the MESSENGER project has focused exclusively on the print media, there is good reason to believe that the results are also reflective of science and technology reporting in the broadcast media as well. A study of the British press by Bauer,¹⁰ for example, showed that science as reported in the printed press is a proxy for media science in general. Similarly, Hansen and Dickenson¹¹ compared various media outlets other than the printed press and showed that over an extended period the distribution of thematic content was the same.

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- 4 Smith, M.E., Van Ravenswaay, E.O. & Thompson, S.R. (1988) Sales loss determination in food contamination incidents. *American Journal of Agricultural Economics*. 70: 513-520.
 - 5 Wiegman, O. et al. (1989) Newspaper coverage of hazards and the reaction of readers. *Journalism Quarterly*. 56: 846-862.
 - 6 Mazur, A. & Lee, J. (1993) Sounding the global alarm: Environmental issues in the US national news. *Social Studies of Science*. 23: 681-720.
 - 7 Begley, S. (1991) The contrarian press: How the press decides which issues of environmental risk and food safety to cover. *Food Technology*. 45: 245-255
 - 8 Schanne, M. & Meier, W. (1992) Media coverage of risk. In: J. Durant (ed) *Biotechnology in Public: A review of recent research*. Science Museum for the European Federation of Biotechnology.
 - 9 Rurmann, J. (1992) Genetic engineering in the press. In: J. Durant (ed) *Biotechnology in Public: A review of recent research*. Science Museum for the European Federation of Biotechnology.
 - 10 Bauer, M. et al. (1995) *Science and Technology in the British Press, 1946-1990*. London Science Museum. (Tech. Rep., vols 1-4).
 - 11 Hansen, A. & Dickenson, R. (1992) Science coverage in the British mass media: Media output and source input. *Communication*. 17: 365-377.

3.1.2 Methods

There has been substantial debate in recent years concerning appropriate methodologies for analysing the content of media articles and reports. Previous traditions, in which Marxist, feminist, psychoanalytical and post-modernist perspectives were applied to obtain qualitative 'readings' of the material, have declined to a considerable degree as researchers have pursued a more objective basis for their assessments. Some have argued that media content analysis even excludes all but quantitative methods. Kimberly Neuendorf,¹² for example, argues:

"Content analysis is a summarizing, quantitative analysis of messages that relies on the scientific method and is not limited as to the types of variables that may be measured or the context in which messages are created or presented."

Quantitative methods have the advantage of lending themselves easily to computer-based procedures that can examine extremely large volumes of data. SIRC, for example, is engaged in on-going monitoring and analysis of media coverage in the UK of obesity and related issues and has amassed a database of over 25,000 full text press article. Previously, SIRC conducted a study for the Home Office on media coverage of reported crime which involved over 12,000 such articles.

While such approaches are essential to contemporary content analysis they have, of course, some limitations. We accept the point made by Pamela Shoemaker and Stephen Reese:¹³

"Reducing large amounts of text to quantitative data does not provide a complete picture of contextual codes, since texts may contain other forms of emphasis besides sheer repetition."

Chris Newbold¹⁴ and his colleagues have similarly argued that quantitative analysis has not been able to capture the context within which a media text becomes fully meaningful. They point to additional issues that have to be considered. Among these are the perceptions of media credibility - whether, for example, the story appears in a quality newspaper or in a popular tabloid. The timing of the article also has importance - a health article published during an outbreak of disease, or worries about the safety of a particular food item, may have greater impact than at other times.

Nonetheless, we take the view that large-scale, quantitative media analyses can be of very significant value in providing overviews of the ways in which scientific knowledge and advice is communicated across different European countries. Understanding how particular fields of science are differentially framed in the media provides a better basis for developing communication strategies, anticipating the kinds of issues that are likely to be raised by journalists.

12 Neuendorf, K. (2002). *The Content Analysis Guidebook*. Sage.

13 Shoemaker, P. & Reese, S. (1996) *Mediating the Message: Theories of influences on mass media content*. Longman.

14 Newbold, C., Boyd-Barrett, O. & van den Bulck, H. (2002) *The Media Book*. Hodder.

In the following section of this report we summarise the development of a computer-based methodology and the results of analyses conducted by the SIRC team. The news sources used in the computer analyses are shown at the end of the 'extended' country sections in the Annexes starting at Section 6.1. In the case of the UK, articles from local and regional papers were included along with those from national daily and Sunday papers. This was in order to provide the broadest overview of science communication and scientific advice in the media as possible. Future analyses might profitably focus on differences between the major news sources and national versus local differences in framing.

Section 3.9 summarises the analysis conducted by the ASCoR group of coverage of two major issues in the Dutch press.

3.2 Large-scale analysis of media coverage in Europe

3.2.1 Methodological approach

Large volumes of full-text news stories are now available by internet download from a variety of sources. One of the principal news databases is *LexisNexis*, which holds material from various parts of the world.¹ Major newspaper web sites are an alternative source of material. The major problem, however, has been that of how to deal with such large volumes of material. The traditional methods, involving hand-coding of themes, content or 'framing',² are appropriate for relatively small samples but have little utility if tens of thousands of articles when particular topics are to be analysed.

Over the past four years The Social Issues Research Centre has developed a computer-based approach to handling such large volumes of material. This approach, in its relatively early stages, was used in a study commissioned by the UK Home Office that focused on media coverage of organised crime in Britain. The method is currently used for monitoring and analysing trends in news coverage of nutrition and health issues.

The method mirrors to a large degree the procedures used in conventional content analysis. Recurring themes in the coverage are identified by a small team of researchers reading sample articles. The various schemas derived are compared and a common set of key words and phrases compiled in the form of a code book to provide definitions of the principal frames and the means of identifying them in the texts

Having identified a frame such as 'moral/ethical issues', for example, a set of commonly occurring words and phrases such as 'ethical', 'unethical', 'morally wrong', etc. are compiled. The material is then scanned to identify other terms that are associated with them. This is greatly facilitated using a piece of software called *Wilbur*³, available free from wilbur.redtree.com. This enables indexing of large volumes of textual material which can then be searched for key terms, revealing the context of those terms. In those contexts lie other recurring words and phrases which can then be added, where relevant, to the initial code book.

Through this process appropriate sets of terms for each theme can be compiled and cast in a matrix – in the MESSENGER case in the form of an Excel spreadsheet. The first column holds the description of the theme, e.g. 'Business/commercial interests' while the cells in each row contain words or short phrases associated with

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- 1 *LexisNexis* provides fewer news sources from some European countries than from others. UK newspapers are the most comprehensively represented while Spanish media are not included at all. The number of Italian sources is also quite small.
 - 2 The concept of 'frame' differs slightly, but significantly, from that of 'theme'. As Gorss and Lewenstein (2005 pp. 19) stress: "a news story on a certain *theme* is presented within a particular *frame* of discourse that puts the topic in a particular light and perspective." (See also Gaskell & Bauer (2001 pp. 40)). The key words and phrases used in the procedures were developed with this distinction in mind.
 - 3 *Wilbur* is currently available for free download from wilbur.redtree.com and is a most useful tool.

that theme – e.g. ‘commercial interests’, ‘multi-national corporation’, etc. An example of such a matrix, together with further details of the way in which it was developed, is provided in The Annexes in Section 6.6.

There is, of course, an obvious problem with this approach. The significance of a word may depend very much on its context or vary in meaning when used colloquially. Consider, for example, the word ‘moral’, which is highly relevant to identifying the presence of the ‘moral/ethical issues’ frame. In English the word also appears in phrases such as ‘the moral of the story’. Similarly the stem of terms such as ‘ethical’ appears in irrelevant phrases such as ‘protestant work ethic’, and so on. In reality, such ambiguities appear relatively infrequently but are sufficient to reduce the accuracy of the analyses. For this reason it is also necessary to scan samples of the textual material for such ambiguities, again using *Wilbur* as an aid. Dictionaries such as the *Oxford English* are also useful in this context. A procedure then needs to be developed to eliminate the irrelevant uses of the word or words from the analysis.

In practice, disambiguating the terms is almost always a matter of noting the words or phrases that appear before or after the key term itself. Thus, the presence of the word ‘tale’ after the term ‘moral’ would be sufficient to eliminate it from the analysis. Preceding and following words or phrases are also included on separate lines of the matrix where the potential for any ambiguity is present (see 6.6).

The matrix forms the primary instruction file for software⁴ developed by SIRC that can read large numbers of newspaper articles on specific science topics and count the frequencies of the major themes across them. Prior to this, however, other specially written software is required to process raw downloads from, say, *LexisNexis* and store this in individual files, split into sentences and with extraneous coding removed. The software used at this stage also detects and excludes duplicate articles. Articles with very low frequencies of keywords relating to a specific area of science – e.g. nanotechnology, biotechnology, etc. are also excluded at this stage.

The main analytic software not only counts frequencies of key words and phrases associated with the frames for each science topic but also measures co-occurrences among them. The output, therefore, is in the form of a matrix of distances (co-occurrences) for each topic. An article may not only be framed, say, in terms of ethical issues associated with a given aspect of science or technology, but may also include within it consideration of business interests, environmental issues, etc. It is important to capture this sense of overlapping framing in the analyses.

This approach to media analysis, of course, may be criticised for its inability to detect nuance in the way that a human reader might. It also cannot detect irony, sarcasm, or other elements of normal language use. In the case of newspaper reporting, however, such elements are relatively infrequent. While the software used in this study would be inappropriate for the analysis of poetry or epic novels it has considerable utility in the more ‘mundane’ field of science news coverage.

4 The source code for this software, *FrameCoOccur*, written in Visual Basic.Net, is hosted on the MESSENGER web site and is freely available for others to use. A copy is also provided in the Annexes in section 6.7. Note, however, that it has been developed by a social scientist rather than a professional programmer!

The basic English input matrix was used as a basis for the design of similar matrices in French, German and Italian for analysis of science coverage in those countries. This, however, involved some difficulties – not least the issue of the conceptual equivalence of various words across languages. Quite different words and phrases were also required to detect potential ambiguities. The process of development, by scanning news articles manually for recurring terms, was, however, substantially the same as that used in the case of British media coverage.

Further checks on the comparability of the matrices was undertaken by having linguists read a sample of articles in each language identified as having a particular theme content or frame. Did the human understanding of the article match that of the computer program? This led to many revisions of all of the matrices. While the final versions used in this study may need further refinement in the future, we are confident that they provide at this stage a fairly robust basis for analysing science coverage in each of the countries concerned and for comparing between countries. Is, for example, science communication and advice in Italy more frequently framed in terms of moral/ethical issues than in Germany or the UK? These are elements that need to be considered fully when developing strategies for the communication of scientific advice tailored to particular readerships across the EU. The SIRC approach has been developed specifically with these pragmatic aims in mind.

As part of the MESSENGER project we have also undertaken qualitative assessments of the most significant science articles in the English, French, German, Italian and Spanish media. These have been conducted by a group of linguists in close association with members of the SIRC team. Articles for analysis were selected on the basis of the high densities of science topic keywords within them and the presence of the principal frames. These analyses have also been instrumental in guiding the development of the quantitative methods described above.

The analyses have focused on pre-defined science areas – primarily, biotechnology, nanotechnology, nuclear energy, assisted reproduction and stem cell research. These were selected on the basis that it is in these fields that most controversy appears to exist. The presence of distinct frames is, therefore, more likely than in areas where more simple and relatively uncontroversial, factual reporting tends to occur.

The following sections contain the results of the quantitative analyses followed by qualitative assessments and a considerable number of examples from each country's press. They are intended to form a reference resource for use by science communicators and are posted on the MESSENGER web site at:

www.messenger-europe.org.

3.3 United Kingdom

3.3.1 Quantitative analysis

The computer-based analysis outlined in 3.2.1 focused on four main areas of science coverage in the UK – biotechnology, nanotechnology, assisted reproduction (IVF) and nuclear issues (excluding weapons).¹ The thematic aspects of coverage (frames) included:

- 'Health' (including medical procedures, therapies, etc.)
- 'Risk' (potential negative consequences of a particular technology or procedure)
- 'Regulation' (discussion of need for controls or legislation on either development or application of a scientific process)
- 'Science' (technical and scientific explanation)
- 'Moral' (ethical, religious considerations, etc.)
- 'Miracle Cures' (claims for major health breakthrough)
- 'Business' (commercial aspects and corporate interests)
- 'Terrorism' (potential terrorist or other criminal uses of a technology)
- 'Agricultural' (farming and food aspects of a particular area of science)
- 'Environment' (environmental issues and concerns about technologies)
- 'Activism' (protest and pressure groups and their views on a particular branch of science or technology)

The period of coverage was from January 2004 to mid 2005 and included all of the UK national and major regional newspapers. A total of 14,944 articles were analysed. To identify the presence of a particular frame, up to 15 key words were used, together with disambiguating words and phrases where required. The results are shown below for each science topic.

3.3.1.1 Biotechnology Figure 3-1 below shows the distribution of frames for biotechnology across all of the articles. The Y axis shows the percentage of all articles in which a particular frame was evident. From this we can see that the dominant focus was on agricultural aspects of biotechnology – farming and foods – with medical applications (the 'health' frame) receiving substantially less coverage.

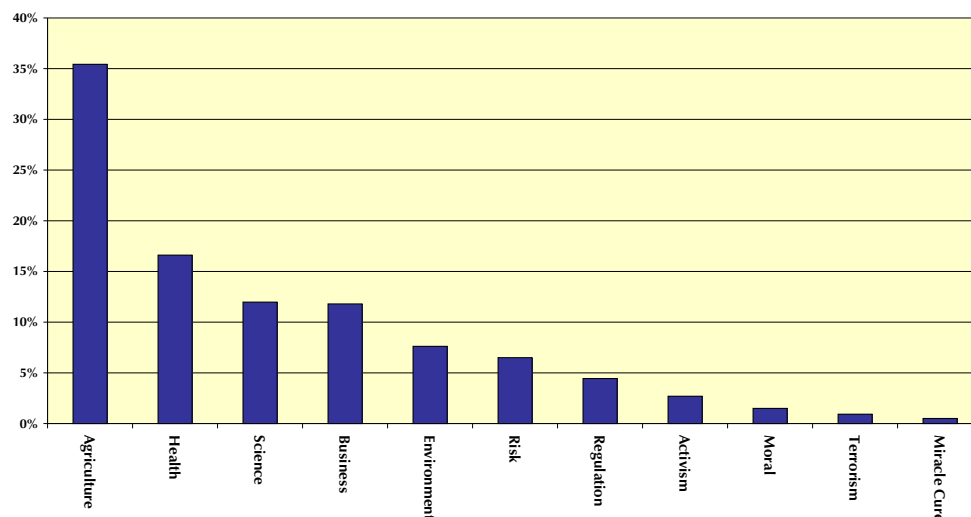
Significant attention was also paid to the 'science' of biotechnology – the technical and research aspects – and to the commercial applications of, for example, genetically modified foods and medicines.

Perhaps surprisingly, less attention was given to the environmental impacts of biotechnology and the potential risks. This indicates a change from coverage in

¹ 14,944 full text UK articles were analysed by *FrameCoOccur*. See section 3.2.1 for details of the computer procedures. For a list of news sources used see section 6.1.36.

previous years, as we note in 3.3.3 below. Framing in terms of regulatory or moral and ethical issues was similarly at a relatively low level.

Figure 3-1 Frames in UK coverage of biotechnology – 2004-2005



As noted in 3.2.1 above, the computer algorithms yielded not only frequencies of the occurrence of specific frames but also their co-occurrences. If, for example, both an agricultural and a business/commercial frame were evident in a particular article, the count of co-occurrences of that pair would be increased by one.

These co-occurrences are, in many cases, amenable to further analysis using multidimensional scaling (MDS).² The exceptions are when the coverage of particular aspect of science is relatively uni-dimensional – i.e. when articles have only one significant frame or theme in which the topic is described and discussed.

Figure 3-2 below shows the results of this analysis. Our interest is primarily in those objects (frames) that are most tightly associated with each other - i.e. those that centre around the origin of the 2-dimensional representation. We can see, for example, that the 'science' frame is most closely associated with that focusing on health. This allows us to conclude that the scientific and technical details of biotechnology are most often provided in articles about biotechnology in the medical field – less so in stories about agricultural applications of biotech.

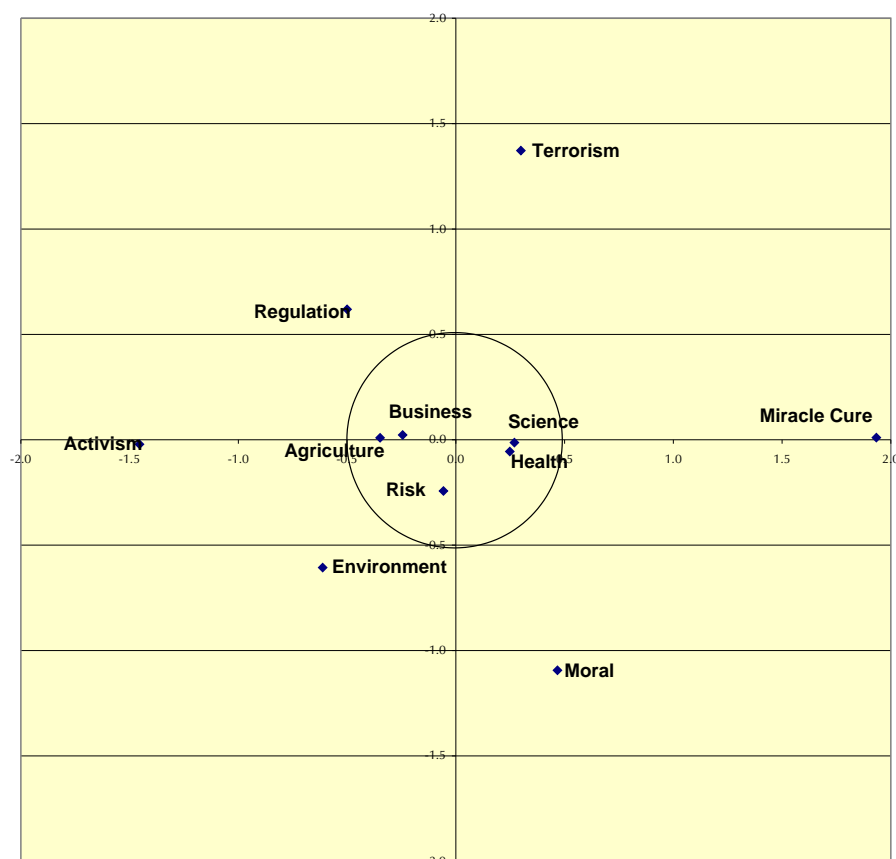
We can also see from Figure 3-2 that commercial/business aspects of biotechnology are to found more often in stories that focus on its agricultural and food applications.

2 The objective of multidimensional scaling is to detect underlying dimensions in matrix data that enable observed similarities or dissimilarities (distances) between the investigated objects. Here, the interest is not so much in the meaningfulness, or otherwise, underlying the data, but in the spatial relationships in 2-dimensional space of the objects (frames) themselves. See, for example, . B. Kruskal, J.B. and Wish, M. (1978) *Multidimensional Scaling*. Sage Publications: Beverly Hills, CA.

The issue of risk, although relatively infrequently referred to overall (see Figure 3-2 above) appears to be raised in the context of both medical and agricultural biotech. Framing in terms of concern about environmental issues, again relatively infrequent overall, is clearly much more associated with farming and food than with medical applications of biotech.

The remaining frames are at some distance from the origin and reflect the pattern shown in Figure 3-1.

Figure 3 - 2 Co-occurrences of frames in UK coverage of Biotechnology – 2004-2005



3.3.1.2 Nanotech The framing of articles in the UK press focusing on nanotechnology is summarised in Figure 3-3 below. Here we can clearly see that the 'science' frame is most evident in this coverage along with discussion of medical applications and the possible risks of the new technology. Potential commercial applications, environmental issues and the need for regulation were also used to frame the articles. The notion that nanotechnology could lead to medical 'breakthroughs' or 'miracle cures' featured less significantly.

Figure 3-4 below shows the results of multidimensional scaling analysis of the nanotechnology co-occurrence data. Here we can see a tight cluster of frames including those of 'science', 'health' and 'environment', indicating that many

articles cover all of these aspects. Business/commercial interests also feature along with these themes, together with environmental issues and the perceived risks of the technology.

Figure 3-4 Frames in UK coverage of nanotechnology – 2004-2005

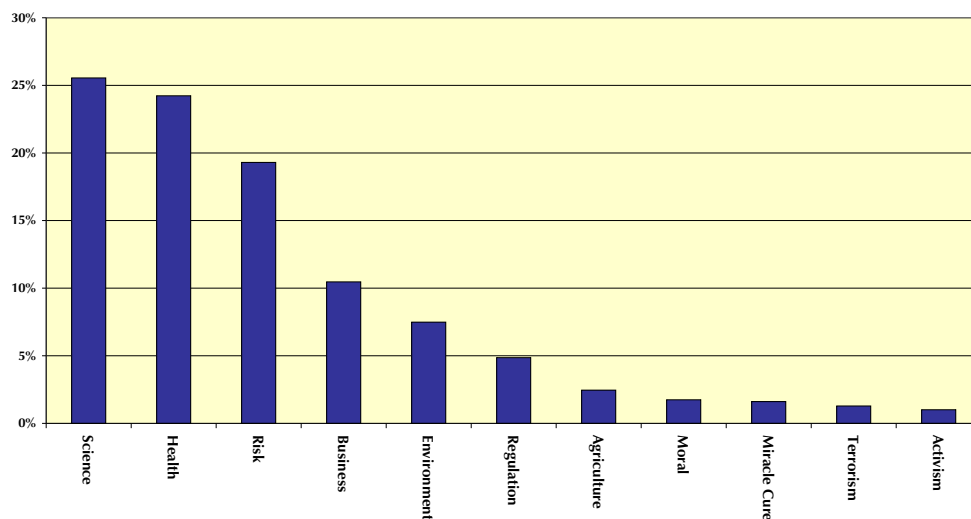
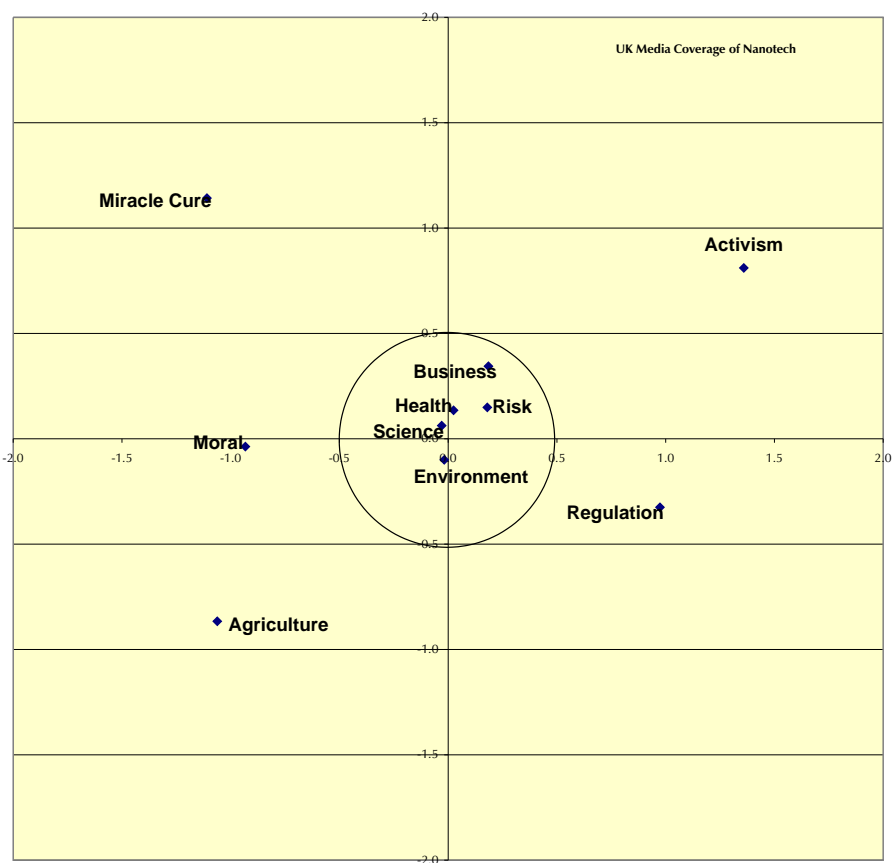


Figure 3-3 Co-occurrences of frames in UK coverage of nanotechnology – 2004-2005



Other types of frame, such as 'activism/protest' and 'regulation' co-occur less frequently with other themes in the coverage and feature, as we have seen in Figure 3-3, less frequently in the coverage generally.

3.3.1.3 Assisted reproduction

Coverage of assisted reproduction, largely focused on in-vitro fertilisation (IVF), is summarised in Figure 3-5 below. As we would expect the stories were mostly framed in medical and health terms. Other framing, however, was evident with risk, regulation and the scientific and technical aspects appearing in the articles. Concern with the moral and ethical aspects of assisted reproduction, and IVF in particular, was also apparent.

Figure 3-5 Frames in UK coverage of assisted reproduction – 2004-2005

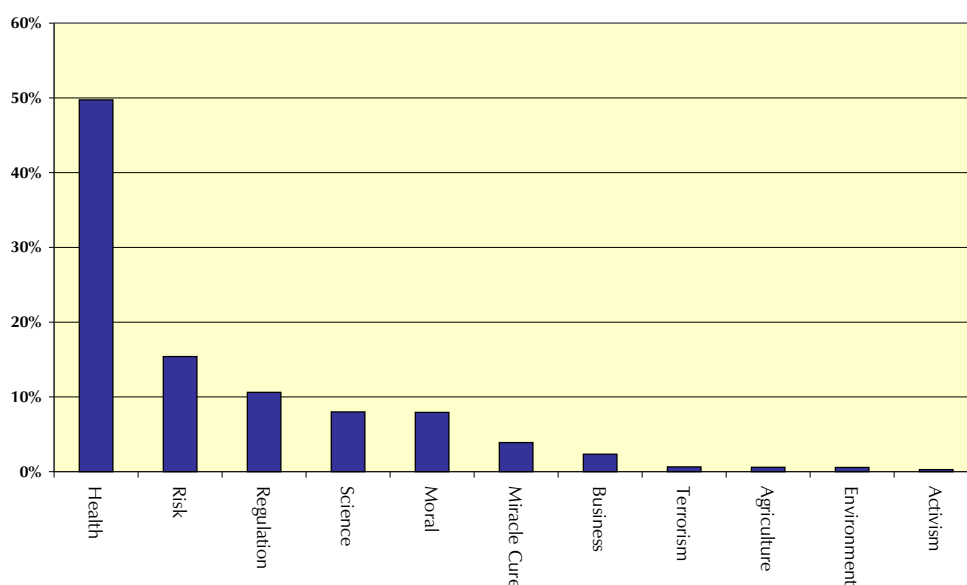
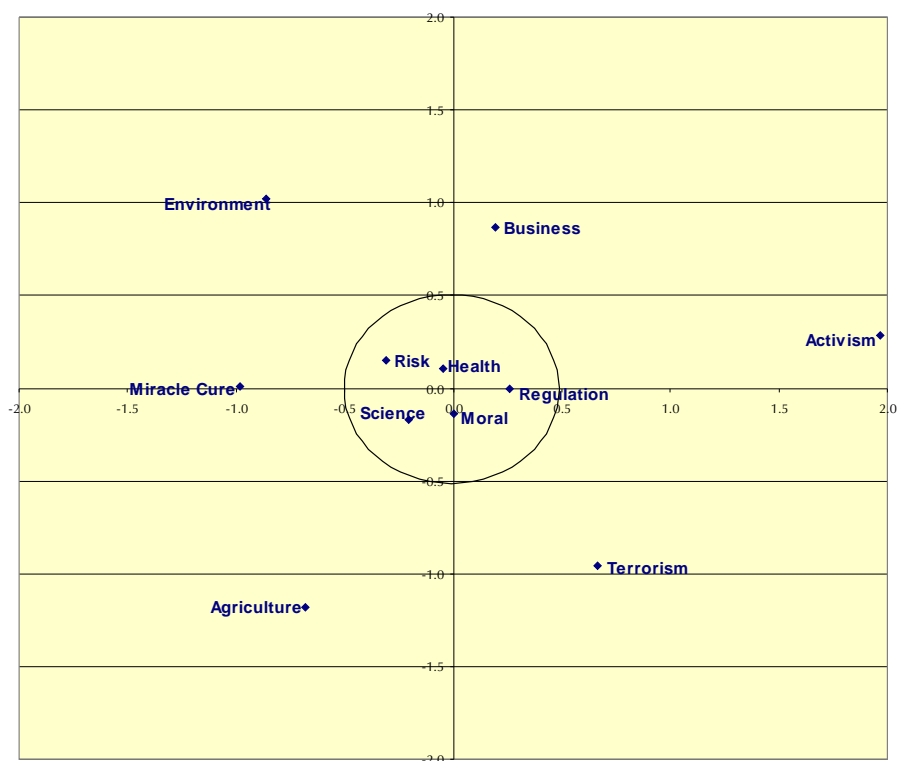


Figure 3-6 shows that while concern with moral issues was relatively low in terms of simple frequency of associated keywords, the frame was very much associated with other thematic aspects in the coverage. The 'moral' frame co-occurs significantly with risk, health, regulation and health themes as shown by the cluster around the origin of the graph. The location of the other frames some distance from the origin indicate that they had little prominence in the coverage.

Figure 3-6 Co-occurrences of frames in UK coverage of assisted reproduction – 2004-2005



3.3.2 Stem cell research

Stem cell research, like assisted reproduction, was most frequently framed in terms of health and medical aspects. A significant number of articles, however, also made reference to the scientific and technical aspects of stem cell research and its applications. Concern with moral and ethical issues and with the need for regulation of the research was also evident, as shown in Figure 3-7 below. Frames in UK coverage of stem cell research – 2004-2005.

The multidimensional analysis also revealed significant co-occurrences in the articles between the science, moral, and regulation frames with that of health. These are illustrated in Figure 3-8 below.

Figure 3-7 Frames in UK coverage of stem cell research – 2004-2005

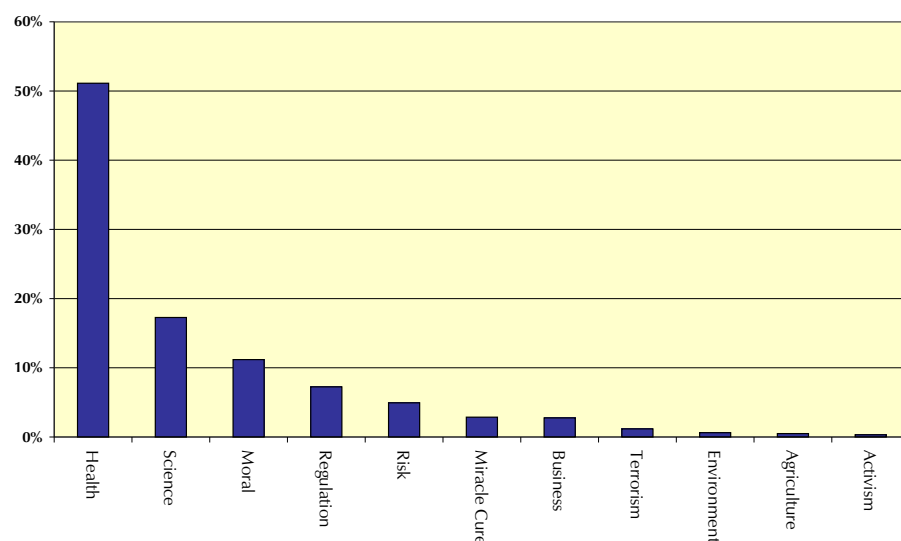
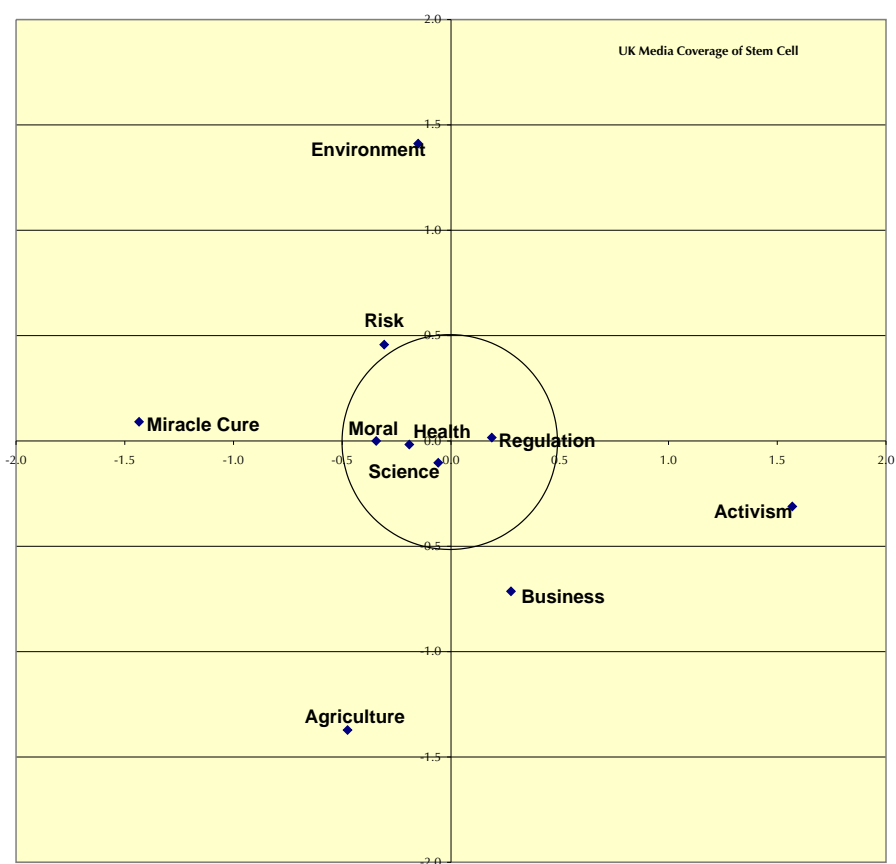


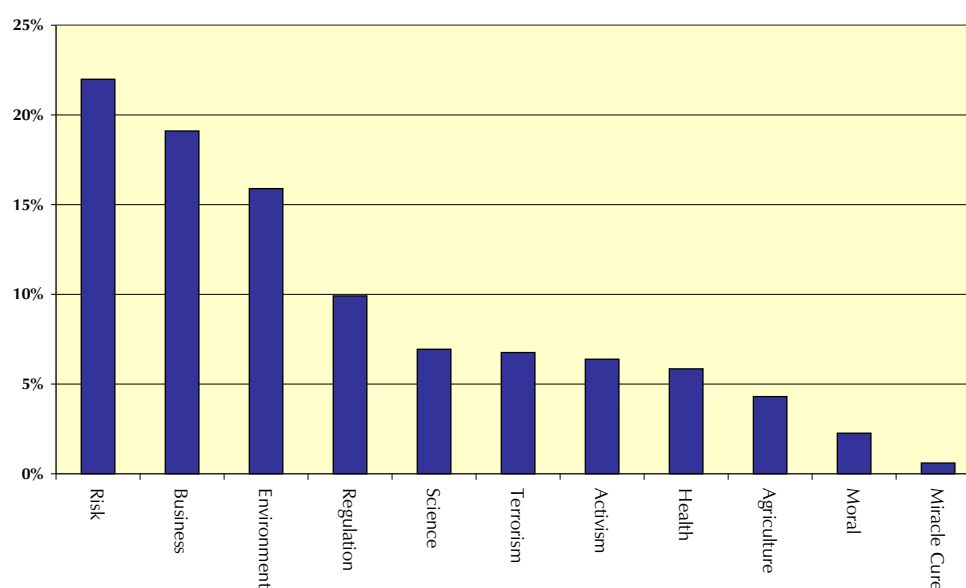
Figure 3-8 Co-occurrences of frames in UK coverage of stem cell research – 2004-2005



3.3.2.1 Nuclear issues The focus in this field was on nuclear power and research involving, for example, nuclear fusion and fission. Particular care was taken to exclude articles concerned with nuclear weapons and warfare.

Figure 3-9 below shows that the risks posed by nuclear energy were stressed in over 20% of articles. Commercial and business interests and potential environmental impacts also featured significantly. The need for regulation of the technology constituted a frame in 10% of articles while the scientific and technological details featured in only about 7% of articles. Concerns about possible terrorist uses of

Figure 3-9 Frames in UK coverage of nuclear issues – 2004-2005

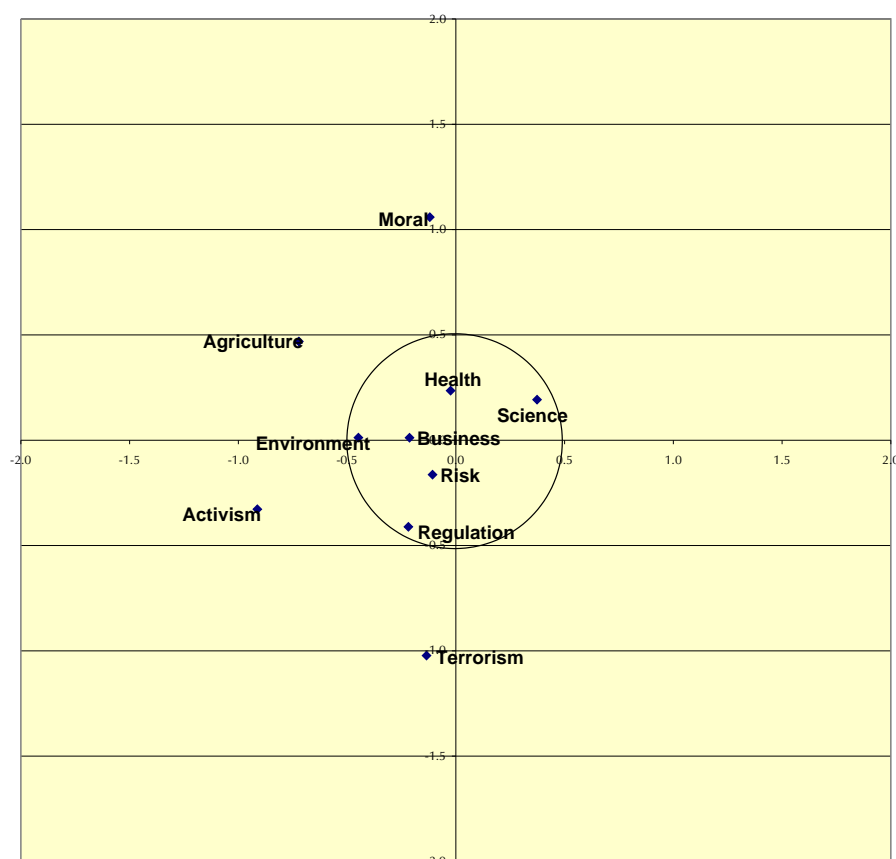


nuclear material are expressed in this context and the role of protest and activist groups is also evident.

The multidimensional scaling analysis shown in Figure 3-10 below again emphasises the centrality of the risk and commercial frames in the reporting of nuclear issues. These are closely surrounded by the frames of regulation, environment and science. Interestingly, the health frame, which numerically is relatively infrequent in terms of its associated keywords, co-occurs quite strongly

with the more frequent frames. This suggests that the health risks associated with nuclear power may be more significant than the keyword counts might indicate.

Figure 3-10 Co-occurrences of frames in UK coverage of nuclear issues – 2004-2005



3.3.3 Qualitative Analysis – Comparative overview – 2000-2005

UK science coverage across this period can be roughly divided between the broadsheets and tabloids in terms of depth, balance and sensationalism, with the former generally representing more ‘responsible’ coverage. Both, however, contained editorialised and relatively sophisticated coverage of wider ethical, moral and social debates, particularly of the life sciences. Also prominent were UK-specific debates over animal testing and, to some extent, assisted reproduction. Indeed, UK press coverage of IVF in particular provided a good example of a scientific innovation which was once considered highly controversial being slowly accepted, with a corresponding change in the accuracy and balance of news coverage. IVF and related reproductive technologies today receive a sophisticated and relatively balanced level of press coverage in the UK, indicative of a wider public understanding of the science involved and its pros and cons.

The dominant frames which occurred across science reporting in the period were associated with risk - health and environmental issues. Coverage was distinguished beyond these frames in terms specific to the particular area of science and its wider applications. Nanotechnology and nuclear issues, for example, were

often reported in terms of business and investment. This is in line with the quantitative analysis, noted in 3.3.1.2 and 3.3.2.1 above which demonstrates a high occurrence and levels of co-occurrence of the business frame in Nanotechnology and Nuclear reporting.

The pro-science line of the UK government, framed in terms of fostering a globally competitive 'knowledge-based economy', influenced how science generally was reported, debated and discussed in the media in 2000-2005. Business and investment were high on the science news agenda during this time. Again, this supports the findings of the quantitative analysis which demonstrates a high co-occurrence of the business frame (with the exception of assisted reproduction and stem cell research) even where the actual occurrence of the business frame is comparatively low.

This optimistic, pro-science government stance was in many cases (GM, Nuclear) presented in the press as being in marked contrast to a so-called 'anti-science' backlash amongst the public. On the other hand, UK press coverage of science and science and society issues displayed awareness of an increased need for openness in nationally framed public debate of science issues.

In general, it also seems that UK science reporting tended to look to America rather than Europe, both in terms of science research news and investment.

Press coverage of science issues generally represented a balanced cross-section of representatives from civil society. There was a slight tendency, however, for a relatively small number of 'big name' scientists, academics, media commentators and civil society 'representatives' to dominate some debates throughout the period. Various interest groups, the commercial lobby, and op-ed journalists (as opposed to science journalists) also commanded a significant amount of coverage. The letters pages, particularly of the broadsheets, were often the sites of rather polarised debates, and op-ed pieces regularly acted as a spur for wider debate. This level of engagement – although not uniform – is perhaps indicative of a fairly well informed civil society.

3.3.3.1 Biotechnology UK press coverage of biotechnology from 2000-2005 fell mostly into two sections: coverage of medical applications and coverage of agricultural applications. More general biotechnology coverage was mostly framed in terms of business and investment, as biotechnology investments were regularly touted as "the next big thing" in finance pages.

GM Agricultural stories were dominated by GM, and press coverage of GM during the period could in many senses be taken as case study on the need for responsible and balanced reporting of science. By 2005, there was reflection in a lot of the press on the GM "PR disaster" – despite the 2003 GM*Nation* public consultation exercise – and the need to ensure that the reporting of emergent sciences (such as Nanotechnology) and their applications do not follow the same path.

At the start of this period the press debate on GM was already well under way, and coverage was quite balanced, reporting on public concerns and mistrust but also expressing some wariness of 'anti-science' sentiment. Newspapers were distinguished by their editorial / ideological lines – for instance, the *Daily Mail* led a strong anti-GM position. Towards 2002, coverage of GM moves from an environment and science frame to a consumer rights frame, and much of the

negative coverage expresses public mistrust of the UK government. Overall, coverage of GM was negative but opposing views were generally well represented.

Medical The human genome project received a substantial amount of coverage from 2001 onwards. The partial mapping of the human genome was published in 2001, with the complete project released in 2003, well ahead of schedule. These announcements were met with almost universally positive coverage, which trickled on into 2004 and 2005, and the work was hailed as a British triumph due to the substantial involvement of a UK research group at the Sanger Institute. There was some discussion about the “danger” of reducing medicine to genetics, but overall coverage was very positive.

Stem cell research and cloning were the other major medical biotechnology stories. Coverage was balanced and did not change substantially in tone or focus over the five-year period, although major international news events such as claims of cloned human births tended to dictate particular volumes of press coverage. Overall these issues were reported on as debates, with a willingness to engage in technical medical detail and also to solicit the opinions of academic “heavyweights”. This supports the findings of the quantitative analysis which reveal a high co-occurrence of science and health frames when reporting both on general biotechnology and specifically on stem cell research, indicating that discussion of medical biotechnology applications typically involved some technical scientific detail.

Opinion was divided between optimism about the medical potential of stem cell research and cloning and a moral confusion about the limits of life and the ethics of embryonic research. This reflects the relatively high levels of co-occurrence of the moral frame in stem cell research reporting, even where its actual occurrence was comparatively low. An overall distinction was made between therapeutic and reproductive cloning. Religious groups made their voices heard on these subjects more strongly in Scotland and Ireland than in England or Wales.

3.3.3.2

IVF As a reproductive technology pioneered in the UK in the 1970s, the social, moral and ethical implications of IVF received in-depth consideration in public debate and legislation. Where IVF was once considered scientifically and socially controversial, it has gradually been publicly accepted as a beneficial technology.

Reproductive technologies have been thoroughly debated in the UK and are subject to extensive legislation. Press coverage of IVF and other reproductive technologies from this period were often concerned with legal precedents, and the ‘human interest’ stories behind them. In general, press coverage of IVF in the UK was perhaps less concerned with moral and ethical issues about artificial reproduction than other parts of Europe – Italy for example (though this is not to say that the pro-life lobby did not have a significant voice on these issues). This is consistent with the quantitative analysis, which demonstrates a relatively low occurrence of the moral frame in assisted reproduction reporting, particularly when compared to the health frame.

Tabloids tended to focus on sensationalist human interest stories, the practicalities of access to cutting-edge IVF techniques (the NHS ‘postcode lottery’), IVF treatment for gay and lesbian couples, legal battles of parents or individuals, and scare stories about embryo mix-ups. The tone and framing of coverage did not change significantly over the five year period. IVF was framed as a health story –

well regulated and legislated for in the UK – and debated in the press in terms of risk as well as ethics.

3.3.3.3 Nanotech Nanotechnology stories generally focused on nanotechnology's status as a new science, its projected health and environmental risks, and its business and investment potential.

Nanotechnology received a relatively small but sustained amount of coverage in the UK press from 2000 to 2005. Much of this coverage (across broadsheets and tabloids) was "sci-fi" in tone, at times combining futurology, sensationalism and scaremongering. This was tempered, however, by an increased awareness in some sections of the press of the need for responsible and balanced reporting.

Much coverage was concerned with descriptions of what nanotechnology is, along with its existing and potential applications. This supports the quantitative findings which show the science frame to be the most frequently occurring in nanotechnology coverage. The science frame also had the highest rate of co-occurrence, which indicates that most nanotechnology stories included some scientific detail. Public engagement initiatives - like the *NanoJury* launched in 2005 by *The Guardian*, Greenpeace and Universities of Cambridge and Newcastle - were launched and received wide coverage in some sections of the press.

Coverage was generally divided between stories based on news releases emerging from the commercial sector (IBM, Intel etc) and stories emerging directly from university or otherwise independent research institutes.

The economic and investment potential of nanotechnology was discussed at length, a factor reflected in the quantitative analysis which shows high occurrence and co-occurrence of the business frame (following science, health and risk frames). There was also some discussion of environment and environmental risk, with many reports taking a cautious line on environmental and health risks. This is again reflected in the high co-occurrence of the environment and risk frames in the quantitative analysis.

3.3.3.4 Nuclear energy Nuclear stories were generally framed in terms of risk: environmental, terrorist and health. Quantitative analysis indicates a very high level of occurrence and co-occurrence for the risk frame in nuclear coverage. By 2005, there had been a re-framing of stories in terms of business, economics and regulation, as the possibility of re-commissioning in the UK was widely discussed. The quantitative analysis noted in 3.3 above indicated that business was the second-most regularly occurring frame in nuclear coverage, after risk.

From 2000 to 2005, a substantial shift was evident in the focus of UK nuclear press coverage. In 2000, coverage focused on international issues, decommissioning, safety scares and political and financial stories about UK nuclear providers, many of them negative. This coverage was presented against a backdrop of public support for nuclear decommissioning in the UK.

Towards 2001, there was some suggestion in the UK press that nuclear power was back on the political agenda. Following the EU's ratification of the Kyoto protocol in 2002, climate change and reduction of carbon emissions became a major political and economic concern in the UK; nuclear energy was increasingly put

forward (reportedly by the nuclear industry lobby and DTI) as a potentially viable low-carbon energy resource, a line that received increased and steady coverage.

The debate was re-framed, and the nuclear issue was subsequently presented as a conflict between an influential pro-nuclear lobby (including many prominent environmentalists and well as politicians and civil servants) and a traditionally left/environmental anti-nuclear lobby. Both sides claimed that their arguments were grounded in concerns about sustainability.

This press coverage took place against a backdrop of overall public scepticism about the environmental costs of nuclear energy, concerns about safety (including increasingly in the wake of 9/11 fears of potential terrorist attacks on nuclear sites) and scepticism about the trustworthiness of the UK nuclear energy industry. By 2005 press opinion appeared to shift slightly further towards the pro-nuclear position.

3.3.3.5 Animal Testing UK press coverage of animal testing from 2000 – 2005 reflected an increasingly acrimonious divide between the scientific community and animal rights campaigners. The actions of animal rights “extremists” dominated coverage and debate over the five-year period.

Press coverage of animal testing was fairly balanced, reflecting a middle ground view. Animal testing has been subject to substantial public debate and legislation in the UK. Public scepticism about the pharmaceutical industry was thought to overlap with the debate on animal testing, however, and this was reflected in some of the coverage.

The voices of scientists, moderate animal rights campaigners and general supporters of animal testing for medical research purposes were fairly equally presented in the coverage. Hard-line animal rights campaigners, on the other hand, such as those who targeted Huntingdon Life Sciences and Oxford University were presented by the press – and considered by the public – to be extremists, if not ‘terrorists’.

A widespread unwillingness on the part of scientists to make themselves targets for animal rights extremists had some stifling effect on public debate, although the pro-testing lobby became more visible towards the end of this period.

More detailed analysis of British science coverage between 2000 and 2005 is provided in Section 6.1.

3.4 France

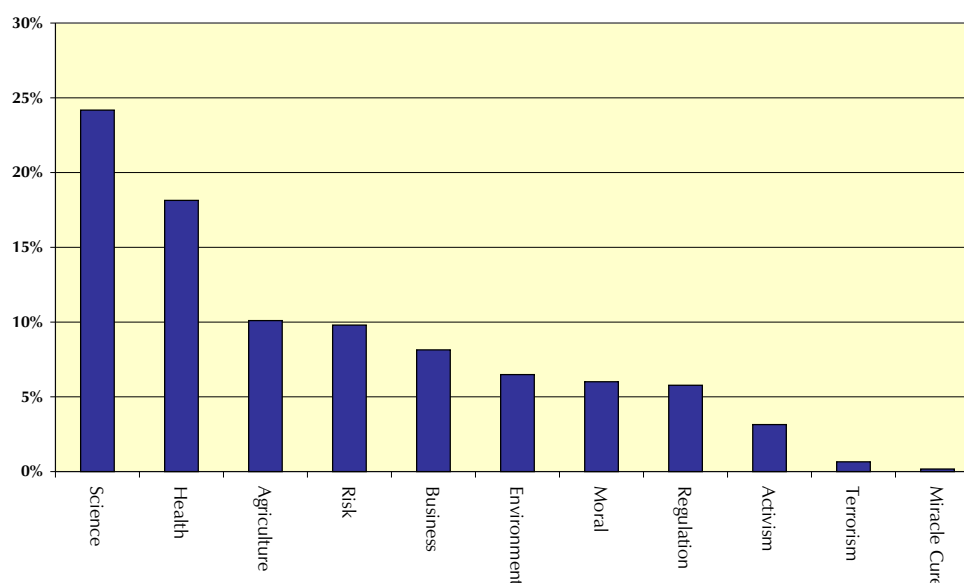
3.4.1 Quantitative analysis

The computer-based analysis¹ of French science coverage focused on the same topics and thematic areas as in the UK analysis and 17,074 articles were analysed.² In designing the matrices to define the frames, however, care was needed to establish broad conceptual equivalence with the UK frames. This involved not simply the translation of keywords but an intelligent reading of a sub-sample of articles to determine the most appropriate words and phrases.

We would not wish to claim at this stage that complete equivalence has been established. That may not, in any case, be achievable. We feel, however, that the results of the analyses demonstrate the utility of the method quite clearly and form a basis for future refinement and development.

3.4.1.1 Biotechnology The major framing of articles on biotechnology in the French media was in terms of its scientific and technical aspects, reflecting the more 'factual' approach of the country's media. From Figure 4-1 below we can see that the medical and health aspects of biotechnology received more attention than those relating to agriculture and food. The potential risks of biotechnology appeared as frames in around 10% of all biotech coverage.

Figure 4-1 Frames in French coverage of biotechnology – 2004-2005



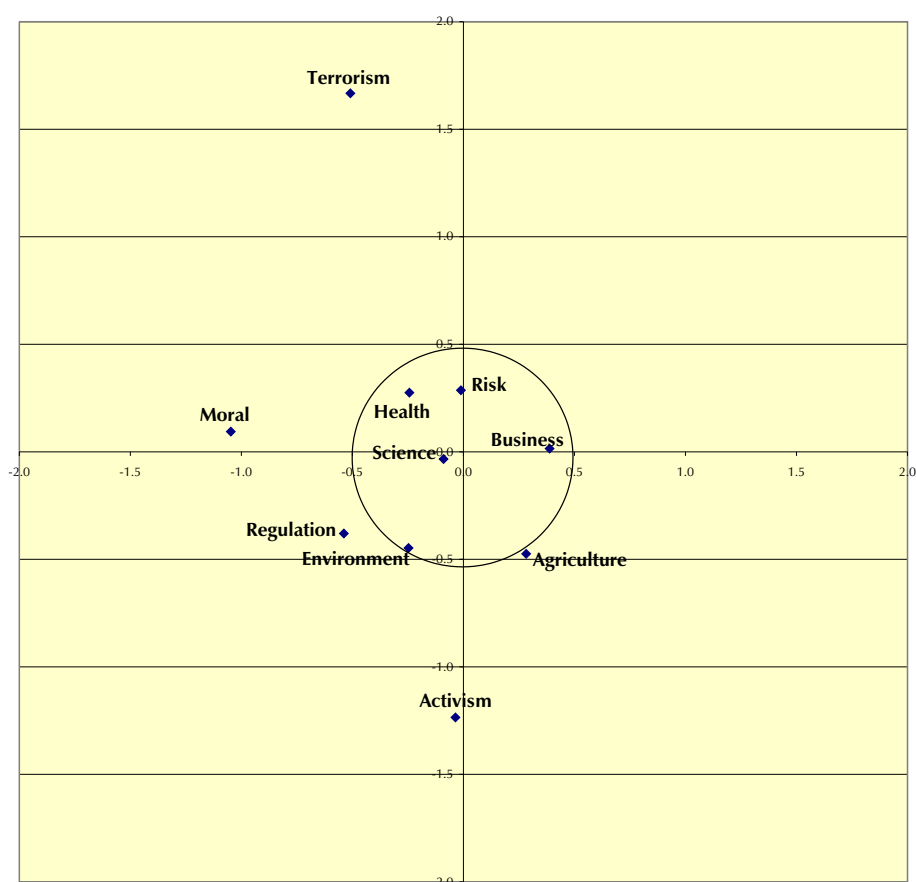
The results of the multidimensional scaling analysis shown in Figure 4-2 below reinforces the the fact that a significant amount of French coverage of biotech

- 1 17,074 full text French articles were analysed using FrameCoOccur. See section 3.2.1 for details of the computer procedures.
- 2 For a list of news sources used see section 6.2.30.

combines the themes of science, health, risk and commerce. The agriculture frame is further from the origin, reflecting its relatively lower co-occurrence with this set. From the almost equal position with environment on the Y axis we can conclude that these regularly co-occur in articles, which makes perfect sense.

We can also see from the MDS plot that the 'activism' frame, although quite infrequent, is more likely to appear in articles that deal with biotech applications in the agricultural and food areas rather than in stories about medical biotech. Environmental issues are also brought into the picture in these contexts.

Figure 4-2 Co-occurrence of frames in French media coverage of biotechnology – 2004 2005



3.4.1.2 Assisted reproduction

Figure 4-3 summarises the distribution of frames surrounding coverage of assisted reproduction and IVF in the French newspapers. We can clearly see here that in addition to the scientific and technical details there are strong moral and ethical issues discussed. Health, regulatory frameworks and potential risks are less frequently featured.

The health frame, however, when it does appear in coverage, co-occurs quite extensively with the 'science/technical' and 'moral/ethical frames', as shown in the MDS plot in Figure 4.4.

Figure 4-3 Frames in French coverage of assisted reproduction – 2004-2005

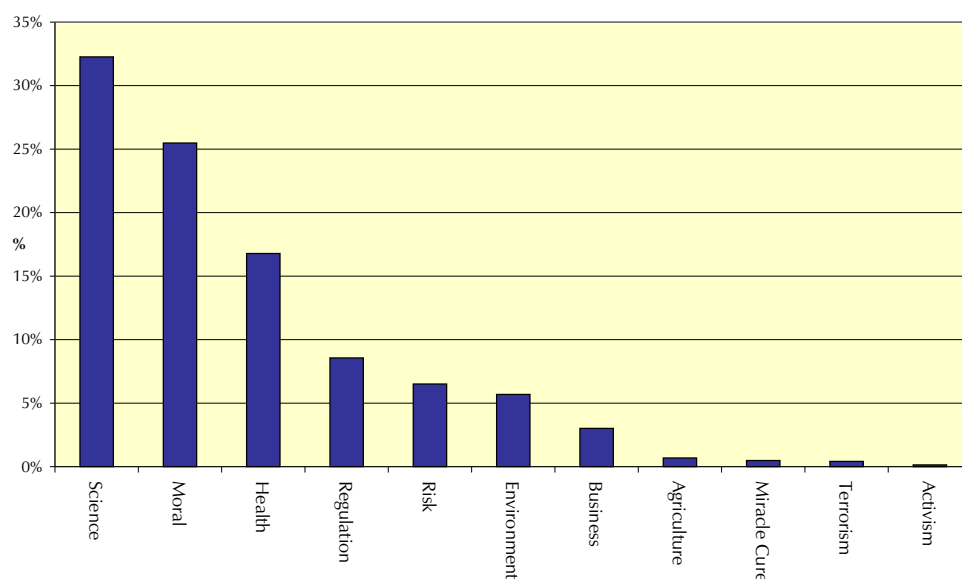
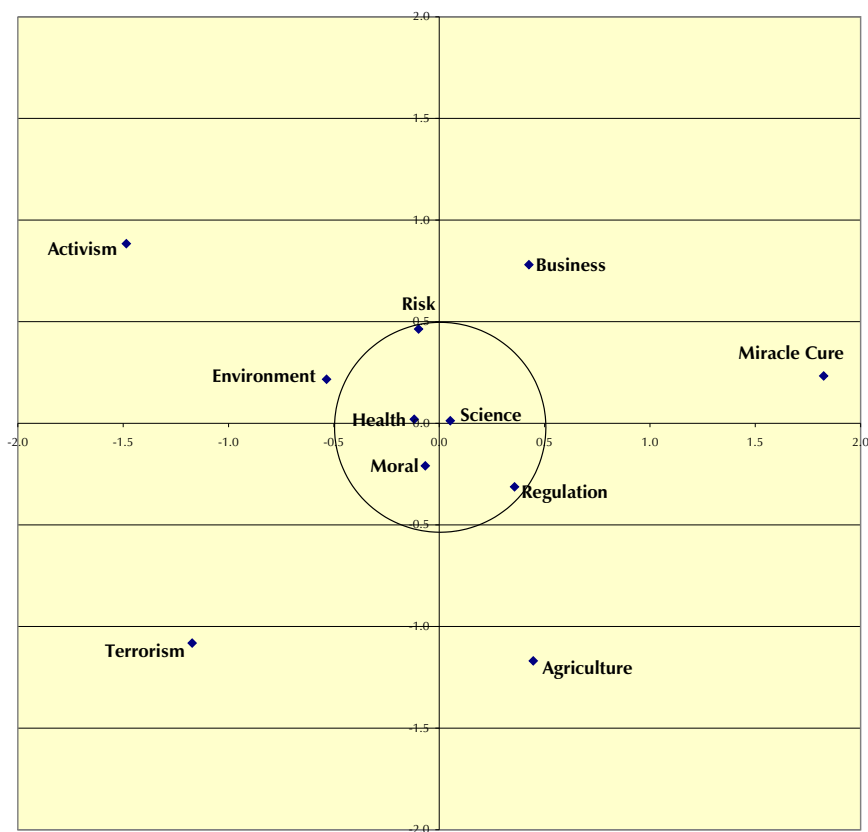


Figure 4-4 Co-occurrence of frames in French media coverage of assisted reproduction – 2004 2005



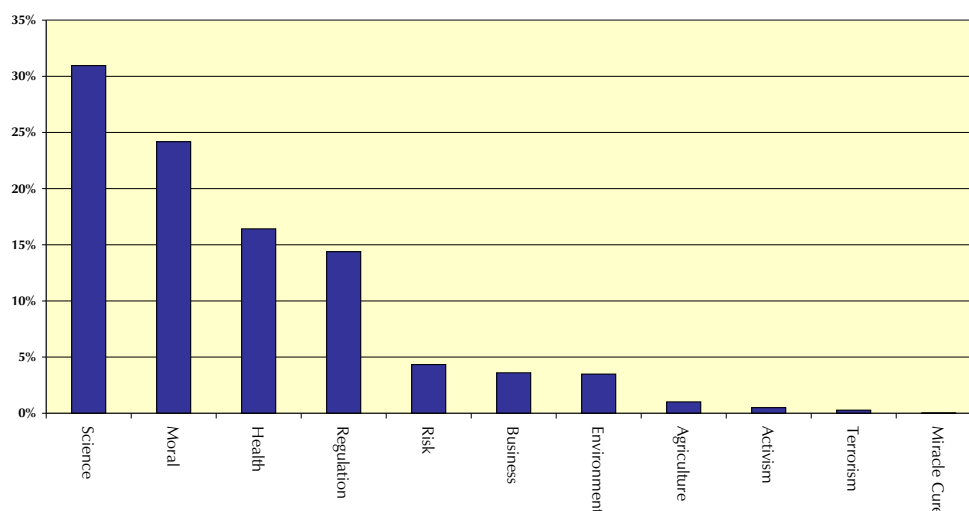
Apart for 'risk' and 'regulation' the other frames in Figure 4 above are of little significance.

3.4.1.3

Stem cell research

French coverage of stem cell research followed a pattern very similar to that concerned with assisted reproduction. the moral/ethical frame was very apparent, second only to discussion of the scientific and technical aspects of the work. The results are summarised in Figure 4-5.

Figure 4-5 Frames in French coverage of stem cell research – 2004-2005

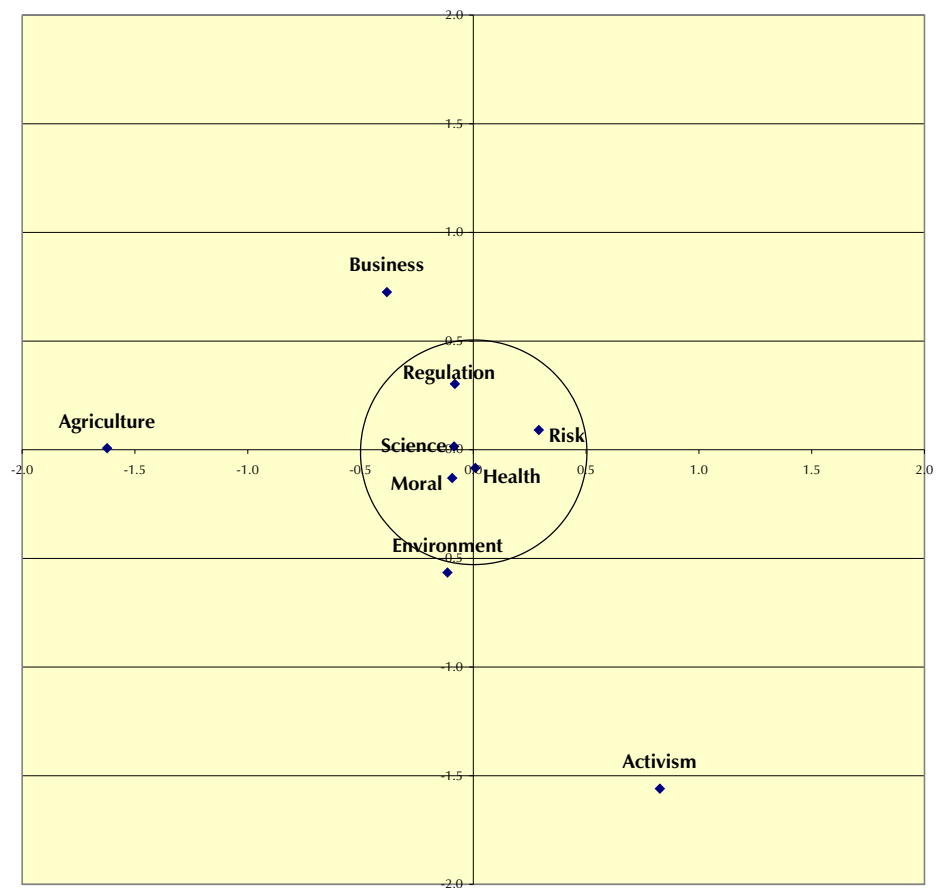


The very low frequency for the 'miracle cure' frame was unexpected. This frame comprises themes related to medical 'breakthroughs' and potentially life saving innovations. It seems, however, that it is more prevalent in the context of assisted reproduction – 'giving hope to infertile couples', etc. than in this context.

The output from the multidimensional analysis is shown in Figure 4-6 below. To achieve a meaningful analysis it was necessary to remove the most infrequent frames from consideration, including that of 'miracle cure'.

We can see that the 'science', 'moral' and 'health' frames are tightly clustered around the origin of the 2-dimensional plot. The 'regulation' and 'risk' frames are also within the arbitrary circle around the origin, indicating their substantial co-occurrence with the most central frames.

Figure 4-6 Co-occurrence of frames in French media coverage of stem cell research – 2004 2005



3.4.2 Nanotech

The most frequent framing of nanotechnology stories in French media was in terms of 'straight' science – the theoretical and technical aspects of the novel process. All other frames, including those of the potential commercial applications of nanotechnology, health issues and environmental concerns are much less frequent as shown in Figure 4-7 below.

While the 'science' frame dominates French coverage of nanotechnology, appearing in over half of all articles, it is some distance from the origin of the MDS plot shown in Figure 4-8. Here we can see that most co-occurring frames are those of 'business' and 'risk'.

What this indicates is, first, that the majority of articles present the theoretical and technical aspects of the technology but add little in the way of polemical discourse or debate. On the other hand, there are articles concerned with commercial exploitation of nanotechnology and the potential risks involved, but these provide very little technical information about this field of science itself.

Figure 4-7 Frames in French coverage of nanotechnology – 2004-2005

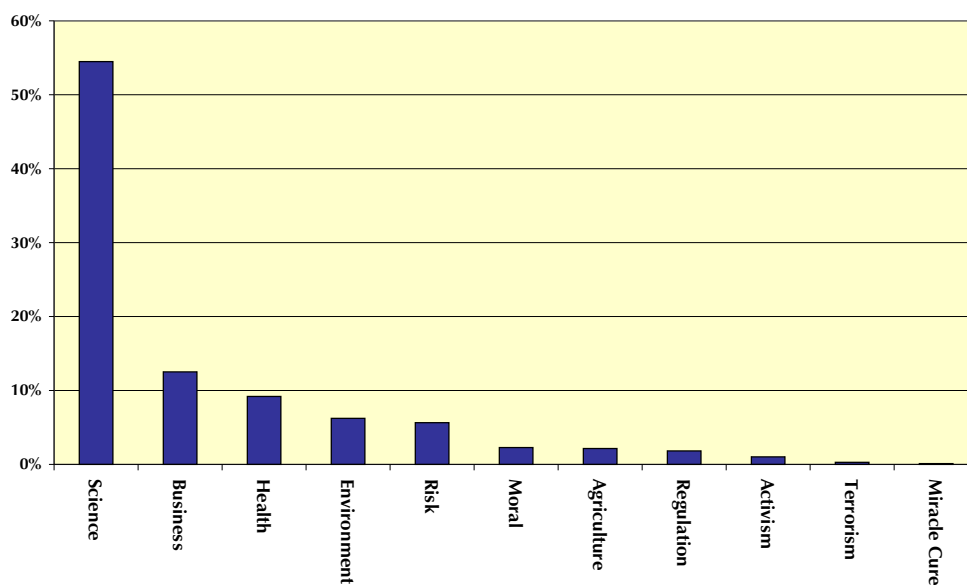
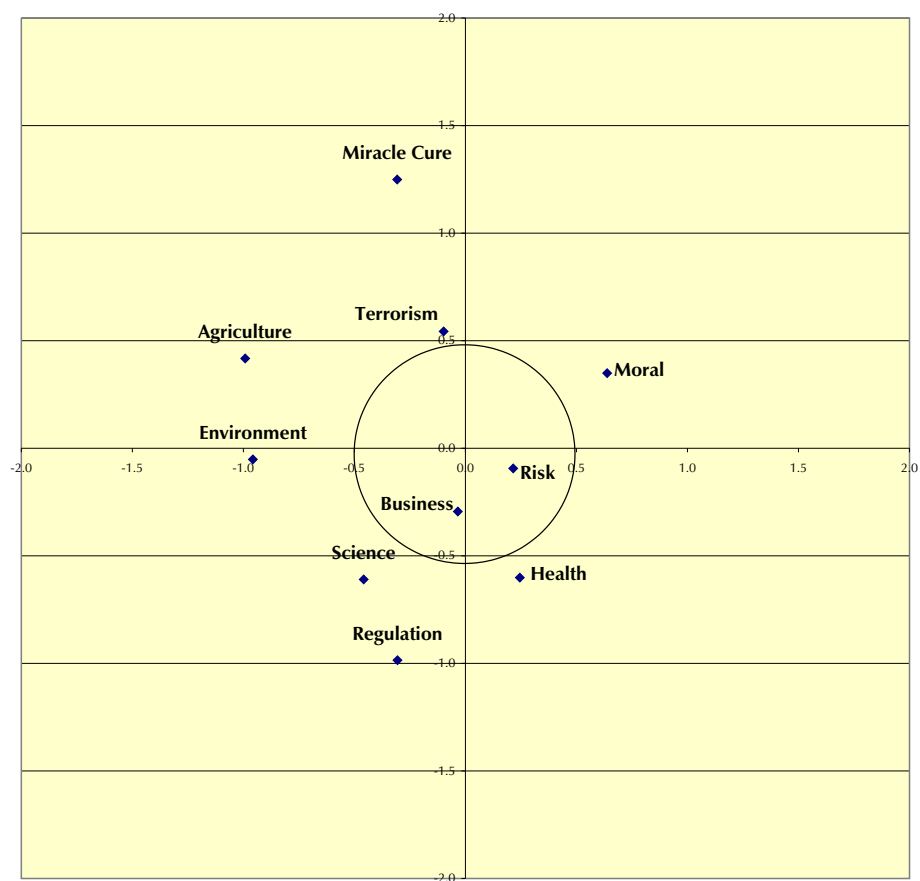


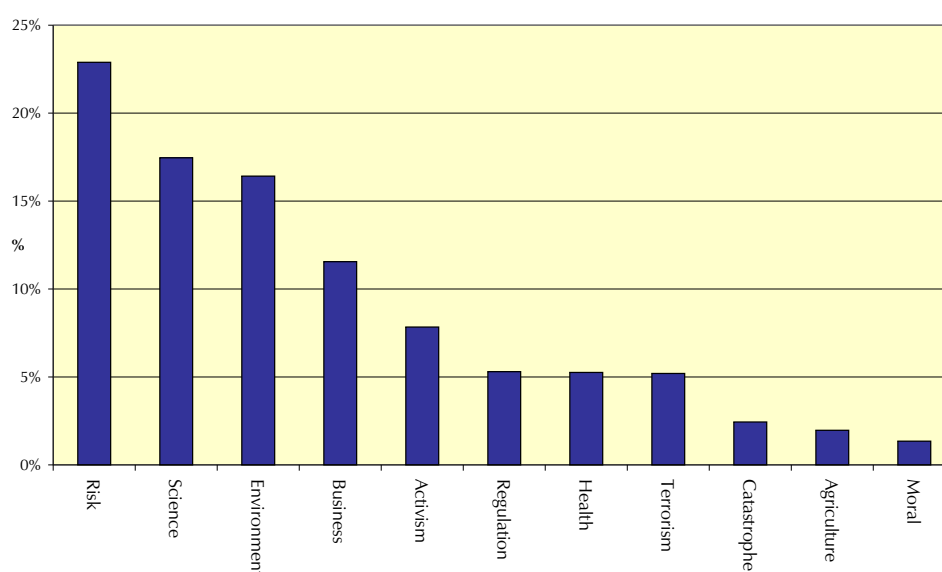
Figure 4-8 Co-occurrence of frames in French media coverage of nanotechnology – 2004 2005



This illustrates the complementarity of the two types of analysis that we have undertaken. Simply counting the frequencies of frames, as measured by their associated keywords, does not provide a full picture or characterisation of news coverage.

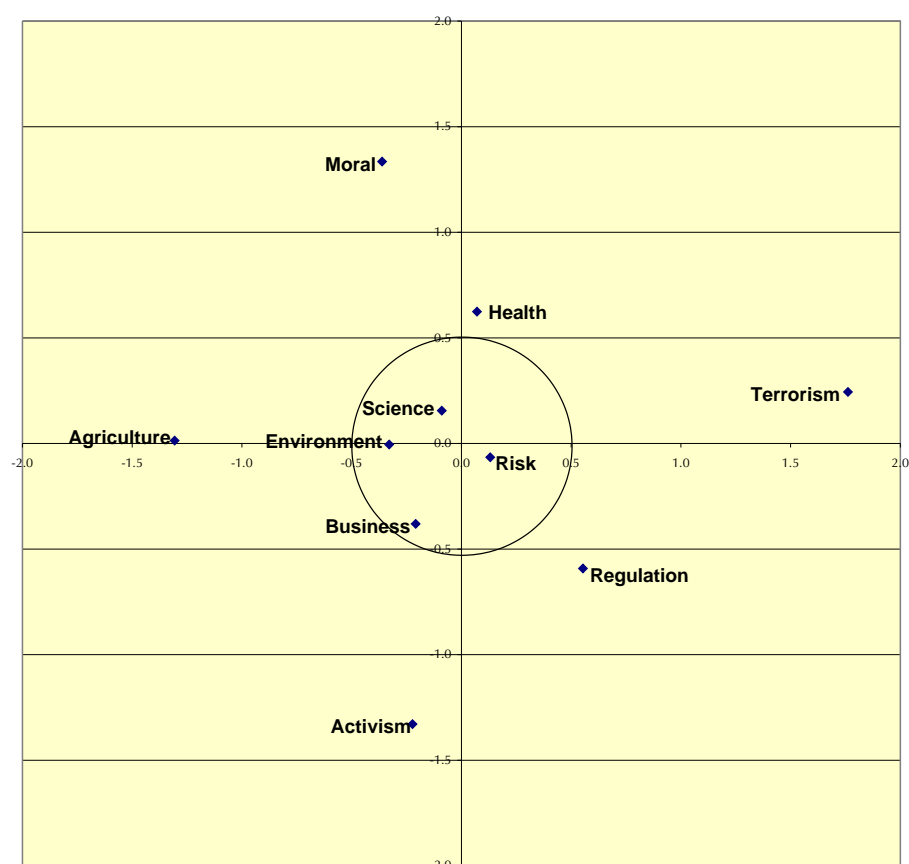
3.4.2.1 Nuclear energy The dominant themes in French coverage of nuclear energy and related issues are shown in Figure 4-9 below. Here we can see that a concern with the risks involved dominates coverage in nearly a quarter of all articles and reports. Descriptions of the science surrounding nuclear power, environmental issues and the commercial aspects also feature significantly in the coverage.

Figure 4-9 Frames in French coverage of nuclear energy – 2004-2005



The co-occurrences of the frames in French coverage of nuclear issues is shown in Figure 4-10 below. Here we can see a pattern of associations between the 'risk', 'science', environment' and 'business' frames, indicating that a substantial number of articles cover all of these aspects to one degree or another. The 'health' frame, although relatively low in frequency, appears just outside of the circle around the origin but close to 'risk' in the X axis. This indicates that some concern with health risks – e.g. to those living near nuclear reactors – is evident in articles that discuss the risks of the technology. The main focus of risk reporting, however, appears to be more on environmental impacts.

Figure 4-10 Co-occurrence of frames in French media coverage of nanotechnology – 2004 2005



3.4.3 Qualitative Analysis – Comparative overview – 2000-2005

French science press coverage from this period addressed science stories from a range of angles, particularly emphasising business, policy, ethical and social implications and the environment. Coverage tended to avoid sensationalism (with some exceptions) and journalists were not afraid to tackle the complex ethical questions raised by scientific research and applications. The influence of the Catholic Church was evident in much of this discussion (most substantially of course in the Catholic press), without being over-riding.

In many areas, the views of NGOs were well represented. This is particularly the case in coverage of environmental concerns, including GM agriculture and nuclear energy. Scientists' views were also well-represented – a scientist is often quoted as 'the last word' on a particular story. Science reporting also tended to keep an eye on national, European and international legislation, so although regulation in itself was not the most prominent news topic, many of the reports incorporate some discussion of French or international policy on science issues.

There was a significant international slant to much of the coverage, which often portrayed scientific research as an international competition in which France and more generally Europe must work hard to keep ahead. Business coverage of science stories tended to emphasise the positive role of science in the French economy, and, as mentioned above, kept an eye on international research funding policies as well as legislation on scientific research.

There was some difference between coverage of 'new' science and of more well-understood scientific areas. As scientific developments were understood and accepted, coverage tended to shift to a more local focus, looking at implications for everyday life as well as science and business. This tendency was observed in coverage of nanotechnology (which as 'new' science emphasised positive implications and focused on science and business) in coverage of GM (as the science became more well understood GM started to be reported as a lifestyle issue as well as a science issue), and in coverage of nuclear (where the science was thought to be generally understood and was superseded by coverage of risk, policy and environmental questions).

3.4.4 Biotechnology

French biotechnology press coverage in 2000-2005 fell into two fairly equal parts - coverage of medical applications and coverage of agricultural applications. This is consistent with the quantitative analysis that revealed infrequent co-occurrence of agricultural frames with health, science and business frames in French biotechnology research, demonstrating that agricultural and medical applications were mostly reported on separately. Reports focused on ethics, legality and public awareness, with one eye continually kept on international opinion and legislation. Biotechnology investment and worldwide research trends also received coverage. The most hotly debated issues were GM, human cloning and stem cell research.

Coverage of the GM debate moved from being overwhelmingly negative in 2000 to a more balanced representation in 2005. However, in 2005 GM remained a controversial subject in France. Coverage of the organic farming debate shifted over the years from focusing on organic agriculture as an environmental issue to focusing on organic food as a lifestyle issue, and there are points at which the GM debate is conflated with the organic food debate. The activities of a vocal anti-GM environmental movement were widely and consistently reported over the five year period.

The debate on cloning became increasingly sophisticated as a distinction was made in the public mind between reproductive and therapeutic cloning. Widespread condemnation of reproductive cloning was accompanied by an interest in the potential benefits of therapeutic cloning. The Catholic Church made clear its condemnation of human cloning, and the cloning debate received most widespread coverage in the Catholic press. In 2005 France rejected a UN declaration which sought to ban all human cloning.

3.4.5 Assisted Reproduction

French press coverage of assisted reproduction did not change dramatically between 2000 and 2005, although the debate became more sophisticated and technically informed by the end of this period. IVF is reported as a science issue, a

moral issue, a health issue and also a family/social issue. This supports the quantitative findings which show science, moral and health to be the most commonly occurring frames in the assisted reproduction coverage.

The following features were evident in the coverage:

- A fairly even balance between positive and negative coverage. Alongside substantial coverage of health risks and moral questions associated with IVF, substantial space was also given to family-oriented reports and success stories
- Willingness on the part of the press to fully engage with specific and complicated moral and ethical questions about IVF. This was constant throughout the five-year period, although increased reporting on technical scientific details about IVF towards 2005 also made the ethical debate more technical. This is consistent with the quantitative findings which show a high occurrence and co-occurrence of the moral frame
- A happiness to report on specific scientific details about IVF and associated treatments, along with an increasingly sophisticated handling of statistics and conflicting scientific reports. This is reflected in the relatively high occurrence and co-occurrence of the science frame revealed in the quantitative analysis
- A continued 'looking outwards' to international cases, attitudes and legislation, partly influenced by a number of sensational international cases from this period
- IVF being framed as a 'family' issue, but with very little coverage of implications for 'non-traditional' families e.g., gay couples

3.4.6 Nanotech

French press coverage of nanotechnology during this period started off on a highly positive note. Coverage from 2000 to 2002 was almost universally positive, focusing on potential applications and economic opportunities brought by nanotechnology developments. There was an overall sense of excitement, and nanotechnology was typically presented in a scientific or economic/industrial frame. Much of the economics coverage presented nanotechnology research as an international 'race' in which Europe must work hard to maintain its position.

The early coverage was also notable for its 'sci-fi' tone, and for the fact that most articles were prefaced with a brief outline of nanotechnology. This suggests that nanotech at this stage was being presented as a technology of the future rather than the present. This is in line with the quantitative findings which demonstrated an overwhelming dominance of the science frame, reflecting the trend for nanotechnology coverage to focus on the actual science.

The tone of nanotechnology coverage shifted towards the negative in 2003, and for the first time nanotechnology was presented as an environmental story in the mainstream press, as well as a science or economics story. There was some suggestion that nanotechnology was 'the new GM', as environmental pressure groups voiced their distrust. Although the occurrence of risk and business frames was found to be comparatively infrequent in the quantitative analysis, their co-occurrence is high, which reflects the trend for slightly more negative nanotechnology coverage to focus on big business and risk combined.

This shift was accompanied by substantial coverage of research and the need for research into nanotechnology's risks and dangers.

Towards 2005, nanotechnology coverage became more balanced. Sensationalist concerns (“grey goo”) continued to be reported, but this material was balanced out by reports of public consultation exercises and the economic implications of international nanotechnology strategies. Overall, coverage towards the end of this period displayed a cautious optimism, looking ahead to potential applications and benefits while calling for improved research into risks and dangers.

3.4.7 Nuclear

French press coverage of the nuclear energy issue in 2000 to 2005 started off negative and became slightly more positive towards the end of the 5-year period. This change was most likely due to an increased French political focus on improving nuclear waste management strategies and involving the public in consultations on this subject.

Nuclear waste management was the single most significant topic, and in some cases completely dominated the years’ press coverage of nuclear energy. Most coverage of the issue focused on France’s alleged lack of a coherent waste management strategy, and on calls for France to develop a publicly available national inventory of radioactive waste sites. This reflects the high occurrence and co-occurrence of the risk frame demonstrated in the quantitative analysis.

Coverage maintained an international focus, continually examining other countries’ nuclear energy and waste management strategies.

There was a steady stream of low-level radioactivity scare stories, which remained constant across the five years. These typically involved some radioactive material being found in a local environment like a school or rubbish dump, where the actual risk involved was fairly negligible.

Nuclear energy was discussed as a possible low-carbon alternative energy source. Coverage of the nuclear energy debate was framed on both sides by environmental concerns – on the one hand the wish to reduce France’s carbon emissions and on the other a concern about the environmental impact of using more nuclear energy. However, confusion prevailed about the potential environmental impact of nuclear, and much of this confusion hinged, again, on the issue of waste management.

More detailed analysis of French science coverage between 2000 and 2005 is provided in the Appendices in Section 6.2.

3.5 Italy

3.5.1 Quantitative analysis

The development of the matrices of keywords to describe the frames of science coverage in Italy followed the pattern described for France in the preceding section and 6,322 articles were analysed.¹ The frame definitions were refined to match those of the UK and France as much as possible and attention was paid to eliminating ambiguities using 'after' and 'before' words and phrases.

3.5.1.1 Biotechnology The distribution of frames across Italian coverage of biotechnology is shown in figure 5-1 below. Here we can see that reporting was most typically framed in terms of the commercial and business aspects of the technology but strong ideological issues were raised, as indicated by the frequency of the 'moral' frame.

Figure 5-1 Frames in Italian coverage of biotechnology – 2004-2005

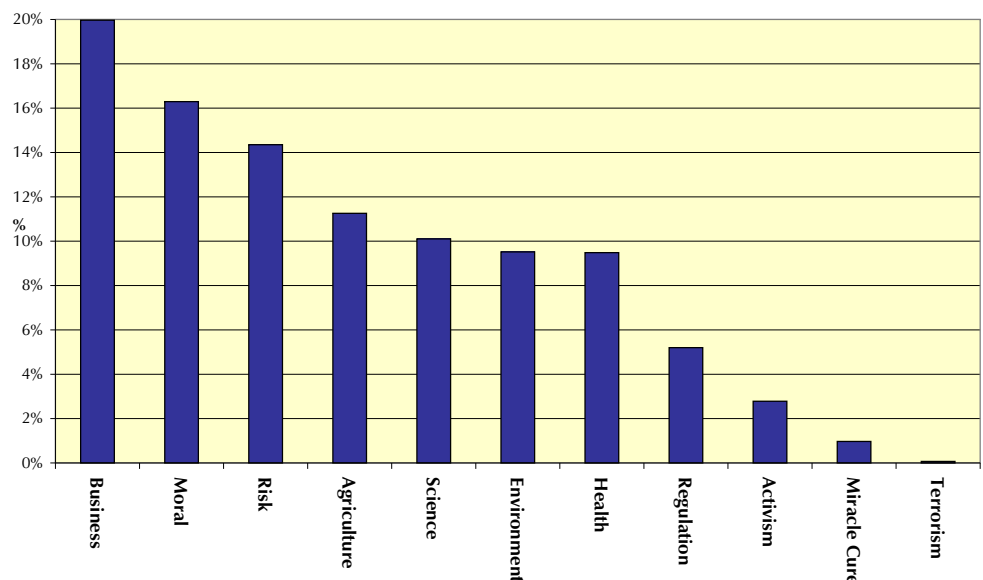


Figure 5-1 also indicates a significant concern in the Italian newspapers with the risks associated with biotechnology. The slightly higher frequency of the 'agriculture' frame compared with the 'health' frame indicates that coverage tended to focus more on food and farming issues rather than on the medical applications of biotechnology. The scientific details of biotech were given relatively low prominence and broad environmental concerns were less evident than in other countries.

The co-occurrences of the frames in Italian media coverage of biotechnology are illustrated in Figure 5-2 below.² Here we can see a central cluster of 'risk',

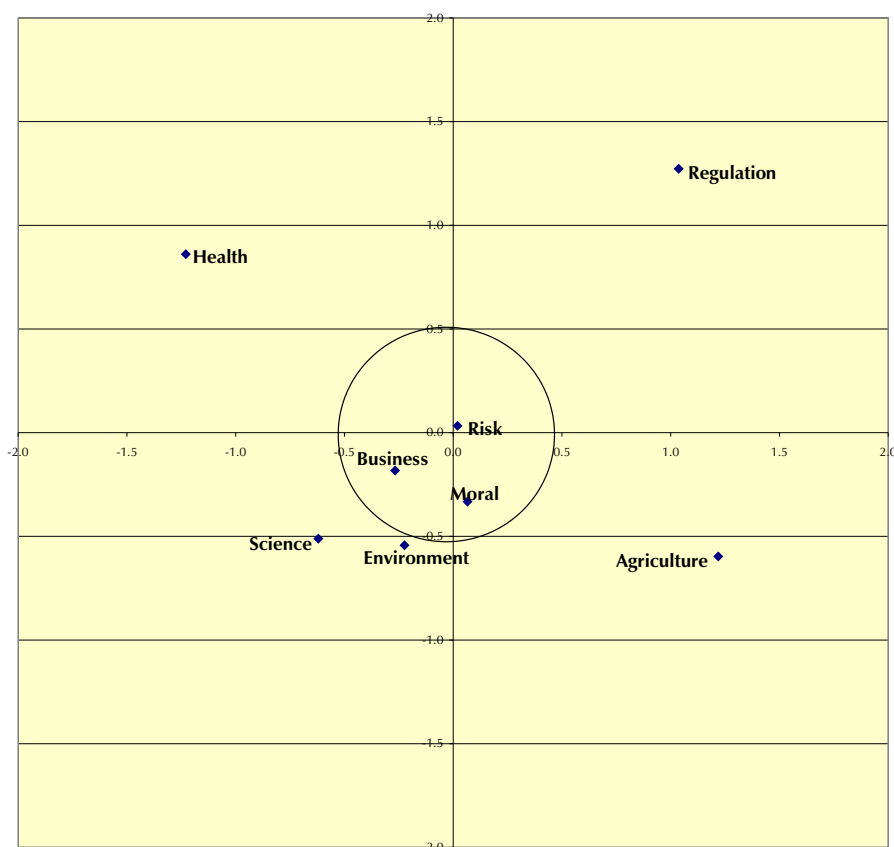
1 6,322 full text Italian articles were analysed using FrameCoOccur. See section 3.2.1 for details of the computer procedures. For a list of news sources used see section 6.4.23.

2 The low frequency frames 'terrorism', 'miracle cure' and 'activism' had to be eliminated from the analysis in order to obtain meaningful results.

'business' and 'moral' near the origin of the 2-dimensional plot, indicating that these frames commonly co-occur in the same articles.

The 'environment' frame is close to the arbitrary circle around the origin while the 'health' and 'agriculture' frames are some distance away from the central cluster.

Figure 5-2 Co-occurrence of frames in Italian media coverage of biotechnology – 2004-2005



3.5.1.2 Nanotech The relative frequencies of the frames in Italian media coverage of nanotechnology are shown in Figure 5-3 below. Here we can see that articles on this aspect of science, unlike the coverage of biotechnology, involved very little in the way of concern for moral ethical or ideological issues. Rather, coverage tended to be framed more in term of the scientific details of the technology and its potential commercial applications.

The potential risks of nanotechnology also received relatively little attention in Italian newspapers. Concern with the impact on the environment was similarly quite low. The co-occurrences of the frames in Italian newspaper coverage of nanotechnology is shown in Figure 5-4 below. Here we see the two dominant frames of 'science' and 'business' clustering centrally with 'risk' and 'environment' close by. The other frames are of little consequence, indicating that they included in the main coverage relatively infrequently.

Figure 5-3 Frames in Italian coverage of nanotechnology – 2004-2005

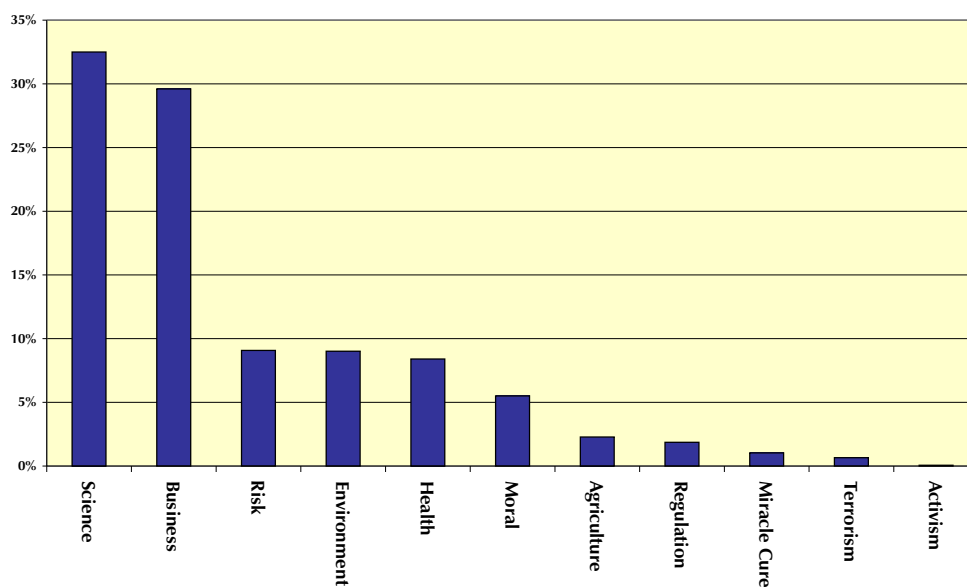
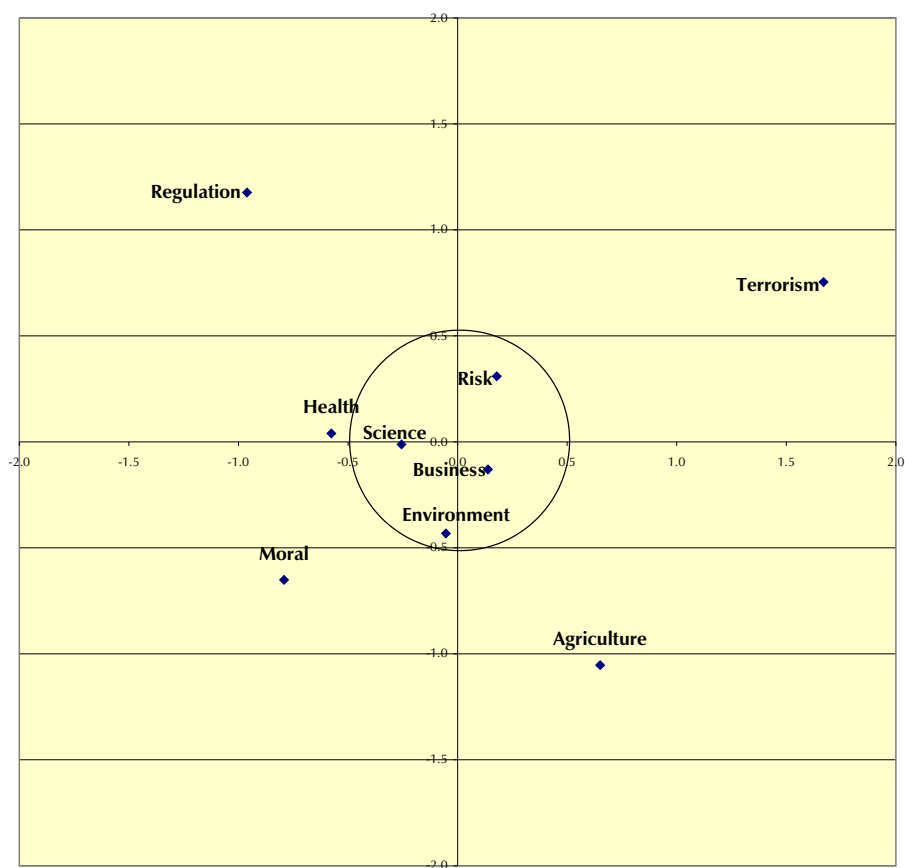


Figure 5-4 Co-occurrence of frames in Italian media coverage of nanotechnology – 2004 2005



3.5.1.3 Nuclear energy From Figure 5-5 below we can see that the risks of nuclear power dominated Italian newspaper coverage of this aspect of science. Potential environmental issues were also used to frame stories, along with the commercial and regulatory aspects.

Figure 5-5 Frames in Italian coverage of nuclear energy – 2004-2005

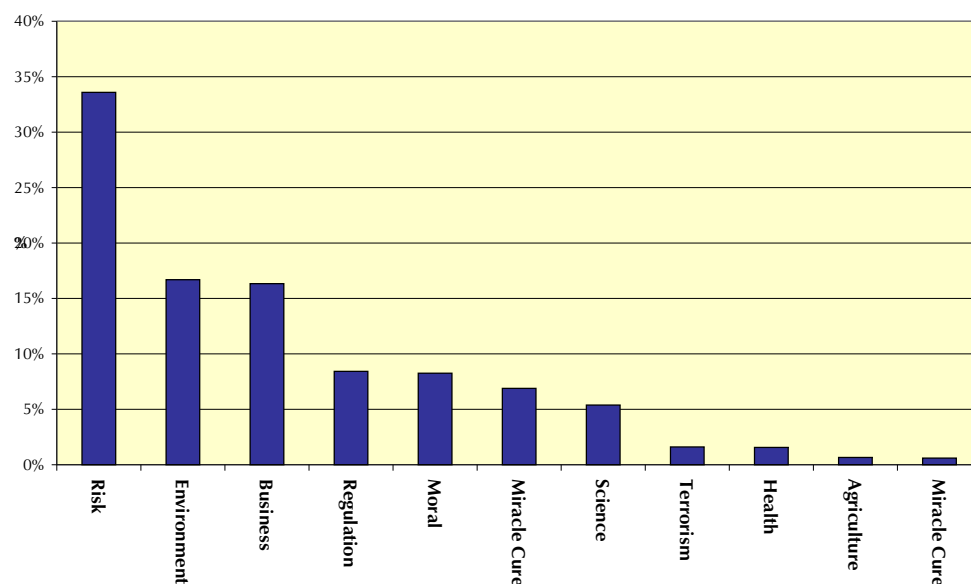


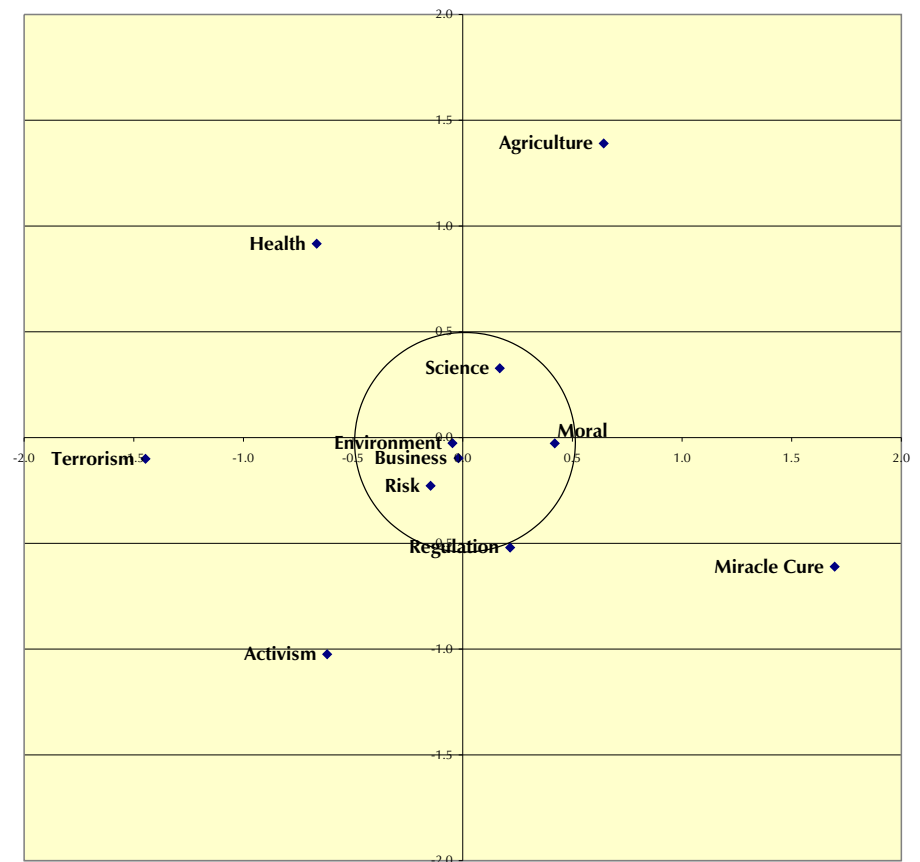
Figure 5-5 also shows that relatively little in the way of coverage of the scientific principles and technical aspects of nuclear energy was included in the Italian coverage.

Figure 5-6 below shows a rather different picture. Here we can see that the two most closely co-occurring frames are those of 'environment' and 'business'. The 'risk' frame, while the most frequent, co-occurs with other frames rather less. This indicates that stories about the risks of nuclear power tend to be relatively more uni-dimensional – they include other ways of framing the story to a lesser degree.

We can also see from figure 5-6 that the 'moral' and 'science' frames start to take on greater significance. This means that although the frames themselves, as measured in terms of the frequency of their associated keywords, rarely dominate coverage, many articles framed, say in terms of risk, will include some reference to them. The 'moral' frame, we should note includes ethical, religious and ideological components.

The issue of regulation of nuclear power, including the location or otherwise of reactor plants in Italy, also takes on greater significance than the simple frequency counts in figure 5-5 might indicate. Again, this indicates that although regulatory issues are rarely used to frame the stories themselves, reference to them occurs alongside other more dominant frames.

Figure 5-6 Co-occurrence of frames in Italian media coverage of nanotechnology – 2004 2005

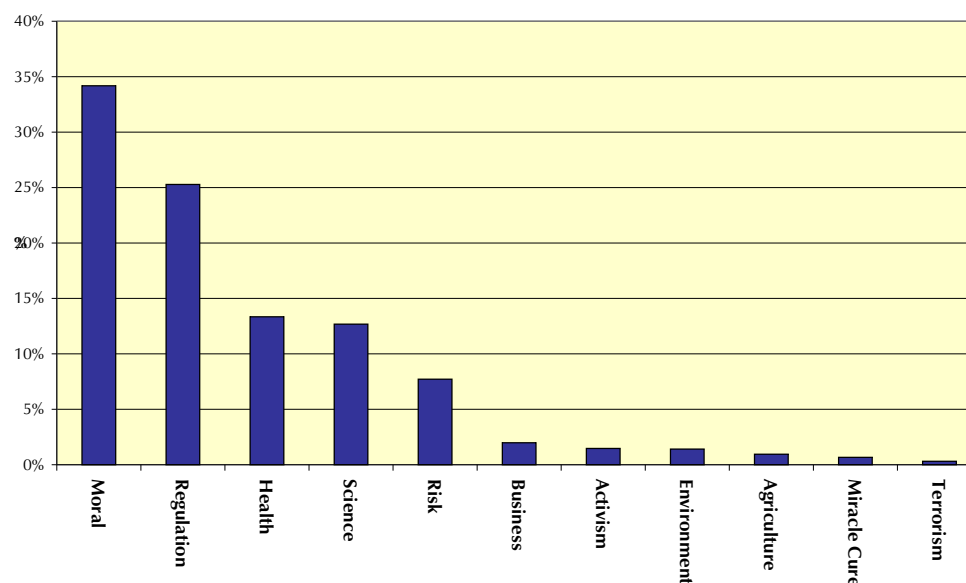


3.5.1.4 Assisted reproduction

The dominant frames used in Italian coverage of assisted reproduction, including in-vitro fertilisation (IVF) are shown in figure 5-7 below. Here we can see that newspaper articles were very much focused on moral, ethical, religious and ideological aspects of this branch of medical science. Framing of stories in terms of 'health', 'science' and risk was much less common.

Because of the dominance of the 'moral' and 'regulation' frames, and the lack of co-occurrences with these and the other frames, a multidimensional scaling analysis was unable to generate meaningful results.

Figure 5-7 Frames in Italian coverage of assisted reproduction – 2004-2005

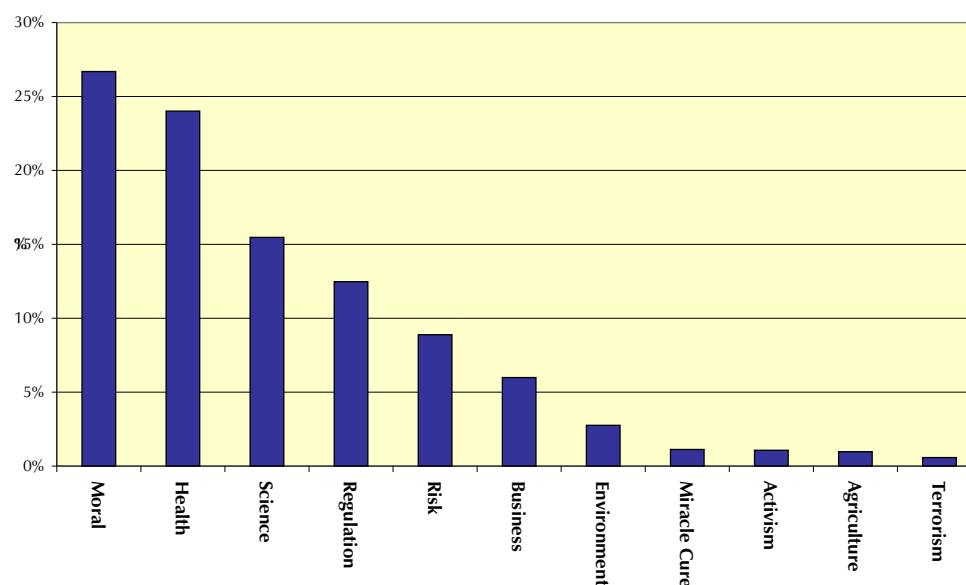


3.5.1.5

Stem cell research

The dominance of framing in terms of moral, ethical and religious issues was also evident in the Italian coverage of stem cell research and its potential applications, as shown in Figure 5-8.

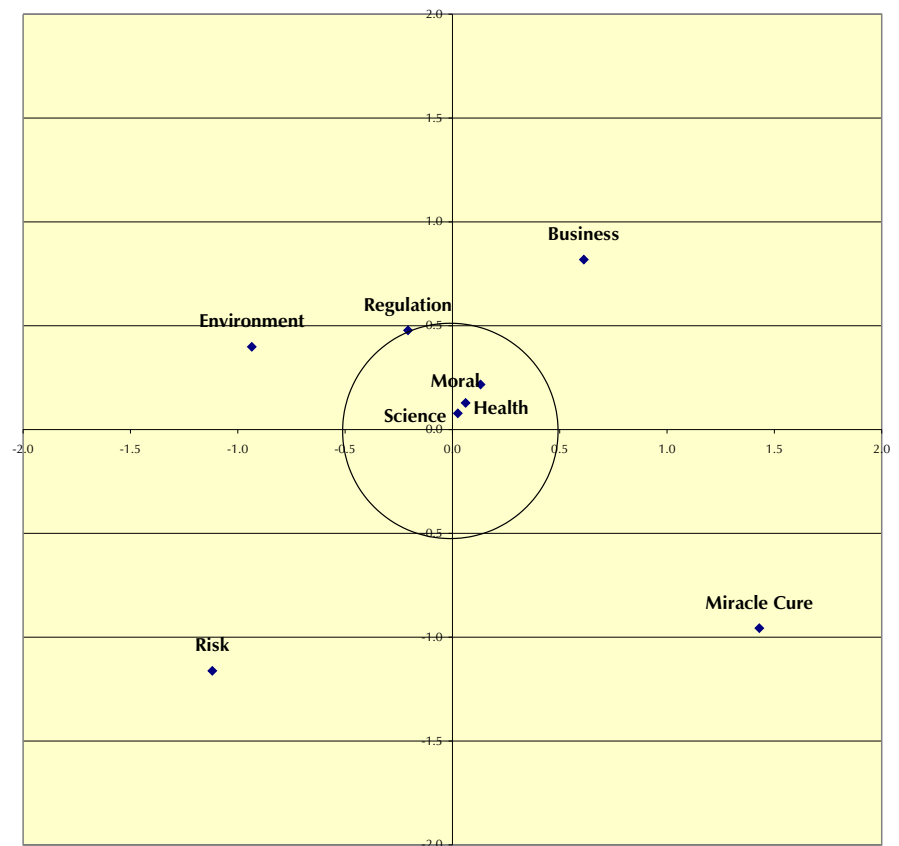
Figure 5-8 Frames in Italian coverage of stem cell research – 2004-2005



From figure 5-8 we can also see that medical/health aspects and the technical details of stem cell research were also included in reports and discussion of the regulation of this aspect of medical science was included in about 12% of all articles.

Figure 5-9 below shows the results of multidimensional scaling analysis of the co-occurrences of the frames across all articles on stem cell research in Italian newspapers. Here we can see a tight, central cluster of the 'moral', 'health' and 'science' frames, indicating that many articles included all three of these aspects. Apart from 'regulation', the other frames are of little significance.

Figure 5-9 Co-occurrence of frames in Italian media coverage of stem cell research – 2004-2005



3.5.2 Qualitative Analysis – Comparative overview – 2000-2005

Italian press coverage of science stories in 2000-2005 fell into three main divisions – coverage that concentrated on ‘boundaries of life’ issues, coverage that dealt with new technologies and political/ policy-oriented coverage. ‘Boundaries of life’ coverage included reports and discussion on cloning, stem cell research, assisted reproduction and, to a lesser extent, genetic modification. Ethical implications of these technologies were discussed extensively, with the moral aspect clearly dominant in discussion of stem cell research and IVF. The influence of the Vatican was also evident, and coverage reflected the tension between a religious tradition with a strong moral stance on certain scientific issues, and the generally accepted need for Italy to stay ahead in scientific R&D.

Coverage of new technologies, such as nanotechnology and some genetic research, was generally positive and optimistic about future applications. Reports on new

technologies typically focused on the science itself, rather than associated moral or social questions. Coverage of nanotechnology in particular made grandiose claims about the potential of the new science, suggesting that nanotechnology was seen as science of the future rather than the present.

Energy and agricultural reporting generally displayed a more political focus. Nuclear energy has traditionally been a divisive political issue in Italy, where the political left is mostly anti-nuclear. Political science coverage also monitored international approaches and legislation to science issues, reflecting a concern for Italy's place in world R&D.

Overall, Italian science media coverage from this period was characterised by forward-looking optimism about the potential of new technologies, moral concerns about the implications of science at the “boundaries of life” and a political focus on certain well-established applications. This took place against a backdrop of concern for Italy's place in international R&D and steady monitoring of international scientific affairs and legislation.

3.5.3 Biotechnology

Italian biotechnology press coverage from 2000 to 2005 fell into two clear parts – coverage of medical applications and coverage of agricultural applications. Coverage of medical applications tended to focus on ethical debates, while coverage of agricultural applications typically focused on policy and public opinion. This is consistent with the relatively low co-occurrence of the agricultural and moral frame together in biotechnology coverage revealed in the quantitative research. GM reporting leaned towards a food/farming angle rather than a strong environmental angle, although there was some coverage of the environmental debate, particularly in political discussion.

Coverage did not change substantially over the five year period, although public events and announcements such as the first human embryo cloning by Advanced Cell Technologies (ACT) in 2001 had some influence on levels of coverage.

The ethical debate over medical applications of biotechnology focused on human cloning and embryonic stem cell research. The influence of the Vatican was evident in most of this discussion, and coverage was fairly balanced, typically representing views from all sides of the debate. A distinction was made in most reporting between medical biotechnology applications such as pharmacogenetics and the more morally controversial human cloning and embryonic stem cell research.

General biotechnology coverage focused quite heavily on economics, and concerns were repeatedly voiced about Italy “falling behind” the rest of the world in biotechnology research. Biotechnology was typically presented as a growth area with great potential for Italy, and substantial coverage was devoted to calls for improved government strategies on biotechnology research and industry. This reflects the predominance of the business frame (and the significance of its co-occurrence) demonstrated in the quantitative analysis.

3.5.4 Nanotech

Italian press coverage of nanotechnology from 2000 – 2005 generally portrayed nanoscience as "the next big thing". The press dealt with medical, industrial and commercial applications, from the everyday to the sensational. A lot of coverage was framed in economic and investment terms. This reflects the dominance of the business frame, as demonstrated in the quantitative analysis, although the science frame dominates nanotechnology coverage overall due to the tendency of reports to discuss the details of the new science.

There was some reflection on the nanotechnology research climate in Italy, and it was suggested that, in comparison with other European countries, Italy might be lagging behind, hindered in part by an 'anti-science' Vatican. Later in the period, the institution of collaborative forums to discuss the costs and benefits of nanotechnology received coverage.

3.5.5 Nuclear energy

Italian press coverage of nuclear issues from 2000 – 2005 is framed around nuclear power gaining ground as an energy option; its pros and cons being increasingly discussed in the press, as its profile rose on the political agenda, with an increasingly pro-nuclear government. There is a significant amount of coverage which compares Italy's position on nuclear to that of other EU countries, as well as that of the US, and the demands of the Kyoto protocol.

The political left has long been anti-nuclear in Italy, and there continues to be reporting of local level demonstrations against the construction of new nuclear power stations, reprocessing plants and the like, as well as the Italian Green party's anti-nuclear line. This reflects the dominance of the risk and environment frames, demonstrated in the quantitative research. In 2005 we see calls for a national referendum on the issue.

Coverage is generally balanced, and assesses the nuclear option in terms of environmental risk, economic benefit / necessity, global competitiveness, and the demands of the Kyoto protocol. This supports the quantitative findings, which demonstrated a clustered co-occurrence of environment, business and risk frames in nuclear coverage. Of note is the tendency in the Italian press to reflect upon the debates being conducted in other EU countries, notably Germany, France and the UK, on the nuclear energy question.

More detailed analysis of Italian science coverage between 2000 and 2005 is provided in the appendices in Section 6.4.

3.6 Germany

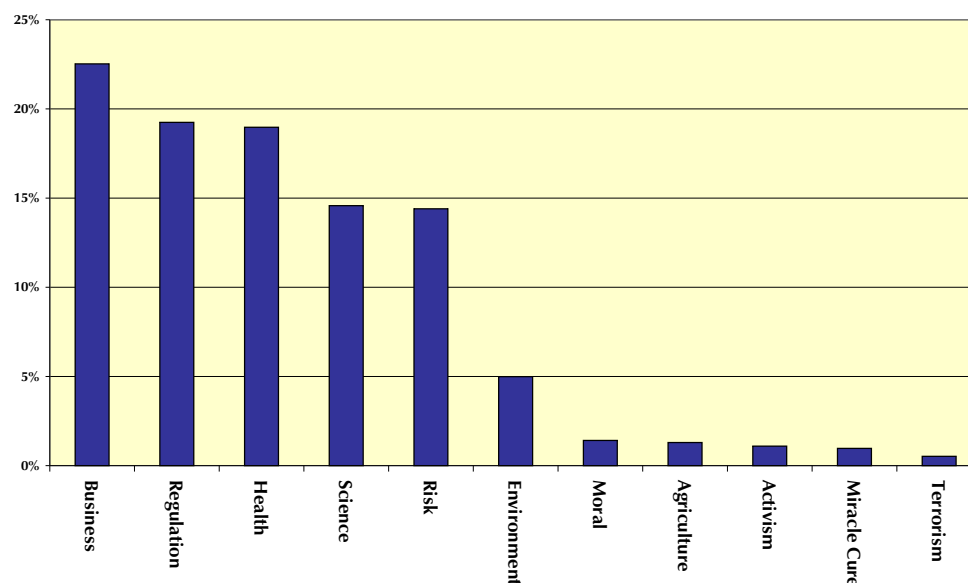
3.6.1 Quantitative analysis

The development of the matrices of keywords to describe the frames of science coverage in Germany¹ followed the pattern described for France and Italy in the preceding sections and 19,063 articles were analysed. The frame definitions were refined to match those of the UK as much as possible and attention was paid to eliminating ambiguities using 'after' and 'before' words and phrases.

3.6.1.1 Biotechnology Figure 6-1 shows the distribution of frames across all German coverage of biotechnology. We can see that a relatively large number of articles about this field of science were framed in terms of the business and commercial aspects. Other articles focused on the need for regulation of the technology and on its medical applications. The scientific and technical aspects of biotechnology formed a frame for stories in around 14% of cases with the potential risks highlighted in a similar number of cases.

The 'agriculture' frame appears, rather surprisingly, with very much lower frequency, suggesting that relatively few articles focused on genetically modified crops and farming methods.

Figure 6-1 Frames in German coverage of biotechnology – 2004-2005

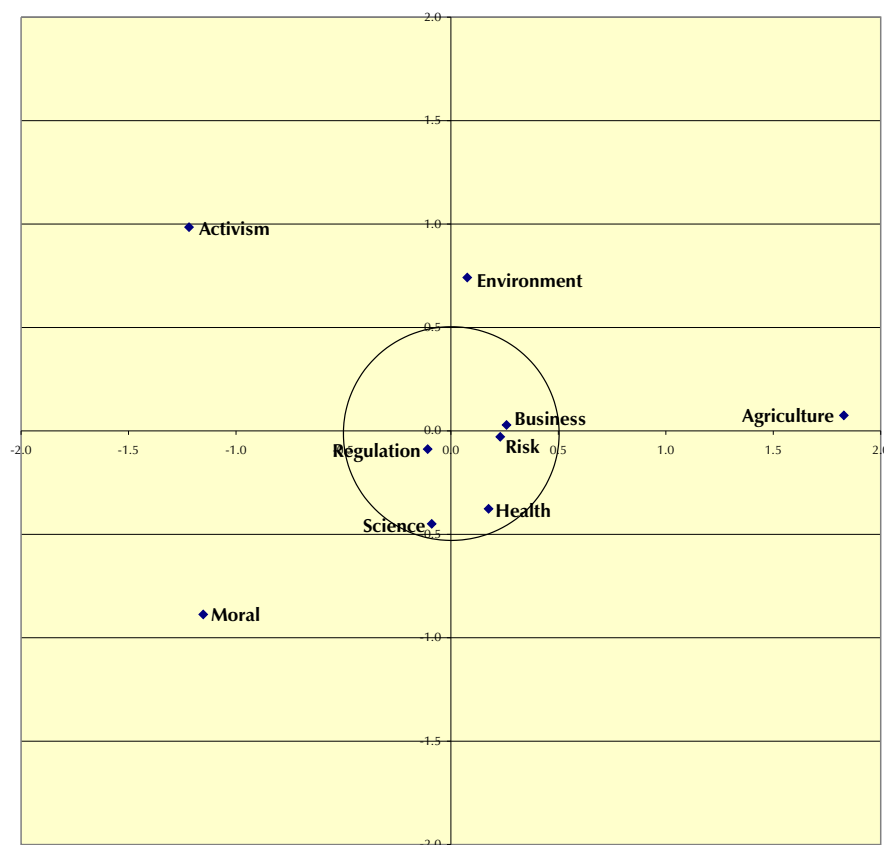


The results of the multidimensional scaling analysis of the co-occurrences of frames in German coverage of biotechnology are shown in Figure 6-2 below. Here we can see that there is a close association between the 'business' and 'risk' frames, reflecting their high level of co-occurrence. The 'health', 'risk', 'regulation' and 'science' frames also cluster together around the origin of the plot.

1 19,063 full text German articles were analysed using FrameCoOccur. See section 3.2.1 for details of the computer procedures. For a list of news sources used see section 6.3.22.

The 'agriculture' frame is some distance away from this cluster, confirming its relatively low frequency in German media coverage of biotechnology. The 'environment' frame is similarly located away from the central cluster.

Figure 6-2 Co-occurrence of frames in German media coverage of biotechnology – 2004-2005



3.6.1.2 Nanotech German media coverage of nanotechnology was dominated by framing in terms of the scientific and technical aspects of the processes, as shown in Figure 6-3. 'Business' and 'risk' frames were also evident in around 18% of articles. Medical/health frames were present in around 12% of stories.

The analysis of co-occurrences of frames, shown in Figure 6-4, provides a slightly different view. Here we can see that the 'science', 'health' and 'business' frames co-occurred quite frequently, as represented by their clustering around the origin. The 'risk' frame, however, while as frequent as 'business' had a lower level of co-occurrence with the most central three. This suggests that risk concerns are often covered in the German media fairly independently of other considerations. Other types of framing were both of relatively low frequency and co-occurrence.

Figure 6-3 Frames in German coverage of nanotechnology – 2004-2005

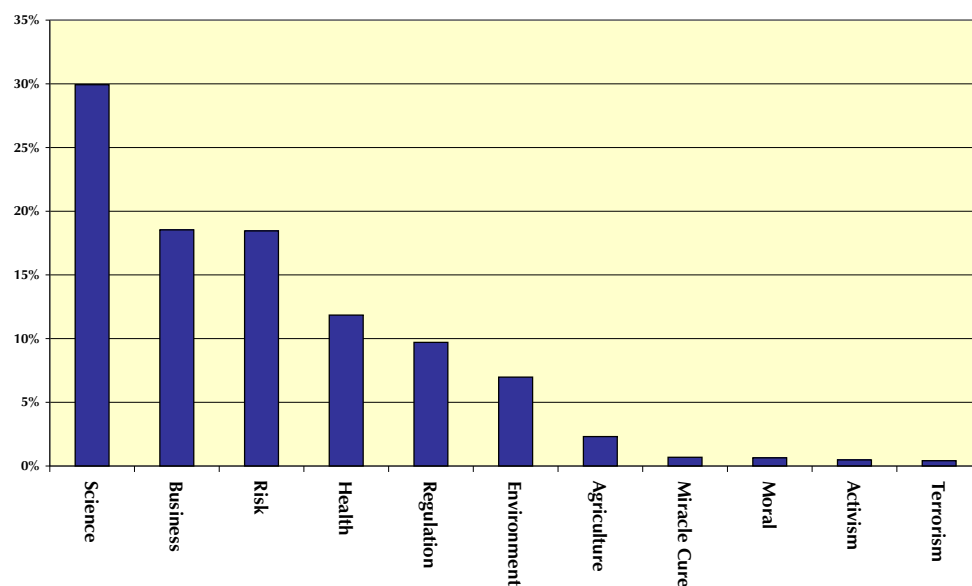
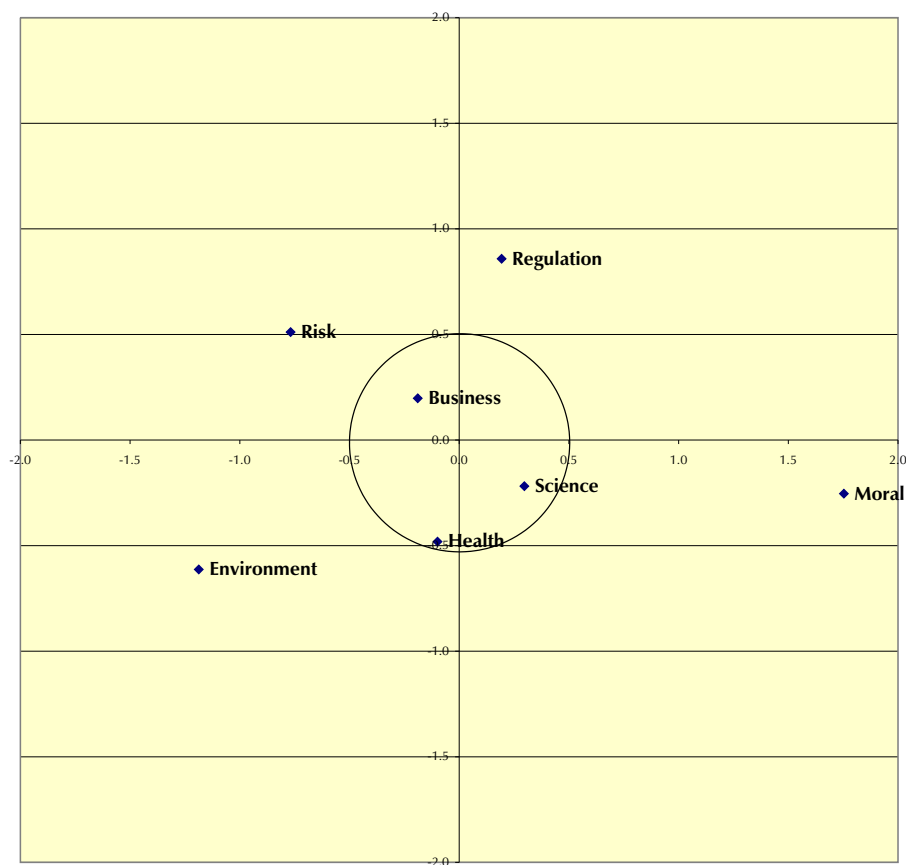
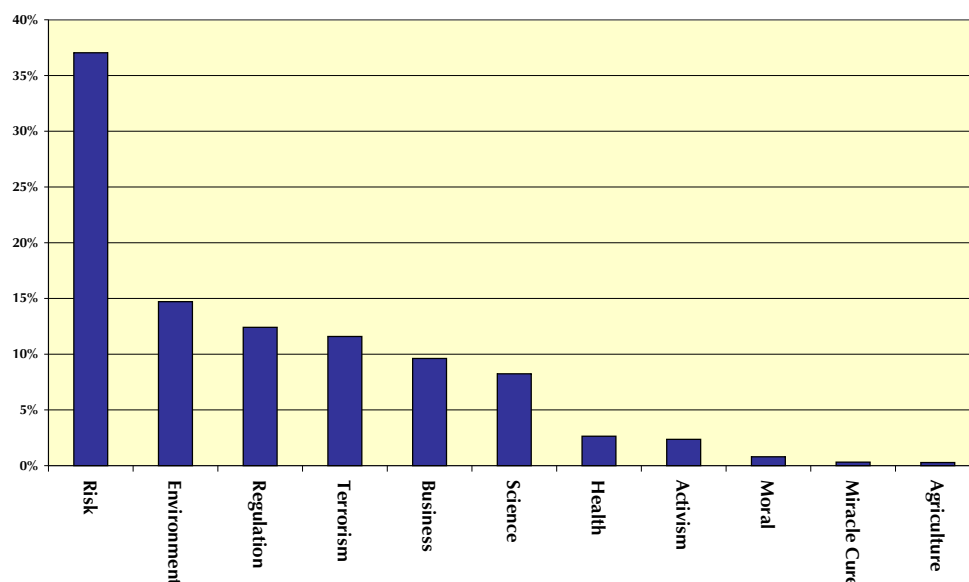


Figure 6-4 Co-occurrence of frames in German media coverage of nanotechnology – 2004 2005



3.6.1.3 Nuclear energy German media coverage of nuclear energy was very much dominated a 'risk' frame, focusing on the potential hazards of the technology and expressed concerns. From Figure 6-5 we can see other types of framing were much less common, although the potential environmental impacts and the need for regulation were evident in 12-13% of articles. The potential uses of nuclear material by terrorists and other types of criminal framed over 10% of articles - a surprisingly high figure and above that found in media coverage in other countries.

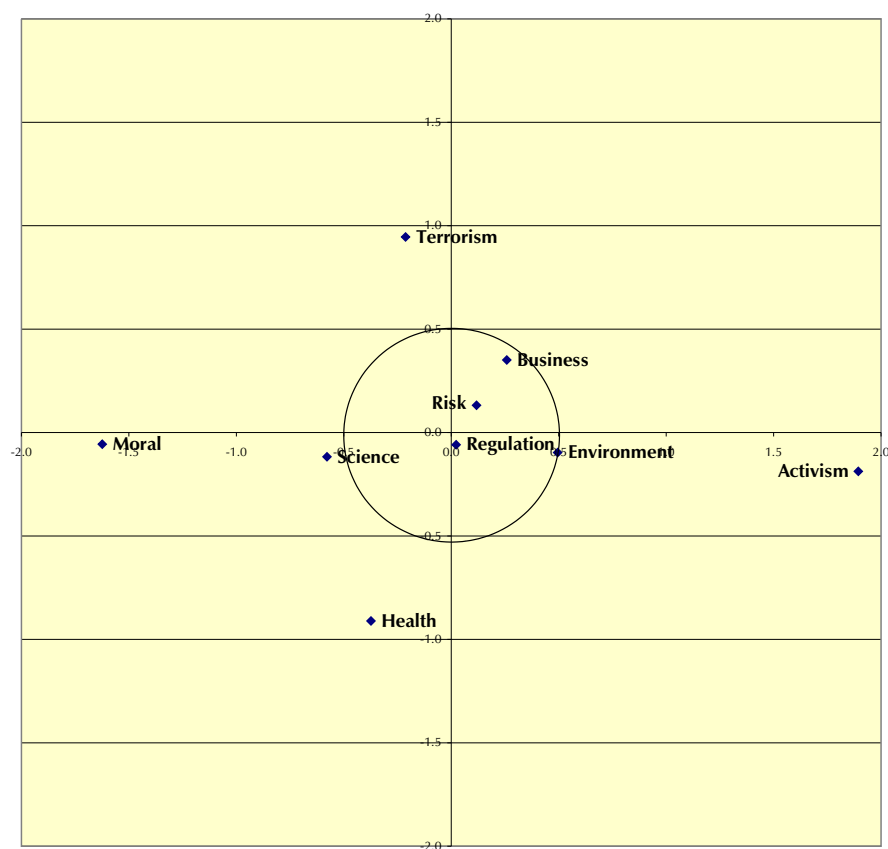
Figure 6-5 Frames in German coverage of nuclear energy – 2004-2005



The multidimensional scaling of the co-occurrences among the frames produced the results shown in Figure 6-6. This shows that the dominant 'risk' frame was most often accompanied by consideration of commercial interests and regulation of the technology. Concern for environmental impacts also just appeared in the central area around the origin.

While potential terrorist uses of nuclear material, or attacks on nuclear plants, were evident in reporting, as noted above, there was little association between such framing and the rest. This suggests that the terrorism issue relating to nuclear fuel tends to be separate from discussion of, say, other types of associated risk.

Figure 6-6 Co-occurrence of frames in German media coverage of nuclear energy – 2004 2005



3.6.1.4 Assisted reproduction

Coverage of assisted reproduction in the German media, most commonly in vitro fertilisation (IVF), was typically framed in terms of the medical details and health implications, followed by regulatory aspects and potential risks, as shown in Figure 6-7. Other types of frame were of much lower frequency and of little overall significance, as shown in the analysis of co-occurrences in Figure 6-8.

Surprising in this context was the lack of discussion of moral and ethical issues in this context. Only around three percent of articles covered these aspects. Such concerns were more evident, however, in coverage of stem cell research, as shown in the next section.

Figure 6-7 Frames in German coverage of assisted reproduction – 2004-2005

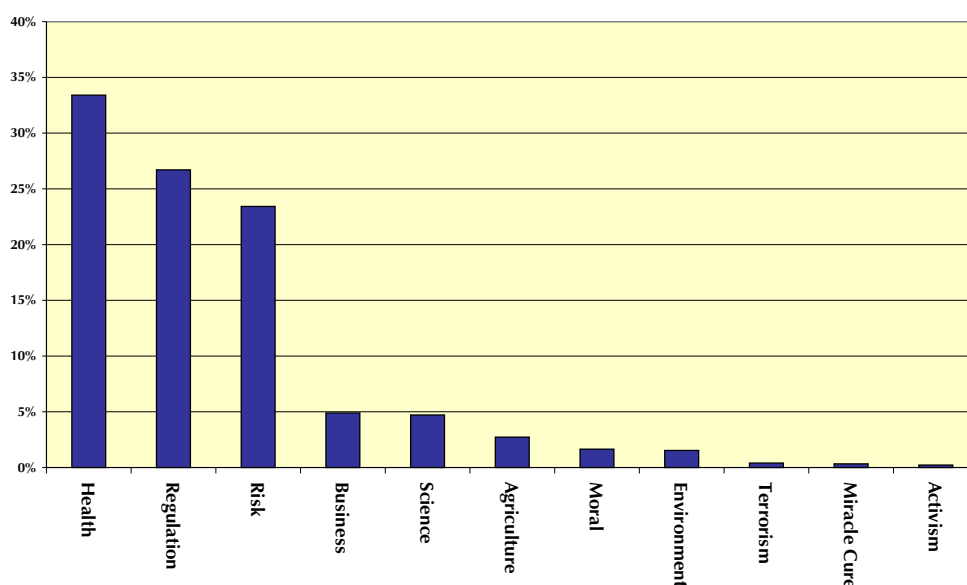
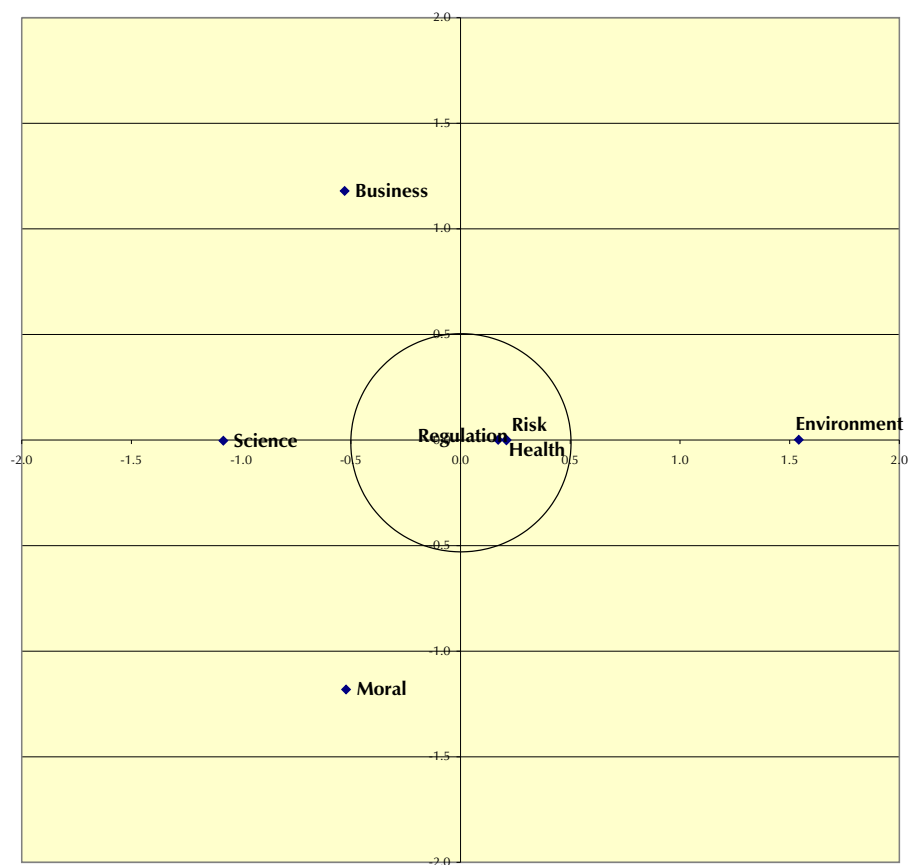


Figure 6-8 Co-occurrence of frames in German media coverage of assisted reproduction – 2004-2005



3.6.1.5

Stem cell research

Coverage of stem cell research in the German media was most frequently framed by consideration of regulatory frameworks required to limit the application of this aspect of medical science, as shown in Figure 6-9

Figure 6-9 Frames in German coverage of stem cell research – 2004-2005

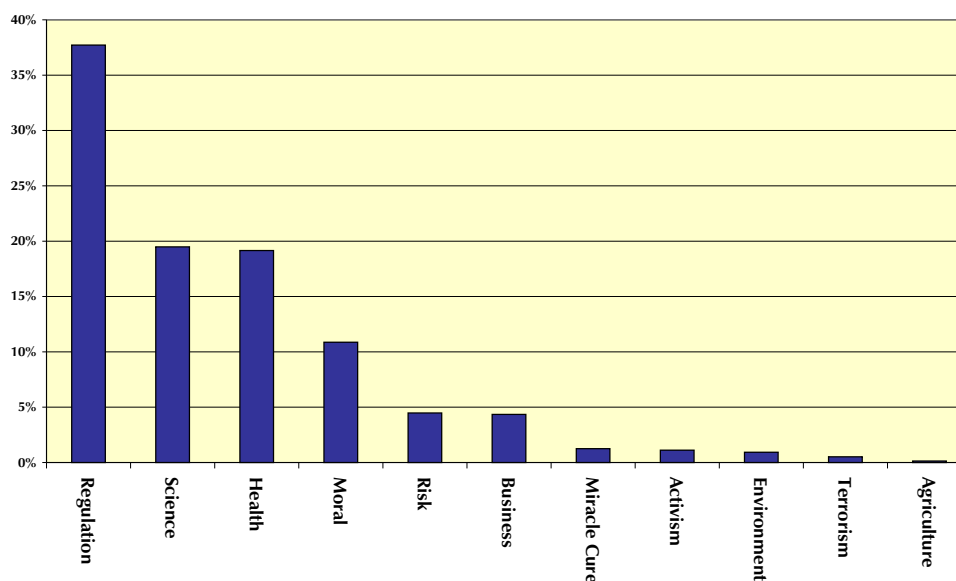
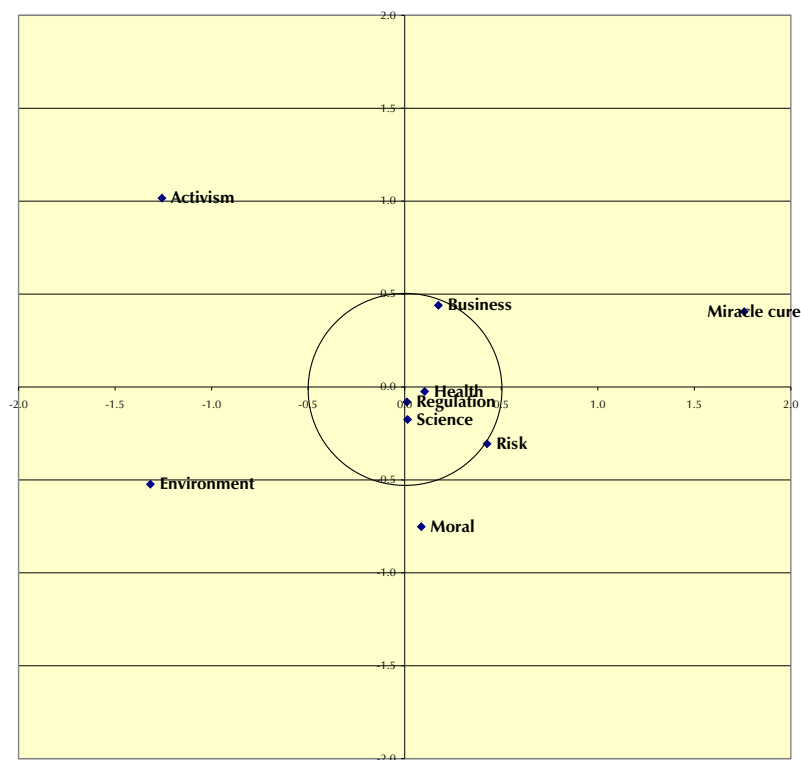


Figure 6-10 Co-occurrence of frames in German media coverage of stem cell research – 2004 2005



We can also see from Figure 6-9 that attention was also paid to the medical and scientific details of the procedures and some moral and ethical issues were raised in around 11% of all articles on this subject.

Figure 6-10 shows a very tight clustering of the 'health', 'regulation' and 'science' frames around the origin of the MDS plot, illustrating their high levels of co-occurrence. Here we also see that the 'risk' and 'business' frames, although low in terms of the frequency of their associated keywords, also edge into the central region, suggesting that they are most often mentioned in the context of the other more central frames.

3.6.2 Qualitative Analysis – Comparative overview

German science coverage from this period involved a combination of straight science research reporting and, particularly on the more controversial life sciences such as stem cell and gene therapy, a sophisticated, editorialised reporting of wider social debates. In biotechnology and nuclear coverage voices from the government, scientists, business and civil society (in the form of national and international interest groups) generally received wide and balanced coverage, indicating an informed and engaged civil society. The results of parliamentary commissions and proceedings of the German Bioethics council were also reported and reflected on from both national and EU perspectives.

There was substantial comparative and critical reflection on Germany's position *vis à vis* other EU countries, both on issues of investment and regulation of controversial life sciences and on broader public engagement issues. German press coverage of science, and science and society issues presented a trend toward an open, comparative international perspective.

Dominant overall frames for science reporting presented a leaning toward business / economics, regulation (under which could be subsumed wider moral / ethical judicial debates), risk and risk in terms of public health. Often, explicit reference to ethical and moral frames was markedly lacking.

A handful of high profile scientists and academics repeatedly appeared as social commentators throughout the period. In many cases editorialised pieces in the press were intended to prompt debate. Coalitions of interest and pressure groups – targeting GM and stem cell research in particular – received significant but balanced coverage.

3.6.3 Biotechnology

Biotechnology coverage, particularly of agricultural, GM and non-medical industrial applications, was dominated by discussion of business, investment and international competitiveness. Much of this coverage addressed worries that Germany would be “left behind” if it did not fully embrace biotechnology. This was balanced by a concurrent cautionary approach to biotechnology R&D. The frequency of articles on agricultural and plant biotechnology was, however, relatively low as shown in Figure 6-1 above.

Medical and life science applications tended to focus more on risk, regulation and wider long-established social, ethical and moral debates. The press coverage of debates on stem cell research and gene therapy were particularly sophisticated and generally well balanced. The level of debate in this particular area was critically reflected upon in some of the press as being a result of Germany's need to rid itself of its self-perceived historical shadow of Nazi eugenics. Indeed, one theme which

ran through the medical / health biotechnology coverage was the idea that Germany had missed out economically in certain scientific developments in the 1990s due to public and political concern with ethical debates.

3.6.4 Nuclear

Unlike France, Italy, Spain and the UK there was little debate in the press over the relative merits of nuclear energy, what with Germany's decision to abandon nuclear power in 2000 and completion of decommissioning scheduled for 2020. With the arrival of the new administration in 2005, however, this decommissioning timetable was challenged, a development which perhaps reflected a similar government/business led shift in debate to that which occurred in the UK and Italy over the same time frame. There was a significant focus on the development of alternative 'green' energy sources, and in many cases this was discussed in terms of economic and investment opportunities for Germany.

3.6.5 Nanotech

As was the case with coverage from France, Italy, Spain and the UK, Germany had still to establish a wide-ranging debate on the risks, ethics and social applications of nanotechnology. Coverage instead focused on what nanotechnology is, what its potential and actual applications are, and pre-empting the need for engaging civil society in wider debates as they develop. Coverage tended toward caution, however, and there was some concern expressed that Germany, unlike the US and UK, had not engaged in government-led debate on nanotechnology. The investment potential in nanotechnology and Germany's particularly strong research base in this area also received significant coverage.

* QUAL PARAS ON IVF AND STEM CELL ARE MISSING

More detailed analysis of German science coverage between 2000 and 2005 is provided in the appendices in Section 6.3.

3.7 Spain

The MESSENGER project had limited access to Spanish newspaper coverage of science issues. Media analysis for Spain was restricted to articles from *El Pais*, *El Mundo* and *ABC*. For this reason it is impossible to draw overall conclusions about the nature of science reporting in Spain in 2000-2005. Given that these three papers represent the highest Spanish news circulation, however, illuminating insights can still be drawn from examination of their coverage. More detailed analysis is contained in the Appendices in Section 6.5.

3.7.1 Biotechnology

Overall, biotechnology coverage from the three papers was cautiously positive, although its tone differed widely between coverage of medical biotechnology and agricultural biotechnology. In *ABC*, for example, coverage of medical biotechnology was generally positive, while agricultural biotechnology was presented mostly in a negative light.

Consistently negative comment on agricultural biotechnology may have in part been influenced by the Spanish government's comparatively open approach to genetic modification. The most commonly expressed worry about agricultural biotech was the danger of "cross-contamination" of crops. Concerns about lack of regulation and good practice guidelines were also voiced across the board, although the focus of this concern differed from publication to publication, with some choosing to focus on corporate governance while others called for more coherent policy and action from the government.

3.7.2 Environment

Coverage of environmental issues from this period was mostly negative. Spain has a comparatively poor record on pollution and carbon reduction, and many reports dwelt on the worrying levels of ground ozone (often a significant component of smog) around some Spanish cities. The focus of environmental concerns varies across the publications, however – all three contained mostly negative coverage, but where *El Pais* generally dwelt on the government's responsibility to step up to the environmental challenge, *El Mundo* coverage concentrated more on individual responsibilities and attempts to control carbon emissions. Attitudes to environmental groups also varied, with *ABC* arguing that green activist groups were sabotaging the energy industry and hijacking debates. Overall, environmentally-focused coverage was dominated by questions about climate change, Kyoto and carbon reduction.

3.7.3 Nuclear

Nuclear coverage varied widely across the publications, indicating perhaps the contested place of nuclear power in current political debate in Spain given the anti-nuclear stance of the current socialist administration. *ABC* coverage generally leant in favour of the nuclear energy option, arguing that nuclear's current "taboo" status has hindered rational debate on the subject. *El Mundo*, on the other hand, presented almost universally negative coverage of the nuclear issue, focusing on popular opposition and activist movements. *El Pais* presented fairly balanced coverage, although leaning slightly towards an anti-nuclear position. Nuclear

energy was presented across the board as a key issue for Spain given the need for serious carbon emission cuts if the country was to attempt to meet the requirements of the Kyoto agreement. Discussion of the nuclear issue was dominated by this concern.

3.7.4 Nanotech

Nanotechnology coverage overall was very positive. Most articles were prefaced with an introduction to the science, and many gave an optimistic vision of a future involving life-saving, industry transforming nanotechnology applications. This optimism was tempered by calls for increased regulation and fears about misuses, along with some scepticism about nanotechnology's capacity to deliver on overblown predictions. *ABC* stands out among the sample for its comparatively minimal coverage of nanotechnology. Very few articles on the subject were available for review from *ABC*, although those that were available were mostly positive.

More detailed analysis of Spanish science coverage between 2000 and 2005 is provided in the Appendices in Section 6.5.

3.8 Summary of cross-national differences in science reporting

The computer-based analyses using FrameCoOccur, together with qualitative 'reading' of representative articles, has highlighted a number of differences between the ways in which science and technology news is framed in various EU member states. A word of caution, however, needs to be introduced here.

As noted in Section 3.2.1 earlier there are always a number of difficulties in establishing the equivalence of analytical methods that require, for example, matrices of words and phrases to be translated into different languages. Each matrix, which forms the primary input for the FrameCoOccur program was built with cross-national comparisons in mind but also had to be tailored to both the recurring content of news coverage in a particular language and the words and phrases present in the text. Thus, while the words associated with, say, the 'moral/ethical' frame may be the most suitable for each language, they are not necessarily exactly equivalent across languages.

There is, ultimately, no complete solution to this problem. In the way that the English word 'need' will never be exactly equivalent, in conceptual or functional terms, to the French term 'besoin', the frames derived in the MESSENGER project for analysis of media science coverage in different languages will never map on to each other in a perfect way.

Given such caveats, the results are nevertheless of considerable interest and show that particular areas of science and technology tend to be framed in quite different ways in different countries. In the field of biotechnology, for example, we have seen that reports and articles are dominated in the UK by a focus on agricultural issues, reflecting the now long-standing concerns about genetically modified crops and food. In France, while the 'agriculture' frame is evident, a greater number of reports focus on the science of biotechnology and on associated medical and health issues. In Italy and Germany the dominant concern is with commercial exploitation of the technology – with both supportive and critical stances being evident.

On the topic of nanotechnology, there is much greater commonality in framing across languages with British, French, Italian and German coverage all focusing primarily on the scientific and technical aspects of this field of science. In the UK, however, there is a much stronger emphasis on medical applications of nanotechnology, and with the potential risks of the technology in general, compared with Italy and France. In Italy and Germany the business and commercial aspects of nanotechnology receive greater attention than elsewhere while concern about the potential risks – including the potential environmental impacts – appear to be of little significant concern in France. Interestingly, although 'activist' organisations such as Greenpeace have expressed grave concerns about the potential risks of nanotechnology, an 'activism' frame is evident in only about 3% of articles in the UK press and occurs with even less frequency in other parts of Europe.

Coverage of nuclear energy and related issues is dominated by a 'risk' frame in all four of the languages analysed using FrameCoOccur. Media coverage in this area also tends to have an 'environment' frame and, with the exception of Germany, a strong focus on the business and commercial aspects of nuclear energy.

There appear to be quite dramatic differences in the framing of news about assisted reproduction, and in vitro fertilisation (IVF) in particular. In Britain and Germany the most frequent frame is that of 'health', – focusing on the medical procedures involved but also on the potential health consequences. In France, in contrast, there is greater attention paid to the pure science aspects of IVF while in Italy the subject is most often framed in terms of moral and ethical issues. This is understandable given the strong opposition to IVF by the Vatican and the role of the Catholic Church in Italy. We see a similar pattern in the context of stem cell research with, again, a dominant 'moral' frame in Italian coverage. In Germany, however, the 'regulation' frame dominates, with a strong focus on the need for legislation and controls on stem cell research.

An appreciation of these cross-national differences in media science coverage is essential if scientists are to communicate effectively with the media in different countries. Someone engaged in stem cell research, for example, is likely to have the moral and ethical justification of their work questioned by journalists in Italy, reflecting the concerns of their readers. In Germany, however, where framing of this area of medical science is more usually in terms of regulatory process, a very different focus is likely to be present in an interview.

The MESSENGER analysis of the framing of science coverage is, obviously, far from complete. The project has, however, demonstrated the utility of a method for analysing very large volumes of written material and for highlighting cross-national differences within them. It has the potential for further development in terms not only of the areas of science and technology to be assessed but also in terms of refinement of the basic matrices which define the frames. Even at this stage, however, we feel that this aspect of the MESSENGER project has provided worthwhile insights that would be extremely difficult to obtain using the more traditional content analysis methods.

3.9 The ASCoR media analysis

The objective of the ASCoR project within MESSENGER was to develop a model for evaluation of news on risk topics¹ in the media. The model is based on content analysis of media coverage and interviews with key persons in the field of media and science and with relevant stakeholders. News 'waves' rather than individual stories were the level of analysis and evaluation. The starting points for the evaluation model were the SIRC/RI/RS *Guidelines on Science and Health Communication*² and additional literature on risk reporting and risk perception.

3.9.1 Evaluating the news media

3.9.1.1 Media criticised News media are often criticized for the way they handle risk and science topics. They are often accused of being biased, inaccurate, sensational, exaggerated, simplistic and polarizing.³ The amount of media coverage about certain risks (SARS for example) is perceived as being unrelated to the 'real' risks in terms of mortality rates or damage to society.⁴ Most risk stories are not about risk itself, but about accusations, worries, actions and counteractions. What happened, who is to blame and what is the government doing about it all, are all more important for the reporter than the question of whether or not exposure, to say, electromagnetic fields might cause health problems in the long run.

A conflict between actors makes an issue newsworthy although the risk is quite small or even non-existent in scientific terms. Alarming content, extreme opinions and outrage are seen as dominating coverage on risk topics.⁵ Journalistic criteria for newsworthiness repeatedly reconfirm the psychological patterns in risk. Due to the media, the critics say, the audience is overestimating unfamiliar, new and exotic risks, while underestimating familiar, everyday life and lifestyle risks. Instead of warning the audience of relevant risks, the media make irrelevant risk issues socially relevant.

3.9.1.2 Criticism criticized Operational modes. The problem with this kind of criticism is that it does not take into account the social context in which a reporter operates; the consequence of which is that the reporter then sees this criticism as purely theoretical and therefore useless in the daily news production. As Peters argues measuring media coverage against scientific 'truth' (the 'technocratic' perspective on the role of the media) has to be questioned.

- 1 The concept of 'risk issues' is used here to refer to all issues in society, involving uncertainty about (long term) consequences for public health and controversy on scientific data and a process of social amplification. Examples are: gm-food, dioxin contamination, nanotechnology, biotechnology, cell phones, etc.
- 2 Available from http://www.sirc.org/publik/revised_guidelines.shtml
- 3 Dunwoody, S. (1992) The Media and Public Perceptions of Risk: How Journalists Frame Risk Stories. In: D. W. Bromley & K. Segerson (eds). *The Social Response to Environmental Risk* (pp. 75-100). Boston: Kluwer.
- 4 Singer, E. & Endreny, P. M. (1997) *Reporting on Risk: How the Mass Media Portray Accidents, Diseases, Disasters and Other Hazards*. Franklin Pierce Law Center Home Page: <http://www.fplc.edu/risk/vol5/summer/singer.htm>
- 5 Sandman, P. M. (1997) Mass Media and Environmental Risks: Seven Principles. In: Bate, R. (ed.) *What Risk? Science, Politics and Public Health* (pp. 275-284). Oxford, Butterworth-Heinemann.

" because it assumes that risks are known to technical experts and that risk reporting should popularize the experts' knowledge. This is the view of the scientific and technological elite I seriously doubt that organizing the public discourse along experts' frames and priorities – as the technocratic model assumes – best solves this problem." ⁶

Peters rejects this technocratic perspective because:

- There is not always consensus in the assessment of a risk
- Lay persons construct risk and risk-benefit analysis differently and from their social point of view as perfectly 'rational'
- The media cover the activities of the social actors
- The public wants information about the social and political factors accompanying the risk problem

As a result, the media can hardly limit themselves to the top down dissemination of information on the topic of risk; they have to report what is going on and they have to take into account the way the public defines the issues with all the accompanying controversies. Media coverage of risk issues includes all kinds of stories, varying from scandal and investigative exposés to popular science.

According to Peters, the media operate in different modes: apart from popularizing the scientific debate on a risk topic, they will report the social and political activities of different stakeholders (politicians, activists, lawyers, etc.) involved and the contradictory claims they make regarding the risks. In the 'arena mode' they offer a platform for different views and reporters will evaluate the debate in their commentaries and op-ed pages.

"So journalistic practices in dealing with risk issues vary significantly with the communication mode. While questions of audience relevance, comprehensibility or even compliance govern risk reporting as popularization or public information, the valid assessment of the competing conclusions becomes the most important reference point for media reporting in technological controversies."

In these articles the media perceive risk issues mainly in their political and not their technical context: Who is responsible? Who knew about this risk? Who is to blame? Will this official have to step down now? This implies an information demand, which is very different from that of an expert. The point made by Peters is that an evaluation of the media has to take into account the different modes in which the media operate.

Social amplification of risk Another aspect of the social context the media operate in is the process that has been described by the Social Amplification of Risk Framework (SARF)⁷. This framework tries to explain why hazards and events, with relatively low statistical risks (such as Creutzfeldt-Jakob Disease

6 Peters, H. P. (1994) Mass Media as an Information Channel and Public Arena. *Risk: Health, Safety Environment*. 5: 241-250.

7 See: Pidgeon N, Kasperson RE, Slovic P. (2003) *The social amplification of risk*. Cambridge: University Press.

linked to BSE or the dangers of living near power lines) can become the centre of social and political controversy (risk amplification), while other, potentially more serious dangers receive comparatively little attention (risk attenuation).

Risk amplification refers to the chain of events in which a specific risk is magnified, causing in turn many secondary social, political and economic consequences. This approach is based on the metaphor of amplification: signals are received, interpreted, amplified and passed on by different social actors. The media belong to important 'stations' of amplification by framing risk messages and transmitting them to the public. It is important, therefore, to include in the evaluation of the media, the role they play in this process of risk amplification. The media can follow, but they can also lead. They can report ongoing events, disseminating information to the public, but they can also play a leading role in the social amplification of a topic by magnifying, for example, the human interest stories of (potential) victims or by neglecting or downplaying scientific data on the risk.

On the one hand, it belongs to the core business of the press to reveal potential risks and hazards; to be critical and distrustful of statements by official sources and to give people who feel they are victims of hazardous exposures a voice in the public arena. On the other hand, it is also the responsibility of the press not to become a megaphone of specific interest groups but instead to promote the general interest by showing different perspectives on the matter.

Risk perception Arguing that the media should not take the lead in an uncontrollable amplification process does not mean that the reporter should ignore the public's perception of risk issues. Herein lies another dilemma of reporting on risk; media that concentrate on the scientific information only, without addressing risk perception among the public, run the risk of losing contact with their readers and viewers. Media who do not report on the risk issues that people worry about are not taken seriously. The fact that people are worried makes the issue news-worthy, even if there is little scientific evidence that proves the risk.⁸

The media therefore have to address the so-called outrage factors that play an important role in the response of the public. People become outraged, fearful, angry, defensive or frustrated if the risk is perceived to be involuntary, uncontrollable, immoral, unfamiliar, dreadful, uncertain, catastrophic, unfair or untrustworthy. This implies that the way the public frames a risk issue is very different from that of, for example, scientists or government officials who tend to rely on factual information about the risk involved. According to Walter, Kamrin and Delores, the media should keep in mind these different frames for risk perception, address the outrage factors and help the audience to evaluate the risk.

Framing risk As noted above, there is a conflict in many cases between the perspective of officials and experts on the one hand and the public on the other. In the view of the expert any risk needs to be proven before action can be taken, whereas the public might demand action even if there is only just a worry about the consequences of exposure to a perceived risk. In many cases scientific data do not play any role at all in the views of the public. The social perspective is defined

8 Walter, M. L., Kamrin, M. A. & Delores, K. J. (1996) Revised in (2000) *Reporting tools, risk communication basics*. FACSNET:
http://www.facsnet.org/tools/ref_tutor/risk/ch6comm.php3

by the outrage factors such as uncertainty, involuntary exposure, and lack of trust in official sources. Wiedemann et al distinguish five types of lay persons' frames:

- Things can happen sooner than you think
- Who is to say there isn't...?
- We are all victims already
- Don't let them get away with it!
- It was bound to happen sooner or later

They go on to stress the fact that the lay persons' frames are most of the time steps ahead of the experts' frames. "We wish to argue that the lay perspective, which emphasises above all the social context of the risk, usually tends to intensify the magnitude of the perceived risk."⁹ This means that even before exposure to a pollutant has taken place (or has been proven to have taken place) the public response can already be framed in terms of "Don't let them get away with it!" – which is based on the assumption that damage already has been done.

The main question regarding media frames is: how do the media frame the risk issue in their different stories (genres), but especially in their news reports on events and the activities and claims of social actors? Whose frame is structuring this reporting on the risk topic and the activities of the social actors? The media can report the viewpoint of an actor within the framework of the opposition. In that case the media are formally offering access, but at the same time the message is framed in another context. A statement by an official ("exposure stayed within health limits") can be framed in the narrative of the victims ("we are victims already!"). The question is: Do the media adopt the lay persons frames or do they also pay attention to the scientific risk perspective of risk assessment?

3.9.2 Evaluation criteria for risk coverage

Criticism of media reporting of risk is abundant but in most cases the critics do not take into account the social context in which the news media operate. A new model for the evaluation of risk coverage has to incorporate not only the different modes of the media but also the role of the media in the amplification process and the different frames used by experts and the public. The consequence of this approach is that evaluation should not only take place at the level of individual article but also on that of the coverage as a whole. One article may pay attention to the point of view of the officials – another might be about the scientific approach or the worries of the public. But what kind of picture emerges when the complete news wave on a topic is evaluated? Which sources or frames dominate the coverage as a whole? Who has the power to define the issues? Which language (linked to which frame) is used to describe the issue?

Looking at coverage from this level will provide new criteria for the evaluation of risk coverage that will complete existing professional criteria and the *Guidelines on Science and Health Communication* – viz:

⁹ Wiedemann, P. M., Clauberg, M. & Schutz, H. (2003). Understanding amplification of complex risk issues: the risk story model applied to the EMF case. In: N. Pidgeon et al. (2003) *The Social Amplification of Risk*. Cambridge: Cambridge University Press. pp. 286-301.

- Reliability (attribution to sources and verification of facts)
- Fairness (to sources and the public)
- Balance (give a voice to different perspectives)
- Independence (no commercial or political dependency)
- Distance (impartiality)
- Relevance (inform on relevant developments and social problems) and
- Social responsibility (self-reflection and accountability)

In order to develop this new model for news evaluation two tracks are followed:

1. An analysis of news coverage on two recent risk issues in Dutch newspapers
2. A series of (21) in-depth interviews with key persons in the areas of science, communication, media, government and stakeholders

3.9.3 Content analysis to explore evaluation criteria

For the content analysis two different risk issues have been chosen: the growing protest against the construction of Universal Mobile Telecommunications System (UMTS) relay stations and the problem of fine particle air pollution (FPP). These

De Volkskrant, November 2, 2005, SECTION: 2, LENGTH: 533 words

HEADLINE: " I always compare it with asbestos, it used to be harmless as well." Growing resistance against installation UMTS base-stations.

BYLINE: Rik Nijland

DATELINE: HAAKSBERGEN

BODY:

As long as the consequences for the public health are not known, de UMTS base-stations should not be installed, according to the people of Haaksbergen. It is a safe technology, KPN says.

The house of Annet and Gerard Wildenborg, right beside their caravan company in Haaksbergen, shows a rain-wet banner with the text www.stopumts.nl.

"If you would believe only one percent of everything you read on this website, then the risks are still too much." Says neighbour Richard Weegerink, owner of a cobbling company. At about hundred meters in the distance through the forest the relay station, that caused all the anxiety among the inhabitants, can be spotted.

A few weeks ago the KPN installed a UMTS-station in this mast, just above the other stations of the mobile phone network. When the mechanics returned to connect the new transmitter to the network, they were confronted by an action-group of residents blocking the road. Four cables are hanging free from the thirty metre mast.

"No permission is needed for the installation of UMTS, despite the health risks involved." Says Wildenborg. "I needed a permission for a drainpipe, while this is allowed just like that. Incredible. We are not people who make a lot of fuss,

but now this is in our backyard we will take up arms. I compare it with asbestos; it used to be harmless as well, but turned out be life threatening."

"We asked the KPN to guarantee us that we and our families will not develop any health problems. But there came no definite answer. So let's wait until the risks are clear before we go ahead with UMTS," Wildenburg says.

The residents committee found a way the fight back. A closer look at the construction permit, dating back to 1998, learned that KPN put the mast 4,5 meter away from the planned location. No problem, admits mayor Karel Loohuis van Haaksbergen, but still KPN has been ordered to dismantle the mast and rebuild it on the right spot.

For Loohuis that is a way of addressing the unanimous resistance from the city council against the installation of UMTS, as long as the health of the residents cannot be guaranteed.

A year ago hundreds of people protested when the city gave Vodafone a permit for a base station. "We underestimated the worries and the emotions tremendously", says Loohuis. "In the end we withdrew this permit again. Vodafone is still suing us in court for that."

Another lawsuit is on its way for Haaksbergen. KPN is not prepared to relocate the mast, said the company last week. "A relocation is useless, it does not serve any goal," according to KPN spokesperson Maaïke Scholten. "We are determined to connect the base-station to the UMTS network. This is a safe technology; we are convinced of that. You can never be completely sure, but there is no reason to think that there are health risks involved."

Tingling feelings caused by UMTS-radiation?

UMTS (Universal Mobile Telecommunications System) is a new mobile phone technology that links computers with mobiles. The UMTS consumer can watch movies on his mobile or surf on the Internet. Just like more than ten years ago with the introduction of GSM, there are worries about health risks caused by the electromagnetic radiation of UMTS-base stations. A study in 2003 by TNO showed that UMTS-radiation was causing dizziness and tinglings. Later the report was withdrawn by TNO because it was unsubstantial. Research shows that mechanics have to be careful. Residents in the area do not have to worry, according to operator KPN. The WHO and the Dutch Health Council support this view. ■

two are typical risk issues, each with a different structure. In the case of UMTS there is a considerable degree of uncertainty about the actual risks for public health – that is to say, negative effects have not been proven yet – while the risks of fine particle air pollution are quite certain in terms of mortality. In the UMTS case, outrage factors such as involuntariness play an important role in the outrage – "we don't want this on the roof of our apartment building." In the latter case this is irrelevant because people have no individual choice (they do have a collective choice of course). Everywhere in the Netherlands local residents are trying to prevent the installation of new relay stations, using the Internet to inform and mobilize other citizens (see: www.stopumts.nl), while there are hardly any protest movements against FPP. These two cases offer interesting dilemmas for the media, which can be used to sharpen the criteria for the evaluation model.

3.9.4 A typical example?

Let's take an example from the news on the UMTS base stations.

This article on the UMTS issue, published in the Dutch national daily *de Volkskrant* can be seen as typical for an article on this topic. More than half of the article (the first part) is dedicated to the worries and the protest actions of people in the town of Haaksbergen against UMTS. In addition, the headline and the lead are phrased from the point of view of the residents: as long as risks are unclear, the base stations should not be installed. There is also a lack of trust in the government regarding the statements on the 'once considered harmless' asbestos. The telecom operators get two quotes to respond ('safe technology, but never completely sure'). In a separate frame the reporter informs the readers on UMTS and the results from the TNO study, which was said to have been withdrawn as 'unsubstantial'.

So, is this a 'good' example of responsible reporting of risks? All parties are quoted correctly, there is information on the scientific research, it is not written down sensationally, but still, there are some problems with the article. It seems to be unbalanced, not only because the Haaksbergen residents get a lot more attention than other sources, but also because their views frame the article. The residents, not the telecom operators or the local government, define what is news, and the news is that UMTS is a health risk issue. Furthermore, information on the health risk is very limited: the TNO study is not referred to correctly – it was not withdrawn because it was 'unsubstantial'. The risk is also not put into any broader perspective that would make it possible for the reader to evaluate it properly. Overall, the article leaves the reader with the impression that there are good reasons to stop the UMTS stations because there might be a risk. 'Better safe than sorry' is the main message.

One could argue that there is nothing wrong with articles like this so long as the overall coverage is balanced, offers more angles and frames and gives more information on the context of risks. That is correct, but what if this kind of reporting is dominant in the coverage of UMTS? In that case the media can play a role in the social amplification of risk, creating crisis situations for the government on the basis of extremely small or completely non-existent risk.

So what does the coverage as a whole on UMTS look like? What kind of sources and frames are dominant? Who gets the power to define the issue in the news? How do the media refer to scientific studies on risk and UMTS? These were the main questions for our content analysis of UMTS as well as FPP coverage in Dutch newspapers.

3.9.5 Introduction to UMTS and FP pollution as risk issues

- 3.9.5.1 UMTS** In 2005 in the Netherlands more than 40 city councils decided to postpone the implementation of new UMTS (Universal Mobile Telecommunications System) base stations in response to growing resistance from people living in the areas where the stations were planned. The main reason for the opposition against this new technology is that people worry about the health effects of the electromagnetic fields (EMF) in the direct vicinity of the masts.

The new base stations are part of the rollout of a completely new network for UMTS signals which makes it possible to get access to the Internet on mobile phones and to transport more data such as wireless video. In 2000 the Dutch mobile phone companies paid the Dutch government over 27 billion Euros for a share in the UMTS frequencies. A nationwide network has to be established by 2007 with the cooperation of the Dutch government and city councils.

In 2003 the Dutch TNO (Organization for Applied Scientific Research) published the results of a double blind study which explored the effects of exposure to GSM and UMTS signals on self-reported well-being and cognitive functions. Two groups of 36 people were involved. One group consisted of people who had complained about health problems which they attributed to EMF. The other group contained people with no problems. A small, but statistically significant effect, was reported in both groups when people were exposed to UMTS signals.

The study was criticized because of the selection of the respondents, the questionnaire used to establish well-being and the levels of EMF applied. Nevertheless, the TNO study attracted a lot of media attention, not only in the Netherlands but also internationally. It was often presented as the first 'proof' of health risks related to UMTS signals. The TNO research was conducted at the request of the Dutch government, responding to critical questions from members of the parliament. The Dutch health council concluded that a definite answer on health risks and UMTS was not possible on the basis of the TNO study and advised more research including a replication of the TNO research.¹⁰

After the publication of the TNO study the resistance against the rollout of the UMTS network increased. In several cities, but notably in smaller towns, groups of worried residents organised protest actions, demanding the city councils stop the mobile phone companies and wait for definite results regarding the health risks. The city councils seem to be in the middle of the conflict with, on the one hand the worried citizens, and on the other hand the companies threatening them with lawsuits.

The "growing resistance against UMTS" (as it is reported in the Dutch press) is a perfect case for analysing the role of mass media in risk communication and amplification. What would be responsible journalism in this situation, where there is hardly any proof for negative health effects, but where a lot of people are still worried about the antennas on their roofs?

3.9.5.2 Fine particle pollution

In 1995 the Dutch Health Council issued a warning about the negative health effects of fine particles, a kind of air pollution probably causing more than 600 premature deaths in the Netherlands. A study in Amsterdam in 1995 showed an increase in mortality rates of six percent due to fine particles in the air, caused by traffic and industry as well as natural particles such as sea salt. A few years later environmental groups tried to get this 'chemical nightmare', as this pollution was labelled, onto the political agenda. Despite their efforts 'fine particles' (FP) was not a big issue in the daily news. In 2002 the National Institute for Public Health and

10 In 2006 a replication study (UMTS Base Station-Like Exposure, Well Being and Cognitive Performance) was published in Switzerland, which showed no links between exposures and well-being.

the Environment published new research estimating between 1,700 and 3,000 premature deaths a year as a consequence of this type of pollution.

In 1999 the EU also issued new air quality directives in which the problem of FP was addressed. Stricter emission limits for each European Country were introduced. The new policy had to be implemented by 2005, a goal that could not be reached by the Dutch government because it was impossible to reduce the concentration of FP in urban areas. For that reason the Dutch government tried (in vain) to postpone the implementation until 2015 in order to have more time to take action. In 2004 the government presented several plans to reduce emissions, including raising the tax on diesel fuel.

In 2005 this kind of air pollution became an important issue because several building projects (houses as well as roads) were interrupted by court decisions. These projects would have increased FP levels and therefore violated the EU regulations. This problem brought the issue to the front pages of the national dailies and in 2005 FP pollution received a lot of media attention. At this stage more and more residents living in 'dirty' areas (backed by environmental groups) also started to protest against the pollution and the failing policy of the government. In contrast to Germany, however, where FPP became a real scandal issue with the German car makers under attack, the situation in the Netherlands did not trigger much public outrage. The debate and the news coverage seemed to be on a technocratic level: how to solve the problem without damage to the Dutch economy?

In 2006 new research seemed to show that the FP emissions were much lower than previously assumed and mostly within the EU regulations. Moreover, the cabinet introduced a new law on air quality stating that only extensive building projects (leading to a 3 percent increase of air pollution on a national level) should be able to meet the EU criteria. Only five percent of the projects belonged in this category and for all others there are no restrictions any more.

The Hague also decided to balance 'dirty' areas against cleaner ones, thereby generating a positive value for the Netherlands as a whole. Project developers and builders could move ahead again. As consequence FP became a much less important issue in the news. The problem seemed to have been 'solved' by this government, at least in the short term.

In the case of FPP there is an existing and scientifically proven health risk, and although estimates of mortality vary, there are EU emissions standards, there are worried residents living in polluted areas, there is governmental action to solve the problem and there are the media to report on all this. But how *do* they report on the issue? Which sources do they use? How do they define the issue? How do they cover the scientific data on fine particle pollution? Do they give a voice to worried citizens? What does this coverage offer in regard to the model for evaluation of risk reporting?

3.9.6 Hypothesis content analysis UMTS and FPP

For the content analysis of newspaper coverage on UMTS and FPP the following research questions were formulated:

- 1) **Who are the most important sources in the coverage?** Sources are defined as people (or organizations/institutions) who are quoted (direct) or paraphrased (indirect)
- 2) **Who are the most important actors in the coverage?** Actors are defined as people who do something (active actor) or to whom something is done (passive actor)
- 3) **Who has the highest scores in defining power?** Defining power is defined as the outcome of a formula which includes direct and indirect quotes and subject/object positions. Someone who is quoted and who is an active actor has more defining power than people who are not quoted at all or who are mentioned only in the object position. They have less power to define the issues at stake.
- 4) **What are the most important issues in the news?** Are these issues evaluated positively or negatively?
- 5) **Which actors relate to what issues in the news?**
- 6) **How do the media evaluate the different actors?**
- 7) **Which frames can be observed in the coverage?** Frames can be defined as specific constructions of a problem relating to causes, consequences, accountabilities, perspectives and solutions.
- 8) **Whose language is being used in the coverage?** To describe the problem the media can use expressions from the vocabulary of the experts and from the language of lay persons.
- 9) **How and how often do the media report on the results of the scientific studies?** How did the different actors evaluate these studies?

3.9.7 Methodology of content analysis

For the content analysis of the articles the program INET is used, which is based on the 'Net method' – Network analysis of evaluative texts. This method is an elaboration and generalisation of Osgood's evaluative assertion analysis¹¹ and is based on the idea that the explicit or manifest content of a text can be depicted as a network consisting of relations between meaning objects. To map the content of a text into a network, texts are parsed into nuclear sentences, each of which connects one meaning object to another.¹² Meaning objects can be actors, sources and issues. People or organisations who are talked about are called actors, but those who get to say something in the news coverage are called sources. They are quoted directly or paraphrased. In a text the relationships between these objects

11 Osgood, C.E. (1956). Behavior Theory and The Social Science. *Behavioral Science* 1(3): 455-469.

12 See: van Cuilenburg, J.J., Kleinnijenhuis, J & de Ridder, J. A. (1986) A theory of evaluative discourse. *European Journal of Communication*, 36 (1), 65-96. Also: de Ridder, J. A. & Kleinnijenhuis, J. (2001) Media monitoring using CETA: the stock-exchange launches of KPN and WOL. In: M.D. West (ed.) *Application of computer content analysis*. Westport: Ablex. pp. 165-184.

exist by means of verbal connections. These connections have an evaluative direction, that is to say they can be positive, negative or neutral. To map the content of a text into a network texts are parsed into nuclear sentences, each of which connects one 'meaning' object to another.

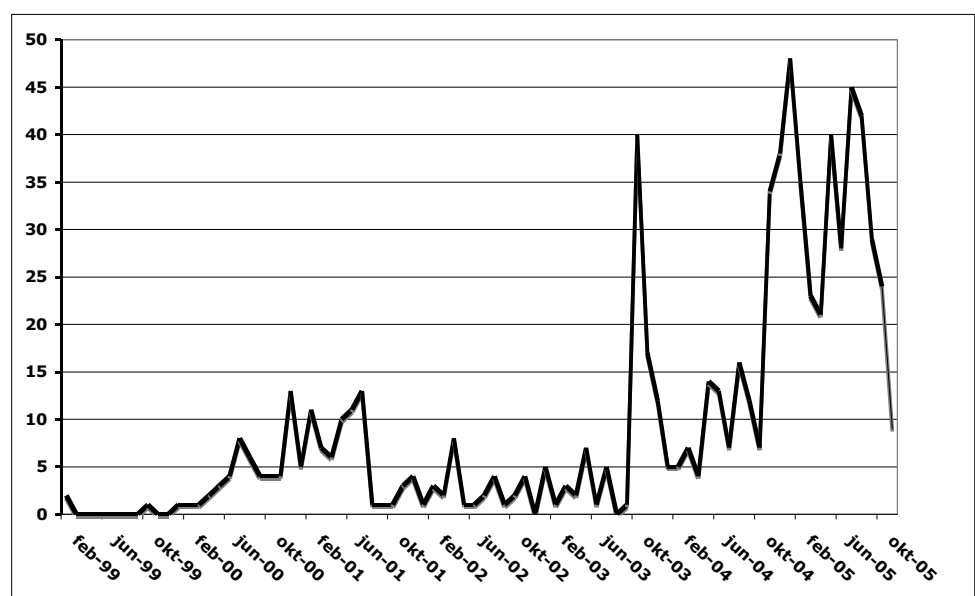
In this way the quantitative aspects of the content were coded in a Microsoft Access form. In order to find out which frame dominates the coded articles, operational questions were deferred questions from the general characteristics of the predefined frames. All questions are phrased in a way that when answered in the affirmative the answers will serve as indicators for the presence of a certain frame.

UMTS sample In total the following newspapers published 756 articles on the UMTS network (**search terms: UMTS and Send? OR ?Mast IS THIS RIGHT??**) between February 1999 and November 2005: *Dagblad van het Noorden*, *Deventer Dagblad*, *Haagsche Courant*, *Eindhovens Dagblad*, *Brabants Dagblad*, *Algemeen Dagblad*, *Utrechts Nieuwsblad*, *Rotterdams Dagblad*, *Algemeen Nederlands Persbureau ANP*, *De Telegraaf*, *de Volkskrant*, *Amersfoortse Courant*, *Dagblad Tubantia/Twentsche Courant*, and *De Gelderlander*. The distribution of the articles over this period is shown in Figure 9-1 below.

The auction of the UMTS frequencies in 2000 received some media attention because this also triggered a debate over the revenues for the government, which were regarded as much too small in comparison with profits from UMTS auctions in other countries.

Until about October 2003 the link between the UMTS network rollout and the health risk was hardly ever mentioned. This changed after the publication of the TNO study in October 2003. From that point coverage of the UMTS risk issue grew, showing several waves of media attention. For this research it was decided to take a sample of five newspapers and three periods.

Figure 9-1 Total number of articles per month about UMTS and relay stations, February 1999-November 2005.



For this explorative study five Dutch newspaper were selected, two national dailies (*De Telegraaf* (circulation: 765,000 in 2005), *de Volkskrant* (289.000) and three regional newspapers: the *Amersfoortse Courant* (142.000), *De Gelderlander* (170,000) and *Twentse Courant/Tubantia* (124,000). Over a period of two years three (two months) 'waves' of UMTS news were selected for analysis: October/November 2003; December/January 2004/2005 and July/August 2005. The reason for this choice is that during these months the newspapers paid the most attention to the problem.

The regional newspapers published more articles in the second and the third wave. National daily *de Volkskrant* hardly published any articles during the second and the third wave in which local initiative against the UMTS network rollout emerged. In 2005 UMTS became a local more than a national issue, because of several local initiatives against the UMTS-stations – see Figure 9-2.

This sample resulted in 98 articles, which were subsequently coded, resulting in 2664 statements to be analysed.

Figure 9-2 Number of articles UMTS in the three periods.

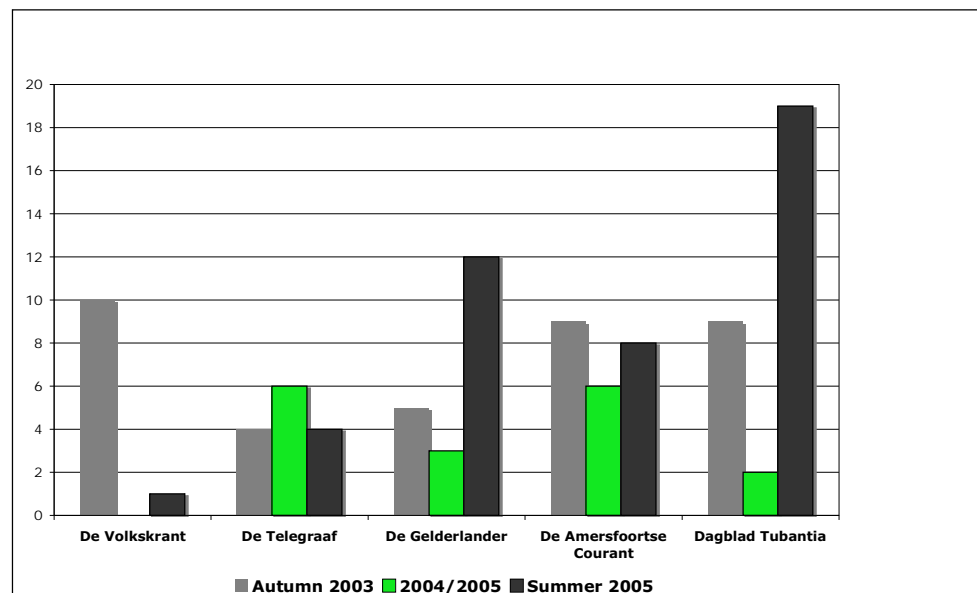
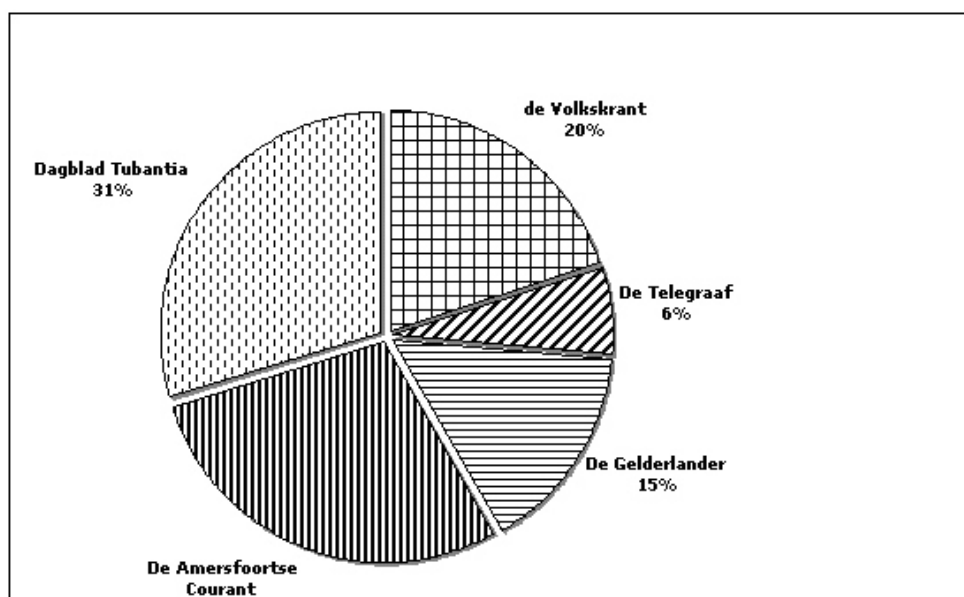


Figure 9-3 Number of sentences per newspaper during the three periods.



FPP sample In total the following national newspapers published 252 articles on air pollution by fine particles (search terms: 'fijn stof' OR 'fijnstof') between January 2001 and February 2006 (62 months): *Algemeen Dagblad*, *De Telegraaf*, *de Volkskrant*, *Trouw* and *NRC Handelsblad*.

The majority of these articles were published in 2005 (171), whereas in the previous years the total was about 7.5 times smaller – see Figure 9-4 below.

Figure 9-4 Number of articles published in sample 2001-2006.

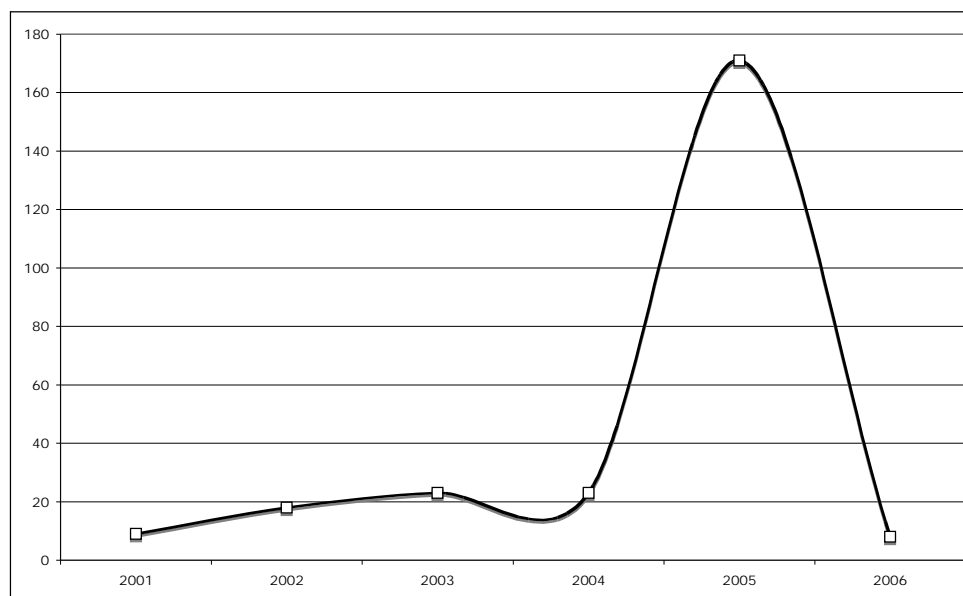


Figure 9-5 shows the share of each newspaper in the total coverage: *de Volkskrant* and *NRC Handelsblad* report more than 50 percent of the total, the rest is equally divided among *Trouw*, *Algemeen Dagblad* and *De Telegraaf*.

Figure 9-5 Share of newspapers in the total coverage on fine particles 2001-2006.

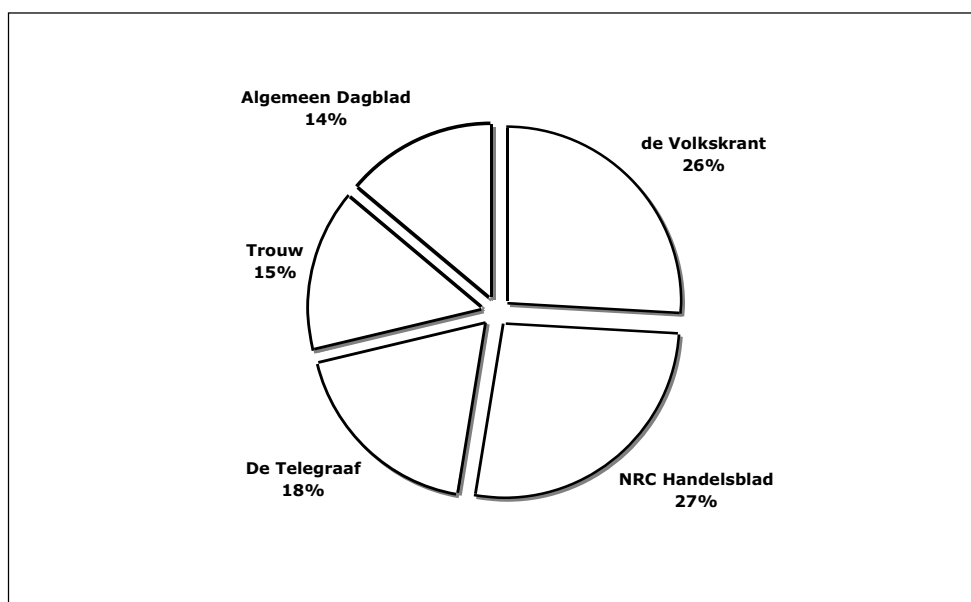


Figure 9-6 below shows that the newspapers more or less follow the same pattern over the years with high levels of coverage in 2005. *De Volkskrant* and *NRC Handelsblad* publish more than 45 articles in 2005, with the other national dailies on lower levels. *Algemeen Dagblad* has the lowest number of articles (19) in 2005.

After coding the articles the analysed dataset contained 2949 statement. These sentences were not divided equally among the newspapers, which means that some

newspapers have, on average, articles that are much longer than others, as shown in Table 9-1 below. It is remarkable to see that *De Telegraaf*, which has a reputation as a mass market newspaper, publishes long articles on the fine particle issue. *NRC Handelsblad* and *de Volkskrant* published twice as many articles, but much shorter ones.

Figure 9-6 Number of articles on fine particles per newspaper 2001-2006.

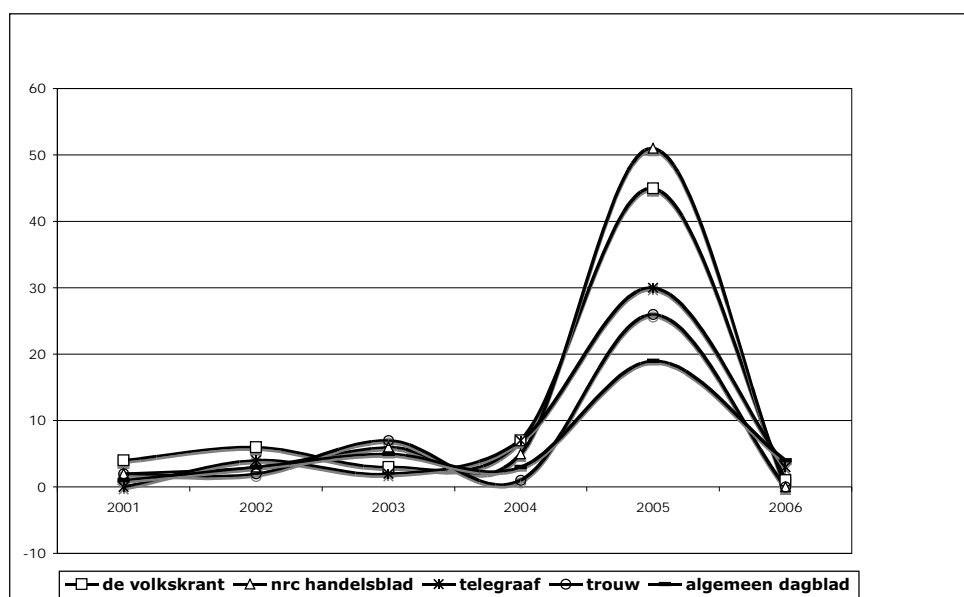


Table 9-1 Fine particles: articles and sentences.

FINE PARTICLES	Articles	Sentences	Average per article
<i>de Volkskrant</i>	66	338	5.1
<i>NRC Handelsblad</i>	67	322	4.8
<i>De Telegraaf</i>	46	1026	22.3
<i>Trouw</i>	38	768	20.2
<i>Algemeen Dagblad</i>	35	495	14.1

3.9.8 Results of the quantitative content analysis of newspapers

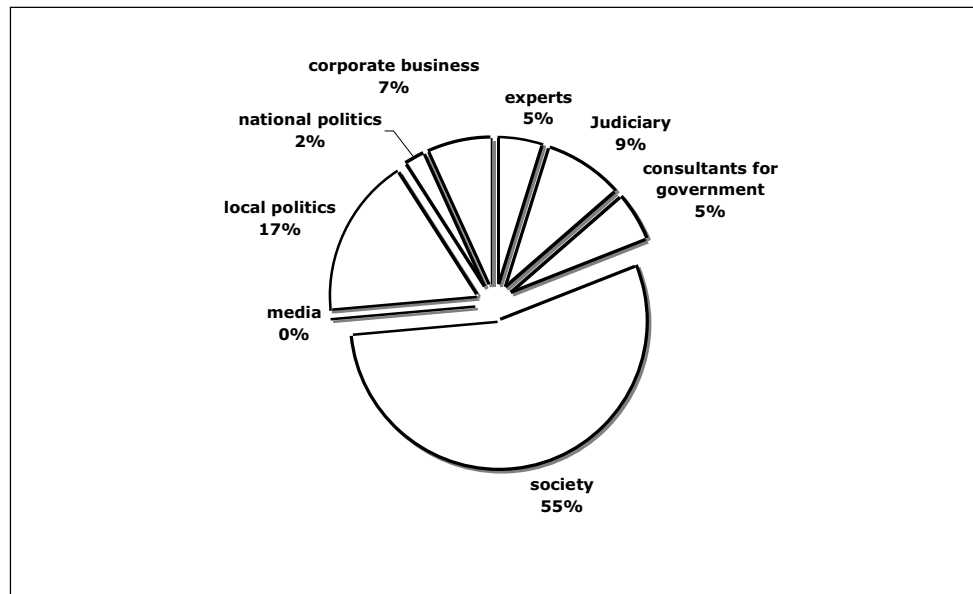
3.9.8.1 Sources in the news on UMTS and FPP

An important question for the evaluation of news is: who are the most important sources in the coverage? Sources are defined as people (or organizations/institutions) who are quoted (direct) or paraphrased (indirect). Apart from being quoted (directly or indirectly) persons or institutions can also play a role in the news as actors: they are being talked about, either in a subject position (someone is described as saying or doing something) or in an object position (one is being talked about). In the next part, sources and actors in the coverage are inventoried.

Quotes and paraphrases. Who is quoted most often in newspapers coverage on the issue of UMTS and FPP? In the case of UMTS more than half (55%) of the sources can be labelled as 'society' (action groups and residents), followed by local city council members (17%) and people from the judicial system (9%), while

spokespersons from companies and expert sources are quoted in only seven to five percent of the total – see figure 9-7.

Figure 9-7 Sources quoted in the news on UMTS.



In the FPP coverage there are 598 sources who are quoted or paraphrased in this coverage. More than 75 percent of the sources can be labelled as 'official', belonging to the scientific, political or consultancy domains. Society (interest groups, citizens) and corporate businesses have score of 13.9 and 8.2 percent. Sources from the judicial system hardly reach a score of 1 percent. Government funded research institutes like the RIVM, TNO and MNP (Milieu en Natuur Planbureau), universities and scientific experts are quoted very often. See Figure 9-8 below.

If we compare UMTS and FPP the conclusion is that the coverage on UMTS is dominated by layperson sources, with local residents who are worried about UMTS in equal position to activists against the stations. In contrast the FPP coverage is dominated by a majority of official, political and professional sources. Society as a category is quite small (citizens: 4 percent, action groups 10 percent), indicating that this is not a news flow defined by residents worrying about air pollution.

Apart from being quoted sources can also be paraphrased without quotation marks. When sources in UMTS news, quoted and paraphrased, are aggregated the share of the residents and action groups gets smaller (43 percent), while sources local politics reaches 20 percent.

The expert sources (scientists) are quoted and paraphrased in only five percent of all quotes, which is a rather small share, considering the fact that the issue of UMTS involves scientific debate and research. See figure 9-9 above.

Due to coding problems there are no specific data available on paraphrased sources in FPP coverage.

Figure 9-8 Sources quoted in the news on FPP.

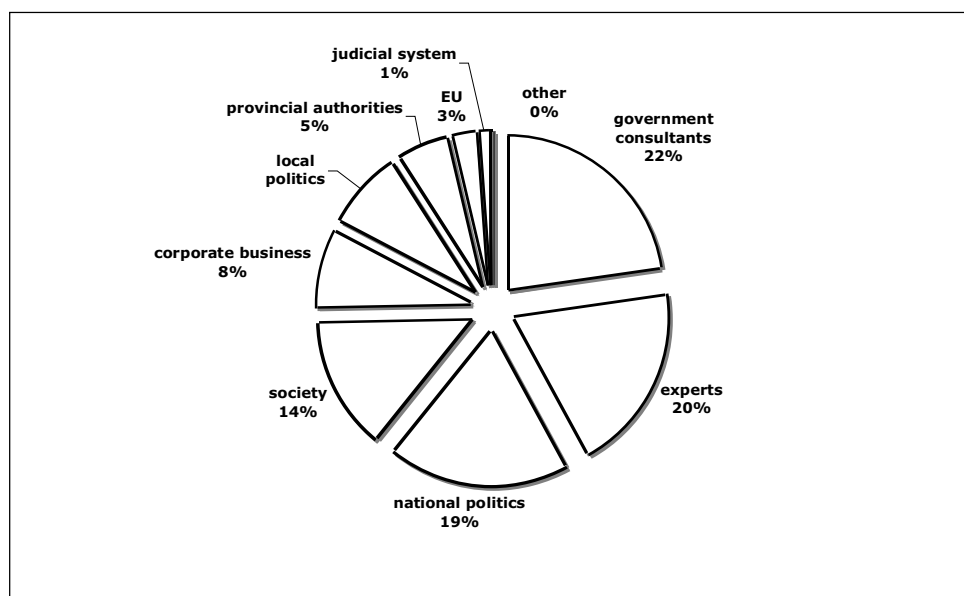
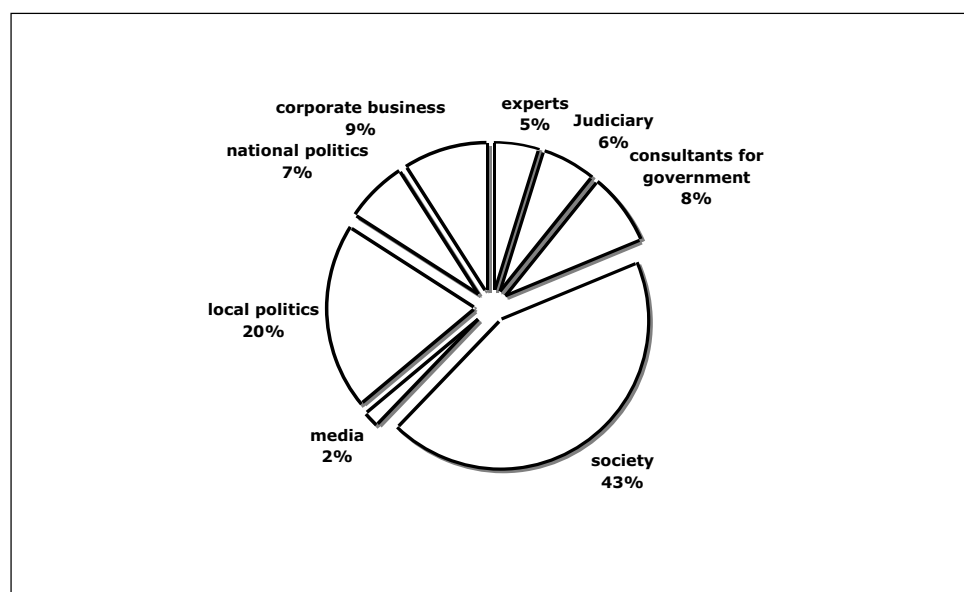


Figure 9-9 Sources quoted and paraphrased in UMTS news.



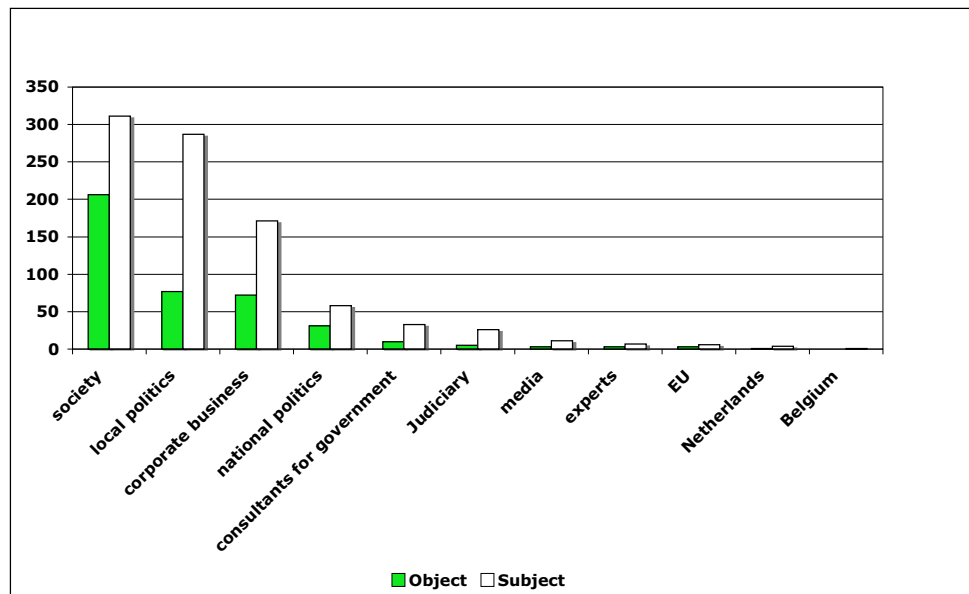
3.9.8.2 Subject or object position

Apart from being quoted and paraphrased actors are being talked about, either in a subject position (someone is described as saying or doing something) or in an object position (one is being talked about).

In absolute numbers in the UMTS news the citizens and their interest groups have the highest score (517), followed by local politics (364) and corporate business

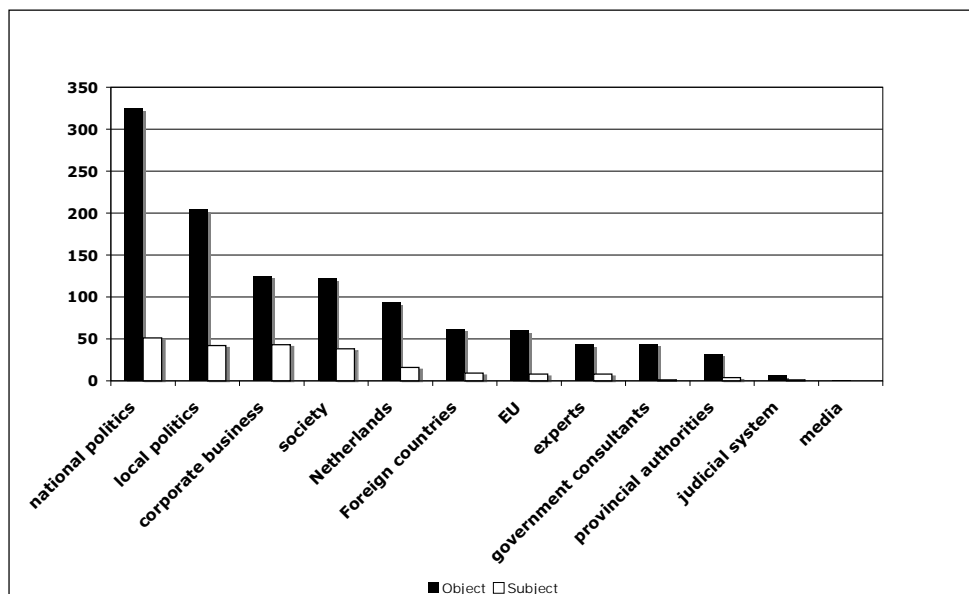
(243). All of the other parties are mentioned in much smaller frequencies. See figure 9-10.

Figure 9-10 UMTS: subject, object positions per actor in absolute numbers.



Society outnumbers corporate business in the subject position (311 versus 171), with local politics in between (287). However, business is in 70 percent of its total in a subject position, while society only reaches 60 percent and local politics 79 percent. The conclusion is that people against the UMTS relay stations are mentioned most often, as actors doing something or as objects being talked about, followed by local politics. Corporate business has less initiative in the news in both positions.

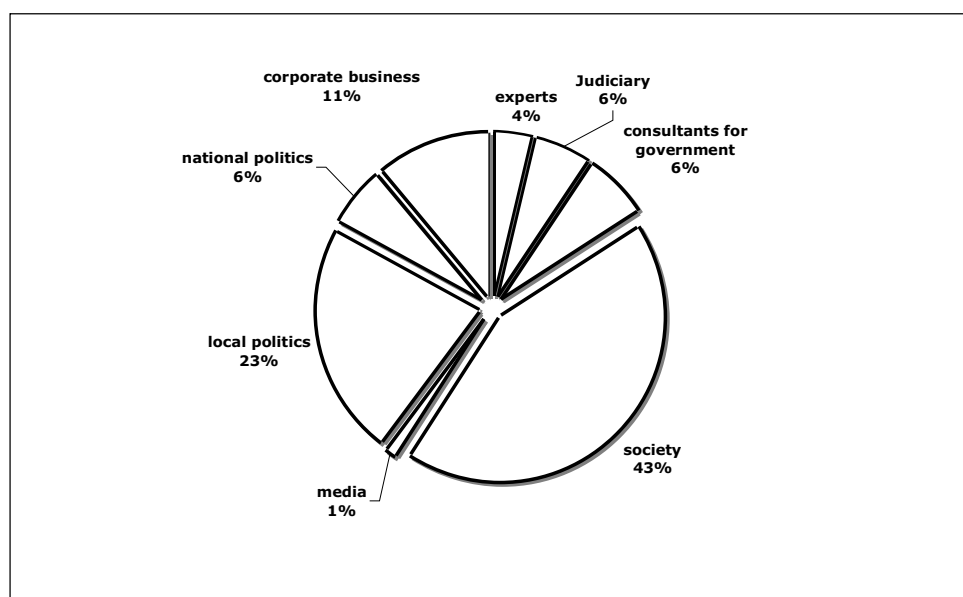
Figure 9-11 FPP: subject, object positions per actor in absolute numbers.



In the FPP coverage national politics, local politics, corporate business and society

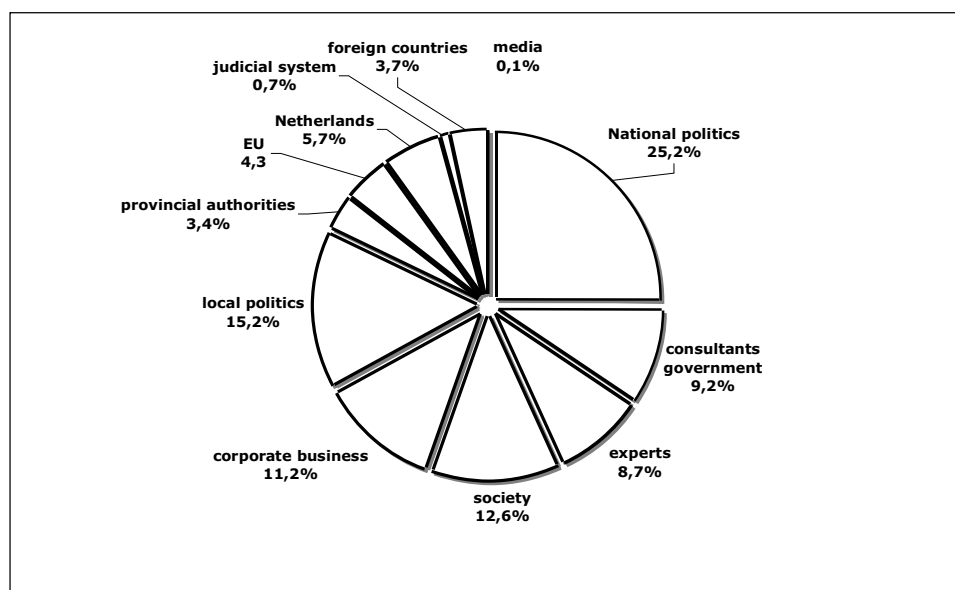
are mentioned most often in the object position. Politicians, on national and local levels, seem to be key figures in the issue. See figure 9-11 above.

Figure 9-12 Share of actors/sources in the total number of quotes, paraphrases, object and subject positions in the UMTS news.



The total number of quotes, paraphrases, subject and object positions in the news on UMTS is quite differentiated among the sources. Society has the largest share (43%), followed by local politics (23%) and corporate business (11%). This also gives a strong indication of the dominance of worried residents and action groups in the news – see figure 9-12 above.

Figure 9-13 Share of actors/sources in the total number of quotes, paraphrases, object and subject positions in the FPP news.



The total number of quotes, paraphrases, subject and object positions in the news on FPP shows that actors on different political levels dominate the field with 40

percent, or even 51 percent adding up their consultants as well. It is remarkable that society is quite small: 12.6 percent – see Figure 9-13 above.

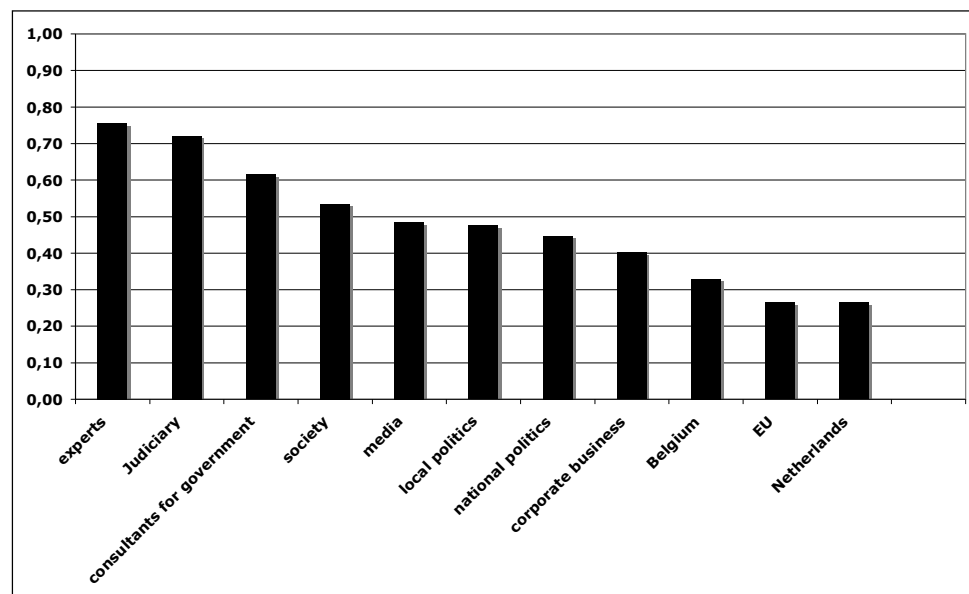
3.9.8.3 Defining power Being quoted and paraphrased and referred to in the news, either in a subject or object position, can be seen as an indication of the amount of power actors have in defining the issues in the news. The actor who is given a central role in the article (being quoted extensively, mentioned in the headline, etc.) is presumed to have a strong influence on the content of the article.

Actors who are rarely quoted and/or paraphrased and who are more often in the object than in the subject position seem to have the least defining power in the news. They are mainly talked about and do not get a chance to deliver a quote themselves. The result is that they do not have much authority in the news. Defining power is based on this formula:

$$\frac{(1 * \text{source}) + (2/3 * \text{paraphrase}) + (1/3 * \text{subject}) + (0 * \text{object})}{(\text{source} + \text{paraphrase} + \text{subject} + \text{object})}$$

Looking at the defining power position in the UMTS news on a scale from 0 to 1, actors like experts, judges, government and advisory committees have much power (0.76, 0.72, 0.67), residents have a score of 0.54 and the city council 0.49, while the operators hardly reach a score of 0.4 – see Figure 9-14.

Figure 9-14 UMTS defining power in the news.

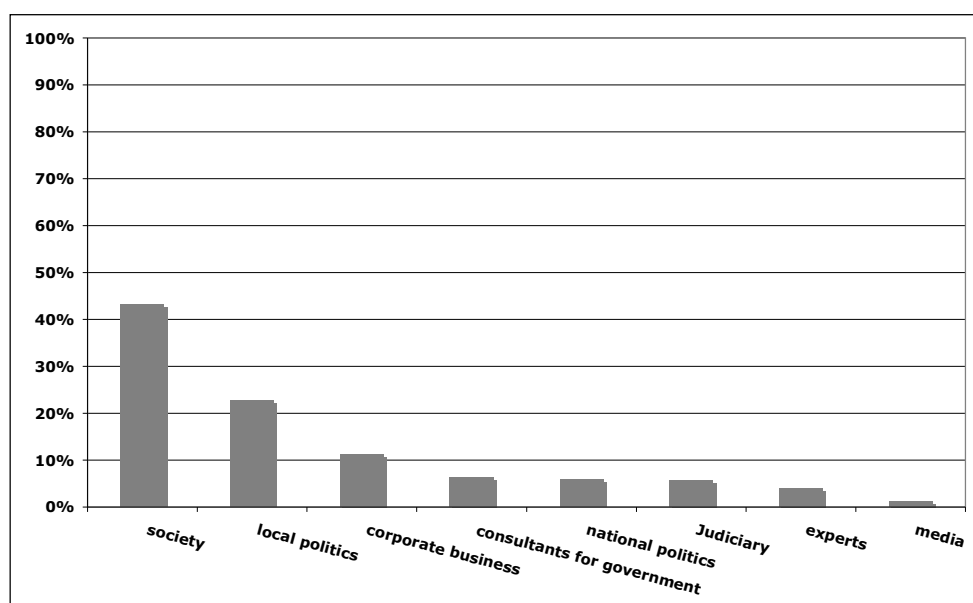


Experts, members of the judiciary and consultants have much authority, but as we have seen in terms of the absolute frequency of being quoted, paraphrased and mentioned as object or subject, these sources are not mentioned very often compared with other sources such as society or local politicians.

If the power score in UMTS news is related to frequency of being mentioned in the news (in all four positions) the following image results. Without any doubt society

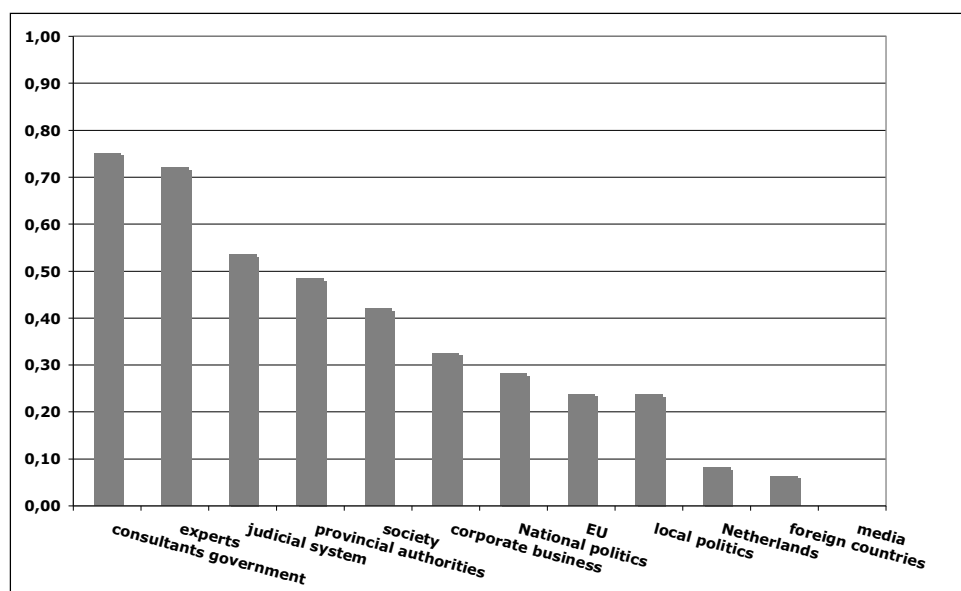
sources dominate the news, they are mentioned most often in a powerful position, followed by local politics – see Figure 9-15.

Figure 9-15 UMTS Power score and frequency as share of total.



Looking at the power position in the FPP news (Figure 9-16) on a scale from 0 to 1, actors like experts, judges, government and advisory committees have much power (0.75, 0.72, 0.54), but national and local politics have lower scores of 0.28 and 0.24.

Figure 9-16 Defining power in the FPP news.

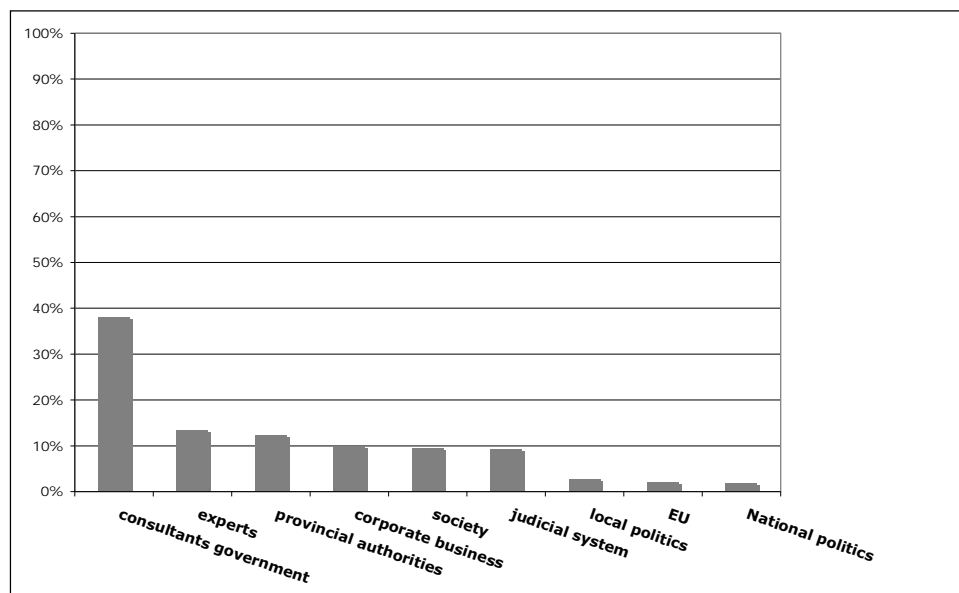


For this index a different formula was used, because no data were available on paraphrases:

$$\frac{(1 * \text{source}) + (1/2 * \text{subject}) + (0 * \text{object})}{(\text{source} + \text{paraphrase} + \text{subject} + \text{object})}$$

Experts, members from the judiciary and consultants again have much authority, but these actors aren't mentioned very often compared to other sources like society or local politics. If the power score is related to frequency of being mentioned in the news (in all three positions source, subject and object) the picture shown in Figure 9-17

Figure 9-17 FPP Powerscore and frequency as share of total



Summary actors Overall one can say that actors and sources in the category 'society' dominate the news on UMTS, while in the case of FPP the official actors (belonging to the domains of politics, science and consultancy) play the most important role in the coverage. Society (citizens, sometimes organized in action groups), do not play an important role in the FPP coverage.

In the UMTS case one can see that local politicians are the second most important source and actors, followed by corporate business. This can be explained by the fact that the worried citizens address the local politicians in their protest against UMTS. The operators building the UMTS network do not seem to be in the frontline of the action. They have less defining power in the news and are mentioned less often than residents and local politicians.

In the FPP coverage the situation is completely different: this is news dominated by experts and consultants while local and national politics have low scores. The provincial authorities seem to play a more important role as well as corporate business. This may be caused by postponement of important building projects against which the action was taken. The conclusion is that the fine particle issue is a news topic based mainly on official, political and scientific sources.

3.9.8.4 Issues in the news

What are the main issues in the news on UMTS and FPP: the problem of risk and consequences; the worries and resistance against government policy or the facts on the problem and what is being done about it?

The issues are divided among four categories:

A. General information UMTS and FPP

- News about the UMTS technology and network rollout
- News about FP emissions (characteristics, causes, studies, import of FP), legal limits, courts decisions, etc.

B. Risk and consequences of UMTS and FPP

- UMTS and FPP health complaints
- Risk of UMTS and FPP (air pollution, health problems, mortality)

C. Resistance

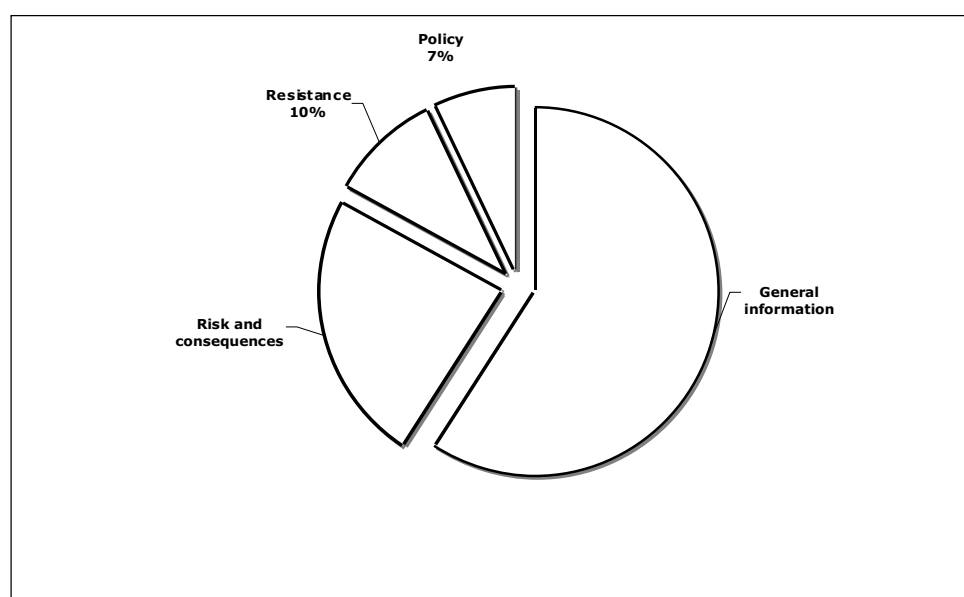
- Resistance against fine particle pollution (residents, action groups, protest)
- Resistance against the UMTS network rollout

D. Government Policy

- Government decisions and actions concerning fine particles (diesel filters, cancelled roads, etc.)
- Government policy in the case of the UMTS network

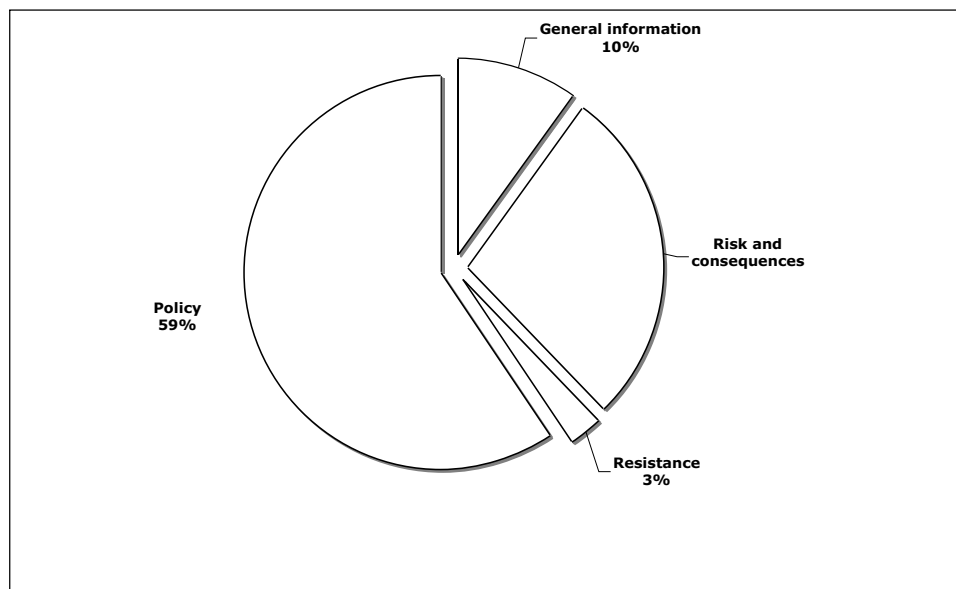
In the UMTS coverage the largest share is for the General Information on UMTS technology and the network rollout. Risk and consequences score 24 percent, in combination with resistance (10 percent): 34 percent, Government policy regarding UMTS score 7 percent, as shown in Figure 9-18. The overall conclusion is that the issues Risk and Resistance play an important role in the coverage.

Figure 9-18 Share of the main issues in the news on UMTS.



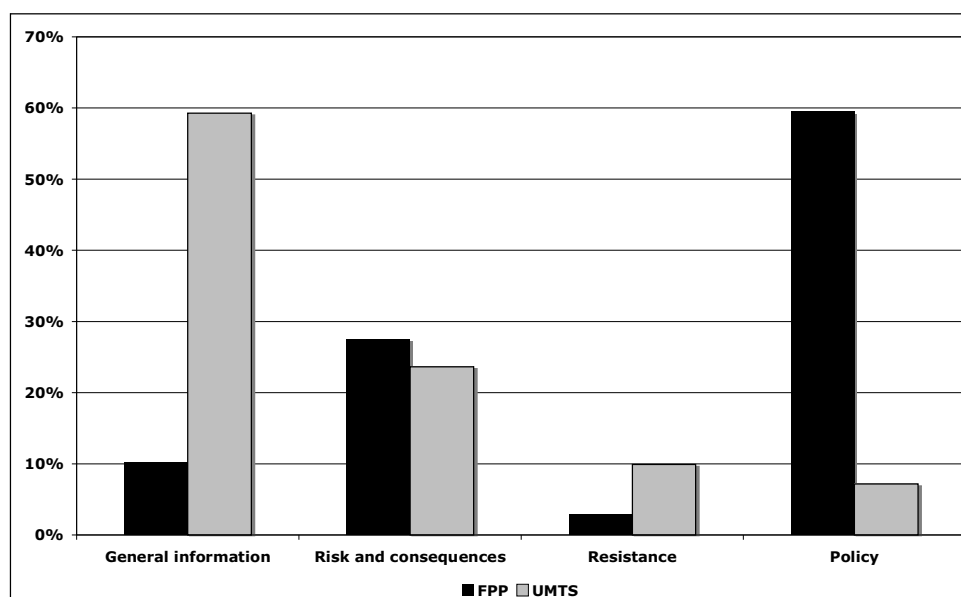
It is interesting to see that in the FPP coverage resistance is quite small (only 3 percent), while the most attention is paid to Policy (59 percent) – see Figure 9-19.

Figure 9-19 Share of the main issues in the news on FPP.



If UMTS and FPP issue coverage is combined the differences between UMTS and FPP become very clear, as shown in Figure 9-20.

Figure 9-20 Share of the four issues in the news on FPP and UMTS.



The share of Risk and consequences in FPP and UMTS coverage is almost equal, in both cases the issue is defined as a risk issue, but while in the case of FPP attention focuses on Policy, in the UMTS 'General Information' is dominant, while Resistance also gets a lot more attention. These results, combined with the observation that the coverage is dominated by official sources, confirm the idea that the issue surrounding fine particles is not defined in terms of worried residents

or protest actions, but in terms of a government issue: how to deal with the problem of this kind of air pollution and how to reduce emissions to meet the EU levels.

Actors and issues Looking at the UMTS issues addressed by the most important actors the following image emerges (see Figures 9-21 and 9-22):

Figure 9-21 Actors and issues UMTS.

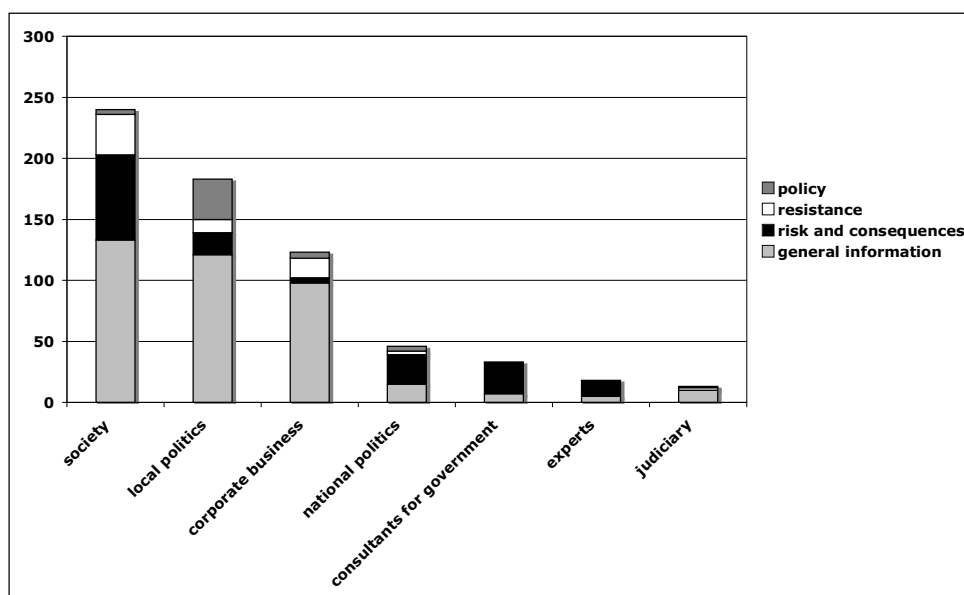
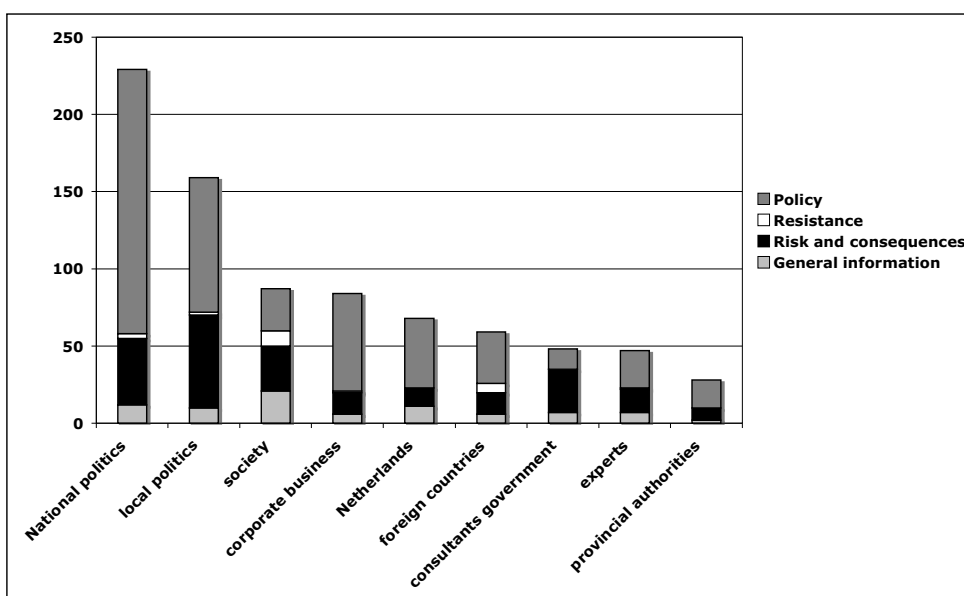


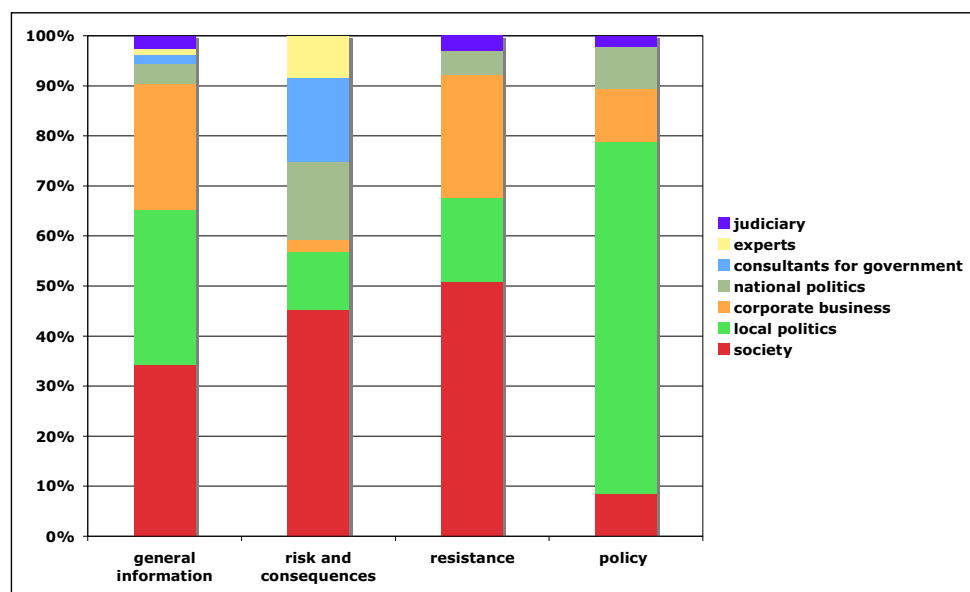
Figure 9-22 Actors and issues FPP.



- 1 **General information.** This issue is mainly addressed by Society (in 133 articles, - 34%), Local politics (121 - 31%) and Corporate business (98 - 25%). Experts do not play a role at all (5 - 1%).

- 2 **Risk and consequences.** The Risk issue is mainly defined by Society (70, 45%), corporate business is almost completely absent (4 - 3%), interesting to see that the consultants to the government address this issue (26 - 17%), while local politicians score 12 percent. For experts this is an important issue, because this is the only area where they get attention (8%).
- 3 **Resistance.** More than half of the coverage of the issue Resistance is coming from Society, followed by corporate business and local politics, other actors hardly play a role here.
- 4 **Policy.** Seventy percent of the issue Policy is addressed by local politicians (33 - 70%) , followed by corporate business with eleven percent and national politics with nine percent.

Figure 9-23 Actors and issues UMTS (share per issue).



Regarding FPP and issues and actors, the picture is different from that of UMTS: national politics dominates overall and mainly addresses Policy matters (mentioned in 171 articles), followed by Risk and Consequences (43). Local politics is the next most influential actor, addressing the same two topics. Society and Corporate business are much smaller, but with a different focus: Risk versus Policy – see Figure 9-23.

Focusing on more specific actors in the UMTS case it is clear that action groups (apart from the general information) focus on more on Risk and Consequences; Residents more on Resistance, Local Councils more on Policy and the Telecom Operators the most on General Information, followed by Resistance (although in absolute numbers this is very small (17), see Figure 9-24.

Figure 9-24 Actors and issues FPP (share per issue)

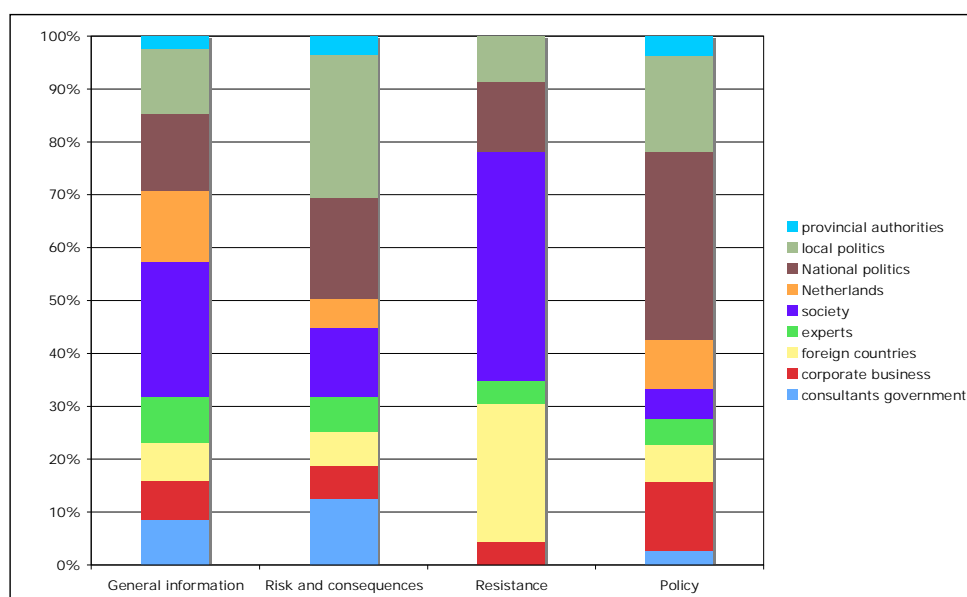
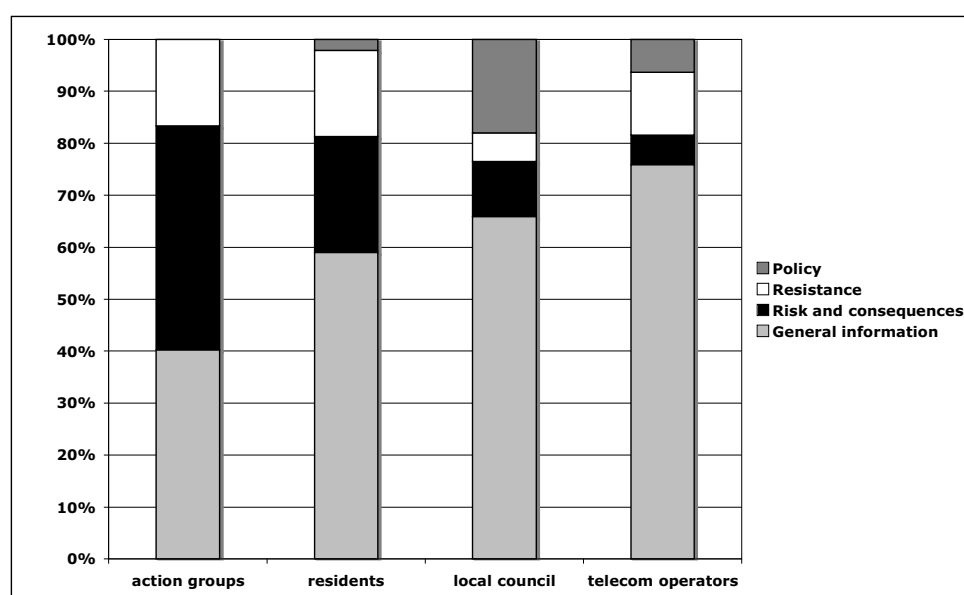


Figure 9-25 Specific actors in UMT coverage and issues

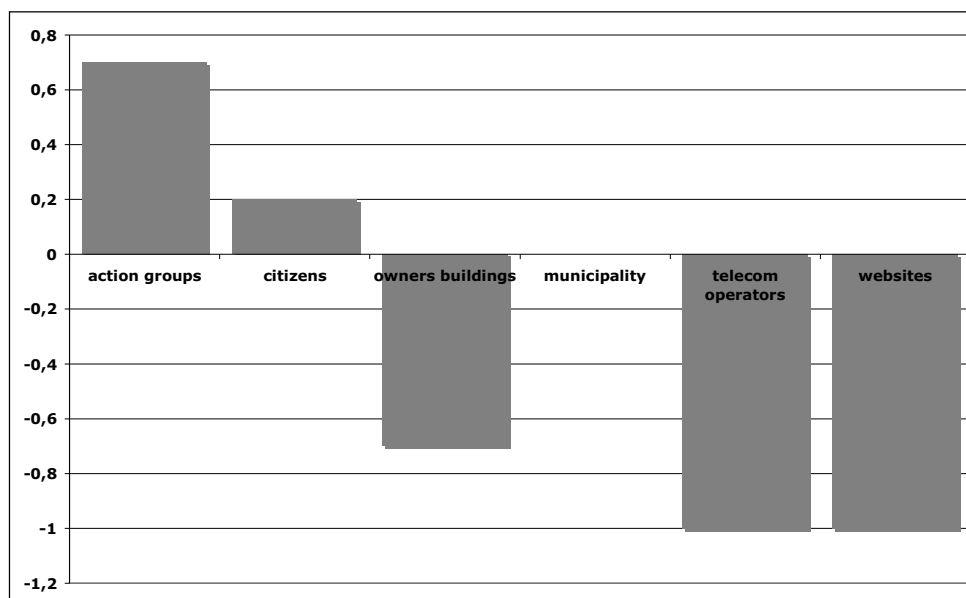


Conclusions – actors and issues In the case of UMTS as well as FPP national and local politics are mainly addressing Policy Issues and General Information, while Society focuses on Risk and Consequences and Resistance. But in the case of FPP the share of Society is considerably smaller than in the case of UMTS. Corporate business mainly focuses on General Information and Resistance, while hardly paying attention to the topic of Risk.

3.9.8.5 How do the media evaluate the different actors?

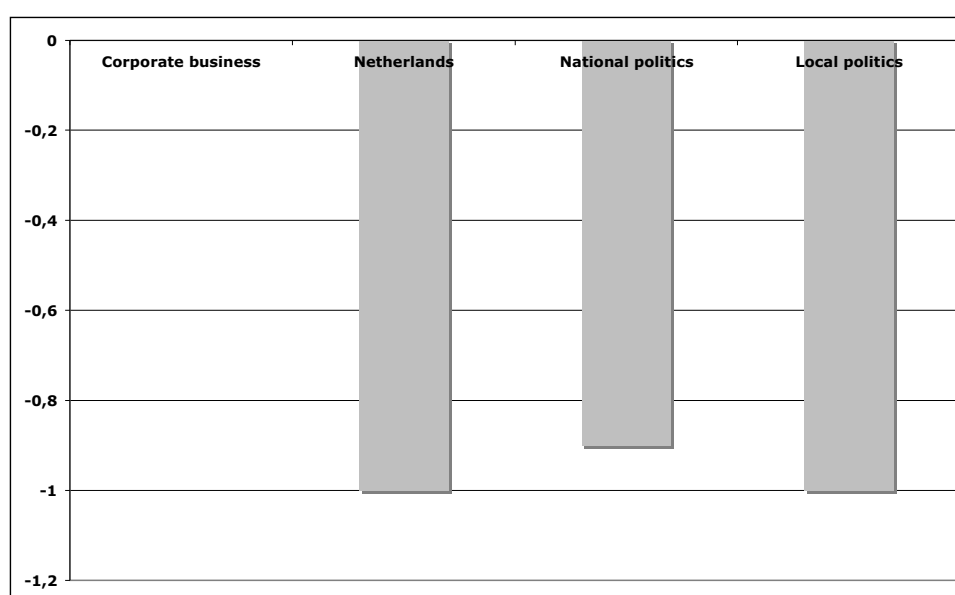
As the figure 9-26 shows, on UMTS the media are quite negative about the owners of buildings where relay stations are established, as well as about the telecom operators, while they have a neutral approach to the local municipality. (On a more specific level the media are negative about local politicians and the municipality, but not about the mayor and his aldermen.) The media are very positive about the action groups against UMTS, as shown in Figure 9-26.

Figure 9-26 UMTS: Evaluation of actors by the media.



In the FPP news the media are quite negative about national and local politics, as well as the Netherlands as an actor (total statements: 28), while corporate business is mentioned only twice in a neutral way, as shown in Figure 9-27.

Figure 9-27 FPP Evaluation of actors by the media.



Looking at a more specific level we see that the media (with 83 statements out of 147) are negative about governments actions against fine particle pollution, including speed reduction, gas tax increase, etc. Actions in the area of diesel filters or bio-fuel are evaluated as neutral.

Overall the media are critical about the Government (FPP), Telecom operators and Building owners (UMTS) while they are positive about Residents and Action groups (UMTS) and neutral towards Corporate Business (FPP).

3.9.9 Frames in the coverage

To evaluate media coverage on UMTS and FPP it is necessary to establish how the media frame the problem and which actors and sources play a dominant role in this process of framing.

The following formal aspects are important in framing a risk issue:

1. **Problem construction:** is there a problem or a risk?
2. **Perspective:** which angle is used to define the problem or risk (economic, health, etc.)?
3. **Cause:** who or what causes the problem or risk?
4. **Consequences:** what are the consequences of the problem or the risk?
5. **Accountabilities:** who can be held accountable for (causing and or solving) this problem or risk?
6. **Solutions:** how to solve the problem or the risk?

On the basis of these questions several specific frames can be defined:

1. The precaution frame defines the problem as a potential health risk that demands government action, even if there is no definite scientific proof yet. 'Better be safe than sorry', is the motto. Local councils should listen to their worried citizens who show a growing distrust. Main actors: lay persons, residents.
2. The scientific frame states that the exposure people worry about is no problem as long as the emissions are within the official limits, based on scientific research. People worry because they have not been informed well by the authorities or are being misled by action groups. Policy has to be evidence based. Main actors: scientists, consultants.
3. The technocratic frame says that only balancing the different interests of the actors involved can solve this problem. It is important to address the worried citizens (resistance is understandable, but very small risk), but not without losing sight of the political and economical interests. Main actors: local authorities, national politics, telecom operators.
4. The scandal frame is built on outrage over the fact that people already have been exposed to the harmful emissions. The authorities were well aware of

the risk, but decided to let commercial interests prevail over caring for their citizens. There is a scandal and drastic action has to be taken; people responsible have to resign. Main actors: residents, action groups, and dissident scientists.

In tables 2 and 3 these frames are applied to UMTS and FPP.

Table 2 UMTS: aspects of different frames				
Frames UMTS	Precaution frame (lay persons)	Scientific frame (experts)	Technocratic frame (city council, operators)	Scandal frame (action groups)
Problem	Worries about health risk	Resistance is problem, exposure matter of limits	Dilemma: worries versus network rollout	People have been exposed
Cause	UMTS emissions	Bad communication	New technology procedures	Reckless disregard, negligence
Consequences	Distrust against government	Irrational policy	Uncertainty	Health damage confirmed
Accountabilities	City council, national politics	Technocrats; media	Media; action groups	Politicians and operators
Solutions	Postpone UMTS	Continue	Look for dialogue	Stop UMTS and resignations

Table 3 FPP: aspects of different frames				
Frames Fine Particles	Precaution frame (lay persons)	Scientific frame (experts)	Technocratic frame (EU, National politics)	Scandal frame (action groups)
Problem	Worries about health risk	Exposure matter of limits	Dilemma: health damage versus economic damage	Air pollution
Cause	Industry, traffic, etc.	Industry, natural, etc.	Stricter emissions limits	Reckless disregard, negligence
Consequences	Air pollution	Premature deaths	Building projects	1000's of premature deaths
Accountabilities	Local authorities		Media; action groups	Politicians and industry
Solutions			Look for dialogue	New regulations and resignations

3.9.9.1 Operational questions In the content analysis the following operational questions were used to establish whether or not a statement connected to one in which the frames are made.

1. **Precaution (damage) frame.** Are there statements in the article that:
 - a. Assume that the risk may have negative consequences?
 - b. Refer to similar examples of risks that were not recognized in early stages?
 - c. Refer to alleged damage?
 - d. Give examples of stories of victims?
2. **Scientific (expert) frame.** Are there statements in the article that:
 - a. Define the risk in terms of exposure limits (within these limits every risk is acceptable)?
 - b. Assume that risk can never be completely excluded?
 - c. Differentiate between different kinds of impact (long or short term, neutral or detrimental, etc.)?
3. **Technocratic (administrative) frame.** Are there statements in the article that:
 - a. State that government action is necessary to reduce public concern over this risk? (risk perception versus risk reduction).
 - b. Refer to the dilemma of caring for residents, but not without scientific proof of negative impact of the risk?
 - c. Refer to different interests involved in this issue (economic, political, European, etc.)?
 - d. State that the options to reduce the risk are limited?
4. **Scandal frame.** Are there statements in the article that:
 - a. Actors were aware of the risk but decided to remain silent?
 - b. State that these actors act on self-serving motives like profit instead of motives based on social responsibility?
 - c. Presume that actions of these actors were unreliable, irresponsible, and scandalous?
 - d. State that the actor knew something (damaging) and should have acted upon this knowledge?

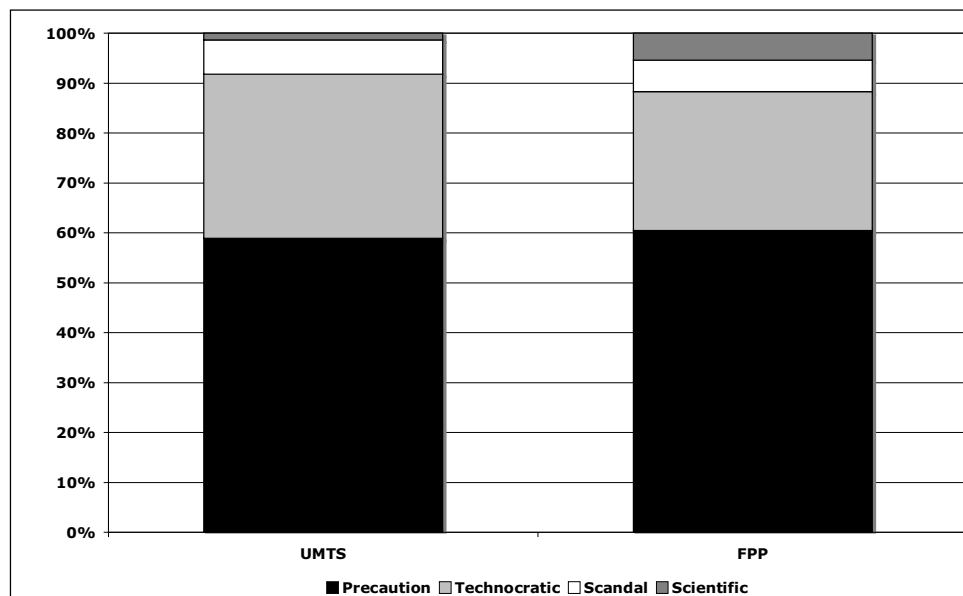
A statement belongs to one of these frames when at least one question can be applied.

3.9.9.2 Results of the analysis of frames in the coverage.

In the UMTS coverage 146 framing statements were found in 91 articles, 7 articles contained none framing statement. In FPP coverage a total of 316 framing statements were found in 203 of the sample of 252 articles on fine particles. Half of the articles (50 percent) contained two or three of such statements.

Figure 9-28 shows the overall results for both issues: there is a remarkable resemblance in the use of the four frames. The Precaution frame dominates (60%), followed by the Technocratic frame (33 and 28%), Scandal scores 7 and 6 percent and Scientific frame 1 and 5 percent.

Figure 9-28 Frames in UMTS and FPP coverage.



In the UMTS coverage we used three different samples from three periods: autumn 2003, winter 2004/2005 and summer 2005. Is there a trend visible in the framing of the UMTS issue? As Figure 9-29 shows, the Precaution frame is the most important frame in all stages, but in stage three it is getting less important. The Technocratic frame is getting more important, while the Scientific frame is absent except for the first period. The Scandal frame is relatively small in the coverage but scores higher in 2004/05.

The conclusion is that the UMTS issue is framed in terms of a risk that may have negative consequences for people, with stories about people who feel victim already and with statements comparing UMTS with other heavy risks (like asbestos) that were neglected in the past. Less attention is paid to the dilemma of the government, the need for evidence-based policy and the different interests involved in the issue. Only a minority of the articles frame UMTS in terms of a scandal, in which the authorities tried to cover up the risk because of self-serving interests.

Analysis of FPP coverage (Figure 9-30) shows that most of the coverage took place in 2005, with 171 articles containing 217 framing statements. Precaution and technocratic frames dominate with 55 and 32 percent of the total. The scandal frame is almost absent in the previous years but in 2005 7 percent belonged to this category.

Figure 9-29 UMTS and frames in three periods.

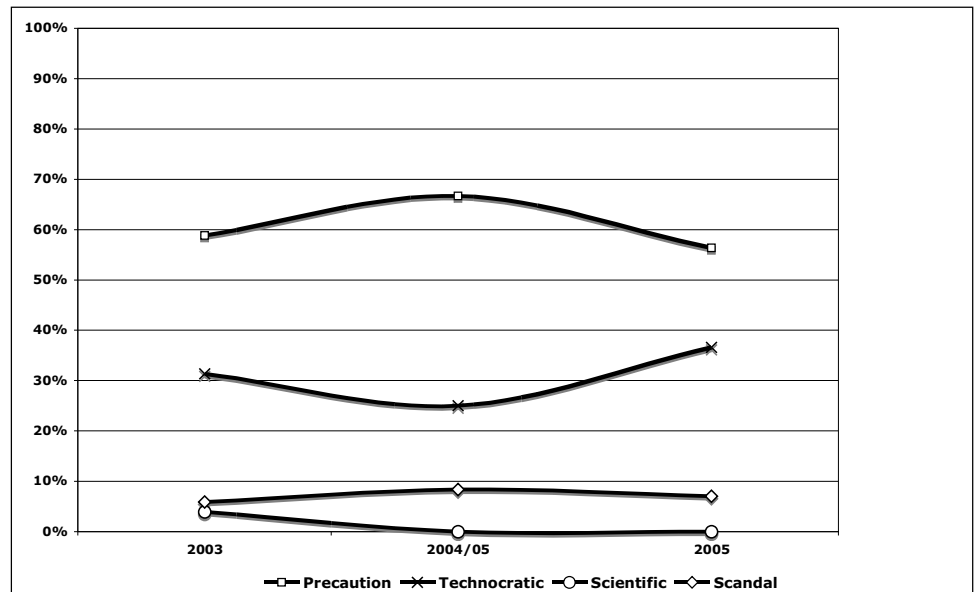
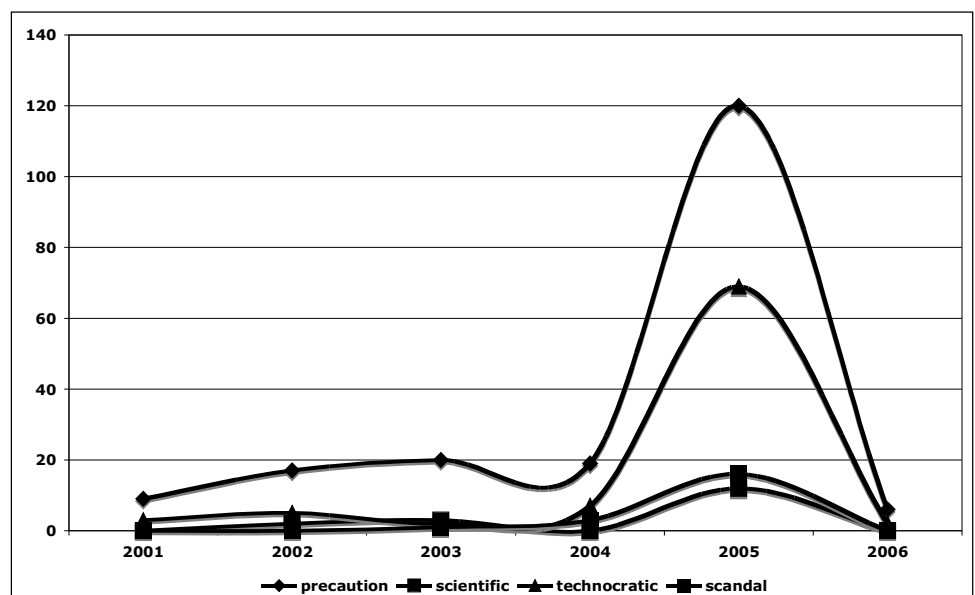


Figure 9-30: FPP and frames 2001-2006.

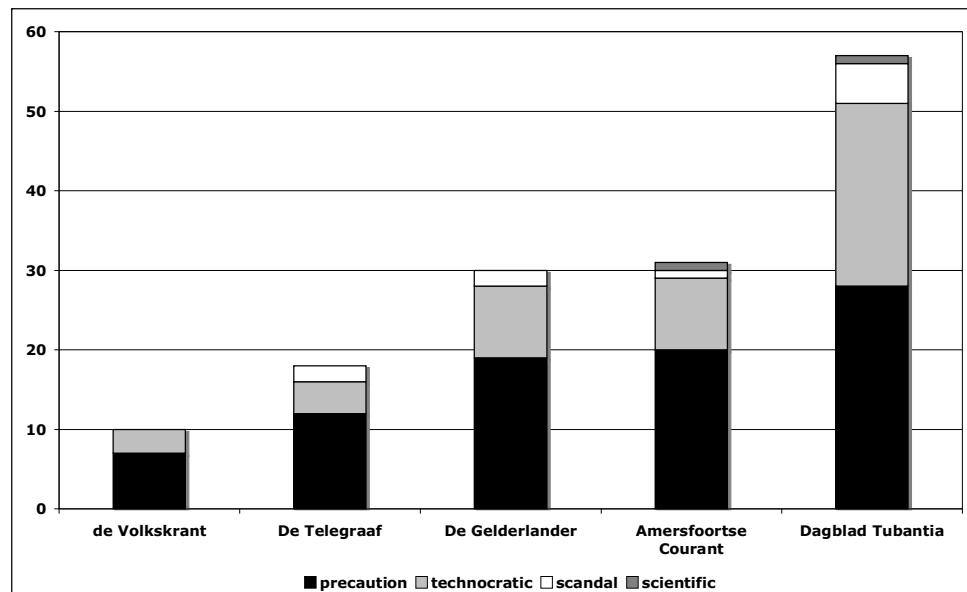


Focusing on the differences between newspapers' framing of the issue the following image emerges in the UMTS coverage – see Figure 9-31.

It is interesting to see from Figure 9-31 that the precaution frame is dominant in the coverage of each newspaper (although the number of articles differ considerably). The second frame is the technocratic one (between 30 and 40 percent for each newspaper). The scientific frame is almost non-existent, only the *Amersfoortse Courant* and *Dagblad Tubantia* have a small share for this frame. The scandal frame is more important however: between 6 and 11 percent for each

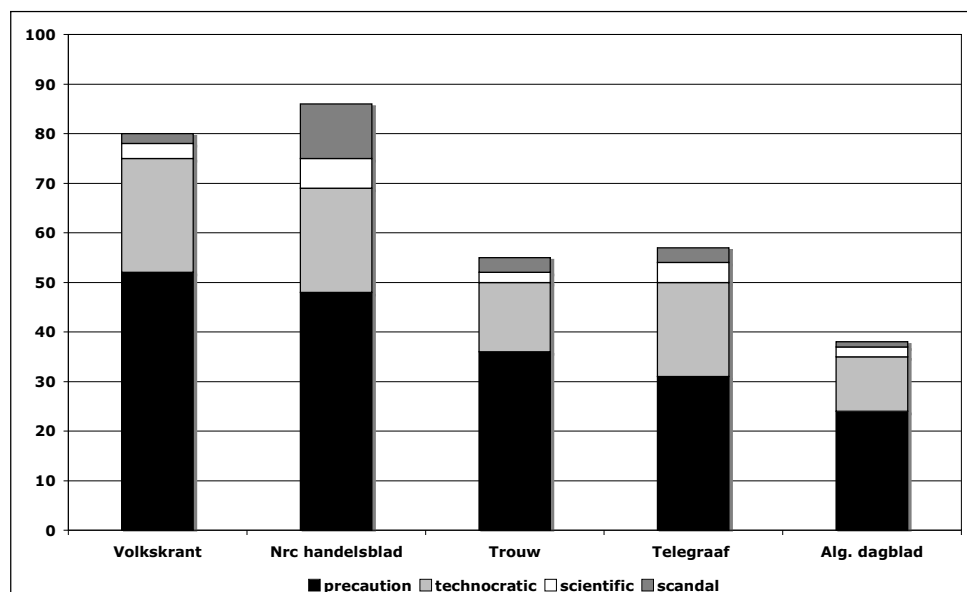
newspaper. In absolute number *Tubantia* has the most articles with a scandal frame.

Figure 9-31 frames per newspaper in UMTS coverage (absolute numbers).



The Precaution frame is also very dominant in the FPP news (between 50 and 60 percent for each newspaper), as shown in Figure 9-32.

Figure 9-32 frames per newspaper in FPP coverage (absolute numbers).



Second is the technocratic frame (between 24 and 33 percent). The scientific frame is quite small, as well as the scandal frame, although there are interesting differences to notice. *NRC Handelsblad* has considerable number of scandal statements (up to almost 13 percent of NRC total). One might expect popular newspapers to have high marks in this area, it is the serious newspaper NRC that scores highest.

Overall, it is important to notice that the differences between the newspapers are quite small regarding the framing of the UMTS and the FPP issues, despite the differences in newspaper editorial.

3.9.9.3 Summary: framing UMTS and FPP A frame is a narrative structure that puts facts, descriptions and statements from sources in a coherent context. In this respect one could say that a frame represents a deeper layer in the news content, which can be revealed by looking for those words and sentences that belong to a specific frame.

A frame contains statements on problem definition, perspective, causes and consequences, accountabilities and solutions. A frame defines the characteristics of the (alleged) problem, its causes, consequences and accountabilities. Predominant in risk issues are the Precaution frame, the Scientific frame, the Technocratic frame and the Scandal frame. The scientific frame defines the problem in scientific terms (risk relative to other risks) and not, as is the case in the scandal frame, in political terms: 'who is responsible and don't let them get away with this'. The Precaution frame stress the 'better safe than sorry' strategy while the technocratic frame defines the risk issue mainly as a problem for the government which has to deal with contradictory demands from the public and other stakeholders (corporate business).

Looking at the development of the UMTS issue, one might expect a large share for the precaution and the scandal frame, while in the case of the Fine Particle Pollution the technocratic frame can be expected to be dominant. Looking at the data, that is not entirely the case: in both issues the precaution frame prevails, with the technocratic frame in the second place and with quite small shares for scientific and scandal frames. This means that in general the news media define both issues in terms of 'something has to be done' and 'which solutions seems suitable taking into account the different interests at stake'.

Regarding each newspaper separately, the differences in framing are not very strong, apart from a few exceptions. The newspapers seem to follow the same patterns of framing, regardless their different editorials and target groups.

3.9.10 Whose language is being used?

Experts and lay persons use different expressions and words to describe the risk of new technology such as UMTS. Experts define the problem using scientific concepts, while lay persons define the risk more in terms of everyday life worries.

Typical for the vocabulary of the expert are concepts such as: electro magnetic fields, radio-frequencies, thermo and non-thermo effects, long-term and short-term exposures, ionizing and non-ionizing radiation, exposure limits, safety factors, exposures within safety limits, etc. Experts always define risks in terms of probabilities while lay persons have a more binary approach: there is a risk or there isn't. Lay persons use words like UMTS radiation (identifying UMTS fields with ionizing radiation) and combinations with negative connotations such as electro-smog, electro-stress and electro-allergy. They talk about radiation victims, UMTS pollution, radiation sensitivity (in which case even the smallest exposure will cause health problems), de-radiation (like de-toxication) of contaminated areas, explosions of radiation and high doses of radiation found in victims. Lay persons are actually often using the vocabulary of nuclear energy to describe UMTS emissions.

Analysis on a lexical level of the different types of language used in the articles gives the following results. In total the lay persons' word 'radiation', and combinations with the word radiation, occur 255 times in 98 articles with 2,664 analysed sentences, which means one in ten. The term 'radiation' scores 148 of that 255.

In contrast, the expert words (exposure limits, EMF, short-term and long-term exposure, radiofrequencies) are only mentioned 56 times in the same total, which is one in forty.

Of the newspapers, the regional newspaper *Tubantia* had the highest frequencies in the use of the word radiation (77) in 30 articles, *de Volkskrant* (national daily) had the lowest (7) in 11 articles. *De Telegraaf* (national daily) mainly uses words like electric pollution, electro-stress and radiation (17 times in 14 articles).

The conclusion is that in the newspaper coverage the words belonging to the experts' vocabulary are hardly used in contrast to the laypersons term radiation (or negative combinations), thereby reinforcing the analogy with nuclear risks.

3.9.11 The TNO study

An important event in the UMTS coverage was the publication of the TNO study in October 2003, investigating the impact of GSM and UMTS electromagnetic fields on subjective feeling of well-being and cognitive performance. In a double blind experiment TNO exposed two groups of 38 test persons: one with and one (control group) without complaints about UMTS fields. The main result was the conclusion that UMTS electromagnetic fields showed a statistically significant link with some aspects of well being, in contrast to GSM where no link was found. An improvement in cognitive performance was also evident.

Well-being was constructed on the basis of self-reporting on anxiety symptoms (4 questions), somatic symptoms (8 questions), inadequacy symptoms (5 questions), depression symptoms (2 questions) and hostility symptoms (4 questions). The significant link was found in regard to inadequacy within the control group. Because the 'complaints' group was the result of self-selection, the results of this group cannot be compared with those of the other, but within the groups, the links proved to be very small, but statistically significant. The researchers emphasized in their press release that it is not possible to conclude from these data that UMTS has a detrimental impact on health and that further research was necessary. After publication other researchers criticized the TNO study by for its methodological shortcomings regarding the selection of the test and the control group, the short sessions of exposure (and the risk of contamination), the questionnaire used to establish well-being and the statistical analysis of the data. The Dutch Health Council evaluated the TNO report and came to the conclusion that there is no proof for a link between UMTS exposure and negative impact on well-being or health. It is interesting to see that according to our content analysis most actors evaluate the report negatively, including the Health Council, while only the government and the parliament have a positive judgment (on the other hand, they asked TNO).

How did the media more specifically report on the TNO study when it was published in 2003, and during the following years 2004-2005?

The study was mentioned in 42 of the 98 analysed articles, not only in the month it was published but also during the other news waves. In these 42 articles 46 statements were made on the TNO study. In most cases the TNO study is only briefly referred to in one or two sentences. The general image of the TNO research in the media is that of a study that found a link between UMTS radiation and health. Sometimes there is just a link; sometimes there is a damaging effect on health or well-being.

Closer analysis of the way the results of this study are summarized in the coverage gives the following results:

- 'Well-being' is mentioned in 8 of the 46 statements (in two cases in combination with negative impact)
- 'Detrimental for your health' occurs 10 times
- Symptoms (headache, dizziness, tinglings, fatigue, nausea, restlessness, lack of concentration, nervousness, heart problems): 21 times
- A link between UMTS radiation and health is mentioned four times
- Four statements doubted a link between UMTS and health problems

Looking at the way the TNO study is represented in the coverage, one can say that the majority of the statements confirm the link between radiation and health complaints. Symptoms are mentioned often, but the concept of well-being (a subjective category, based on self-reporting) is never explained. This does not enable the reader to evaluate the results of the TNO research. Information on the research design, the assembly of the experimental groups and the statistical significance is absent in most articles, except for those immediately after publication of the report in October 2003. But this information was offered with headlines like: "TNO: UMTS stations bad for health" ("TNO: mast voor UMTS schaadt gezondheid").

Overall, one says that the brief statements on the TNO study each time stress that a link has been found between UMTS exposure and health complaints (referring to some of the symptoms) while no further information is offered on the research and the quality of the findings. Only in the beginning, immediately after the publication in 2003, more information is offered and attention is paid to scientific criticism and the doubts of the researchers themselves. In only 4 of the 46 statements on the study in the three samples it is said that the link between UMTS and health has not been established yet.

Looking at this coverage on the TNO study the conclusion is that the press creates a black and white image of the research that is not in line with its results.

3.9.12 Content analysis conclusions

In this content analysis we looked at the coverage in Dutch newspapers on two risk issues: UMTS relay stations and the problems with air pollution by fine particles.

- These two issues differ considerably regarding

- The degree of uncertainty (FPP is causing premature deaths, while there is no proof for any damage of UMTS)
- The outrage factors (involuntariness, visible responsibility, etc.)
- The activities of social actors (hardly any protest against FPP, while UMTS leads to local protest)
- The legal and political context (FPP exceeds legal limits, while UMTS is well within national and international regulations)

The main question of the content analysis was: how do the media handle these two risk issues? And what can be learnt from that for our evaluation model? More specifically the analysis looked at the following questions:

Which sources, issues and frames dominate the coverage of the two topics? Who are the most important actors in the news? Who is addressing which issues? Who has the power to define the issues? Which language (linked to which frame?) is used to describe the issue? How do the media report on important scientific studies?

3.9.12.1 Sources Regarding the sources used in the coverage the conclusion is that there is a striking difference between UMTS and FPP: while news sources like residents and action groups play a very important role in UMTS, these lay person sources are almost absent in FPP coverage. This coverage is completely dominated by 'official' sources: government consultants, national politics and experts especially in terms of quotes and paraphrases. Although UMTS involves controversy on the question of whether or not there is a risk, it is surprising to see that the experts have only a very small share as sources in the news.

In terms of defining power, the lay persons dominate the UMTS coverage, followed by local politicians with half as much power and telecom operators with one fourth of the laypersons power. In FPP news the government consultants have the most defining power, followed by experts and provincial authorities with one third of that score. Corporate business is in the same position as in UMTS.

3.9.12.2 Issues Looking at the issues addressed (general information; risk and consequences; resistance; government policy) it is interesting to see that the shares of risk and consequences are equal, while general information, resistance and policy differ completely. UMTS coverage is mainly about General Information, Risks and Consequences and Resistance, while FPP coverage mainly focuses on government Policy. These results, combined with the observation that the coverage is dominated by official sources, confirm the idea that the issue of fine particles is not defined in terms of worried residents, and organizing protest actions, but in terms of a government issue: how to deal with the problem of this kind of air pollution? This conclusion is underlined by the fact that lay persons sources have a very large share in the UMTS issues Risk and Consequences and Resistance, while local politicians dominate the Policy issue. Regarding FPP the picture is quite different: national politics dominates overall and mainly addresses Policy matters. Overall one can say that in the case of UMTS as well as FPP national and local politics are mainly addressing Policy Issues and General Information, while Society focuses on Risk and Consequences and Resistance.

3.9.12.3 Media and actors In the UMTS coverage the media turn out to be positive on the action groups and the citizens, while being negative about owners buildings and telecom operators and neutral about local politics. In the FPP case the media are negative about the

government at all levels and neutral about corporate business. Overall the media are critical about the Government (FPP), Telecom operators and Building owners (UMTS) while they are positive about Residents and Action groups (UMTS) and neutral towards Corporate Business (FPP).

3.9.12.4 Frames Frames can be defined as a specific construction of a problem, relating to causes, consequences, accountabilities, perspectives and solutions. Distinctions were made between the Precaution frame (better safe than sorry, action is needed); the Scientific frame (there is always risk, everything depends on emission levels); the Technocratic frame (this problem of conflicting interests has to be solved, even in the case where risk is small or absent) and the Scandal frame (don't let them get away with it, damage has already been done).

Despite the differences in sources and issues, the framing of the two issues UMTS and FPP shows a remarkable resemblance: in both cases the Precaution frame is dominant, followed by the Technocratic frame. The Scandal and the Scientific frames are much smaller in the coverage, although Scandal is more important in the case of UMTS.

This means that despite the large differences between UMTS and FPP the news media define both issues in terms of 'there is a risk and something has to be done' and 'which solutions seems suitable taking into account the different interests at stake'. In the case of FPP one might have expected a larger share of Scandal framing, because there is proof for public health damage (in contrast to UMTS) and a failing government (not able to meet EU regulations), but this is not the case: Scandal is very small in FPP coverage. It seems likely that the dominance of expert sources is responsible for this.

Looking at each newspaper individually the differences in framing are not very strong, apart from a few exceptions. One regional newspaper defines UMTS quite strong in terms of Scandal. The newspapers seem to follow the same patterns of framing, regardless their different formula and target groups.

3.9.12.5 Language and scientific information Finally we looked specifically at another two characteristics of the UMTS coverage: the language used and the way the media deal with the results of a study into the effects of UMTS electromagnetic fields on well-being.

In the UMTS newspaper coverage the words belonging to the experts' vocabulary are hardly used in contrast to the lay persons term radiation (or negative combinations), thereby reinforcing the analogy with nuclear risks.

An important event in the UMTS coverage was the publication of the TNO study in October 2003, investigating the impact of GSM and UMTS electromagnetic fields on subjective feeling of well-being and cognitive performance.

Looking at the way the TNO study is represented in the coverage, one can say that the majority of the statements confirm the link between radiation and health complaints as an established fact. Symptoms are mentioned often, but the concept of well being is never explained. Information on the research design, the assembly of the experimental groups and the statistical significance is absent in most articles, except for those immediately after publication of the report in October 2003. But this information was offered with negative headlines. In only a small minority of the articles attention is paid to scientific criticism and the doubts of the

researchers themselves. Looking at this coverage on the TNO study the conclusion is that the press creates a black and white image of the research that is not in line with its results.

Section 4

Guidelines and materials

4.1 Guidelines for scientists on communicating with the media

4.1.1 Introduction

These guidelines have been developed after extensive consultation with key stakeholders and actors across the European Community. They have included members of science, technology and health research institutions and departments; representatives of national and EU government agencies; journalists, broadcasters and media specialists; representatives of civil society groups and organisations. Section 2.1 of this report summarises the key points arising from these consultations.

There has been complete consensus among those consulted regarding the desirability of guidelines for scientists on communicating research and scientific advice through the popular media. Many contributors to the MESSENGER project have insisted that such guidelines are now *essential* if the European Commission's aim to encourage effective engagement and dialogue on science and research is to be realised.

It is also the case that in order for members of civil society to participate meaningfully in this process of engagement they need to be *informed*. The major sources of knowledge available to them are not the peer-reviewed journals, text books and conference proceedings that are the tools-of-the-trade for professional researchers. Rather, it is through the popular media of television, radio, newspapers and magazines – together with an increasing number of internet web sites – that the large majority of citizens gain knowledge about scientific and technological progress and receive scientific advice.

The popular media, of course, are not routinely in the business of providing a free help service for scientists. They exist not only to inform their readers and viewers but also to entertain and to present polemical standpoints. They are also in the business of selling papers or maintaining ratings in order to make profits or justify public investment in the form of licence fees or taxes.

It is crucial that scientists understand the role of the media, and how it operates as a system within society, when they are seeking to spread news about the research they have undertaken, the results that have been produced and the implications of them to members of civil society. This is not to deter scientists from engaging with the media. The science communities are increasingly seen as having a duty to do so and conditions attached to funding may, in fact, *oblige* them to do so. It is all the more important, therefore, that communication with the media is undertaken in such a way that possible sources of misunderstanding are avoided and the potential for accurate and balanced coverage is maximised. This serves not only the interests of the science community but of civil society at large, who have the right of access to information about scientific progress conducted in their name and largely at their expense.

While there are numerous examples of how the media have 'hyped' science stories and generated unnecessary anxieties in the absence of real empirical evidence, there are equally examples of where scientists have communicated, say, data relating to risks in such a manner that public misunderstandings have been almost inevitable. This has led to understandable tensions between scientists and

journalists. On the other hand, a more positive picture of the popular communication of scientific knowledge and advice has also emerged over the course of the MESSENGER project. Most of the science coverage across Europe is, in fact, quite accurate and informative, as we have seen from the media analyses in section 3.2.1 and following sections. The news may be framed to include discussion not only of the science itself but also, for example, the moral and ethical implications of resulting procedures. Discussion of the potential risks versus benefits posed by novel technologies is similarly common across the EU. This, however, is both inevitable and desirable in liberal democracies where scientific endeavour is increasingly seen as having a need to be accountable. It is also the case that the media, reflecting the needs of their audiences, seek not only to communicate scientific knowledge but also to provide advice on managing the risks that might be posed or on ways of maximising the potential benefits.

What is important here, many of those contributing to the MESSENGER programme have stressed, is that such inevitable debates are conducted within a rational framework where the empirical evidence is acknowledged and given due weight. The problem, of course, is that while science operates within the limits of uncertainty, ordinary citizens look for reassurances that the 'system' – sources of power and influence within society – is doing its best to protect them from potential danger and harm. Rather than looking for answers to the questions 'Are mobile phone masts 'safe'?' or 'Does nanotechnology pose a potential threat to the environment?', ordinary citizens (and that includes scientists) read newspapers in order to establish whether their expectations are being met.

It is, perhaps, because the dialogue of science and the everyday language of citizens are different in fundamental aspects that distortions become evident and suspicions are aroused. To a scientist, the reply must be couched in terms of probabilities and potential unknowns. To the citizen this may well be seen as equivocation or a deliberate attempt to 'cover up' something potentially dangerous.

Ultimately, the issue is one of increasing *trust*. European citizens' faith in scientists remains high, but it is not unconditional. The route to trust is through better communication, together with increasing engagement and dialogue between the science communities and civil society – a process in which the popular media have a critical part to play.

These guidelines recognise the potential pitfalls that await all members of the science community when they talk to journalists and broadcasters, whatever their discipline and specialism. They also recognise the need for a free and unfettered press in Europe that will challenge and hold to account members of the science community as much as our politicians, economists, planners and social pundits. The notion of 'Science in Society' that is at the heart of the European Commission's science policy has been fully supported by the contributors to the MESSENGER project and is reflected throughout these guidelines.

4.1.2 Guidelines

- 4.1.2.1 Why should I talk to journalists?** There is a common misperception across many EU member states that the press is the 'enemy' of the science community – always looking for an opportunity to criticise the work of researchers and to hold them accountable for many of our societies' current ills. While such a perception has surfaced during the

MESSENGER consultations it is, fortunately, very much a minority view. The more general consensus is that the popular media play a vital role in communicating science to the European publics and are critical to the wider process of dialogue and engagement.

4.1.2.2 Read the papers, watch TV!

It is important that scientists, technologists and health researchers are aware of how their subject area is covered in the media. What are the main issues and areas of debate that are highlighted? Who are the principal actors quoted in the stories? Are scientists portrayed as 'divided' over relevant areas of research and their perceived implications? Are specific areas of risk highlighted?

In this context, forewarned is forearmed. There is little justification for being surprised when journalists pose questions about an area of research that have already been evident in previous reporting. Similarly, a failure to recognise, for example, widely reported moral, environmental or health concerns associated with your area of work will be unlikely to ensure sympathetic coverage. Communication is no longer a one-way process – it is a matter of dialogue and engagement, and journalists have a central role in representing the views of all stakeholders, not just scientists.

Examples of opportunities for scientists to meet with journalists and broadcasters

- ▶ In France an exchange scheme is organised by the Association for Scientific Journalists for the Press (AJSPI) between researchers and journalists. The initiative, which has the support of the French Research Ministry, attempts to foster a greater understanding between researchers and journalists. Participants of the programme spend a week in an 'alien' environment – journalists in laboratories, scientists in media organisations – promoting an appreciation of each others working processes and environments. www.ajspi.com/echanges2005.htm
- ▶ In the UK the British Association for the Advancement of Science (BA) has been running Media Fellowship Schemes since 1987 allowing researchers to gain first hand experience of the workings of the media through summer placements with print, broadcast and online news producers e.g. Nature, BBC News Online and BBC Television. [www.the-ba.net/the-ba/ScienceinSociety/ Schemes and awards/MediaFellowships/](http://www.the-ba.net/the-ba/ScienceinSociety/Schemes_and_awards/MediaFellowships/)
- ▶ In Portugal, the daily publication *Público* has recently introduced an initiative inspired by the BA's scheme which introduces scientists to the rationale, culture, skills and methods of scientific news production. It is envisaged that through a series of 12-week secondments the enterprise will not only help to improve the quality of science communication but also help to promote the profile of research. cientistas.publico.pt/
- ▶ In Germany, the European Initiative for Communicators of Science (EICOS) offers journalists and science communicators the opportunity to participate in laboratory research with the aim of facilitating dialogue: "*...in which on the one hand journalists might gain a deeper understanding of the scientific endeavour and attitudes of scientists, while scientists on the other hand learn how science is reported and what influences and constraints shape the media content.*" www.eicos.mpg.de

4.1.2.3 Get to know journalists and the world of journalism.

Increasingly forums and workshops are being organised across Europe to bring together researchers and journalists to discuss current science topics. Some examples are shown in the box above.

Styles of journalism and science communication vary, of course, from country to country across the EU. In section 3.3 and following sections of the MESSENGER report we present examples of how science news is framed in the UK, France, Germany, Italy, Netherlands and Spain. What other themes, such as moral, commercial, environmental, regulatory issues, etc. feature most prominently in newspaper articles about science? You may find these analyses useful when talking to journalists in your own country and with those from elsewhere in Europe.

For authoritative, country-specific background information on both broadcast and print media you will also find the European Journalism Centre's (EJC) *European Media Landscape* available at www.ejc.nl/jr/emland/index.html very useful. This invaluable resource provides an overview of the media in over thirty countries and outlines policies, relevant organisations, recent developments as well as links to further information.

4.1.2.4 Do I have a press officer?

University departments and institutions increasingly employ press officers (also described as media or communications officers) to act as a bridge between researchers and the media. Many of these have a journalism or public relations background and often have useful insights into the way the media operate. Their experience can be invaluable when preparing material for popular dissemination and should be used at every opportunity. Some organisations actually insist that researchers do so prior to talking to journalists or engaging in radio and television programmes.

There are current initiatives in progress to encourage the development of the press officer role in science departments and institutions across Europe. One such initiative is Communiqué and details of this can be found at <http://www.communique-initiative.org/>. It has been endorsed by Janez Potocnik, Commissioner for Research, who has said "I welcome the constructive contribution of the Communiqué initiative as a valuable input towards improving Communication on science in Europe."

The initiative is in response to the fact that a disproportionate amount of science coverage in Europe focuses on work conducted in the United States, rather in the EU member states. There is a need to make 'user friendly' accounts of European research more available to journalists and in this process press officers have a critical role to play. If you do not have such an office in your institution, perhaps you might ask 'why not?'

Press officers can be particularly useful in helping you to make your research newsworthy, assuming that it has that potential in the first place. They will urge you to simplify or explain technical terms and to focus on the potential impact of the work rather than the methodological minutiae. In some cases they may suggest that your work is not yet sufficiently advanced or conclusive to warrant media coverage. Their judgement is usually correct in this context.

A press officer, however, may have little expertise in a particular area of science or, indeed, in science at all. While they can be invaluable in helping scientists in the *process* of communication, they cannot be expected to help with the *content* of that

communication. For this reason the points noted below should be considered at all times.

4.1.2.5 What is the status of my research?

Much of science coverage in the European media is concerned with research reports that have been peer reviewed and published in respected journals. If your research has gained this level of 'respectability' it should be made clear. Equally, if the work has not yet been published in this way, that should also be made clear.

This is not to say, of course that peer-reviewed reports are always conclusive or constitute a definitive 'state-of-the-art' in a particular science area. One of the functions of academic journals is to enable early dissemination of research findings that may, or may not, be replicated by others.

Where research is at a preliminary stage, however it may have been published, this must be made clear. While there is a natural temptation to 'enhance' the importance of one's work, this does not serve the interests of either scientists or the public.

Studies which have revealed correlations, for example, but have not identified the causal factors involved, must be communicated very carefully indeed if misunderstandings or distortions are to be avoided. A typical way of treating such reports by sub-editors is with a headline such as 'Brain cancer linked to use of iPods', even though the term 'link' in this context is based solely on what might turn out to be a spurious co-variance.

Communicating implications for human health or behaviour derived from laboratory animal studies must also be undertaken carefully. There are countless examples of newspaper reports heralding, say, a 'breakthrough' in treatment for a particular disease which are based solely on studies of small numbers of rats or mice – something often noted by journalists in the last paragraph or so in order not to 'spoil the story'. This must be anticipated and the limitations of generalising to humans from animal studies should be stressed at the beginning of interviews or releases.

4.1.2.6 What's new?

There is a natural tendency for us all to emphasise what is novel about our research findings. It is also the case that journalists and broadcasters are rarely interested in covering research findings which simply confirm what we already know.

Stressing how your findings differ from those obtained by others serves another purpose. It should allow readers of media reports to put your work in proper context and note that other scientists take a different view – whether your focus is on climate change, levels of obesity in children or the potential applications of nanotechnology.

Be aware, however, that some journalists are keen to highlight divisions within the science community which may not, in fact, exist to any significant extent. A single physician was largely responsible for generating, following remarks he made at a press conference rather than in a published paper, considerable anxieties about the possible effects of the MMR vaccine in the UK by suggesting that it could be linked to the development of both autism and Crohn's disease. Press coverage of

his comments, however, implied that there were much more widespread divisions of opinion within medical circles – a misrepresentation that led many parents to withdraw their children from vaccination schemes. All scientists have a responsibility to present their work in such a way that the potential for this type of distortion is minimised.

4.1.2.7 **The communication of risks and benefits**

The example of the MMR scare leads us to one of the most important, but also most difficult aspects, of media science communication. This has been stressed repeatedly by all of the contributors to the MESSENGER project. How can I tell people about the potential risks or benefits identified in my research in a way that they will be able to understand and put into a proper context?

To a scientist a risk is simply the statistical probability that an event will occur multiplied by the hazard presented by that event. This is not, however, the way that ordinary people, and even scientists when ‘off duty’ think about risk.

Many other factors are involved and these need to be considered carefully when explaining risks. There are substantial reference books, reports and articles advising on the best ways of communicating risks and benefits. Some examples are shown in the box below. The guidelines on risk communication presented here are common to many of those shown in the box and are those which have been identified by contributors to the MESSENGER project as the most significant.

Voluntary and involuntary risks. People tend to be more worried more by risks over which they feel they have no control compared with those that they feel able to do something about. Even though the risks may, statistically, be very small, their involuntary nature magnifies the perceived threat. This is also the case when a perceived risk is imposed by others – e.g. the building of a waste processing centre or the siting of a mobile phone mast.

Catastrophe and dread. Some consequences of a risk may be perceived as so severe that extreme anxieties are aroused even though the probability of the event occurring is very small. The widespread avoidance of British beef following the outbreak of BSE in the UK and the worldwide reactions to possible SARS and avian flu epidemics illustrate this effect.

The potential for large-scale aircraft crashes, melt-down of nuclear reactors or even giant meteors falling to Earth arouse similarly amplified reactions because of the numbers of people that may be affected by such events. Perhaps this is why they feature in popular books, films and television documentaries so frequently.

While the risks of some negative outcomes can be assessed quite precisely, others can not. In many areas there is a degree of ambiguity and ignorance. This was the case, for example, with vCJD – it was difficult to estimate the number of people who might contract the disease over a period of time since the causal mechanism had not been fully identified.

A selection of on-line resources on risk communication

- ▶ OECD (2002) *OECD Guidance Document on Risk Communication for Chemical Risk Management*. (Renn, O., Leiss, W. & Kastenholz, H.)
[www.oelis.oecd.org/olis/2002doc.nsf/43bb6130e5e86e5fc12569fa005d004c/cb81407367ba51d5c1256c01003521ed/\\$FILE/JT00129938.PDF](http://www.oelis.oecd.org/olis/2002doc.nsf/43bb6130e5e86e5fc12569fa005d004c/cb81407367ba51d5c1256c01003521ed/$FILE/JT00129938.PDF)
- ▶ *A Critical Guide to Manuals and Internet Resources on Risk Communication and Issues Management*, Gray, P. & Wiedemann, P. www.kfa-juelich.de/mut/rc/inhalt.html
- ▶ Strategy Unit (2002) *Risk: Improving government's capability to handle risk and uncertainty*, Cabinet Office, London. www.strategy.gov.uk/downloads/su/risk/report/downloads/su-risk.pdf
- ▶ Bennet, P. (1998) *Communicating about risks to public health pointers to good practice*. Department of Health, London. www.dh.gov.uk/assetRoot/04/03/96/70/04039670.pdf
- ▶ Walter, M.L., Kamrin, M.A. & Katz, D.J. (2000) *Risk Communication Basics, A Journalist's Handbook on Environmental Risk Assessment*, www.facsnet.org/tools/ref_tutor/risk/ch6comm.php3
- ▶ Harrabin, R., Coote, A. & Allen, J (2003) *Health in the news; Risk, reporting and media influence*,. Kings Fund. www.kingsfund.org.uk/document.rm?id=85
- ▶ Ballantine, B (2003) *Improving the quality of risk management in the European Union: Risk Communication*,. The European Policy Centre.
www.theepc.be/TEWN/pdf/365551782_EPC%20Working%20Paper%205%20Improving%20the%20Quality%20of%20Risk%20Communication-final.pdf
- ▶ Special issue: Perspectives on Crisis and Risk Communication, *The IPTS Report*, Issue 82, March 2004.
<http://www.jrc.es/home/report/english/articles/vol82/>
- ▶ Covello, V.T. & Allen, F.W. (1988) *Seven Cardinal Rules of Risk Communication*. US Environmental Protection Agency, Washington. www.epa.gov/stakeholders/pdf/risk.pdf
- ▶ *Communicating Risk – an online resource for journalists, public officials and scientists*. Developed by the European Journalism Centre with the support of the European Commission DG Research.
www.communicatingrisk.org/
- ▶ *A Primer on Health Risk Communication Principles and Practices*, Centre for Disease Control, Agency for Toxic Substances and Disease Registry www.atsdr.cdc.gov/HEC/primer.html
- ▶ *Communicating Risk in a Soundbite: a Guide for Scientists* is the result of a meeting between top scientists and journalists, who assessed the best ways to explain risks via the broadcast media.
www.sciencemediacentre.org/downloads/communicating_risk.pdf
- ▶ *Communicating Risk*. UK Resilience, Cabinet Office, London.
www.ukresilience.info/preparedness/risk/communicatingrisk.pdf
- ▶ Amanatidou, E. & Psarra, F. (2004) *Risk Communication: a Literature Review*, Final Report prepared under the study "Evaluation of the use of scientific advice in risk communications and the development of a Community action plan (SARC)".
www.communicatingrisk.org/eufunded/ea1410_Literature_Review_Report_Final.doc

Uncertainty and the precautionary principle. There are many versions of the precautionary principle – some more ‘stringent’ than others. In essence, however, the principle asserts that when there is the theoretical potential for risk, even though no empirical evidence of risk has currently been obtained, precaution should be exercised. In some cases this will mean that development of a new scientific process or novel technology is delayed until the actual risks can better be determined or introduced with strict controls.

All scientists are familiar with the issues posed by this principle – some seeing it as undermining the basis of the scientific method itself. Among the contributors to the MESSENGER project, however, were some strong areas of support for this kind of precaution, particularly when risks to public health are involved. Some suggested that the only reason not to adopt the approach would be if one sought to put the interests of industry above those of the people.

Some scientists interpret the precautionary principle as meaning that they must always prove that something is ‘safe’ before proceeding – something that empirical science, which works on probabilities and involves necessary uncertainty, can never do. In reality, however, the precautionary principle is just one variant of essential risk assessment and it is an issue with which scientists should engage fully and openly.

Explaining what is currently known and precisely where areas of uncertainty still exist reinforces the transparency of science and fosters trust. Simply refusing to be part of the debate does not.

Lack of equity of risks and benefits When potential risks, however small, are perceived as delivering no tangible benefits, hostility can again be heightened considerably. The rejection of genetically modified crops and food products in Europe reflects this process. In this case the arguments were as much about the lack of need for GM food in Europe as they were about risks posed to health or the environment.

In contrast, where the benefits of a technology or process are very visible, the perceptions of the risks involved will be much reduced. X-Rays, for example, are seen as ‘safer’ than potential fall-out from a nuclear reactor. Motor cars are one of the most dangerous forms of transport, but their utility is seen as outweighing the risks they pose.

4.1.2.8 Risks in context From this it is clear that people’s perceptions of risk, and their reactions to them, are not what we would ordinarily describe as ‘scientific’. There may also be ethical and political issues that enter into the assessments. Some people are suspicious of agricultural biotechnology because they fear that multi-national corporations will be able to exert control over small farmers in Africa and Asia. Objections to ‘fast’ or ‘junk’ food may be as much to do with the influence of American-led burger chains as with scientific assessments of their nutritional qualities.

Awareness of all of these factors is essential if scientists are to engage in meaningful dialogue with civil society through the media.

You should be aware that even the most careful presentation of risks and benefits identified in your research will not necessarily be read by others in the way that you intended.

If the journalists and broadcasters with whom you communicate are themselves not clear about the implications of your work, the potential for wider public misunderstanding is greatly increased. From the large body of literature there exists on risk communication and from the advice provided by contributors to the MESSENGER project, we can identify some quite simple steps that may reduce this potential.

4.1.2.9 State the risks and benefits meaningfully

There are numerous examples of press reporting and broadcast news along the lines of “Research has revealed that Factor X increases the risk of Y by 30%.” This is, of course, usually quite meaningless on its own since we are not told how big the risk of Y is in the absence of Factor X. It is also the case that readers simply glancing at the article will interpret it as showing nearly a 1 in 3 risk of Y – an alarmingly high figure. The journalist may not be the main culprit here – the absolute risk of Y was not mentioned in the interview or news release.

The absolute risk should always be stated clearly and early in any statement so that the significance of the increased or relative risk can be understood.

Suppose, in our example, that Y is a form of cancer and out of 10,000 people 80 will contract it if they do nothing. With Factor X, an extra 24 will contract the disease – an increase of 30%. This starts to allow a more sensible appreciation of the relevance of the research to be obtained. There are, however, other factors associated with the data that need to be stressed

In many cases the risk of Y is not evenly distributed throughout a population. The increased risk posed by Factor X may also not be evenly distributed. An example of a report in the UK *Guardian* shows how these issues may best be tackled. It particularly reflects excellence in the way information has been communicated to the journalist.

The headline of the story is ‘**Study spells out heart attack risk posed by painkiller**’. A first sight this seems to be just another ‘scare’ story about common medicines. Two subheads follow, however, ‘**Problem found with patients on high doses**’ and ‘**Authors stress danger is minimal in everyday use.**’

The first paragraph expands on these facts:

“Common painkillers such as ibuprofen and diclofenac can double the risk of heart attack, according to a new study. The increased risk only occurs with high doses and leads to attacks in an extra three people per thousand compared with those not taking the drugs.”

Right from the beginning we have the relative risk (RR) clearly put into a meaningful context – ‘double’ (RR of 2) means an extra 3 heart attacks per 1,000 people using the painkillers. It is also clear that not everyone has an increased risk – just those on high doses. Readers can thus start to assess risk at a *personal* level.

The article goes on to note that the epidemiologist who conducted the study felt that people should not be unduly alarmed by the findings. He was also quoted as saying, “For a person who is unable to move unless they take these drugs, they may be willing to accept that risk if [the drug] is giving them back their life.” The risks are not only presented in a meaningful context but are contrasted with the tangible benefits to the specific population that is at risk.

The article continues with more from the epidemiologist who observes that doctors had been confused in past about the best way to prescribe anti-inflammatory drugs. The new study, he said, “supersedes all the previous work that has been done in the area. We have looked at all the evidence that has ever been done and our report is hopefully going to help doctors to assess these drugs.”

Again, the benefits of the research are clearly communicated by the scientist. Later, the article provides further detail about what ‘high dose’ means in this context – “about twice what the normal person would take” – and reassures us that “People who are popping these for an odd headache, the risks to them are minimal.”

This article reflects both best practice in science journalism by the author, Alok Jha, but also, in particular, excellent communication by the scientist, Dr Colin Baigent. When information is presented clearly and in the right order – e.g. specifying exactly who is at risk very early, followed by appropriate reassurances – it is much easier for a journalist to write an article that is accurate, balanced and informative.

In this example the risks were quite precisely known. In other cases, however, they may be less easy to quantify. This issue of ‘uncertainty’ is perhaps the most difficult one for a scientist seeking to communicate and engage with lay publics. Some specialists in the risk communication field have even suggested that where there is serious uncertainty about the magnitude of a risk it may be wiser to delay communication until a more accurate assessment has been established.

- 4.1.2.10 Comparing risks** One way of putting risk into meaningful context is to make comparisons between a newly discovered risk and one that is more familiar to people. Thus, one might say that the risk to the neighbouring community of emissions from a novel form of power generation is no greater, on the basis of empirical evidence, than that currently associated with gas or coal-fired generators. In this context you might also wish to note that the new process has measurable benefits in the form of lowered emissions.

Comparisons, however, must be relevant. In particular, they should be similar in terms of their voluntary/involuntary aspects. Suggesting to people, for example, that the risks to health posed by their 'unbalanced diets' is much greater than that which might derive from electromagnetic radiation from power lines will be both unconvincing and seen as patronising. People can change their diets. They cannot move power lines.

Expressing risk in terms of the number of people who are likely to be affected is, as we have seen from the example above, a useful way of putting risk in meaningful context. Again, however, some caution is needed. Telling people, for example, that the risk of dying from a source of food-borne contamination such as acrylamide is less than that of winning the jackpot in a national lottery might not be very wise. People think that they might win the lottery – why else would they buy tickets? A better comparison would be between the risk posed by acrylamide and those associated with dioxins, PCBs or other known carcinogens

It is also necessary to understand that people, including some scientists, find it difficult to understand the immediate relevance of very large numbers. Is a one in a million chance a small, moderate or large risk? What does 1 in 10^{58} mean?

This last figure comes from the assessment of risk posed by the collision of sub-atomic particles in a research facility in Italy some years ago. At the time there was some discussion, given wide publicity in the media, of whether there was the possibility of a 'black hole' being generated, with the consequent destruction of the planet. The figure of 1 in 10^{58} was the risk that was calculated. The fact, however, that the scientists could show that there was a risk at all generated considerable anxiety, despite it requiring 58 zeros to express.

In retrospect it might have been wiser to express this risk not in simple numerical terms but with a simple "no" or by saying that 10 to the power of 58 is three times larger than the number of years the universe has existed, "which amounts to the same conclusion."

4.1.3 Frames of engagement

We noted above that people perceive risks not in purely scientific terms but also with regard to psychological, emotional, moral, social and political frameworks. Not surprisingly, therefore, news reports and press articles that cover science developments involving perceived risk also refer to these issues. We have also highlighted in Sections 3.3 to 3.7 of this report that broad scientific areas such as biotechnology, nanotechnology, nuclear energy, etc. are also 'framed' in reference to environmental, ethical or commercial issues. Journalists will often include the views of other actors and stakeholders, from representatives of consumer associations and single interest groups to politicians, priests and moral philosophers, as well as scientists conducting research in a particular field.

This is a healthy process and illustrates, if such illustration is necessary, the extent to which science is embedded in society, rather than standing apart from it. It means, however, that when scientists are interviewed by journalists or broadcasters

they are often invited to comment on these broader issues as well as on the specific scientific content of their research.

4.1.4 Public interest and policy

On occasions research findings have such significance for human behaviour, lifestyles and well-being that they also have strong implications for public policy. This has been highlighted recently by the Royal Society – the leading science institution in the UK. Their report, *Science and the Public Interest* is available from www.royalsoc.ac.uk/downloaddoc.asp?id=2879.

The report notes that strong public interest may arise from research that has specific implications for dietary habits, personal security, the state of the environment, etc. and that these, in turn, may have relevance for policies at national or European level.

In these cases even greater care and responsibility are required when communicating research findings to the general public through media channels. The Royal Society document contains a useful summary of relevant considerations in Annex 1 of their report.

Additional resources

- ▶ *EC, European Research; a Guide to Successful Communications.*
http://ec.europa.eu/research/conferences/2004/cer2004/pdf/rtd_2004_guide_success_communication.pdf
- ▶ *EC, A Scientist's Survival Kit; Communicating Science*
http://ec.europa.eu/research/science-society/pdf/communicating-science_en.pdf
- ▶ *SciDev.net, An E-Guide to Science Communication*
http://www.scidev.net/ms/sci_comm/
- ▶ *BBSRC, Communicating with the Public:*
http://www.bbsrc.ac.uk/tools/download/communicating_notes/cwtp.pdf
- ▶ *STEMPRA, Practical Advice for Science Communicators, Science, Technology, Engineering, Medicine Public Relations Association* <http://www.stempira.org.uk/advice.html>
- ▶ *European Federation of Biotechnology, Dealings with the Media*
http://www.efb-central.org/images/uploads/Dealings_with_the_media_English.pdf
- ▶ *NASA / ESA, Press release guidelines for scientists, available on the European homepage for the Hubble Space Telescope* http://www.spacetelescope.org/about_us/heic/scientist_guidelines.html

4.1.5 A summary and checklist

- All scientists have a professional responsibility to communicate their research to public audiences and to offer appropriate guidance and advice where appropriate. The popular media is a major channel for such communication and should be embraced rather than shunned.
- Get help where it is available – your organisation's press or media officer, for example.
- Keep up-to-date with media coverage of science in general and your area in particular.
- Attend workshops, seminars etc. that enable scientists and journalists to meet and discuss relevant issues. Get to know how journalists work and the constraints that they face.
- Where your work is at a preliminary stage or has yet to be published in a peer-reviewed journal, make this clear in interviews.
- If your findings and conclusions differ from those of other established scientists in the field, make this clear. At the same time, don't talk up the 'novelty' aspect of your work just to appeal to the media.
- Be especially careful when communicating risks or benefits identified in your research. Always express risk/benefit in a meaningful context that people can understand. Never talk of relative risk without clearly stating the absolute risk in simple terms.
- Where your research has implications for lifestyle changes or public policy, be particularly careful how you describe it. It is here that the maximum potential for distortion can arise. This may be the case when your work focuses on, say, dietary issues, personal security, the state of the environment, etc. Be prepared for social, ethical, political discussion and questions in this context.
- ENGAGE! Seek out opportunities to communicate directly with civil society groups and members and to discuss the implications of your work. After all, in a lot of cases they will actually have paid for it. Maintain and build their trust in what you are doing whenever you can.

4.2 Evaluation model for media coverage of risk

The evaluation of media-coverage is often limited to professional standards such as reliability, balance and independence, applied to individual articles. To explore a new, overall approach for evaluating the media two research projects were conducted:

1. Content analysis of the whole news flow to see how the media are covering two completely different risk topics: Universal Mobile Telecommunications Systems (UMTS) and Fine Particle Air Pollution (FPP). Which sources or frames dominate the coverage as a whole? Who has the power to define the issues? Which language (linked to which frame?) is used to describe the issues? This work is described in Section 2.2.
2. Consultation with key persons in relevant areas on the basis of semi-structured interviews. The main focus here was on the question of how to improve media coverage and communication of risk topics. How do the key persons analyse this problem and what kind of advice do they have for the media, the scientists and the government? This part of the work is described in Section 3.9.

What can be learned from the content analysis and the consultation for the evaluation of the media?

The content analysis of the UMTS and FPP coverage, described in Section 3.9, showed remarkable results: the UMTS news is dominated by lay person sources but the news on FPP is in the hands of official sources – government consultants, national politics and experts. Experts have only a very small share in the UMTS news in contrast to the reports on FPP. Telecom operators and corporate business sources are a minority in both issues. This reflects the differences in activities by the social actors, some of whom are passive while others are very active.

This shows that in contrast to the usual criticism of the media, the sources are not always the same in risk reporting and that it is not always the worried citizen with his or her personal story who gets coverage in the media. FPP is an example of risk coverage where the share of these societal sources is small. But can coverage in which the experts dominate be considered to be better than one such as UMTS where lay persons get the largest share? From the point of view that the media should stick to the scientific perspective on risk, the FPP coverage might be better, but keeping in mind that the media should try to connect to what people think and feel when they worry about a specific problem, the UMTS news flow may be better. Applying the professional standard of balance to the coverage as a whole, the conclusion must be that the media should give an equal voice to the relevant actors in society, even if some of the actors are not very active in getting access to the media. This is an argument for coverage that operates more independently than what sources do. Some of the interviewees similarly argued that the media are too much part of the system and should step aside to see what is going on. They should try to unravel the interests behind the issues and the conflicting claims.

The selection of sources has an impact on which aspects get covered and what frames are used. Although the shares of Risk and Consequences in the coverage of UMTS and FPP are almost the same, the other aspects (General Information, Resistance, Policy) differ. In the case of FPP the problem is mainly defined as a

Policy issue, while in UMTS coverage the General Information on the technology dominates.

Despite the differences in sources and issues, the framing of the two issues UMTS and FPP shows a remarkable resemblance: in both cases a Precaution frame (better safe than sorry, action is needed) is dominant, followed by the Technocratic frame (this problem of conflicting interests has to be solved one way or another). The Scandal (don't let them get away with it, damage has already been done) and the Science frames (there is always risk, everything depends on emission levels) are much smaller in the coverage, although Scandal is more important in the case of UMTS.

This means that despite the large differences between UMTS and FPP the news media define both issues in terms of 'there is a risk and something has to be done' and 'which solution seems suitable taking into account the different interests at stake?' In the case of FPP one might expect a larger share of Scandal framing, because there is more proof for public health damage (in contrast to UMTS) and a failing government (not able to meet EU regulations), but this is not the case. Scandal is very small in FPP coverage. It seems likely that the dominance of expert sources is responsible for this. For the same reason the scientific frame is extremely small.

In contrast to what some critics say, the media do not report risk issues mainly in terms of scandal, not even in a case like UMTS where the worried citizens are quite dominant in the coverage. The Precaution frame is the most important frame in both examples of risk coverage. News reporting without any frames is, of course, impossible but what would be a good way of dealing with frames in the coverage?

First of all, the scientific perspective needs to get more attention in the coverage. For a sense of balance it is important to inform the audience about what the scientists themselves think of the issue. Second, to describe a topic in terms of scandal is only justified when the damage has been done, which is often not the case in risk issues. This means that the media have to be very careful with scandalizing the government or for instance telecom operators. The precaution frame is a good starting point, but without scientific proof for the existence of any risk this might be objectionable. The precaution approach legitimizes risk claims that are not evidence based. The technocratic frame is useful for describing what the government is doing to solve the problem, and it also deals with the dilemma of risk perception and the scientifically defined risks.

Regarding the coverage of the TNO study on the effects of UMTS, the conclusion was that the media describe the link between radiation and health complaints as an established fact. Symptoms are mentioned often but the concept of well-being is never explained. Information on the research design, the assembly of the experimental groups and the statistical significance is absent in most articles, except for those immediately after publication of a report in October 2003. This information, however, was presented using negative headlines. In only a small minority of the articles is attention paid to scientific criticism and the doubts of the researchers themselves. Looking at this coverage on the TNO study the conclusion is that the press creates a black and white image of the research that is not in line with its results. This result is in line with criticism on the way the media always deals with scientific results, but on the other hand it is good to realize that the scientist also plays a very important role in the way the media makes news out of a

report. As is said in some of the interviews, it is important for the scientist to take into account that certain words ('radiation') and phrases ('significant link') can be very sensitive, creating threatening images in society. It is important to stay involved in the public debate once the press release is sent to the media.

This project started with the SIRC/RI/RS *Guidelines on Science and Health Communication* and the goal was to develop an evaluation model for media coverage of risk that would take into account the social and political context in which the media function.

The results of the content analysis and the consultation have been integrated in the following criteria for evaluation that are defined at the level of news flows as a whole.

Sources Does the coverage show a variety of sources? It is not sufficient to report only on the active sources, but also the passive ones.

Frames Framing is inevitable, but is one specific frame dominating the whole coverage? Do the media use the same frame for completely different risk issues? Is there enough attention for the scientific perspective on risk?

Amplification Do the media contribute to the process of risk amplification by promoting one specific frame and giving a voice mainly to sources supporting this frame?

Risk perception Do the media take into account the way lay persons perceive risks and do they specifically address these perceptions in relation to scientific risk assessment?

Scientific data Is there enough attention for the probability perspective of science or do the media present scientific data as definite answers?

Language Are the media careful enough with value-laden words connected to certain frames and images?

In using these evaluation criteria it is important to emphasise that the media always operate in a social context in which the issues and frames are defined by actors (for example, scientists publishing a worrying report) in which events take place that are newsworthy not because of the risk topic, but because of the events themselves (a protest march for instance). On the other hand in this context the media have their own journalistic responsibility to report in a balanced way on risk topics.

4.3 Course materials for journalists

Reporting risk topics is different from covering regular events: reporting on risk is dealing with uncertainty and controversy. Be prepared for conflicting claims, put forward by all kinds of actors: scientists, activists, politicians and consultants.

In general there is gap between the scientific definitions of risk (the combination of statistical probability and impact of an unwanted outcome during a stated period of time or as a result from a particular activity) and the social construction of the problem. In contrast to scientists, lay persons perceive risks mainly in terms of involuntariness, injustice, scandal and blame. The 'real' risk (according to scientific risk assessment) is not as important in the popular perception as outrage and anxiety.

The result is that in a typical risk controversy, hazard is low but outrage is high. People feel at risk, although in terms of scientific proof the risk may be extremely small if not completely absent. Sometimes this kind of controversy triggers an amplification process in which a small risk can develop into a huge crisis with all kinds of detrimental effects. At that stage the general reporter and not the science editor is mainly doing the day-to-day reporting of events and claims. That is why general reporters should also be aware of the specific aspects of reporting on risk.

Summarised below are some useful online resources on risk, media and what reporters can do.

4.3.1 Self-instruction course in Risk Communication

This course has been developed by the PAH (Pan American Health Organization); CDC (Centers for Disease Control and Prevention) and ATSDR (Agency for Toxic Substances and Disease Registry). See:

<http://www.bvsde.ops-oms.org/tutorial6/i/index.html>

"The course has been designed for decision-makers, professionals, technical and operations personnel of public institutions, non-governmental organizations, academic institutions, students, and all persons interested in risk communication."

This course is not specifically aimed at reporters, but still it contains a lot of valuable information on risk.

4.3.2 Reporting on Risk Assessment

See: http://www.facsnet.org/tools/ref_tutor/risk/index.php3

By Michael A. Kamrin and Delores J. Katz and Martha L. Walter. Posted April 23, 1996 / Revised Feb. 2, 2000. *Sources: A Journalist's Handbook on Environmental Risk Assessment.*

This site contains an online handbook for journalists covering risk topics and offers specific guidelines for reporters.

"The purpose [...] is to give the reporter an understanding of how risk assessment is practised and publicized. It is intended to enable the journalist to sort through the numbers and scientific terminology to detect whether they are getting the whole story and to identify the strengths and weaknesses of a study. The ultimate goal is to improve public understanding and decision-making regarding environmental risks."

Specifically interesting for journalists are the following sites on Reporting on Risk Assessment:

- 4.3.2.1 Risk Communication Basics** "Audience reactions to risk information are sometimes surprising. Citizen reaction to risk messages is coming under increasing study by communication, psychology, and social science experts. Their findings are helping reporters to formulate stories that increase public understanding." See: http://www.facsnet.org/tools/ref_tutor/risk/ch6comm.php3
- 4.3.2.2 Risk Assessment Basics** "Understanding how risk assessments are done is key to understanding their results, interpreting them for your audience, and detecting bogus, overblown, minimized, or unsubstantiated claims." See: http://www.facsnet.org/tools/ref_tutor/risk/ch1whatis.php3
- 4.3.2.3 Reporting Health Risk Stories** "Environmental policy professor Jonathan Wiener discusses the factors that go into risk analysis and policy." See: http://www.facsnet.org/tools/ref_tutor/risk/wiener.php
- 4.3.2.4 Some fragments from Risk Communication Basics.** **Outrage Factors.** Outrage factors are those components of a risk situation that cause fear, anger, defensiveness, or frustration.
- What causes outrage?** People become outraged-fearful, angry, defensive or frustrated if the risk is perceived to be:
- Involuntary: People don't like to be forced to face a risk like trace chemicals in tap water. (But they will voluntarily assume risks-like drinking diet soda)
 - Uncontrollable: When preventing risk is in someone else's hands (government or industry), citizens feel helpless to change the situation. If the citizen can prevent or reduce the risk (using household chemicals properly) the risk is more acceptable
 - Immoral: Pollution is viewed as an evil. Therefore, people consider it unethical for governments and industries to claim that a risk is acceptable based on cost-benefit analysis or because there is "only" a low incidence of harm
 - Unfamiliar: An industrial process producing an unpronounceable chemical is a much less acceptable risk than something more everyday, like driving a car or eating junk food
 - Dreadful: A risk that could cause a much-feared or dreaded disease (like most cancers) is seen as more dangerous than a risk that could cause a less-feared disease
 - Uncertain: People become uneasy when scientists are not certain about the risk posed by a hazard-its exact effect, severity, or prevalence
 - Catastrophic: A risk resulting in a large-scale disastrous event (plane crash, nuclear reactor meltdown), is more dreaded than a risk affecting individuals singularly (auto accidents, radon)

- Memorable: A potential risk similar to a remarkable event imbedded in the memory, like Bhopal or Three Mile Island, is viewed as much more dangerous than the risk of some unheard-of or little-known disease
- Unfair: People become outraged if they feel they are being wrongfully exposed. For example: UMTS/EMF or GM crops

Risk Communication Guidelines. Reporters can provide information that helps their audience understand and control the risk.

Here are some ways that reporters (and officials) can address the psychological factors influencing citizen response to hazards. The point, of course, is not to diminish legitimate concerns, or heighten illegitimate ones, but to encourage constructive action.

- Describe what individuals can do to reduce their exposure
- Describe what industry and government are/are not doing to reduce the risk
- Describe the benefits as well as the risks to the specific audience (not just society in general) of the substance/process of concern
- Describe the alternatives and their risks. Describe what people can do to get involved in the decision making process
- Provide information that will help the audience to evaluate the risk

Helping the Audience Evaluate Risk Reporters can provide their audiences with information that will help them evaluate the risk information they see or hear.

Ultimately, *citizens* judge how dangerous a risk is and whether they should take action to reduce it. Reporters can play a key role in encouraging sound decisions by providing information that will help their audience evaluate the risk. Some fundamentals are:

- How much of the substance is the audience actually being exposed to?
- What is the likelihood of accidental exposure? What safety/back-up measures are in place?
- What is the legal standard for the substance? Is the standard controversial or widely accepted as sound?
- What health or environmental problems is the standard based on? Are there other problems that should be considered?
- Is the source of the risk information reputable? Who funded the work? What do other sources say?
- Were the studies done on a population similar to this audience?
- What are the benefits of the substance/facility? What are the trade-offs?
- How does the risk compare with other risks this audience faces?

Risk Comparisons. Risk comparisons that contrast an involuntary risk with a voluntary one typically generate anger rather than understanding.

Risk comparisons – comparing a new, unfamiliar risk with an old, familiar one – are appealing because they provide a concrete way to express a numerical concept (such as one death in a million). Risk comparisons appear to establish a scale of severity by which people can judge whether the new risk is something to be concerned about.

However, risk comparisons must be used with great care. Often, an involuntary risk is compared with a voluntary one (e.g., the risk from nearby chemical plant emissions is compared with smoking, dietary habits, or some other lifestyle choice). Such comparing of an involuntary exposure to risk with a voluntary exposure tends not to influence people's perceptions.

The most useful risk comparisons compare similar risks, compare risks with alternatives, or compare risks with benefits.

Several types of risk comparisons are generally more useful than comparing involuntary risks with voluntary ones. These are:

- Comparisons of similar risks
- Comparisons of risks with benefits
- Comparisons of alternative substances/methods
- Comparisons with natural background levels
- Comparisons with a regulatory standard

4.3.3 Power lines as health issue

The role of the media, the public and the authorities in the creation of a health crisis.

This is a simulation workshop to demonstrate the process of risk amplification and the role of the media. It was developed by Peter Vasterman of ASCoR and has been presented at several conferences on Communicating Risk, an online learning resource for journalists, public officials and scientists, funded by the EU. See: <http://www.communicatingrisk.org/home.php>. This site contains all kinds of resources and links.

4.3.3.1 Excerpt from the simulation *Power lines as health issue*

Although there is very little evidence for electromagnetic fields (EMF) as a cause of health problems, living near power lines cannot be proven to be absolutely safe. This creates a situation in which – under certain circumstances – the power line issue can develop into a real health crisis in which the media play a key role.

This process can be explored by stepping into different roles: the media, the public and the authorities. By simulating how these parties react to new developments and also interact, we can see how and why the media can amplify a health crisis, based on – objectively speaking – extremely small risks. Keep in mind that you are playing a 'social' and not an 'individual' role: act like you would expect the media, the residents or the authorities to act under these circumstances. There is nothing you can do wrong: in the debriefing we'll evaluate the social role, not your performance. Don't try to be extremely careful or ethical for fear of being criticized.

We divide the group into different three different roles:

- The media: journalists from different newspapers
- The authorities; the Minister of health, the city mayor, and their communication officers

- The worried residents, victims (parents) and the public (other people in the neighbourhood)

We will have interviews, press conferences and of course media coverage (front page stories of about 600 words, which will be distributed among the whole group). This enables all parties to react to this coverage. There will be two rounds with two editions of media coverage. At the end there will be a debriefing in which we will evaluate the coverage and the role of the actors in the development of the crisis over the power lines taking into account the material on risk communication.

At the start of the simulation the groups get the same first 'situation report':

Fifteen inhabitants of a new housing project in X, living as close as 30 metres of a high voltage power line, have been complaining for months about all kinds of health problems and malfunctioning of electrical appliances in their house (TV, computer, etc.).

According to the local physician the patients report problems like: sleeplessness, headaches, fatigue, drowsiness or weakness, hyperventilation or difficulty breathing, and numbness or paralysis. He was not able to find a cause for their problems. They say the problems started six months ago when they moved into their new houses. They suspect the power lines, which divide their neighbourhood in two.

The electricity company claims that there is no risk whatsoever and refers to scientific research conforming their point of view. The local hospital did run some tests but nothing showed up. Despite these efforts the people living in the project keep worrying about their health and of course their children's health. "Their playground is right under the power lines," says one of the parents, "They can sometimes even hear the 'hissing' cables." At first this was a local story but now also the national media are covering the 'bewitched' housing project. The top advisors of the Health Department are meeting with the minister to discuss future actions (especially, the necessary communication with the general public). The 'victims' demand a general health screening for everybody living in the new area and a temporary shutdown of the power lines until everything is proven safe.

Every group starts by preparing a strategy for the first two press conferences: at first residents meets the press, followed by a press conference by the minister of health and the mayor of the city, assisted by their PR officers.

The simulation gives the participants a real life 'feel' of what happens during the build-up of a risk crisis. It also reveals the dilemmas of the media as well as those of the government, who is forced to take action despite the fact that scientific proof on the risk is lacking.

Further details can be obtained from Peter Vasterman: (vasterman@uva.nl).

4.3.4 Risk Communication Literature Review.

The Risk Communication Literature Review seeks to find out what has been written about in the sphere of risk communications and what the nature of this literature was. It also covers what areas and suggestions for improvements have been reported and the possible quality criteria based on available studies, articles,

reports, etc. and focus on the context of SARS and GMOs with the aim of revealing differences in risk communication in different risk types.

http://www.communicatingrisk.org/eufunded/ea1410_Literature_Review_Report_Final.doc

4.4 A layperson's guide to decoding science and health stories

In Europe we live in societies that are increasingly reliant on scientific progress and innovation – from communication technologies that enable the rapid spread of knowledge to developments in medicine that mean that we live longer and healthier lives than at any other time in our history. But how do we get to know about what is happening in the science and health fields? Where do we turn for information, help and advice in seeking to make sense of the evermore complex worlds in which we live and the understandable anxieties that arise as a result?

Few of us read the specialist journals through which the 'real' business of science is conducted, although a number are now accessible for free online – see, for example, the Public Library of Science at <http://www.plos.org/>. Instead, we rely mostly on the more popular channels of television, radio, newspapers and magazines. Scientific knowledge and advice comes packaged along with the rest of the news. Newspaper editors and television programme producers tend to be as interested in maintaining readership and viewer ratings as they are in ensuring genuinely balanced coverage of science and health issues. A story that hails a 'miracle cure for cancer' is more likely to attract attention than one which simply observes that a study conducted on 10 mice suggests a potential for further investigation of the effects of a particular chemical in humans, but it will be at least ten years before we know if it will work.

Science and health stories, then, need to be 'decoded' – we need to look past the headlines, which are not usually written by journalists themselves but by sub-editors – and find ways of evaluating what is written or what is presented on our TV screens. This is not to say that we should be cynical about media coverage of science – without such reporting our knowledge and understanding would be very much diminished. Uncritical acceptance of science news, however, and its implications for our personal lives, is equally unwise. So how do we sort the wheat from the chaff? Who should we believe, and what kinds of story should we take with a healthy pinch of salt?

The EU-funded MESSENGER project involved extensive consultation with individuals and organisations across the European Community, including scientists and journalists but also members of government agencies, NGOs, pressure groups and civil society bodies (all of the reports and materials from the project can be found at www.messenger-europe.org). From their valuable contributions we have distilled some basic guidelines that may be of help to us all.

4.4.1 What is the source?

All media reports should clearly state the sources on which they are based – the organisation that has conducted a study or the individual who is making a particular claim. They should also say whether the study has been published in a scientific journal. In this case an article should also say whether the journal in question is 'peer reviewed' – each paper being carefully scrutinised for errors and faults by other experienced scientists. If such information is absent, then the credibility of the article should be questioned immediately.

Assuming that the source is quoted, and any publication details provided, further questions need to be asked. Is this an independent, academic organisation or are

there some 'vested interests' here. A study of the health impacts of smoking funded by a big tobacco company, for example, may reasonably arouse suspicion. But there are other types of vested interest that are less easy to identify, including moral, religious, political and ideological stances that may distort the way in which the findings are presented. An alleged 'link' between abortion and subsequent breast cancer, for example, might be given less credence if the source is a pro-life organisation rather than a government-funded medical institute.

4.4.2 Sampling

Poor medical science coverage in the media often neglects to provide us with 'technical details' such as the nature and the size of the sample used in the study. But this is important if we are to assess the extent to which a study might have implications for us as individuals. In some cases a study might have been based solely on experiments with animals – human studies are yet to be undertaken. Or the population used in a study might be very different from the one to which we belong – different gender or age groups for example. Bear these in mind when assessing how relevant the study really is.

4.4.3 Is there a balance?

Good science reporting will usually include comments on the specific study that is the focus of an article from other scientists in the field. While these views often come towards the end of an article or TV report, they are important because they allow particular claims to be put in context. Is the reported finding consistent with other research, or does it add to previous work in a useful and meaningful way? Or does it present a quite different perspective – one that is not shared by other experts in the field? Here the layperson has a problem – who should he or she trust in the debate? Whose view should prevail? All we can do is keep an open mind until we know more.

4.4.4 Can I make sense of alleged risks or benefits

Many science and health stories include statements about the risks or benefits that have been demonstrated in studies. These might vary from the health risks associated with being overweight to the statistical probability of the Earth being obliterated by a large asteroid. Some stories might also report the alleged benefits to health resulting from, say, a low-fat diet or a particular form of exercise.

Here journalists, and scientists themselves, have some difficulty because it is not always easy to describe these risks in a way that is unambiguous and meaningful. Take, for example, a real study which found that taking a particular type of pain killer can increase the risk of having a heart attack. Press reports indicated that the risk is doubled – this is known as the 'relative' risk. But what we also need to know is the *absolute* risk – the probability of having a heart attack if we do not take the painkiller.

Good journalists and broadcasters will seek to explain the risk in terms of the number of extra heart attacks that result. So, although the risk in this case has doubled (sounds alarming), the absolute risk of heart attacks, 3 per 1,000 people, is increased to 6 per 1,000 among those using the painkiller.

Even this information, however, is insufficient in many cases to allow us to make a properly informed decision about whether or not to take the painkiller. The risks are often not evenly distributed. In this study it was clear that the risks only occurred among those taking high doses of the medicine – those taking lower doses had little to worry about. It was also the case that those on the high doses were experiencing such chronic pain that the relief afforded by the drug was seen to outweigh the increased risk of the heart attack.

The point here is that before we start to panic about risks to our health, personal safety or the state of the planet as a result of reading newspaper headlines, we should pay attention to the details of the report. Good articles and TV reports will give us the right kind of information towards the beginning. In some cases, however, it is tucked away at the end. The same principles apply to assessing reported benefits such as those resulting from 'medical breakthroughs', 'wonder drugs' and the like.

4.4.5 Suspicious terms

Quite often a newspaper headline announcing a science or health story will include words such as 'link' or 'trend' or claim that an 'association' has been found between, say, eating particular types of food and ill health. These terms often indicate that the results being reported are not statistically significant – they could be the result of chance or random fluctuation. When the results are unequivocally significant we usually find headlines such as 'Scientists prove that X causes Y'.

Results that are *statistically* significant, however, do not necessarily mean that they are 'significant' to us as individuals. A statistical test may demonstrate that there is, indeed, an observed effect which cannot be attributed to pure chance. But the effect, in real terms, may still be very small – something that is unlikely to affect many people very often. Good journalists and broadcasters should be able to explain this true significance by putting the study into context, especially where a risk is involved. How does it compare with other known dangers with which we are presented, such as being struck by lightning (very dangerous but very rare) or tangible benefits such as winning a lottery (very advantageous but equally unlikely).

4.4.6 Check it out

Widespread access to the internet means that there is no longer a need to rely solely on the papers or television for scientific information and advice. We can all go on the web and find it for ourselves. Here, however, arise many pitfalls. How can we tell if a web site, particularly a medical or consumer health site, is reliable and gives us accurate information and balanced advice? There are a number of factors we should consider. Firstly, who runs the site and why? This should be clearly declared on the site, otherwise avoid it. Secondly, who offers links to the site and what references are quoted? Are these, say, government health departments or respectable academic institutions, or are they just similarly minded or 'alternative' groups? It is also worth checking how frequently the site is updated – medical science moves on and we need access to up-to-date advice rather than old news.

4.4.7 Engage!

There is also no longer a need to be a passive recipient of science news and advice. Increasingly, national government bodies, the European Commission and the major science and health institutions across Europe are encouraging the public to become more involved in dialogue about scientific and technological developments and innovation. Scientists are also being urged to communicate their work more clearly to a wider public and to be prepared to discuss issues arising from their research more openly and directly. The MESSENGER project has developed guidelines for scientists on this aspect of their work which can be found at www.messenger-europe.org.

Many events, open consultations and dialogue initiatives are held across Europe every year and various web sites provide information about them. A number of the most significant resources are also listed on the MESSENGER web site.

Section 5

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Section 6

Appendices

6.1 UK media coverage 2000-2005

6.1.1 Biotechnology

UK press coverage of biotechnology from 2000-2005 mostly fell into two sections: coverage of medical applications and coverage of agricultural applications. In addition there was some general biotechnology coverage which mostly focused on investment, reporting on biotechnology as a financial and international development story.

Agricultural coverage focused on GM. At the start of this period the press debate on GM was already well under way, and coverage was quite balanced, reporting on public concerns and mistrust as well as representing pro-GM opinion. Wariness of 'anti-science' sentiment was evident throughout much of this material.

Towards 2002, coverage of GM moved from a mostly environment and science context to a consumer rights context. In the years to follow, the debate became increasingly polarised. Diverse sectors of the press shared a negative approach to GM on the basis of consumer rights arguments. Much of the negative coverage expressed an implicit public mistrust of the UK government. Overall, coverage of GM was negative but opposing views were well represented.

The human genome project attracted substantial coverage from 2001 onwards. The partial mapping of the human genome was published in 2001, with the complete project released in 2003, well ahead of schedule. These announcements were met with almost universally positive coverage which trickled on into 2004 and 2005, and the work was hailed as a UK triumph due to the substantial involvement of a UK research group at the Sanger Institute. There was some discussion about the 'danger' of reducing medicine to genetics, but overall coverage was very positive.

Stem cell research and cloning were the other major medical biotechnology stories from this period. Coverage was balanced and did not change substantially in tone or focus over the five years, although news events such as international claims of cloned births dictated the volume of press coverage. Overall these issues were reported on as debates, with a willingness to engage in technical medical detail and also to solicit the opinions of academic 'heavyweights'. Opinion was divided between enthusiasm about the medical potential opened up by stem cell research and cloning, and a moral confusion about the limits of life and the ethics of embryonic research. An overall distinction was made between therapeutic and reproductive cloning. Religious groups made their voices heard on these subjects more strongly in Scotland and Northern Ireland than in England or Wales.

6.1.2 2000

6.1.2.1 Summary UK press coverage of biotechnology from 2000 presented the following trends:

- A number of key events in biotechnology ensured a steady level of diverse news coverage. These included: the House of Lords vote to legalise embryo cloning for research; Prince Charles' Reith lecture, in which he voiced his concerns about GM and modern agriculture; major headway made on the decoding of the human genome; controversy surrounding the legality of

environmentalists attacks on GM crop trials, including a group of Greenpeace protestors being cleared of crop damage charges

- Medical coverage focused on human genome research, stem cell research and cloning, while agricultural coverage focused on GM. Agricultural issues received slightly more coverage this year, due to the ongoing GM controversy. General biotechnology was also reported as a financial/ investment story, with biotech being touted as a major new sci/tech growth sector
- Medical coverage revealed willingness on the part of journalists to deal with and explain technical subject matter. The majority of reports on the human genome research made some attempt to explain the science and its significance, as did much of the stem cell research coverage. Stem cell and cloning coverage fell between promises of 'miracle cures' for diverse conditions, and ethical worries about the possibility of human cloning
- GM coverage from this period reflected a sense that the debate was already well under way. Many reports referred to the progress of the debate so far, often criticising the anti-GM lobby for being 'anti-science'. However, reports did also indicate some public mistrust of GM
- GM was also reported as an international issue, with reports looking at GM in terms of international policy, investment and development

6.1.2.2 Major stories from 2000 **Investment** 2000 was a golden year for biotech industry and investment, reported the *Financial Times*: *Biotech, so long out of fashion, seemed the perfect vehicle (for high-tech investment). Like the internet, it is a knowledge-based industry... The very factors that had held biotechnology back – its speculative nature, its lack of profits and its continual need for refinancing – suddenly looked irresistible.* (*Financial Times* (FT), 14.3.2000)

The *Scotsman* (20.1.2000) reported that shares in biotechnology companies are “back in vogue”. However, the author warned that as the development of new drugs is often a “hit and miss affair” the biotech sector can be unreliable.

The *Times* reported on controversies surrounding biotech research and industry: *The picketing of Huntingdon Research shareholders, the destruction of GM crop trials and the debate over human cloning highlight the complex issues faced by the life sciences / biotechnology sector.* (*The Times*, 18.4.2000).

Agriculture / GM The *Times* discussed GM scare stories and called for a balanced approach: *Supermarkets declared themselves GM-free, the Prince of Wales proclaimed his concerns and the Government approved a tough new labelling policy for GM products. Now it turns out, the panic was unjustified. The episode serves as a warning for those wading into controversial areas, where quick answers appear to be prized above accuracy.* (*The Times*, 14.12.2000)

In opposition to the *Daily Mail*'s adamantly anti-GM stance, Stewart Steven in the *Mail on Sunday* responded to the anti-GM lobby: *The anti-science brigade all over Europe are tearing the roof down because oilseed rape 'contaminated' by GM pollen was bought from Canada and unknowingly planted here ... our whole debate on GM is based on ignorance and an extraordinarily old-fashioned fear of science.* (*Mail on Sunday*, 21.5.2000)

At the start of 2000, Tony Blair wrote in *The Independent* about the first global conference on GM food and human health: *It's an important event because it will be the first time that so many scientists, and with so many different views, meet to discuss*

this issue of real public concern... Any casual glance at the guest list would kill off fears that this event is intended to rubber-stamp the safety of GM foods... We are not pro or anti-GM food. We are pro-safety, pro-environment and pro-consumer choice. (The Independent, 27.2.2000)

The *Sunday Times* examined the philosophical issues at the core of the GM debate: *Once "sound science" has done its auditing, the character of the debate as one between competing conceptions of the good life, of the true status of human beings in the wider order, will emerge more clearly. (David Cooper, Philosophy Prof. Durham University, 21.5.2000).*

January saw 130 countries agree on an international protocol concluded under the 1992 UN Convention on Biological Diversity to regulate trade in GM seeds and crops, reports the FT: *The agreement, which largely leaves national governments free to adopt their own regulations on GMOs, was hailed by negotiators on all sides as a breakthrough, the first time that environmental concerns and trade rules have been explicitly reconciled in an international agreement. (FT, 31.1.2000).*

Human Genome Most of the "genome" coverage was concerned with the earlier than scheduled announcement of the near-completion of the mapping of the human genome. This was alternately reported in the press as being the first step in a long process, as holding the promise for cure-alls, and: *billed as the greatest scientific event since the moon landings. (Sunday Business, 25.6.2000).*

There was some attempt across the press of communicating (in as simple way as possible, in this case using a 'spelling' metaphor) genetic science itself; for example, in *The Sunday Times*: *The goal has been to determine the exact sequence of chemicals that make up the long chain of DNA molecules coiled up in our body's cells. The chemicals come in four types, known as A, C, G and T. They're grouped in three-letter words that make up sentences – the genes – containing the instructions for building and operating a human being. (Sunday Times, 11.6.2000)*

Health / Stem cell/ cloning Most of the stem cell research coverage concentrated on scientists' promises for stem cell research, the House of Lords decision in January to allow the cloning of human embryos for use in stem cell research, and outlines of what stem cell research actually entails.

The FT discussed the possibilities opened up by cloning and stem cell technology: *If the nucleus of a patient's cell were inserted into an egg whose own nucleus had been removed, it might be possible to generate an embryonic clone of the patient - a source of stem cells and tissues for compatible transplants. Opponents say "therapeutic cloning" of this sort is open to abuse, because if the technology were perfected, it could be adapted to "reproductive cloning"... There are other approaches. One would be to build up a stem cell bank. (FT, 24.1.2000).*

"Miracle cure" promises continued in the press, with Alzheimer's, cancer, blindness and Parkinson's all discussed. In July, *The Daily Mail* reported: *Transplant boost – Scientists are close to producing tailor-made "spare-part" liver tissue for transplant, it was announced last night... The key to the discovery is so-called stem cells, the earliest, most basic form of embryo cell that have the potential to turn into any of the body's different tissue types. Experts only recently discovered that some stem cells persist in adults, particularly in the nervous system and bone marrow... The ultimate goal is to regenerate a new liver using the patient's own stem cells. (Daily Mail, 20.7.2000).*

Xenoscience Xenoscience received a boost with reports of the birth of five cloned piglets born in Virginia, heralding with them the possibility of medical breakthrough in xenotransplantation. This was reported widely across the UK press.

6.1.3 2001

6.1.3.1 Summary UK press coverage of biotechnology from 2001 presented the following trends:

- Steady coverage of investment continued, amid suggestions that biotech could be the 'new dotcom' after a particularly successful year in 2000. Generally optimistic coverage was tempered with doubts about the reliability of biotech investments, and public ambivalence towards biotechnology
- A clear distinction was made between therapeutic and reproductive cloning in coverage of the cloning issue. Overall, coverage of stem cell research combined overt optimism about potential life saving applications of stem cell research with ethical worries which were explored extensively across the press. Announcements of allegedly successful human cloning from the Raelian sect and the Italian gynaecologist Antinori added fuel to the ethical debate
- One of the major biotechnology events this year was the earlier-than-expected announcement of the partial mapping of the human genome. Coverage was mostly positive and optimistic, and clearly welcomed the fact that one of the two major teams working on this project was British
- GM coverage this year developed into a full and often emotive debate. Public fears were emphasised by journalists, while GM 'whistleblower' Arpad Pusztai announced his new role as a self-appointed anti-GM communicator after being sacked by the Rowett Institute. A number of scientists publicly complained about polarisation in the GM debate
- GM crop trials were reported widely in local papers as well as nationals, suggesting that GM was seen as a local environmental issue as well as a national one. Some commentators argued that GM's potential to solve developing world food problems had been overblown. Overall, GM coverage was negative

6.1.3.2 Major stories from 2001

Investment. The biotech industry sector received substantial press coverage this year. For example, the Express reported: *No doubt you have read about the mapping of the human genome and the potential this has for developing new drug treatments. On the other hand, you may be thinking that it wasn't so long ago that you were being told about the Internet and the New Economy...Finsbury Life Sciences investment trust is owned by Merlin Biosciences, founded by Dr Chris Evans, the 43-year-old Welshman who is Britain's most successful biotechnology entrepreneur...."I particularly like the biotechnology story because I expect to be part of the ageing population who will likely benefit from scientific breakthroughs."* (The Express, 7.3.2001)

The *Independent* provided coverage of the 2001 Biotechnology Industry Organisation Conference in San Diego, suggesting that: *What bullishness there is comes from a general sense of relief that the industry has even come this far.* (Independent, 8.7.2001).

The end of 2001 saw the biotech industry undertake a series of merges, reported in the *FT*, following 2000 as a record year for biotech funding.

Positive expectations about investment were tempered with reports of widespread public doubt. The *Guardian* claimed: *biotech is struggling to win popular approval generally. In a Eurobarometer survey last year, only 41% of the 16,000 people polled agreed that biotech would improve the quality of life over the next 20 years. Those within the industry are in confident form, however, having enjoyed unprecedented success in 2000.* (*Guardian*, 26.4.2001)

Health / Cloning / Stem cell. Scientist Simon Fishel discussed cloning in the *Derby Evening Telegraph*: *The furore that has erupted over this very emotive and complex issue harks back to my early IVF days. There are two issues here. We have therapeutic cloning, which is the process of creating embryos to be mined for the body's 'master' or stem cells that are precursors for tissues such as skin, muscle, nerve, or brain cells...Pro-life groups will take a spiritual stance and say human life is created at conception and shouldn't be destroyed. But scientifically there is a difference between cellular life and human life...The real stumbling block for many is reproductive cloning.* (*Derby Evening Telegraph*, 29.11.2001)

The *Herald* reported on the possibility of human cloning: *Prepare for the first human clone - ...Italian embryologist Professor Severino Antinori is once again courting controversy with his claim that he will attempt to produce the world's first cloned baby.* (*The Herald*, Glasgow, 8.8.2001). The US based Raelian group also gained coverage of their similar claims to have produced human clones.

Scientist Roger Pedersen wrote about his own move from the US to the UK in order to carry out stem cell research in less restrictive confines, in the *FT*. (*FT*, 15.8.2001)

The *Edinburgh Evening News* reported on Edinburgh-based stem cell research: *Hope stems from cell breakthrough – ...Every day two Edinburgh doctors peer into the future. They envisage a world in which the sick will virtually cure themselves, there will be no need for transplant operations and diseases which once cost thousands of lives every year will no longer harbour such a deadly reputation. If there's a science fiction feel about their work, it's hardly surprising.* (*Edinburgh Evening News*, 3.9.2001)

The *Daily Telegraph* reported: *The possibility that a damaged or diseased organ could be repaired with tissue grown in the lab has increased in the past few days with reports on the science of stem cells, the most talented cells in the human body. Stem cell research is hailed as the start of a medical revolution that will lead to new treatments for diabetes, Parkinson's, Alzheimer's, heart disease and cancer.* (*Daily Telegraph*, 9.5.2001)

The *Independent* claimed that there was almost unanimous support within the scientific community for the use of embryonic stem cells. The article addressed how cloning and reproductive cloning have become conflated with discussion about stem cell research, and went on to outline various religious and social viewpoints ranging from Chief Rabbi Jonathan Sacks and Claire Rayner (in her capacity as member of a royal commission on the long term care of the elderly), to Archbishop of Westminster Cormac Murphy-O'Connor.

The *Observer* reported on the highly charged US debate on embryonic stem cell research. The article argued that Bush's "black and white" style of politics could hinder a middle ground consensus between the Christian right and the scientific community.

Xenotransplantation. Press coverage of xenotransplantation largely consisted of reflecting on public and scientific scepticism toward the science, which focused on difficulties in developing the applications to human transplantation, animal rights issues, health worries, ethics and morality, and general distrust. Even within the science community there were voices of dissent about the long term applicability of xeno-science, and it was increasingly argued to have perhaps been overtaken by the promise of 'regenerative' stem cell research.

The *Sunday Herald* (Scotland) reported on the engagement of religious organisations in debates about science in Scotland: *The Church of Scotland is set to give a 'cautious welcome' to the genetic modification of animals and the use of animal organs for transplant into humans at its General Assembly in May.* (*Sunday Herald*, 15.4.2001)

The *Independent* reported on the general pessimism toward xenoscience amongst scientists themselves: *In its most pessimistic report to date, the government body set up to monitor research on xenotransplantation ... says the likelihood of its providing results 'within a clinically worthwhile time frame' is starting to recede...* (*Independent*, 20.2.2001)

Human genome. There was widespread press coverage in February of the publication in *Science* and *Nature* of the partial mapping of the human genome sequence (with the finished sequence being published in 2003).

The *Daily Telegraph* discussed the genome breakthrough in terms of a nature/nurture debate, and discussed some related moral issues: *... the human genome. Written in DNA, it makes us grow and walk and talk, yet leaves us free to develop into individuals... There are worries about social and ethical issues – insurance cover, employment prospects or even the creation of designer babies. It is for society as a whole...to make decisions on such issues, not scientists alone, though their expert knowledge has much to contribute by informing the debate.* (*Daily Telegraph*, 14.2.2001)

Press coverage also included voices of contention amongst scientists themselves, some arguing that the human genome project was chasing the wrong rainbow: *One prominent opponent of the genome sequencing project, William Haseltine, the chief executive of Human Genome Sciences, has long claimed that the right way to find all the human genes is not to sequence the genome itself, but to go directly to the products that the cell makes when it reads the genome.* (*Sunday Times*, 8.7.2001)

Some press-friendly statistics from the announcement were reported: *Perhaps most surprisingly, we share about a fifth of our genes with yeast.* (*Aberdeen Press and Journal*, 3.2.2001)

A rare reflection upon the scientific process came in the *Times*: *As happens so often in science, a peak is conquered only to reveal a still more daunting one ahead... The never-ending fascination of science is that every question raises another, and that nature always has fresh complexity to throw at us. The unveiling of the genome is not an end, but a beginning.* (*The Times*, 13.2.2001)

Agriculture / GM. GM press coverage from 2001 emerged into a fully-fledged, emotive, and at points polarised debate. The *Nottingham Evening Post* reported the views of one scientist: *Professor Don Grierson...must be Public Enemy Number One...*

(his) main research interest has been how fruit and vegetables ripen and how that process can be altered by genetic modification...he is one of the few people prepared to stand up in the current highly-charged climate and argue that GM foods are good for the world...Prof. Grierson, not surprisingly, resents what he sees as polarisation in the GM debate. (Nottingham Evening Post, 17.3.2001)

John Vidal (then environmental editor of the *Guardian*) suggested that *'the euphoria (around biotech) has gone'*, and that claims of GM addressing world food problems fail to ring true: *GM food is for the rich world. The money from GM is in developed countries. (Guardian, 28.8.2001).*

The GM 'whistle blower' Dr Arpad Pusztai was interviewed in the *Glasgow Herald*, and suggested that following his sacking from the Rowett Institute, Aberdeen, he now considered his role to be that of communicator: *The ultimate reason the government and the scientific establishment did not want Dr Pusztai's work to be completed was that ordinary people would readily grasp what it was about, he believes. 'I have never had any problem explaining anything to people. Even complex molecular biology can be explained. The concepts are easily understood. (The Herald, 31.3.2001).*

Several local newspapers covered the GM crop trials, indicating that in most areas this caused a division of interest.

Some historical perspective on 'genetic modification' of animals, in the *Independent*: *Humans have been genetically modifying animals in a non-technical way for thousands of years', said Professor Patrick Bateson, chairman of the Royal Society's working group...On genetically tinkering with the makeup of animals for food, Prof Bateson argued that it was simply a more precise version of selective breeding... (Independent, 21.5.2001).*

6.1.4 2002

6.1.4.1 Summary UK press coverage of biotechnology from 2002 presented the following trends:

- Investment stories concentrated on international growth and a comparative lack of development in Europe and the UK. The EC released its 'Life Science and Biotechnology' strategy paper which proposed updates to the regulatory framework for European biotechnology
- The philosophical discussion over cloning and stem cell research became increasingly sophisticated as a number of academic 'heavyweights' joined the debate in the press. In Northern Ireland and Scotland a religious lobby made its views known, particularly in response to the House of Lords' decision to permit embryonic research
- The GM debate was increasingly portrayed as a consumer issue, with many reports dwelling on the power of the consumer lobby over UK government GM policy and over the GM industry
- The increased polarisation of the GM debate was evident in the furore over a BBC TV programme 'Fields of Gold'. The programme was released to some controversy after the Science Media Centre raised doubts about the plausibility of the science behind the plot. The SMC were themselves publicly accused of being a pro-biotech lobby group by the programme's writers
- The publication of Fukuyama's book *The Posthuman Future: Consequences of the Biotechnology Revolution*, prompted some fairly sensational discussion of biotechnology and bioethics

6.1.4.2 Major stories from 2002

Investment January saw the European Commission release a policy paper entitled: *Life Science and Biotechnology – A strategy for Europe: The goal is an all-encompassing biotechnology framework, a hugely ambitious project that will need a disciplined and balanced approach which keeps both consumers and industry on board. A first step is the updating of the regulatory framework. A European directive is proposed, which will harmonise patent laws across the EU, protecting biotechnological inventions from GM goods to cloning. But what should and what should not be patented for ethical reasons: should the directive, for instance, extend to human genes?* (Times, 29.1.2002)

Biotech sector investment continued to receive coverage in the business pages: *Biotechnology is the new oil', says Hamad Al-Omar, a board member of Jeddah BioCity, Saudi Arabia's aspiring biotechnology area.* (FT, 26.6.2002)

...The enthusiasm for biotechnology seen among US institutions is matched only by the antipathy of their peers in the UK. (Times, 24.1.2003)

Health / Cloning/ stem cel. 'To ban or not to ban' was the question that dominated press coverage of cloning. Baroness Warnock entered the debate in July, suggesting that the blanket ban on human cloning be lifted. She added her voice to a list of academic "heavyweights" including Prof Sheila McLean, director of the Institute of Law and Ethics in Medicine at Glasgow University and fertility expert Dr Richard Fleming.

In Ireland and Scotland in particular, the cloning issue remained controversial as it was widely discussed in the press as a religious question as well as a scientific one: *Increasing numbers of ethicists and medical experts are now speaking out in favour of reproductive cloning...test tube baby pioneer Robert Edwards...suggested that cloning could one day be as acceptable as IVF...* (The Sunday Herald, 1.9.2002)

Embryo stem cell research was given the go-ahead in the UK by the House of Lords Select Committee on Stem Cell Research: *The Lords' decision means British scientists can continue research on adult and embryo stem cells – the body's master cells which have the ability to change into any other body cell. The controversy arises because stem cells are taken from cloned or 'spare' human embryos. While cloning babies is banned the process of cloning embryos is allowed for 'therapeutic' purposes.* (Evening News, Edinburgh, 27.2.2002)

Agriculture / GM Some of the 2002 articles situated the GM debate in the UK in terms of it first coming to public attention in 1998 through "whistleblower" Arpad Pusztai. For example: *a food expert at the publically funded Rowett Research Institute sparked off the backlash against GM foods in August 1998. In an interview he said that he would not eat GM foods because they had not been properly tested. Overnight the GM tide turned from a technology of almost unlimited potential that was making quiet inroads into British farms and shops to a 'Frankenstein Food' banned by the supermarkets.* (Times, 20.8.2002)

The GM debate was portrayed as a triumph of the public-as-consumers: *After the British public rejected GM food in 1999, and supermarkets took all GM products off their shelves, the Government realised the expert advice on GM they had been getting*

was simply ignoring real public concerns, and real identified risks...So the Government set up the Agriculture and Environment Biotechnology Commission to take a wide-ranging look at GM crops, and their social, environmental and economic impacts... (Evening News, Edinburgh, 18.3.2002)

The *Sunday Herald* reported on insurance companies' unwillingness to insure GM crops: *Genetically modified crops, like war and nuclear accidents, have been deemed too dangerous to insure against (The Sunday Herald, 10.3.2002)*

Biotechnology, and in particular GM crops were the subject of a BBC drama in 2002. *Fields of Gold* was billed as a conspiracy thriller, and was concerned with addressing media-hyped public concerns about the food chain. It brought the writers into conflict with the Science Media Centre (SMC), as reported in *The Independent*: *The Science Media Centre found itself cast as in its own conspiracy by the drama's authors – Alan Rusbridger, editor of the Guardian, and his co-author and Guardian colleague Ronan Bennett – after a row about the plausibility of the science in the anti-GM storyline...the writers described the new SMC as a 'lobby group' for big biotech companies...The scientists real concern was that, if unchallenged, the drama and publicity around it could generate another round of anti-GM headlines which would further entrench public opposition at a crucial time in the debate over GM...That a group of scientists anticipated this debate and engaged with it should be welcomed as sign of a new willingness by scientists to work with the media. The fact that scientists were uncharacteristically on the front foot – a place usually reserved for media-savvy protest groups – seems to do more to explain the angry response than any hard evidence of a biotech-driven conspiracy. (The Independent, 18.6.2003)*

Fukuyama and responses 2002 saw US author Francis Fukuyama publish *The Posthuman Future: Consequences of the Biotechnology Revolution*. It prompted debate (especially in the broadsheets) on the ethics of biotechnology, its potential societal impact, its regulation and its future: *our social elites will translate their transitory social and economic advantages into permanent genetic advantage, creating an ever-widening genetic gap between classes...Fukuyama makes a compelling case for limiting the fields in which biotechnological research and development should be allowed and he calls for an immediate ban on human cloning to set a precedent... (Evening Standard, 13.5.2003)*

The *Edinburgh Evening News* reported: *While the "Frankenstein science" ... associated with the industry grabs the headlines, Dr Barbara Blaney, of BioIndustry Association, prefers to focus on the fact that the science has helped treat conditions in more than 250 million people worldwide in the last 20 years...'The UK is one of the most regulated biotech countries in the world, particularly if you look at the issues surrounding stem cells and cloning. (Evening News, Edinburgh, 20.8.2002, 4315 txt)*

Bio Luddites Square up to Friends of Frankenstein -...'The current biotechnology debate remains mired at a relatively abstract level about the ethics of procedures such as cloning or stem cell research', notes Francis Fukuyama...biological innovations have often been greeted by denunciation – then widely accepted (Times Education Supplement, 17.5.2002, 2021 txt).

6.1.5 2003

6.1.5.1 Summary UK press coverage of biotechnology from 2003 presented the following trends:

- Cloning and xenotransplantation received substantial coverage after the announcement of the cloning of 5 pigs in Scotland, genetically modified to provide organs for transplant. The announcement was met with extensive discussion of moral and animal rights issues, as well as discussion of medical implications
- 2003 saw the publication of the UK government 'GM Nation' report, following a lengthy public consultation exercise. The report indicated an overwhelming level of public scepticism about GM and UK government GM policy. Some commentators drew parallels between the UK government's policy on Iraq and its policy on GM, arguing that in both cases the public was being misled
- Coverage of GM was mostly negative, although some commentators argued in favour of GM and the Vatican voiced its support for GM crops as a potential solution to developing world food problems. An increasing number of anti-GM lobby groups made their voices heard in the press
- Coverage of cloning was dominated by a number of international claims of cloned human births. The RC Church in Scotland continued to have a strong influence on the cloning debate there, while coverage of research focused on European and international legislation. Coverage overall was fairly balanced
- The mapping of the human genome was completed and the results published this year. Coverage, which had continued in a steady trickle since the announcement of the partial decoding in 2001, was very positive. The decoding was portrayed as a UK triumph due to the substantial British involvement in the project

6.1.5.2 Major stories from 2003

Xenotransplantation January saw the announcement by Scottish-based and Roslin Institute aligned PPL of the production of five piglets genetically modified to provide organs for human transplantation. The pigs were cloned using patented gene-technology. This was heralded as showing xenotransplantation as having: *A lot of possibilities for the treatment of patients with end stage organ failure... Dr Andrew George (Molecular Immunologist, Imperial College)... "how society would reach that decision I have no idea because it is an incredibly interesting ethical issue"* (Birmingham Post. 3.1.2003).

The cloning raised moral and ethical concerns, from the animal rights lobby amongst others: *Sarah Kite, BUAV's research and information director, said: 'Xenotransplantation research causes unacceptable suffering to sentient animals. Not only do we question the right to genetically engineer animals to use as spare-parts, we also believe that the science of xeno is so poorly developed that clinical trials cannot reasonably be considered* (ibid.)

Coverage of the five piglets generally focused on the issues of animal cruelty, the cogency of xeno science in terms of safety, and moral and ethical issues: *Organ donor pigs put animal welfare in the spotlight...Whether the birth of the cloned piglets will move xenotransplantation forward is still highly speculative...in the hype surrounding each apparent scientific breakthrough, the ethical and welfare issues for animals are overlooked.* (Sunday Express, 6.1.2003).

Agriculture / GM. The Guardian focused on the influence of the public-as-consumers on the GM debate: *Tony Blair and his government appear to be on a collision course with consumers, who remain deeply suspicious of GM food, and the environment movement which sees GM crops as a danger...first it is necessary to appear*

to have consulted as widely as possible and the government has embarked on a 'countrywide debate' on the future of GM in Britain. The debate was the brainchild of the agriculture environment biotechnology commission, a quango set up to look at public opinion, consumer choice and economic impacts of GM. (*Guardian*, 17.8.2003).

Unlike medical biotechnology, the development of which appeared to receive broad public approval, plant and food biotechnology were highly contentious and regarded with suspicion by the public. A proliferation of anti-GM groups such as GMWatch, aiming to 'expose' the links between industry-friendly scientists, PR organisations and Industry lobby groups such as the Agricultural Biotechnology Council (ABC) meant that there were plenty of interested parties receiving press coverage.

Arpad Pusztai's was quoted in Scotland's *The Sunday Herald*: *he argues that GM food should have to undergo something like the MOT test cars must pass. It would be in the interests of everybody to go through a proper regulatory process, beefed up by science, transparently and independently done science.* (*The Sunday Herald*, 20.7.2003).

The Royal Society suggested that the Pusztai study was: *flawed in design, execution and analysis, and lacked detailed controls. The potatoes studied by Dr Pusztai were modified to contain lectin, a substance known to be toxic to most animals.* (*The Times*, 14.12.2000, 8945 txt).

GM Nation 2003 saw the public consultation exercise GM Nation running through the summer. The outcome report, published in September, was damning of the Government and highly sceptical about GM, indicating that the UK public was suspicious of the perceived close relationship between government and the biotech business sector, of the UK government's support of US policy (pro-GM), and also of the possible health and environmental impacts of GM.

The biggest test so far of public opinion has overwhelmingly rejected GM crops. The Evening Standard has learned that more than nine in 10 people are frightened of 'Frankenstein foods' because so little is known about longterm effects. More than 35,000 people sent emails or letters and attended 600 public meetings in June and July which produced more than 40,000 responses ... the mood ranged from caution and doubt, through suspicion and scepticism to hostility and rejection...(and) low levels of trust in the Government to listen to ordinary people or defend their interests. (*Evening Standard*, 24.9.2003)

The hostile result of yesterday's report on the national GM debate is yet another obstacle in the way of Tony Blair's five-year mission to import genetically modified agriculture to Britain...EU reluctance to accept GM has infuriated the Americans in recent years. But in signing up to GM Mr Blair did something very uncharacteristic in so canny a politician – he got out of step with the public mood...And how this scepticism and hostility have been rubbed in the Government's face – through a public debate it endorsed and funded itself... (*Independent*, 25.9.2003)

Congratulations to the government for asking people what they think about genetically modified crops...Most people turn out to have an intelligent understanding of the issues, a rational scepticism about the benefits and a healthy mistrust of GM advocates...The method used to consult the public differed from the traditional approach of issuing green and white papers and asking for responses. Instead, people were invited to join the debate

through public meetings and focus group discussions. The meetings were dominated by activists with strong views... (FT, 25.9.2003).

If the Government was not previously aware of the full extent of public unease about genetically modified crops, the findings of a nationwide consultation exercise should leave ministers in no doubt that the issue continues to raise strong passions. At the centre of this concern lies a widespread mistrust of both Government and the multi-national food companies. Twenty or 30 years ago, most people instinctively trusted those in positions of authority to do the right thing. (Birmingham Post, 25.9.2003)

There is a danger of demanding impossible standards of proof that would be brushed aside as unnecessary if there were demonstrable health benefits. But GM Nation? shows the public to be sceptical of those in authority – medical, scientific or political – who try to convince them of this. Consumers remember the assurances about mad cow disease, the spread of foreign plants and predators and the Chernobyl disaster... Perhaps the most striking finding of the consultation is the mistrust of all those involved in the GM debate... (FT, 25.9.2003)

The Independent, generally known for its pro-environmental / anti-GM stance, gave space to a comment piece by Paul Rylott (chair of the ABC at the time, as well as Bayer CropScience's Head of Bioscience UK): British consumers today demand affordable safe high-quality food produced in a way that is more eco-friendly than some current farming practices. Genetically modified crops offer the solution... The time has come for case-by-case responsible introduction of this technology within the UK. (Independent, 25.9.2003)

Parallels were made in some coverage between the governments' claims about Iraq's possession of weapons of mass destruction as reason for invasion and its support of GM. For example: Would our Prime Minister spin insubstantial evidence to persuade us to do what President Bush wants? (Western Morning News, 8.6.2003).

The Times reported on the Vatican's surprise support of GM: The Vatican stunned opponents of genetically modified foods yesterday by declaring that they held the answer to world starvation and malnutrition. Until the statement, the Vatican had been neutral in the confrontation between the European Union and the United States over GM food. (Times, 4.8.2003).

Health / General medical biotech A comment piece in the Guardian attempted to put claims about the potential of biotechnology in historical perspective: *Those familiar with medical research funding know the disgraceful campaigns waged in the 70's and 80's by scientists hunting the genes for such diseases as cystic fibrosis. Give us the money, we'll find the gene and then your problems will be solved, was the message... Now we have an almost wholly reductionist biomedical community which repeatedly makes exaggerated claims about how it is going to revolutionise medical treatment – and which repeatedly fails to achieve anything. (Guardian, 12.2.2003)*

Medical biotechnology, touted as a potential 'bubble' industry as well as a cutting edge field of scientific research, received a lot of business coverage. The promise of the UK biotech industry was seen to have faltered with companies not delivering on promises of 'cancer cure drugs' and the like, and having being overtaken by East Asia and Israel amongst others: The drugs don't work... Biotech was hailed as the perfect modern industry. (Guardian, 27.11.2003)

The *Independent* reported Blair's views on the potential of biotechnology: Mr Blair has described biotechnology as the edge of a new scientific discovery, but acknowledged that some part of public opinion regards it as a threat... 'The science of biotechnology will probably be, to the first half of the 21st century, what the computer was to the second half of the 20th century. Its implications are profound; its benefits, potential and massive'... (*Independent*, 17.2.2003)

The *Guardian* featured an opinion piece on perceived cultural differences between Europe and America with regard to the promise of new biotechnologies: If you debate the new genetics in Europe and America these days you get asked the same question in two different ways: The average European says, with dread: 'How do we stop people doing x?'. The average American says with excitement: 'When will I be able to do x?' For x read 'test myself for future dementia risk', 'change my unborn children's genes', or even 'fill my blood vessels with nano-robots to enable me to live to 150'. To the jaded European palate, the American attitude seems silly and irresponsible. Caution should be the watchword for all new technology. I beg to differ. I think the American optimism is necessary and responsible. It is the European pessimists who are in danger of causing real harm. Caution has risks, too. (Matt Ridley – *Guardian*, 3.4.2003)

Health / Cloning/ stem cell Coverage of cloning was dominated mostly by the Raelian cult's claim to have created a human clone, along with American fertility expert Dr Panos Zavos' claim to have produced the first human cloned embryo for reproductive purposes and implanted it in a woman's womb. Italian fertility doctor Severino Antinori's claims also received coverage. The Raelian cloning-tech company Clonaid also made claims to have found ways to reverse the aging process and cure diseases such as Alzheimers. These claims fuelled moral and ethical debate in the press, and prompted pragmatic questioning from other scientists over their validity.

In February, the first cloned animal, Dolly the sheep died. This prompted questions about whether being cloned affected her having to be put down.

European Parliament voted to amend and tighten cloning and stem cell research regulation: Britain's plans to become the leading light in research on cloned human embryos has suffered two major blows in the past few days, one from scientists investigating whether it will ever be possible and the other from Catholic and Christian Democrat Euro MPs. (*FT*, 23.4.2003)

The Roman Catholic Church in Scotland reiterated its ethical opposition to current practices involved in cloning: Mario Conti, the Archbishop of Glasgow, has been an outspoken critic of cloning and in-vitro fertilisation since being installed... (he) wanted a public debate on the issue which would be accessible to laymen... He accused the Roslin Institute ...of hiding the true nature of its practices from the public. (*The Glasgow Herald*, 20.5.2003).

The *TES* reported on international stem cell legislation: The majority of Australians support the use of foetal tissue for research but only with excess IVF embryos or from abortions carried out for other reasons... Canadian projects on ways to trigger muscle repair and on pancreatic cell regeneration have been among some of the most promising stem cell discoveries... Stem cell research in France is banned under laws that should have been revised four years ago... The Roman Catholic Church opposed any relaxation... Some French scientists left for the US, the UK and Switzerland to continue their work... (In Germany) ..Parliament has approved a law to allow the import and use of embryonic

stem-cell lines created before January 1 2002... (In Israel) ...the Jewish faith allows the use of embryo's to save people's lives...While cloning a human being is illegal, there is no prohibition against cloning embryos...(In Italy)...The power of the Catholic Church means Italy's conditions on stem-cell research are among the most restrictive in Europe. (TES, 18.7.2003).

Human Genome The human genome project: *another outstanding scientific achievement could quickly bring us into a brave new world, a world where mankind has overcome genetic diseases like cystic fibrosis, debilitating conditions like diabetes and even our biggest enemy – cancer...scientists believe it will usher in a new era of discovery and advances. (Derby Evening Telegraph, 15.4.2003).*

There was some discussion of the free availability of the genome project, and the notion of transparency in such research: *Sir John Sulston, director of the Sanger Institute believed the three billion letter 'book' was the birthright of all humankind, to be posted freely on the internet...(he) led the fight to ensure The Human Genome Project remained publicly funded, with its results available to everyone. (The Herald, 14.4.2003).*

6.1.6 2004

6.1.6.1 Summary UK press coverage of biotechnology from 2004 presented the following trends:

- Coverage of biotechnology investment was generally negative, claiming that the biotechnology sector had failed to deliver on its early promise. Some commentators argue that this was because previous claims made about the biotechnology market were overblown
- Coverage of GM continued with a generally negative tone. GM appears in a public opinion and consumer rights frame just as much as an environment or science frame. A wide spectrum of the press (*The Independent* to the *Daily Mail*) shared views on the issue of consumer choice. Stories about specific foodstuffs (bread, honey) received substantial coverage which emphasised the universal and local relevance of the GM debate
- The complexity of the debate over cloning and stem cell research was reflected in the range of press coverage. Reports emphasised the dramatic potential of stem cell technologies to “make paraplegics walk again” and “create new brain tissue”. On the other hand human cloning was almost universally condemned
- There were some warnings that the UK may have been in danger of losing its pre-eminent position in stem cell research due to lack of funding and 'vision', but the development of the new UK stem cell bank was heralded as a positive development and an indication of clear-cut government policy in this area

6.1.6.2 Major stories from 2004 A TES interview with Freeman Dyson made free with speculation about the future of biotech: *If home biotechnology becomes the latest fad, we'd better start laying down rules, says Freeman Dyson. 'I see a bright future for the biotechnical industry when it follows the path of the computer industry... Genetic engineering, once it gets into the hands of housewives and children, will give us an explosion of diversity of creatures, rather than the monoculture crops that big corporations prefer. (TES, 3.12.2004).*

Investment/ development There was substantial business page and FT coverage of the fortunes and future of the biotechnology industry in the UK. Seen a few years before as a potential 'biotech bubble' and cash cow for New Labour's 'knowledge economy', it was subsequently thought to have failed to deliver:

Britain's biotechnology industry, once touted as the most exciting thing since Sir Alexander Fleming forgot to put his sandwiches back in the fridge and accidentally discovered penicillin, is down on its luck. Having ripped through billions of pounds in just a few years, it is staggering along the street, cap in hand, serenading the dismissive fund managers that used to be its friends. (Daily Telegraph, 11.9.2004)

The FT reported: Switzerland has emerged as a major force in European biotechnology over the last few years... But according to Peter Fellner, chairman of Celltech, the UK's biggest biotechnology company European companies are 'chronically undercapitalised', compared with their US rivals... But Europe still has more than 1,800 biotechnology companies, about 300 more than the US. (FT, 22.5.2005)

The Sunday Telegraph argued that the initial claims made for biotechnology were excessive: The 'biotech revolution', which has been acclaimed by scientists as the path to miracle cures, has not delivered genuine improvements, according to an official study published this week... Prof. Steve Jones, a leading geneticist at University College, London, said that excessive claims had been made about biotechnology. (Sunday Telegraph, 31.10.2004)

Lord Sainsbury, the science minister and one of Tony Blair's closest allies, has been called upon to put greater distance between his business and political interests... highlighting the dilemma posed by Sainsbury's shareholdings in the genetic modification and biotechnology industries... (Sunday Times, 22.2.2004).

Agriculture / GM Opinion polls published in the press indicated that the UK public in general were broadly sceptical about GM: *Opinion polls show 70% of the European public do not want it (GM food), while 94% want to be able to choose whether or not they eat it. (Guardian, 27.4.2004).*

George Monbiot wrote in the Guardian: GM technology permits companies to ensure that everything we eat is owned by them. They can patent the seeds and the processes that give rise to them. They can make sure that crops can't be grown without their patented chemicals. They can prevent the seeds from reproducing themselves... the purpose of the biotech industry is to capture and monopolise the sources of wealth and the means of production. (Guardian, 9.3.2004)

The right to choose was discussed across the UK news spectrum: Millions will lose their right to choose The EU says that even organic food will be allowed to have the equivalent of up to almost one in 100 mouthfuls of pure GM ingredients. This is not scaremongering, but genuinely scary... (Daily Mail, 8.3.2004). If there is a potential significant risk, then avoid it. Organic standards have banned GM from food production since the Nineties... Million will lose their right to choose... thanks to consumers voicing their concerns, supermarkets have banned GM ingredients from their own brand products... when it comes to food, contacting your supermarket is more important than writing to your MP. (Independent, 5.4.2004)

U turn on GM loaf – A major campaign by British bakers has forced a U-turn on plans to launch a GM wheat which would have changed our 'daily bread' forever. The climbdown, announced yesterday by American biotech firm Monsanto, follows fierce pressure from UK bread makers, farmers and green lobby groups. It will be seen by many as a hammer-blow to the future of GM farming. (Daily Mail, 11.5.2004)

The government has now pledged to: assess GM crops on a case-by-case basis, making the protection of human health and the environment the top priority, provide choice for consumers through mandatory labelling of GM food products, consult on measures to allow GM and non-GM crops to co-exist, and to provide compensation to non-GM farmers who suffer a financial loss. (Lincolnshire Echo, 10.3.2004)

Specific concerns were voiced about honey, contaminated by bees which do not discriminate between GM and non-GM crops, syndicated newswires reporting: *We might then be in the ridiculous situation of putting 'May contain GM' labels on our honey pots. (UK Newsquest regional press – this is Ryedale, 28.4.2004)*

Health / Cloning/ Stem cell The Times discussed the: *widespread consensus that using cloning to make babies is inherently wrong as well as medically unsafe...producing the first human clone remains the least sought after first in medicine. (Times, 17.6.2004).*

The Times discussed the “problem” with therapeutic cloning, arguing that: *it is medicine’s misfortune that both reproductive and therapeutic cloning share the same first step. (Times, 17.6.2004).*

Cloning split the international community, and the science community. Prof. Wilmut of the Roslin Institute publicly chose to distance the RI’s work from that of Dr Zavos of Kentucky who claimed to have implanted a cloned human embryo into a 35-year-old woman’s womb, and from Antinori’s work on reproductive stem cell research, on the grounds that it is irresponsible medicine.

The Times pointed out that the US debate on stem cell research did not fall into a simple pro-life / pro-choice split: *Even anti-abortionists are among signatories to a letter to the American President urging him to relax federal legislation governing stem cell research. (Times, 17.6.2004)*

Coverage of stem cell research, (like cloning) focused on regulation and ethics, as well as news of new and potential medical applications and advances: *the brave new technology that Christopher Reeve had hoped would enable him to walk again...Have scientists discovered a panacea that will not only cure some of mankind’s most debilitating illnesses but also get paraplegics walking again? (Sunday Times, 7.10.2004)*
...replacement organs...replacement teeth...creating new brain tissue...growing fresh eye tissue...baldness...deafness...diabetes...heart disease...replace damaged heart muscle...available three to five years... (Mirror, 20.5.2004)

The UK was seen to have clear cut regulation on stem cell research, demonstrated by the new National Institute for Biological Standards and Control, a global central bank for stem cells: *... the bank is a testament to Britain’s clear-cut policy in an area of research that raises ethical questions...the majority of people in this country are in favour of stem cell research as long as embryos are not made solely for the purpose of extracting stem cells. (Guardian, 20.5.2004). Stem cells: the future of medicine” – The world’s first stem cell bank opened in the UK yesterday, bringing with it new hope of finding cures for a whole host of serious illnesses, from heart disease through to blindness and paralysis. (Mirror, 20.5.2004)*

The Telegraph warned against Britain falling behind in stem cell research: *Don’t let others steal our glory: Britain leads the way in stem cell research – Time and time again in the history of British science, we make a big breakthrough and push back the frontiers*

of science , only to lose out to those with more chutzpah, vision and money. (Telegraph, 01/12/2004)

Human Genome The press continued to reflect on the impact of the human genome project: *...it has been incredible what the human genome has done for medical research... There have been several new disease genes found...* (The Guardian, 2.1.2004) *Unravelling of the human code paves way for new treatments.* (The Scotsman, 21.10.2004).

The TES reported on pharmacogenics and the commercial applications of genomic technologies: *Knowing DNA's structure has opened our scientific horizons, but its social effects are barely explored, says Ian Wilmut. Few areas of science have had a greater impact on society than our still-developing understanding of the molecular mechanisms of inheritance.* (TES, 8.10.2004).

6.1.7 2005

6.1.7.1 Summary UK press coverage of biotechnology from 2005 presented the following trends:

- Investment coverage continued to be mixed, with commentators arguing on the one hand that biotech companies were failing to deliver, and on the other that 2004 was a great year for biotech. Biotechnology investment reporting also maintained an international focus
- Cloning and stem cell research received substantial coverage this year, partly due to Professor Ian Wilmut of the Roslin Institute being granted a license to clone embryos for research. Much of the coverage displayed some sympathy towards Wilmut's aims, along with an overall wish to distinguish therapeutic from reproductive cloning. However, there was also some discussion of the moral 'cost' of the UK's comparatively open stance on stem cell research and cloning
- The GM question continued to be strongly debated, with clearly drawn pro- and anti- camps making their views known in the press. Stories were framed in terms of public health, diet and consumer rights as well as science/technology and the environment. Public opinion appeared to be unanimously against the development of GM crops, and fears about cross-contamination and health risks are widely reported. However, some commentators argued that the UK's antipathy towards GM would eventually backfire if the biotech industry pulled out of Britain

6.1.7.2 Major stories from 2005

Investment Around 3/8 of the biotech coverage was devoted to the fortunes of biotech /pharma companies, positive and negative: *there is the gnawing fear that the biotech business model is broken in Europe... So far, UK biotech has created only one blockbuster drug.... Most argue that successful biotech investment is about 'shots on goal'* (Independent, 29.5.2005) *At least half a dozen biotechnology companies are limbering up to float in London this year after 2004 proved to be the best year for the sector since the bursting of the technology bubble in 2001...* (FT, 6.1.2005)

Failure to use science letting down worlds poor says UN – Governments and development organisations are failing to exploit science and technology to alleviate poverty ... Cuba's biotech sector is among the world's most successful, despite the country's

poverty...Biotechnology can thrive in countries with per capita income of \$4,000 and good basic infrastructure.... (FT, 7.1.2005)

Public perception ...the mismatch between the daily agenda of the media and the glacial pace of research has set a familiar pattern, where the media turn tentative findings into headline news, and with equal glee, seize on the inevitable disappointments and failures that follow... (Telegraph, 29.6.2005)

On 'The challenge of the biotech century': In Britain, parliamentarians and judges have been drawn into the fray; bioethics played a big role in the US presidential election too, and even the UN has been forced to consider the ethics of biotechnology... (Guardian, 21.5.2005)

Health / Cloning/stem cell Cloning to create copies of human babies is outlawed in Britain but therapeutic cloning has been legal since 2002 (Guardian Unlimited, 8.2.2005)

There is nothing outrageous or immoral about human cloning – The Luddites have been at it again. This month Ian Wilmut won a license to clone embryos for research into motor neurone disease. No sooner had he done so, the critics were out, denouncing his work as 'Frankensteinian'...what can be more ethical than attempting to alleviate suffering through the development of new techniques? It is time we turned the ethical tables on the Luddites and their immoral arguments. (The Times, 19.2.2005)

On the legacy of Dolly the cloned sheep: The news of Dolly ... inevitably triggered often sensationalist speculation over the prospect of human cloning, prompting the German paper, Der Spiegel, to splash an image of a regiment of Hitlers on its cover... it can't really be said that there has been much of a debate on reproductive cloning; rather, it is just announced that it is 'unethical'... (The Scotsman, 18.2.2005)

He (Prof Ian Wilmut) seems to feel the burden of acting as a lightning rod for some of society's deepest fears – 'cloning Hitler' or as the Daily Mail asked in the days after Dolly's appearance, 'Could we now raise the dead?'... Wilmut, a former agricultural student who was diverted from farming by an interest in livestock research, is about as far removed from the image of the mad scientist cloning Hitler as it is possible to imagine... (Guardian, 26.7.2005)

The Daily Mail objects to Britain's stance on stem cell research, and argues that Britain's place at the head of any international cloning 'race' will come at a high moral cost: The race to clone embryos surely derives from a different agenda altogether – to put Britain in the forefront of scientific discovery. This serves the interests of scientists looking to win empires and Nobel Prizes, and of a government keen to cash in on the resulting economic bonanza and Britain's standing in the world. Britain might indeed achieve distinctive standing on this issue – but as a pariah. (Daily Mail., 23.5.2005)

Ethical considerations are also hampering stem cell research... Gerald Schatten, a stem cell expert at the University of Pittsburgh... argues that it would be unethical not to pursue stem cell therapies. (Guardian, 20.5.2005)

This is where the future lies: science fiction within our grasp – Despite being one of the most exciting areas of medical research in the UK, to most of us stem cell research is a closed and bewildering shop... The BioIndustry Association, which promotes bioscience in the UK, believes that stem cell research, and, more specifically, research into embryonic

stem cells, will not only provide valuable new information on fundamental cell biology but will also shed light on the complex mechanisms that drive diseases such as cancer. (Western Mail, 11.4.2005)

Three decades after a way to make them in the lab was developed, they are far from the 'magic bullet' once portrayed by the media. Gene therapy was trumpeted as a potential treatment for 4,000 inherited diseases and a vast range of ailments with a genetic component, from cancer to heart disease. But little progress has been made since the first clinical trial began in 1990...Lord Winston '...it is just that we must not make exaggerated claims. In the long run they will come back to haunt us. (Daily Telegraph, 29.6.2005)

Xenotransplantation Very little coverage appeared on xenotransplantation this year. It was mentioned in the context of an article about cloning in the FT: *An Asian triumph for therapeutic cloning research – One project is to grow pigs that are virus-free and compatible with the human immune system, as a source of organs for xenotransplantation.* (FT, 20.5.2005)

Human genome Genome coverage: *Life: All of human history can be written with four letters* (Guardian, 28.4.2005). *British scheme to map cancer genome wins backing from US* The Times, 29.3.2005) Announcement of Wellcome Trust Sanger Institute, Cambridge's unravelling of genetic code of African sleeping sickness, Chagas disease and leishmaniasis.

Agriculture / GM The GM debate continued, with clearly drawn pro and anti camps, and the majority of public opinion tending toward an anti-stance with scares such as the Char Superweed, feeding into health/diet/environmental concerns. Across the UK press the debate united voices which were more often opposed; the *Daily Mail* and the *Independent* for example, with Geoffrey Lean writing in both.

The debate over agriculture continued, with public opinion apparently stacked against GM crops: *Cautious suspicious or outright hostile – that's what the public thinks of GM crops. A report based on the GM Nation Debates ... showed that the vast majority of participants were opposed to the so-called 'Frankenstein' food.* (UK Newsquest Regional Press 1.6.2005)

Research reveals GM superweed – The first genetically modified superweed has been found after cross breeding GM oilseed rape with a weed in trials, according to new government research. Environmental campaign group FoE said the revelation raises serious concerns about the impact of growing GM oilseed rape in Britain and comes weeks after the UK tried to persuade other European countries to lift their own bans on growing GM oilseed rape. (Daily Post, 26.7.2005)

EU governments are deadlocked on the issue...meanwhile, evidence is mounting even in research by the biotech giant Monsanto that GM foods may endanger human health... (Daily Mail, 26.7.2005)

Farmers joined environmental campaigners and a cross-party group of AM's to demand tough new laws to prevent GM contamination of conventional crops (Western Mail, 1.3.2005)

Britain may pay price for botched GM debate says Reith lecturer (Times, 16.4.2005). BBC Reith lecturer and Royal Academy of Engineering president, Lord Broers suggested that the UK was losing out as a result of (misplaced) public hostility toward GM food: *The agrobiotech industry is now pulling out of Britain. Rather than discussions about the merits of each GM crop, say the scientists, the debate has been reduced to pro and anti GM.*

Consumer-led debate?: The problems have surfaced for biotechnology companies promoting GM crops in Britain, with the discovery of the countries first genetically-modified superweed. GM oilseed rape grown during farm trials has cross-bred with charlock to produce a mutant herb-resistant variety of the common weed. Environmental campaign group Friends of the Earth said the revelation raises more questions about the effects of growing GM crops... (Western Mail, 2.8.2005)

In May, a *Which?* survey suggested that public support for GM crops had fallen to 26%.

General medical “Magic bullet” for cancer coverage of molecular biotech in pharmaceutical industry: *How the war can be won – Doctors believe they have found the drugs to save millions of people from dying of cancer... The strategy in scientific terms is to identify molecular targets for cancer therapy... Transforming cancer into a chronic disease is just a promise for the majority, but it’s a realistic one.* (Sunday Times Magazine, 19.6.2005)

6.1.8 Nanotechnology

Nanotechnology received a relatively small but sustained amount of coverage in the UK press from 2000 to 2005. Much of this coverage combined sensationalism (*Clothes so smart they can even talk.* The Daily Mail. 23.8.2003) with scare-mongering (*Small but deadly.* The Independent. 22.12.2004), but this was tempered elsewhere with responsible and balanced reporting. Much of the coverage was also concerned with descriptions of what nanotechnology is, along with its existing and potential applications.

The two stories which appear to have gained most coverage and had the most influence on debates in the press during this period, however, were reviews of Michael Crichton’s novel *Prey*, which based its story on the unintended consequences and doomsday scenario, and Prince Charles’ announcement of his concerns about nanotechnology.

Coverage made significant use of science fiction imagery and metaphors. Press coverage of nanotechnology also included a significant number of computer generated images to describe the science, depicting so-called ‘nanobots’ working on blood platelets for example. Such science-fiction applications of nanotechnology undoubtedly have the newsworthy ‘wow’ factor, as reflected by the fact that more prosaic – and ready existing – applications such as *waterproof clothing and self cleaning glass* (Sunday Telegraph, 15.6.2003) received less press attention.

Coverage was divided between stories based on news releases emerging from the commercial sector (IBM, Intel etc) and stories emerging directly from university or otherwise independent research institutes. Commercial stories had the edge

overall, and the economic promise of nanotechnology received significant coverage.

6.1.9 2000

6.1.9.1 Summary Nanotechnology, heralded as the so-called Nanotech Revolution, was portrayed across the media as *the* emergent new science. Coverage was typified by a combination of hyperbolic sci-fi imagery and doomsday predictions of a world taken over by self-replicating nanobots. The potential technological, medical and other applications of the new technology were considered. Reports tended to focus more on the future possibilities opened up by nanotechnology than on the science of nanotechnology itself.

6.1.9.2 Major stories from 2000 Bill Joy, US co-founder and chief scientist at Sun Microsystems issued dire warnings about the dangers of nanotechnology in an article published in US technology magazine *Wired*, which was quoted widely across the press.

The Sunday Express reported: *Billions of dollars are being invested in trying to build sub-microscopic machines and circuits – nanobots – atom by atom. These will revolutionise manufacturing technology but also have the potential to eliminate all life on Earth, out-evolving flesh, blood, leaves, and wood to cover the planet with what Joy calls ‘grey goo’* “ (*Sunday Express*. 26.3.2000).

The Times discussed Joy’s position: *His article, Why the Future Doesn’t Need Us, is being compared to Einstein’s 1939 letter to President Roosevelt alerting him to the possibility of a nuclear bomb...Mr Joy foresees a ‘rerun’ of the nuclear arms race, but this time, unlike the original Manhattan Project that developed the atom bomb, it will be driven “by our habits, our desires, our economic system, and our competitive need to know.”* (*The Times*, 15.3.2000). Joy explained his position as a computer scientist trying to make the world a safer and better place, but indicated that he could now conceive of a time when his work could be used for opposite ends.

Similarly, *The Independent* reported: *Homo Sapiens RIP. Bill Joy is not a Luddite. He is not afraid of new technology. On the contrary, as chief scientist at Sun Microsystems ... he has been in the vanguard of the hi-tech revolution for more than 20 years: a geek’s a geek if ever there was one. But recently Joy took a glimpse into the future and it scared him to death.* (*Independent*, 15.3.2000)

The Edinburgh Evening News reported the story: *Robots have ability to kill us all, says top scientist* (15.3.2000).

There was coverage of a report from the government backed Foresight group of ‘futurologists’ who suggested that nanotechnology advances would allow: *Paints that can be programmed to change to suit people’s daily moods* (*The Newcastle Journal*. 1.6.2000).

The future is minute, say scientists, microscopically, frantically minute. The promise of thinking small will be startling, say proponents of nanotechnology, the science of the absurdly small. Soon, aspirin-sized capsules will monitor our arteries; tiny computers in our clothes will tell our washing machine how hot its water should be; recording machines will store the entire Encyclopaedia Britannica on pinhead-sized records; and microscopic sensors in wristwatches will monitor dust-particle levels which threaten to trigger asthma attacks. (*The Times*, 15.3.2000).

The Scotsman reported: *Small wonders will make science fiction a reality* (10.4.2000). Giving everyday examples of the possible applications of nanotechnology which dominates a lot of the coverage: *A computer in clothes will tell the washing machine what the water temperature should be. Ballpoint pens will blink a warning when their ink gets low. Your shoes will let your car know you are approaching, so it can adjust the seat and mirrors and unlock the door.*

6.1.10 2001

6.1.10.1 Summary There was a relatively small amount of coverage of nanotechnology developments in the UK press in 2001. Most of these were feature pieces concerned with potential applications in fields of product design, medicine, IT and industry.

6.1.10.2 Major stories from 2001 The *Financial Times* reported in June that £18m of public funds were to be invested in nanoscience collaborations at Oxford and Cambridge universities (15.6.2001).

In a rare piece based on the announcement of new university produced nanotech research, The *Independent* reported findings published in *Science* produced by St Andrews, under the byline *It's a tractor beam Scotty, but not as we know it* and going on to report the development of laser-based optical tweezers potential role as a vital part of the new science of nanotechnology, *where engines, cogs and wheels are built on the scale of atoms.* (The *Independent*, 4.5.2001).

The applications and investment opportunities in Nanotech industries continue to be excitedly reported across the press. Even the FT didn't shy away from hyperbolic sci-fi imagery: *A miniature world of tubes balls and locusts...invisible machines with components only a few atoms thick are swarming over a lump of coal. By imperceptible degrees, they rearrange each atom of the coal and turn it into diamond. This may sound like something out of a novel by H.G.Wells but to nanotechnologists it is far from science fiction...Most of this work will not be seen outside the laboratory for some time...scientists do not predict the industrial use of nanomachines for another 10 or 20 years. Time enough to prepare for the grey goo.* (FT, 23.4.2001)

The promise of nanotech's applications was encapsulated by headlines such as this one in the *Daily Mail*: *Clothes so smart they even talk.* (*Daily Mail*, 23.8.2001), and by the *Times*: *Small step for mankind.* (The *Times*, 26.11.2002)

The *Birmingham Evening Mail* reported on the UK government's release of funds for research into nanotechnology (alongside biomaterials, sustainable energy and mobile wireless communications), highlighting a pro-technology for business policy (*Birmingham Evening Mail.*, 5.3.2001).

6.1.11 2002

6.1.11.1 Summary Nanotechnology received slightly more press coverage in 2002. Most of this remained concerned with hypothetical applications, scare stories and counter-scare-stories.

6.1.11.2 Major stories from 2002 *Tiny warriors will fight battles in bloodstream – Futuristic visions of tiny vessels smaller than a human cell travelling through a patient's bloodstream to deliver precise doses of medicine could soon become a reality...* (The Scotsman, 16.1.2002).

Of all the goals of nanotechnology and biomimicry, self-assembly seems the most far fetched...But the reason technologists are optimistic of success comes from the growing convergence of molecular biology, materials science and electronics. Biological nanomachines such as the ribosomes that manufacture proteins in every cell can be seen to assemble themselves in the test tube.. (Guardian, 9.5.2003).

Future science – The future is just around the corner, and it might be more amazing than you think. IBM are leading the way in making ultra-powerful, microscopic computers the size of atoms...Tiny devices could even carry out repairs. A fantastic voyage indeed. (Irish News, 27.7.2003).

The Daily Mail discussed outlandish fears: Grey goo armageddon – One couldn't imagine a more depressing way for the world to end...with the ultimate whimper; as all life dissolves – in a matter of hours – into a mass of formless grey goo.. Nanotechnology at present exists more on the pages of theoretical journals than in reality (just as computing did in the Forties)...if enough money is thrown at it, nanotechnology could be with us sooner than we think. If this happens, the age of the nanobot will soon be upon us. We will have to hope the future remains bright, not grey. (Daily Mail, 22.1.2003)

Nanotech was also reported as a financial story, indicating that nanotechnology could be “the next big thing” in sci/tech investment. The development of a nanotech centre in the north east; centred round the University of Newcastle, was announced the sector optimistically reported on in the press: *Nanotech is the new name on investors lips (Birmingham Post, 19.2.2003).*

Similarly The *Newcastle Journal* reported the establishment of the Centre for Nanoscale Science (CNSAT) based at the University of Newcastle with the purpose of forming a hub for research and business technologies in the area (*The Journal*, 5.12.2002).

The *Financial Times* laid out the potential of nanotechnology investment in a piece underlying the significant government support for such research, countered by wariness amongst investors. Out of 100 investors asked the FT reported that just under half claimed: ‘misguided promises that nanotechnology can fix everything’ were the biggest potential cause of a backlash against the technology...the piece goes on to outline: nanotechnology is not a set of easily defined products. It is definitely not a distinct industry. The tools and techniques of nanotechnology may affect just about any business that makes things. (FT, 5.09.2002).

Later in the month, The *Financial Times* suggested that fears about the perceived risks and dangers of nanotechnology were limits to its potential growth as a revenue-generating technology. The article cited Harvard professor of nanoelectronics Charles Lieber, suggesting that in promoting dialogue with the public early, nanotechnology could avert the kind of public relations disaster hindering other research areas. (FT 25.09.2002).

September saw The *Times* report: *A researcher hailed as a genius of nanotechnology is under scrutiny for his results.* (18.09.2002). Discrepancies in graphs used by the US-based German researcher were flagged up following it being published in *Science and Nature*. The *Times* saw this as a challenge to such respected journals to rethink how they validate such specialised but potentially revolutionary research.

December saw the UK launch of Michael Crichton's book *Prey* which presented a doomsday scenario of a cloud of self-replicating lab-escaped nanoparticles plaguing the globe. This novel was reviewed across the press: *Is it a bird? No, it's a cloud of escaped microrobots coming to get you* (The Observer, 15.12.2002).

6.1.12 2003

6.1.12.1 Summary Nanotechnology received a significant amount of press coverage during Spring of 2003, with Prince Charles writing to the Royal Society to voice his precautionary concern about nanotechnology.

6.1.12.2 Major stories from 2003 The *Guardian* reported on the Prince's advocacy of the precautionary principle with regards all science. This was challenged by an experimental physicist at Nottingham University who suggested that: *There is a genuine debate to be had about the future of nanotechnology, but grey goo isn't it...It has to be said that very few scientists working in nanotechnology take the prince seriously.* (Guardian 23.12.2003)

Headlines are full of nanobots (robots that are little bigger than a few molecules), grey goo (which is all that will be left when the nanobots have taken over the planet), and imminent apocalypse – either that or nanotechnology making us immortal and/or saving the planet...When a term encompasses everything on the molecular scale from physics to chemistry to biology and biochemistry, it becomes unclear what use it is. And the term has been stretched by scientists keen to be involved in the nanotech revolution. (Guardian, 6.11.2003)

The *Financial Times* reported on the Royal Society for the Encouragement of Arts, Manufacturing and Commerce's "Forum for Technology, Citizens, and the Market": *one focus will be public concerns about nanotechnology. The Royal Society and the Royal Academy of Engineering are conducting a study that will increase understanding of the risks of nanotechnology across Europe, while seeking to allay any unnecessary fears. Public fear of nanotechnology has been fuelled recently by public figures ranging from thriller writers to members of the English monarchy...'We want proper testing, which hasn't been done yet', explains Pat Mooney, executive director of ETC (Action Group for Erosion, Technology and Concentration). The scientists have some worrying precedents for what can happen when the dialogue between technicians and the public breaks down...These examples have impressed upon nanotechnologists the need for public accountability.* (FT, 15.1.2003).

Headlines such as: *Will nanotech become the next biotech bubble?* (FT, 19.3.2003), focused on nanotechnology as the next big thing for investors, whilst those such as: *Grey goo armageddon* (Daily Mail, 22.1.2003), sensationalised the perceived risks.

The *Guardian* discussed the definition of nanotechnology. The article suggested that: *In many ways the definition of nano is so broad that it is an unhelpful prefix...for them (scientists) anything remotely small becomes nano-technology. Whilst for most of us nanotechnology means building tiny, tiny machines, that sort of thing* (The Guardian, 6.11.2003).

The *Times Higher Education Supplement* suggested: *Nanoscience and nanotechnology (N&N) represent a new perspective but certainly not a new field. We are just getting better at assembling larger and larger bunches of atoms and molecules to do more and more things; a bottom-up approach to assembly.* (THES, 18.7.2003).

TES also reported on Science Minister Lord Sainsbury's concern to prevent nanotechnology becoming a media scare story to rival GM. He was keen to emulate the stem cell debate, which he saw as a success story for science communication (TES, 27.6.2003).

The *Herald*, amongst others, reported on the Royal Society and the Royal Academy of Engineering being commissioned to carry out a study on the potential benefits and dangers of nanotechnology (12.6.2003).

6.1.13 2004

6.1.13.1 Summary Coverage in 2004 continued to be a mix of miracle and scare stories, with reflection on the need for a full public consultation in wake of the continued GM crop scares and a perceived 'anti-science' backlash. 2004 also saw continued coverage of Prince Charles' contribution to the nanotech debate. He received widespread criticism and ridicule for drawing parallels between the effects of Thalidomide and similar as-yet-unknown side effects of nanotechnology applications.

Attempts to avert a 'public opinion debacle' saw calls for more public consultation and 'transparency' in debate about nanotechnology, its development and application. Amid concern that most people don't know what nanotechnology is, (a survey conducted by the Royal Society showed that only 29% of the population even recognised the term 'nanotechnology'), its existing applications and possibilities for the future were addressed across the press.

In September, the think tank Demos published a report which called for the government to engage the public in a debate about nanotechnology and its applications to prevent "another GM debacle". This report received substantial coverage.

6.1.13.2 Major stories from 2004 Efforts were made to explain the new science in understandable terms: *Much of this research is based on the round assembly of 60 carbon atoms known as the buckyball, or fullerene...Buckyballs have remarkable characteristics. If you shoot one of these virus-sized particles at a steel plate at 15,000mph, it bounces back unharmed...viruses are an example of naturally occurring nano-sized particles. (Independent, 11.12.2004) Nature has been doing nanotechnology for millions of years. A gecko's feet for instance have superfine hairs which can slip between the molecules of other substances allowing the creatures to hang upside down on glass... (Western Mail, 26.11.2004)*

In July, Prince Charles' op-ed in the *Independent* on Sunday, in which he drew a parallel between the unknown risks of nanotechnology with the effects of Thalidomide, caused a furore: *SMALL IS HAZARDOUS – ...As someone whose wife luckily escaped from being prescribed thalidomide when pregnant, I remember such difficulties vividly. It would be surprising if nanotechnology did not offer similar upsets unless care and humility is observed. (Independent on Sunday, 11.7.2004)*

Reactions to Prince Charles *Nanoo Naoo - And so it has come to pass that the Prince of Wales – no small anxiety himself to supporters of cutting-edge science and new and exciting architecture – has expressed his disquiet about nanotechnology...And now we are confronted by an outbreak of ermine goo: the unleashing of self-replicating royal pronouncements on progress... (Times, 12.7.2004)*

Scientists accused Prince Charles of causing an unfounded scare today over his latest warnings about the new science of nanotechnology...Fertility expert Lord Winston said it was 'very unfortunate' that Charles was feeding a growing suspicion of science in society. (Evening Standard, London, 12.7.2004).

Reactions to the DEMOS report Nanotechnology is set to become the next 'GM scare', to the detriment of true debate...Given its vast possibilities, scientists ought to be looking forward to public discussions of this nascent science. Unfortunately, this is not the case...The sinister antics of the Green Goblin, the alter ego of the hed of a nanotech firm in the Spider-man films, probably sums up current popular exposure to the subject... (Times, 25.10.2004).

Eva Oberdoster, a toxicologist at Southern Methodist University in Dallas, Texas told nanoscience researchers that water laced with all-carbon nanoparticles called buckyballs could damage cell membranes in the brains of fish. The story was picked up by newspapers around the world. Researchers and policymakers fretted that such coverage could poison public perception of all things nano...and tar the science with the same brush as previous abortive revolutions such as agricultural biotechnology and nuclear power...the field stands at a critical crossroads in public perception around the world... (FT, 18.6.2004)

New regulations are needed to protect human health and the environment from unknown threats that might be posed by nanotechnology, a government advisory panel recommended yesterday. (Times, 30.7.2004)

The FT reported on the DEMOS report: An urgent public debate on nanotechnology is needed to prevent another anti-science backlash, according to an independent think-tank. Demos warned scientists and technology companies exploiting nanotechnology ... that they could face a public outcry similar to the row over genetically modified crops. The government should start a public debate at an early stage of research and development, so legitimate concerns about new technologies could be fully considered, it said in a report published today. (FT, 1.9.2004)

The Times reported on the anti-nanotech lobby, and parallels to GM debate: In that 'debate', anti-GM campaigners had to make some effort to generate popular concern through the media before they then presented their views as those of the public and used that as their entry ticket to policymaking...With nanotechnologies, campaign groups have had to make no such effort. They have secured their place as mediators of 'public concerns' in the alphabet soup of official and semi-official science policy bodies from the outset (or 'upstream' as the think-tank Demos called it in a recent pamphlet. Such a desire to influence policy would be fair enough – we are all free to argue a case – but for the fact that the activity is presented as promoting 'public involvement', 'democratising science' and 'reinvigorating democracy'. It is none of these...Groups such as Greenpeace are hardly disinterested vehicles for public opinion (Times, 25.10.2004)

And:

...opponents foresee dire consequences, environmental degradation, a widening of the gulf between rich and poor even the eventual extinction of the human race (UK Newsquest regional press – This is Wiltshire, 3.2.2004).

Scientists on nanotechnology in the press Nanotechnology – the science of the incredibly small – may pose a threat to health, scientists said yesterday. Nanoparticles,

the ultrafine powders produced by the industry, can build up in the brain if they are inhaled...Scientists suspect that nanoparticles from diesel fumes exacerbate heart disease, asthma and other respiratory diseases. (Guardian, 9.1.2004).

'Grey goo' is science fiction' says Ken Donaldson, professor of respiratory toxicology at the University of Edinburgh ...the need for public accountability. A moratorium on research, along the lines of that on GM crops, would be a 'disaster', says Prof. Donaldson. The promise of nanotechnology...is too great to be neglected. But in order to reassure the public, scientists need to engage in public debate... (FT, 15.1.2004)

Some coverage focused on potentially life-changing applications of nanotechnology, including: Cosmetics and skincare (Guardian, 8.5.2004, 132 txt). Nanotechnology helping deaf children hear – cochlear implants and BMW and Mercedes ... introducing nanoscale features which can sense if the car is heading for a collision and gauge tyre pressure...Without nanotechnology, you wouldn't have CDs, you wouldn't have inkjet printers. (Evening News, Edinburgh, 30.7.2004). Cure for cancer, eliminating dependence on hydrocarbon fuels. (TES, 18.6.2004).

TUC's Brendan Barber, on Royal Society/Royal Academy of Engineering report: This isn't an apocalyptic warning about 'nano-goo' or renegade 'nanorobots', but a genuine concern for the safety of staff breathing in and absorbing tiny, toxic particles. (Evening News, Edinburgh, 30.7.2004).

6.1.14 2005

6.1.14.1 Summary UK debates over nanotechnology were influenced and to some extent dictated by new approaches from a government concerned with fostering a knowledge-based economy (DTI estimates spending on nanotech research is at least £85m per annum). Industry, scientists and the media attempted to engage the public at as early a stage as possible in debates about science and technology and "upstream engagement" exercises.

6.1.14.2 Major stories from 2005: The NanoJury project was launched, involving the *Guardian*, Greenpeace, the Policy Ethics and Life Sciences Centre at the University of Newcastle, and Mark Welland, Professor of Engineering at Cambridge University: *We have learned lessons from other areas, such as GM, where science, exploitation and public concerns have been disconnected from each other. Ten years ago, when nanotechnology began to hit the headlines, terms such as citizen's jury, public engagement and democratisation of science were grouped together in my mind as a science fringe activity largely patrolled by pressure groups. (Guardian, 19.5.2005)*

The Independent on Sunday discussed allegedly skewed public perceptions of nanotechnology: It's probably fair to say that what most people know about nanotechnology will have come from one of two sources – Michael Crichton's novel Prey, in which evil swarms of nano-sized robots flutter about the place; and the speech in which Prince Charles warned of the possibility that self-replicating nanobots could churn up the entire biosphere into a mass of 'grey goo'. (Independent on Sunday, 13.3.2005)

ThES discussed public perception of risks involved in nanotech: As the policy think-tank Demos emphasised recently, this is about more than risk analysis. The assumptions of nanoscientists, Demos says, and their visions of a future of ultra-high-tech society, 'need to be brought to the surface and opened up to public debate. (In a climate

where) ...people no longer accept assurances that new technology is good. (ThES, 28.1.2005)

The *Daily Telegraph* also discussed risk: Outstanding examples are the carbon fibre reinforced materials, especially those that use carbon nanotubes only a few nanometres in diameter, and the sun screens that include nanometre size titanium oxide particles to absorb ultra-violet radiation. Like every technology, there have been worries. (Daily Telegraph, 13.4.2005)

The *Guardian* addressed the motivation for NanoJury: Both (Greenpeace and Cambridge University) wanted to avoid another GM-style fiasco, where business charged ahead oblivious to public sentiment. (Guardian, 28.7.2005)

Insurance Day discussed the risk of unknown technologies and applications: Applications of nanotechnology ...are definitely bringing a range of benefits and hazards that have sprung up too fast for many to comprehend. As insurers and legislatures play catch-up, consumers are being left on the starting blocks and may have questions later. (Insurance Day, 2.8.2005)

In the EU context: Nanotechnology is a key area where Europe is in the lead... The European funding initiative will aim to see E4bn being made available between 2007 – 2013... The result of the EC's proposal would be the creation of a European centre for biology and electronics. The co-ordination point would also ensure that ethical principles are respected and that citizens' concerns and expectations would be taken into account... There are proposals to build risk assessment into the research and developing guidelines... (Insurance Day, 22.5.2005)

The Royal Society and Royal Academy of Engineering report on nanoscience and nanotechnologies included the recommendation: that public debate should be developed whilst the technology was still in its infancy. (TES, 28.1.2005)

The FT quotes Doug Parr of Greenpeace: the longer term issues of the social, environmental and ethical impacts of nanotechnology are barely recognised... Government has a key role in helping steer the debates to come – decisions cannot be left to markets structured around yesterday's technologies. (FT, 26.2.2005)

6.1.15 Nuclear energy

Between 2000 and 2005, a substantial shift was evident in the focus of UK nuclear press coverage. In 2000 coverage focused on international issues, cases of decommissioning, safety scares and political and financial stories about UK nuclear providers, many of them negative. This coverage was presented against a backdrop belief that nuclear was being phased out in the UK. The UK public was accepted to be firmly against nuclear power as an energy option, and the process of complete decommissioning in the UK thought to be under way.

Towards 2001, there was some suggestion in the UK press that nuclear power was back on the political agenda. Following Kyoto, climate change was a major political concern in the UK, and nuclear energy was put forward as a potentially valuable low-carbon energy resource.

The climate change debate dictated the discussion of nuclear energy for the rest of this period. The debate was presented as an argument between an influential pro-nuclear lobby (including many prominent environmentalists as well as politicians and civil servants) and an anti-nuclear environmental lobby. Both sides claimed that their arguments were grounded in environmental concerns.

The debate took place against a backdrop of overall public scepticism about the environmental worth of nuclear energy, concern about safety (including potential terrorist attacks on nuclear sites) and scepticism about the trustworthiness of the UK nuclear energy industry. Press opinion appeared to shift slightly towards the pro-nuclear position in 2005.

Amid discussion of nuclear energy as a national and political issue, there was a steady stream of local coverage about specific safety risks and re/decommissioning issues in the local press. This was particularly concentrated in Scotland, probably due to the comparatively high number of nuclear energy and waste sites in the country.

6.1.16 2000

6.1.16.1 Summary UK press coverage of nuclear issues from 2000 presented the following trends:

- The coverage was fairly balanced, but with a slight lean towards the negative. Positive coverage focused on the potential of nuclear energy as a low-carbon resource, while negative coverage focused on specific safety scares in the UK and abroad, with a particular emphasis on the performance and safety record of the Sellafield processing plant
- Having pointed out the substantial coverage of nuclear as a low carbon energy resource, it should be noted that this option was not fully explored in 2000. The majority of nuclear news coverage was devoted to decommissioning and safety issues
- While most coverage focused on UK nuclear issues, some international stories received attention, particularly the Kursk submarine disaster (which in many cases was framed as a specifically nuclear story) and the announcement of the closure of the final working reactor at Chernobyl
- Reactor safety was a very important issue for local newspapers (particularly in Scotland), as reflected in the constant stream of Scottish coverage about the safety of the Dounreay power station

6.1.16.2 Major stories from 2000 The FT, the *Times* and the *Guardian* approached the question of nuclear power's return to the energy agenda in light of climate change. The FT suggested that: *Halting further development has proved much easier than closing existing plants, much to the frustration of Greenpeace and other environmentalist groups.* (FT, 25.2.2000)

The spectre of Chernobyl lingered on in UK press coverage of the nuclear issue. The *Scotsman* reported on the closure of the Ukrainian plant's last operational reactor: *The Chernobyl power plant, scene of the world's worst civil nuclear disaster in 1986, will be closed down at the end of the year, the Ukrainian president, Leonid Kuchma, announced yesterday.* (6.6.2000, The Scotsman)

The *Guardian* meanwhile reported on the UK's nuclear industry being on the up, focusing on technical and financial issues: *Thanks to Sellafield's troubles, the future of nuclear power is up for grabs again. Recently the nuclear industry has been upbeat...It is*

up to the Government to promote innovation and bring forward options that will allow climate change to be tackled. This might not be so difficult. (Guardian, 22.2.2000)

The *Independent* reported on the ongoing controversy surrounding the Sellafield nuclear waste reprocessing plant: *The rise of the green movement and the public's general distrust of nuclear power has forced many governments to reconsider other, non-nuclear forms of energy generation. And finally, last September's revelation that a few BNFL workers had falsified quality- control data on Mox fuel resulted in a cascade of events culminating in the company losing the confidence of its major customers and being publicly lambasted by Her Majesty's Chief Inspector of Nuclear Installations. (23.06.2000, Independent)*

The *Newcastle Journal* put nuclear power debates in historical context, referring to the 1950's: *The claim then was that nuclear generated electricity would be "too cheap to meter". It never has been, of course. The article quoted Prof. Bob Harrison of Sunderland University, who suggested that in the future power is likely to come from a mix of sources, including nuclear.*

A number of Scottish newspapers voiced concerns about safety at the Dounreay power station: *A radioactive particle has been found on a beach near Dounreay (Scotsman, 19.02.2000). First Minister Donald Dewar ordered management at Dounreay to get a grip on safety after a Health and Safety Executive report 18 months ago highlighted 143 recommendations for improvements (06.02.2000, Sunday Mail).*

The *Independent* reported on the Kursk submarine disaster, focusing on the submarine's nuclear capacity: *Russian officials yesterday sought to reassure the world that there was no danger of radiation leaking from its sunken nuclear submarine. (26.08.2000 Independent)*

6.1.17 2001

6.1.17.1 Summary UK press coverage of nuclear issues from 2001 presented the following trends:

- The possibility of nuclear energy as an alternative low-carbon energy resource was fully explored. The question of whether to go 'pro-nuclear' was widely debated, amid reports that powerful lobby groups in the civil service and the financial sector were supporting a return to nuclear power for the UK
- Local coverage continued to address safety and environmental concerns about specific plants, especially in Scotland
- There was some indecision as to where the impetus for a return to nuclear was coming from. Some argued that economic and environmental factors all pointed towards a return to nuclear, while others argued that the shift has been powered by an influential lobby rather than by practical concerns
- Nuclear energy was reported as a financial, political, environmental and local interest story this year

6.1.17.2 Major stories from 2001 Nuclear power was widely reported as a financial story. The *Sunday Telegraph* reports: *Top executives are known to feel that the economics of power generation is swinging in favour of building new nuclear power plants. They are also conscious that nuclear electricity is the one form of power that does not contribute to global warming. There is a view that, far from being viewed as a pariah, nuclear power generation should be given a tax advantage in a world which is obsessed with climate change. (Sunday Telegraph, 4.3.2001)*

The *Guardian* discussed the pro-nuclear lobby within the civil service: *Nuclear option back on agenda - The public dislikes the idea and the economics do not support it - but atomic energy could nevertheless be set to return. There is a very large nuclear lobby in the UK not least including the chairman of the review (a Cabinet Office review of energy policy and needs), Brian Wilson. The biggest nuclear energy advocates have always been inside the DTI.* (*Guardian*, 28.6.2001)

There was a lot of coverage in the Scottish dailies, and elsewhere, of decommissioned nuclear power plants in Scotland being in line for re-commissioning.

The *Financial Times* argued that the public needed to *reconcile its alarm over global warming with its aversion for nuclear energy* (FT, 11.1.2001). It reported that environmentalists and anti-nuclear activists point to the issue of nuclear waste disposal as undermining any claims that nuclear presented a 'green' alternative to coal and gas. They also argued that nuclear is expensive, dangerous and has links to wider nuclear proliferation. Mid-way in the debate were the Royal Society and the Royal Academy of Engineering who said: *The nuclear option should be kept open until it can be demonstrated that the renewables industry has developed to the extent that it can replace this carbon-free source of power.* (FT, 11.1.2001, 14247 txt).

In a lengthy article interviewing the incoming chairman of BNFL, Hugh Collum, the *Independent* presented both sides of the nuclear argument, quoting Mr Collum as saying: *The most important thing is to improve the perception of nuclear energy. That's the biggest issue in the industry. So many people refer back to Three Mile Island or Chernobyl, bearing in mind (they) were in 1979...and 1986...It was a long, long time ago and technology has come a long way since then...Lobby groups will not be put off campaigning against all things nuclear. Friends of the Earth says the biggest issue is without doubt the management of nuclear waste.* (*Independent on Sunday*, 2.9.2001)

There was also coverage of US energy policy going pro-nuclear, reporting on the increased likelihood that the UK would follow suit. (*Scotland on Sunday*, 20.5.200)

6.1.18 2002

6.1.18.1 Summary UK press coverage of nuclear issues from 2002 presented the following trends:

- The resurgence of nuclear power as a low-carbon energy option for the UK continued to be explored, and the actions and opinions of the pro-nuclear lobby were extensively reported
- Reporting on the pro-nuclear lobby occurred against a backdrop of general public scepticism about nuclear power, based on a combination of apprehension about the technology itself, concerns about waste disposal, and general mistrust of the UK nuclear industry
- A number of comment pieces voiced support for the idea that nuclear power is an environmentally friendly option
- British Energy received substantial negative coverage in both the financial and the mainstream press
- Safety concerns at specific nuclear sites continued to be reported, but overall nuclear coverage focused on the national energy debate this year

6.1.18.2 Major stories from 2002 The *Sunday Herald* reported on the decline of British Energy: *The underlying problem – the hopelessly uneconomic nature of nuclear power – will persist. The pitiful plight of British Energy is a direct result of the high cost of ensuring nuclear safety and of dealing with the dangerous radioactive wastes reactors inevitably create.* (*The Sunday Herald*, 8.9.2002)

The *Times* covered the nuclear energy debate, and considered whether the benefits outweigh the risks, suggesting that in any case: *Whatever experts think, public opinion may still make nuclear power an unacceptable option.* (*Times*, 20.7.2003)

Blair set to put nuclear power back on line – Tony Blair is edging towards a decision to back a new generation of nuclear power stations in a policy shift that would outrage environmental groups and many on the Left...A key figure behind the expected shift in government policy is David King, Mr Blair's Chief Scientific Adviser. Previously a sceptic on conventional nuclear power, Professor King now believes that the option needs to be revived if Britain is to combat global warming. (*Times*, 2.9.2003)

The *Daily Telegraph* presented nuclear as the 'green' option: *Environmental menace or friend of the earth? If lobsters, rabbits and geese had a vote, there is no doubt they would say: 'Nuclear power? Yes please'* (*Daily Telegraph*, 21.5.2003)

The *Independent* was also positive about nuclear: *The generation of electricity by nuclear power is becoming an increasingly desirable proposition...All technology carries some risks, but the advantages of nuclear power seems unquestionable.* (*Independent*, 3.6.2003)

The *Daily Mail* reported on speculation that British Energy was to be given government tax breaks: *Labour mired in a nuclear shambles - ...conflicting messages as evidence that the Labour Party is in turmoil over the issue...* (*Daily Mail*, 11.2.2003)

6.1.19 2003

6.1.19.1 Summary UK press coverage of nuclear issues from 2003 presented the following trends:

- The major nuclear story this year continued to be the possibility of a return to nuclear energy in the UK, in the belief that this would provide a more environmentally friendly and low-carbon resource than other technologies. This was reported against the backdrop of a predicted 'energy crisis', and the belief that the UK needed to quickly come up with low-carbon energy solutions
- Unlike press coverage and debates about biotechnology, nanotechnology and genetic research, the nuclear debate and its press coverage continued to be fairly down to earth, avoiding 'sci-fi' language and futuristic scene-setting. This was probably due to the fact that the debates have been had before, and the science underpinning nuclear technology was apparently more well-established
- The debate over whether to 'go nuclear' was presented as a head-to-head between nuclear lobbyists and various environmental groups, with newspapers increasingly taking sides on the issue. Both sides of the debate argued that their position is grounded in environmental concerns

6.1.19.2 Major stories from 2003 Debates across the press focused on nuclear power as a possible future energy source, in the wake of dwindling gas and oil supplies and fears about climate change: *Britain must build a new generation of nuclear power stations to prevent*

blackouts and fight global warming. Sir Alec Borsers, the president of the Royal Academy of Engineering, said that the government plans to generate 20% of electricity from renewable sources by 2020 were unrealistic and investment in nuclear power was critical if shortages were to be avoided...Sir David King, the Government's Chief Scientific Adviser, has made the same recommendations. Roger Higman, of Friends of the Earth, disputed the need for new nuclear power stations, however, saying that there were better ways of reducing greenhouse gas emissions. 'Nuclear power is expensive, dirty and unreliable', he said. (Times, 18.8.2003)

The Sunday Herald reported on the Energy White Paper: The nuclear enthusiasts, led by the energy minister, Brian Wilson, and thought to include the Prime Minister Tony Blair, have lost out to the nuclear sceptics, notably Environment Secretary Margaret Beckett and Welsh Secretary Peter Hain. 'This White Paper does not contain proposals for building new nuclear power stations' says a leaked draft. (Sunday Herald, 23.2.2003)

Head of BNFL, Hugh Collum in the Sunday Telegraph: He would be delighted if the events of recent weeks (blackout in London) forced ministers (who are obsessed with renewable energy to the detriment of nuclear) to engage their brains on the issue of the UK's future energy supply... 'the new reactor models are very safe and, while nuclear waste is an issue, it's very much under control...there is still exaggeration and emotion around this, exaggeration when it comes to renewables and emotion when it comes to nuclear. (Sunday Telegraph, 7.9.2003)

6.1.20 2004

6.1.20.1 Summary UK press coverage of nuclear issues from 2004 presented the following trends:

- The debate over whether to support the re-introduction of nuclear power continued as before. There was continued mistrust of the UK nuclear industry, exemplified by the stream of negative coverage of controversies surrounding the Sellafield power plant. This was balanced against a general acceptance of the urgent need for low-carbon energy solutions
- Many reports looked internationally for insight into the nuclear option. The potential influence of the US on UK nuclear policy was reiterated
- The nuclear debate was reported across all sectors of the press, and was clearly seen as a key domestic political and environmental issue
- There was substantial coverage of nuclear issues in Scotland, due to the comparatively high proportion of nuclear sites there, and the development of nuclear waste dumping plans
- Obstacles to UK support of the nuclear option were reported as: waste disposal, safety (including safety from terrorist attack), scepticism about the trustworthiness of the UK nuclear industry, concern that the public were being misled about nuclear energy's environmental benefits

6.1.20.2 Major stories from 2004: Controversy over the safety of the Sellafield nuclear plant continued, as the *Financial Times* reported: The European Commission plans to take the UK to court for failing to provide proper information about nuclear material stored at its controversial Sellafield plant and for not giving European safety inspectors adequate access to the site (*Financial Times*, 25.03.2004) Sellafield continued to be reported as a national political story rather than a local interest safety issue.

The US influence on UK nuclear policy was discussed in the FT: *In Britain – where all nuclear plants except one are scheduled to shut by 2023 – Tony Blair...told a parliamentary committee in July that while the government had not agreed to a new generation of British nuclear power stations, he believed the UK should not ‘close the door’ to the idea. He said that the US had been pressing him to look again at the nuclear option*(FT, 10.8.2004)

A report in the *Guardian* Science section debated whether nuclear power could be a safe, environmentally friendly option for the future: *Nuclear power is back on the march...billing nuclear power as the only practical way of countering climate change...so is it possible that public opinion is wrong, and that nuclear should be the fuel of choice for the future?...In many other places, including Britain, there is little or no public support. Nuclear has, however, found an important niche market in Asia...*(*Guardian*, 12.8.2004)

Within the debate there was concern about nuclear waste disposal, pollution, safety and expense, as well as nuclear power facilities being potential targets of terrorism: *Germany’s nuclear power watchdog Bfs wants five of the country’s 18 reactors shut down because of the fear of terrorist attack.* (*News of the World*, 22.02.2004)

Scottish local coverage of nuclear issues continued amid concerns that Scotland was to become the UK’s nuclear waste dumping ground: *Green activists warned yesterday that Scotland is in danger of becoming Britain’s nuclear dustbin. Research by Greenpeace shows that more than half of the 45 sites identified as possible radioactive dumps are north of the Border.* (*Daily Record*, 03.02.2004)

6.1.21 2005

6.1.21.1 Summary UK press coverage of nuclear issues from 2005 presented the following trends:

- A number of influential environmentalists voiced their support for a return to nuclear energy in the UK
- The 'energy crisis' continued to be emphasised, adding further urgency to the debate
- Nuclear energy was increasingly presented as a political story, something that Labour would have to address quickly following their election victory
- A gradual shift towards a pro-nuclear position was evident in much of the coverage. There was an overall sense that the risks of nuclear should be balanced against the urgency of the need for low-carbon energy technology that works
- Local press coverage of safety and de/recommissioning issues continued, particularly in Scotland and around Liverpool

6.1.21.2 Major stories from 2005 A number of environmentalists including Gaia theorist James Lovelock came out in favour of nuclear power. The *Times* reports: *Concerns over global warming, Britain’s dependence on overseas fuel sources and soaring energy costs last year led to a resurgence of interest in nuclear power. Among those to endorse nuclear power were James Lovelock and Bishop Hugh Montefiore, two leading environmentalists.* (*Times*, 18.01.2005)

The debate is reported in terms of a looming energy crisis. As the *Western Morning News* reports: *Britain could be facing blackouts if the crisis facing our electricity supply deepens ... the most controversial source of power – nuclear energy. It's the word that few in government circles dare to speak openly, it's the one they dread being confronted about, it's the badly kept secret that once exposed to the public glare is likely to provoke uproar.* (22.3.2005, *Western Morning News*)

The *Independent* in the wake of Labour's third term election victory: *The British government elected yesterday will have to take two radioactive decisions by 2008 ... (on) manmade climate change and nuclear weapons...Should we build a string of nuclear power stations? Just five years ago, environmentalists wouldn't have paused for a second before answering: no! no! no!...but now there is an even greater ecological danger than a Sellafield or Chernobyl: man-made global warming.* (*Independent*, 5.5.2005)

No matter who wins the forthcoming general election, the prospect of the UK building new nuclear power stations will be back on the agenda in within a matter of months. Inside the corridors of power , the question is not if we should build new nuclear plants, but how long the politicians can hold off before informing the public of an inevitable reality. The real debate is no longer one that separates the pro and anti-nuclear lobbies, but one that divides the realists from the fanatics... (*Scotland on Sunday*, 27.3.2005)

At the end of March, the Scottish Affairs Select Committee issued its report on power generation: *Nuclear power is back on the agenda with a bang in Britain.* (*The Sunday Herald*, 15.5.2005)

Regional coverage from areas with decommissioned nuclear power stations likely to be recommissioned included Liverpool (Trawsfynydd and Wylfa), Scotland (Torness and Hunterston A & B, Dounreay, Chapelcross).

Some leaders of the green movement, long implacable foes of nuclear power, now say that the risks posed by global warming far outweigh those posed by radioactive waste ...governments will have to persuade the public that nuclear power is safe. (*FT*, 13.7.2005)

6.1.22 Assisted reproduction

As reproductive technology was pioneered in the UK in the 1970s, the social and moral implications of assisted reproduction received in-depth attention in public debate and in government legislation. Where IVF was once considered scientifically and socially controversial, it is now generally accepted in the UK, and provides a good example of gradual public acceptance of new technologies as their benefits are demonstrated over time.

Reproductive technologies have been thoroughly debated in the UK and are subject to extensive legislation. The Human Fertilisation and Embryology Authority (HFEA) is a non-departmental government body which was established in 1991, following the passing of the HFE Act 1990. It oversees the regulation, licensing, monitoring and advice regarding all aspects of reproductive technology in the UK.

Press coverage of IVF and other reproductive technologies in 2000-2005 were often concerned with legal precedents, such as the high profile case of Diane Blood who fought to the High Court for the right to use her dead husband's sperm in order to conceive. In general, press coverage of IVF in the UK was perhaps less concerned with moral and ethical issues about artificial reproduction than other parts of Europe - Italy for example (though this is not to say that the pro-life lobby do not have a significant voice on these issues). The tone and framing of coverage did not change significantly over the 2000-2005 period.

Press coverage of IVF and related technologies was dominated by 'human interest' stories: the practicalities of who has access to cutting edge IVF techniques (the NHS 'postcode lottery'), IVF treatment for gay and lesbian couples, legal battles of parents or individuals, and scare stories about embryo mix-ups.

Areas which did receive in-depth moral and ethical coverage over this period are: the potential for so-called 'designer babies' – genetic screening of embryos; the potential for IVF to allow women to become mothers in to their 60s; the off-shoot applications of IVF technology which potentially utilise 'surplus' embryos for regenerative stem cell research; questions about IVF as an industry, including questions of access.

6.1.23 2000

6.1.23.1 Summary Press coverage of assisted reproduction in the UK press from 2000 presented the following trends:

- IVF was typically reported on in a lifestyle and human interest frame rather than a science or technology frame
- Negative coverage dwelt on "overuse" and "misuse" of reproductive technology, suggesting that IVF treatment had become almost too popular, and was being used for selective functions as well as simply reproductive ones
- Lord Winston, one of the UK's major IVF pioneers, was reported as saying that IVF had become too widespread, and this dominated media coverage of the issue for a while

- Overall, the debate took place against a backdrop of acceptance. The press coverage suggested that assisted reproduction was understood to be part of life in the UK

6.1.23.2 Major stories from 2000

Both the *Guardian* and the *Express* carried stories about Lord Winston, who suggested that IVF treatment had become too widespread a standard option for childless couples. The *Guardian* discussed Lord Winston's being awarded the Royal Society's Faraday prize for the furtherance of the public understanding of science. He was portrayed somewhat negatively in the article: *Lord Winston's promotion of the needs of the infertile, the funding of the NHS, better embryo research and himself continues unabated.* (*Guardian*, 19.8.2000)

January saw the announcement by the HFEA of the first license to a clinic to allow for the thawing of human eggs, heralding: *the verge of a frozen baby boom.* (*The Times*, 16.3.2000)

The *Express* reported that: *IVF has not been a total blessing. Leaving aside the huge expense and the emotional turmoil that some women experience during this treatment, IVF has other undesirable consequences. Its practice has hijacked other simpler and less complex treatments. The huge publicity given to it means that most people now believe that IVF is the solution for all infertility.* (*The Express*, 17.11.2000)

The *Financial Times* – in a comment and analysis piece by the Chief Executive of Health Technology Networks - reported on the use of embryos in regenerative stem cell research and its regulation, suggesting that: *As with other scientific advances that evoked initial disquiet, such as in vitro fertilisation and organ transplants, public concern is often replaced by acceptance as the benefits become evident... Last year the UK government provoked condemnation from the scientific and medical communities by rejecting the recommendation of its advisory committees that embryo stem cell research should proceed.* (*The Financial Times.*, 1.6.2000)

The *Scotsman*, in reporting the case of a couple who were fighting for the right to have a baby girl by IVF having lost a daughter in an accident, reported: *Couple 'cannot choose sex of baby' citing HFEA regulations. The HFEA has indicated that choosing the sex of a child for social, as opposed to medical reasons is not acceptable at present.* (*The Scotsman*, 13.3.2000)

6.1.24 2001

6.1.24.1 Summary

Press coverage of assisted reproduction in the UK press from 2000 presented the following trends:

- The majority of stories about IVF focused on 'human interest', e.g. interviews with couples who have undertaken IVF treatment. There is also some coverage of the prohibitive cost of treatment
- IVF continued to be mostly reported as a lifestyle story, rather than a science story, but some scientific research was reported on amid the human interest coverage
- The news that a woman of 56 gave birth to twins after IVF sparked discussion about the moral and health boundaries of IVF treatment

6.1.24.2 Major stories from 2001:

The *Express* reported on the cost of IVF treatment: *When IVF fertility treatment began, patients didn't have to pay thousands of pounds for treatment. This changed when*

doctors discovered that by using drugs they could collect more than one egg. This way several could be implanted at once, or frozen for future use but it meant the cost of the treatment rose dramatically. Cost is important because the vast majority of IVF in Britain is not free. (*Express*, 13.2.2001)

The *Independent* suggested that the moral and ethical debates surrounding IVF had moved beyond merely bringing the possibility of children to childless couples: *Today there is more to IVF than conceiving a child. It has become a means to achieve other ends, many of them remarkable, a few of them life-saving, some of them controversial. It has already led to the world's first designer baby, an embryo conceived and selected to be born as a life -saving donor for an older sibling.* (24.06.2001 *Independent on Sunday*)

The *Belfast News Letter*, amongst others, reported on a 62 year old French woman becoming one of the oldest mothers in the world: *Artificial insemination is illegal in France for women too old to conceive children naturally. French television and newspapers speculated that the woman, whose identity has not been revealed, underwent in vitro fertilisation in the United States.* (*Belfast News Letter*, 31.5.2001)

Many UK papers covered the story of a 56 year woman who gave birth to twins through private IVF, apparently against medical advice. An added twist for the tabloids came when the apparent donor came forward to express her disapproval of her eggs going to a 56 year old: *A woman of 56 had IVF twins using my eggs. Now I can't bear to see pictures of them. It's just a freak show.* (*Daily Mail*, 28.05.2001)

Several papers also covered research news coming out of Colorado State University which suggested that: *Scientists are working on a test-tube baby 'chip' that would mean embryos being created and controlled by computers.* (*Brave new world of embryo computers, the Daily Telegraph*, 24.5.2001)

6.1.25 2002

6.1.25.1 Summary Press coverage of assisted reproduction in the UK press from 2002 presented the following trends:

- Coverage of IVF generally focused on 'human interest' stories, as well as health scares surrounding links made between infertility drugs and breast cancer. The prohibitive cost of IVF procedures continued to receive some coverage
- There was some discussion of the social and ethical implications of sperm donation, particularly focusing on the donor's right to anonymity
- There was some focus on international legislation on reproductive technology and its link with stem cell research

6.1.25.2 Major stories from 2002: The *Express* addressed some social implications: *Medical, social and cultural questions are being raised about the prospects of some IVF children. These questions link with wider issues in society about the way in which having a baby, a perfect baby of the correct gender, at the right time, has become such as fashionable commodity – almost a consumer 'right' – that the compromises parenthood requires are desperately underplayed at a possible cost to children's wellbeing.* (*The Express*, 5.11.2002)

The *Birmingham Post* reported on a "social loophole" of embryo donation, comparing the assessments which parents wanting to adopt faced with the lack of

assessment facing parents seeking embryo donation: *There is also mounting pressure to allow children conceived through sperm donation to trace their biological fathers, with backing from Baroness Warnock, the main architect of Britain's fertility laws.* (Birmingham Post, 29.5.2002)

The establishment of a UK stem cell bank was welcomed in the business press: *News last week that the UK is close to setting up the world's first stem cell bank was hailed by scientists as another step in the right direction, putting Britain firmly in the vanguard of research into stem cells.* (The Business, 1.9.2002)

The Times voiced concerns about the social implications of IVF: *Rich, white, middle-class – the worrying truth about the fertility industry. The article argues that as infertility grows, so too does the social divide. What we have bred in the IVF industry is a kind of social engineering, and with that an insidious form of racism.* (The Times 18.4.2002)

The Scotsman, amongst others, reported on Nancy Reagan's high profile campaign in favour of stem cell research in the US, where: *President Bush has drawn a line against funding this research, in a way which appeases the anti-abortion groups which are very active in Republican circles.* (The Scotsman, 4.10.2002)

6.1.26 2003

6.1.26.1 Summary Press coverage of assisted reproduction in the UK press from 2003 presented the following trends:

- Human interest and lifestyle coverage continued. Speculation that the Countess of Wessex was undergoing IVF adds to the positive lifestyle coverage
- Some concern was raised over the ethics of egg donation
- Although coverage was balanced overall, there was some fairly negative coverage of health scare stories and concern about a lack of research into the long term risks of IVF and other assisted reproduction methods
- There was some reflection on public opinion, arguing that in the 1970s public opinion about assisted reproduction were similar to those surrounding cloning and more controversial technologies today
- There was some international focus. Reports suggested that the UK now has the lowest rates of available IVF treatment in Europe, with the so-called NHS 'postcode lottery' determining who receives treatment

6.1.26.2 Major stories from 2003 The *Financial Times* reported that Denmark is considered the 'best place' to be for IVF treatment: *provision is free, efficient and almost universally available.* (FT, 30.8.2003)

The *Financial Times* reported on comments from the religious lobby: *some Roman Catholics and anti-abortion campaigners condemn IVF as evil because it creates surplus embryos that are eventually destroyed or used in research. (IVF is) the first step on a nightmarish journey to human cloning', says Mario Conti, the Archbishop of Glasgow.* (FT, 30.8.2003)

The *Daily Mail* commented on women and babies as being used as 'guinea pigs' in IVF treatment: *One of the world's leading IVF pioneers, this week warned that thousands of IVF babies are being used as 'human guinea pigs'...given that Louise Brown,*

the world's first test tube baby, is only 25 years, we simply do not know what the long term effects of IVF are. (Daily Mail, 12.9.2003)

Speculation that Sophie Wessex, had been undergoing IVF treatment increased as she announced her pregnancy in March: *Prince Edward's wife Sophie Wessex is expecting a baby - 15 months after suffering a life-threatening ectopic pregnancy. Sophie, 38, is said to have conceived naturally after having had unsuccessful IVF treatment. (Sunday Mirror, 23.03.2003)*

Much of the coverage focused on specific case studies of couples undergoing IVF. For example: *'WE LOVE NATHAN TO BITS' Ian Wallis, 33, and his wife Julie, 30, from Lincoln, had a son, Nathan, last December. He was conceived through a form of IVF called ICSI (Intro Cytoplasmic Sperm Injection), where sperm is injected directly into an egg and the fertilised egg placed in the womb. (The Express 01.06.2003)*

The UK release of the film, "Maybe Baby", a comedy focused around one couple's progress through IVF, added to discussion about assisted reproduction: *Underlying the humour is a serious issue which Elton, having gone through IVF with his wife, makes funny without being insensitive. (Bath Chronicle, 13.01.2001)*

Ethical concerns were raised by reports that a number of private UK IVF clinics were offering free treatment to couples in exchange for egg donation. These cases fuelled discussion about whether IVF treatment should be available to all on the NHS: *Professor Ian Craft claims childless couples can have families if they sign up to his widely criticised IVF programme - which he launched today in an orchestrated publicity drive. He is encouraging women who have healthy eggs but need fertility treatment for other reasons to give away an entire cycle of their eggs to infertile women... But the scheme has angered campaigners who believe it exploits poorer people and enables wealthier women to buy their eggs. (Evening Standard, 24.06.2003)*

6.1.27 2004

6.1.27.1 Summary Press coverage of assisted reproduction in the UK press from 2004 presented the following trends:

- Plans to universalise access to IVF on the NHS generated some discussion about whether fertility treatment is a right or a privilege
- Fertility treatment continued to be reported as a lifestyle issue. A substantial amount of coverage was accompanied by 'fertility tips' – diet and health advice for couples trying for children. These typically included complementary therapies like acupuncture and reflexology
- There continued to be a steady stream of positive human interest IVF stories
- A number of controversial cases generated discussion about uses and abuses of IVF and surrogacy
- Coverage was dominated by discussion of the limits of IVF and other reproductive technologies, amid changes to laws on embryo screening and announcements about an alleged pregnancy involving a cloned embryo

6.1.27.2 Major stories from 2004 Plans to offer courses of IVF on the NHS were met with a mixed response – the end of the NHS 'postcode lottery' is welcomed, but health services were criticised for only offering one course to patients: *All infertile couples where the woman is under 40 will be offered at least one full cycle of IVF treatment on the NHS from April*

next year, as the first stage towards making fertility services a more integral part of the state health system. (*Guardian*, 25.02.2004)

Discussion of whether IVF is a right or a privilege was prompted by a comment piece from Cristina Odone: *As Cristina says, with limited NHS resources it doesn't seem right to spend them on IVF when there are people dying because they can't have the right drugs, or waiting many months for treatment because the necessary equipment or enough nurses aren't available. If you want a baby, why not forego that big house or foreign holiday? If you can't pay for a couple of IVF cycles, can you really afford to bring up a baby?* (*Daily Mail*, 1.3.2004)

This year much coverage of assisted reproduction was accompanied by alternative health and diet 'tips' for boosting fertility: *Acupuncture helped me conceive after two years of trying* (*The Mirror*, 01.04.2004), *Stress and being overweight or obese can have a dramatic effect on the success of treatment given to couples trying for a baby.* (*Birmingham Post*, 30.03.2004)

The case of a pregnant woman who launched a surrogacy 'scam' on the internet, 'selling' her unborn child many times over to couples desperate for children, was reported on widely in the tabloids: *A Yorkshire woman has admitted to an Internet-based surrogacy scam in which she tricked two couples into giving her cash for the same unborn baby... Surrogacy is legal and can involve legitimate "expense" claims by the natural mother but it is illegal to offer up an unborn baby for sale.* (*Yorkshire Post*, 30.03.2004)

A controversial surrogacy case in which a woman gave birth to her own grandchildren received substantial coverage in the tabloid and mainstream press: *A woman has given birth to her own grandchildren after acting as a surrogate mother for her daughter and son-in-law, it emerged yesterday.* (*Guardian*, 30.01.2004)

Widespread discussion about the role of and need for fathers was generated by the following announcement: *Suzi Leather, chairman of the Human Fertilisation and Embryology Authority (HFEA), says the law should be changed to remove the clause requiring doctors who assess infertile women to take account of the "need of the child for a father" before offering treatment. It would give the green light to single women and lesbians to seek treatment on equal terms with heterosexual couples. But the downgrading of the father's role in child rearing is likely to be portrayed as an attack on the traditional family.* (*Independent*, 21.01.2004)

Coverage of reproductive issues included some discussion of cloning after the controversial announcement from Dr Panos Zavos that he has implanted a woman with a cloned embryo. The announcement was met with widespread condemnation and disbelief: *A maverick fertility doctor's announcement that he has implanted a cloned human embryo into a 35-year-old woman was last night met by a mixture of revulsion and disbelief by politicians, doctors and pressure groups.* (*Sunday Telegraph*, 18.01.2004)

Individual cases continued to be reported, including the case of a boy born from sperm frozen 21 years before, and numerous tales of couples' 'miracle babies', born after many rounds of IVF.

New regulations on screening embryos raised ethical debate: *Moves to grant people carrying a genetic form of cancer the right to screen embryos through IVF to reject those*

carrying defective genes received a cautious welcome yesterday ... However, the Scottish Council on Human Bioethics (SCHB) warned last night that the ruling by the Human Fertilisation and Embryology Authority (HFEA) could "lead society on to a slippery slope towards eugenics" (The Scotsman, 2.11.2004)

6.1.28 2005

6.1.28.1 Summary Press coverage of assisted reproduction in the UK press from 2005 presented the following trends:

- A steady stream of positive 'human interest' coverage continued
- Despite this, there was a substantial amount of negative coverage this year, including concerns about the safety of egg donation, widespread condemnation of a 66 year old woman's pregnancy after IVF and worries about a UK 'fertility time bomb'
- A House of Commons report on assisted reproduction generated substantial controversy and some sophisticated discussion about legislation and the limits of IVF

6.1.28.2 Major stories from 2005: A television drama about a case in which eggs were mixed up at an IVF clinic generated reflection on the social and moral implications of reproductive technology: *Crazy mixed up kids – It is a very 21st century nightmare spawned at the point where science meets our primal instincts, and technological advances collide with human vulnerability to make our moral compass feel hopelessly out of date.* (The Sunday Herald, 17.4.2005)

A House of Commons Science and Technology Committee report which suggested that parents should be free to choose the sex of their child and that the ban on human cloning should be re-assessed generated controversy: *The Commons science and technology committee was split down the middle over its report on human reproductive technologies and the law, with a dissenting MP, Geraldine Smith, calling it "the Frankenstein report", while the chairman, Ian Gibson, criticised rightwingers who were trying to stifle debate* (Guardian, 24.03.2005)

Positive case studies and human interest stories about couples going through IVF continued to receive substantial coverage: *They are the miracles that new mum Sue Davies feared she might never be granted* (Liverpool Daily Echo, 09.03.2005)

The Guardian reported: *The scientist who cloned Dolly the Sheep is expected to be given the go-ahead to experiment on human embryos by the government's fertility authority today* (Guardian, 08.02.2005).

The announcement that a Romanian woman had given birth at 66 received widespread coverage. Much of this was negative and focused on her previous reproductive history: *The world's oldest new mum has revealed she had two abortions in her 20s* (Daily Record, 24.01.2005) *The damage done by Iliescu's vain and egotistical doctors, determined to push the boundaries of science and make a name for themselves, irrespective of the human cost, will be felt much further afield* (The Scotsman, 18.01.2005)

Warnings about potential dangers associated with egg donation were discussed in the Daily Mail: *Experts fear that women who choose to donate their eggs when they are*

not going through IVF themselves may not always be fully aware of the risks (Daily Mail, 01.07.2005)

Worries that the UK faced a “fertility time bomb” were voiced after a talk from Professor Ledger of Sheffield University at the European Society of Human Reproduction and Embryology conference in Copenhagen suggested that: *the rise in childhood obesity, a surge in sexual diseases, a trend towards older mothers and a drop in male fertility was going to make the problem worse in the next decade.* (The Express, 21.06.2005)

6.1.29 Animal testing

UK press coverage of animal testing from 2000 – 2005 reflected an increasingly acrimonious divide between the science community and animal rights campaigners. The actions of animal rights 'extremists' dominated coverage and debate over the five year period.

Press coverage was fairly balanced, and reflected a middle ground view. Animal testing is a significant issue in the UK, and there had been substantial public debate and legislation. The current approach to regulation is codified in the “three R’s”: reduction, refinement and replacement. This principle was institutionalised in 2004, with the establishment of the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs), itself an outcome of a House of Lords Select Committee report on Animals in Scientific Procedures, produced in 2002.

The pro-science line of the UK government – explicit in its wish to foster a competitive ‘knowledge-based economy’ – has perhaps also influenced how animal testing (and science more generally) is debated and discussed in the media from 2000 - 2005. The current government is keen to counter what it deems ‘anti-science’ attitudes, which are considered to undermine the growth and success of the UK biotech industry. At the same time, there was an indication from some sections of the press of public scepticism about the pharmaceutical industry, which overlapped with debates about animal testing.

Press coverage from 2000-2005 generally supported the view that animal testing is a ‘necessary evil’ in emergent medical research, with an emphasis on finding alternatives. Animal testing for non-medical purposes continued to receive widespread condemnation.

There was a significant anti-testing editorial line in some papers, however, particularly in regional news. This was perhaps a product of the influence of local interest groups, and a reliance on press releases issued by groups such as the British Union for the Abolition of Vivisection (BUAV). In turn, animal testing prompted a significant amount of ‘right to reply’ coverage in the letters pages of the national and regional press, with interests groups such as PETA, the National Anti-Vivisection Society, the BUAV and others, using them as a platform to present their views.

From any perspective animal testing continues to be an emotive – and in many ways culturally specific - issue in the UK, which characterises itself as a nation of animal lovers. Animal rights have been under debate in the UK for a long time,

and whilst the direct action of extremists receives substantial press coverage, there is a reasoned consensus that the pros and cons of animal testing for medical research purposes are understood and accepted.

Press coverage of these issues was therefore mostly quite balanced; the voices of scientists, moderate animal rights campaigners and general supporters of animal testing for medical research purposes were equally presented. Hardline animal rights campaigners, on the other hand, such as those targeting Huntingdon Life Sciences and Oxford University were presented by the press – and considered by the public – to be extremists, if not ‘terrorists’. A substantial proportion of scientists and supporters of testing were unwilling to make themselves targets for animal rights extremists by being cited directly in the press, which had some stifling effect on public debate. The pro-testing lobby was becoming steadily more visible and vocal towards 2005, however.

6.1.30 2000

6.1.30.1 Summary UK press coverage of animal testing from 2000 presented the following trends:

- Animal testing issues continued to receive wide press coverage, with a significant amount devoted to the continued targeting of Huntingdon Life Sciences, Oxford University and other centres which either conduct animal testing or breed animals for research purposes
- The detrimental effect of these campaigns on international perceptions of the UK as a viable place to invest in science research also received coverage in nationals such as *The Times*, and the *Financial Times*
- The EC retraction of a possible ban on animal testing on cosmetics received coverage, as did UK government attempts to counter an apparent ‘anti-science’ public opinion. This was thought by commentators to be a case of the high media exposure of a small minority (of animal rights activists) disproportionately affecting what is considered to be public opinion more broadly

6.1.30.2 Major stories from 2000 Coverage of animal testing issues focused on animal extremists’ continued targeting of Huntingdon Life Science in Cambridgeshire and Oxford University Biomedical science labs. In broader terms, *The Independent* reported: *This campaign by eco-activists and animal-rights protesters has closed 50 per cent of Britain’s animal breeding centres, delayed medical research projects and destroyed acres of genetically modified (GM) crops. It has also left dozens of people in fear* (*The Independent*, 18.11.2000)

The Sunday Herald reported: *The world’s leading cosmetics company, L’Oreal, is facing calls for a consumer boycott from an action group determined to end product testing on animals* (*The Sunday Herald*, 19.11.2000)

The Independent ran an article in November covering Tony Blair’s speech to the European Bioscience Conference in London: *He also warned the public of the dangers of slipping into ‘anti-science’ attitudes which could deprive Britain of the benefits of cutting-edge research and technology... There is a danger, almost unintentionally, that we become “anti-science”... Mr Blair called for a “far more considered, rational dialogue” between scientists and the public about the need for research and development... Whilst Lord Melchett, then executive director of Greenpeace, suggested that: “Worshipping slavishly and unthinkingly at the seat of every new scientific fad is more damaging to*

science than the healthy questioning scepticism that most other countries show towards untried, unpredictable and uncontrollable technologies." (Independent, 18.11.2000)

More extremely, The Times reported: An 'avalanche' of biotechnology firms can be expected to leave Britain because of public hostility to genetic engineering, animal rights extremism and regulatory red tape, scientists and business groups said yesterday. One scientist interviewed in the article suggested that public attitudes towards science in Britain were the worst in the world, and that scientific research was suffering as a result. (The Times, 15.11.2000)

The Financial Times reported: British drugs companies have also been deterred from investing at home because of the growing protest movements against GM research and animal testing. (FT, 14.11.2000)

The Independent reported the axing of the potential EU ban on animal tests for make-up: The European Commission has backed down on the ban, due to take effect on 1 July, leaving politicians and animal welfare groups furious at what they describe as Brussels' kow-towing to pressure from big business. With Europe using and killing 38,000 animals in tests every year, campaigners say that hundreds of thousands of rabbits, mice, rats and guinea pigs will die as a result (The Independent, 9.4.2000)

6.1.31 2001

6.1.31.1 Summary UK press coverage of animal testing from 2001 presented the following trends:

- The actions of animal rights extremists and public opinion on animal testing continued to receive press coverage
- There was some characterisation of animal rights campaigners as being 'anti-science' and 'anti-progress'. Animal testing was reported as an issue with potentially great implications for UK research progress and scientific development, as well as an issue of animal rights and public opinion
- Press coverage was generally supportive of animal testing for medical research, limited by the "three Rs" principle

6.1.31.2 Major stories from 2001 The Guardian reported the results of a Guardian/ICM poll: *The use of animals for scientific testing is supported by 46% of adults...the survey shows that 36% oppose it and 18% declared themselves not to know. There are sharp differences of opinion between the generations, between men and women and between voters on the issue.* (Guardian, 23.1.2001). The poll revealed young people as anti-animal testing even for medicines, 59% of Conservative voters backed animal testing, whilst 41% of Labour voters and 45% of Liberal Democrat voters backed it.

The Financial Times described the extremists as anti-democratic, a characterisation that recurred across the press, and shifted the focus of the debate from animal rights to democratic society: *Democratic politics rests on a compact: disagreements, however fundamental, will be resolved through peaceful debate and settled at the ballot box...This, rather than animal testing, is the fundamental issue raised by the campaign against Huntingdon Life Sciences...In the case of tests on animals, campaigners make two distinct arguments: animal testing is useless; and it is also wrong, because suffering should never be inflicted on members of one species for the benefit of members of another.* (FT, 22.1.2001)

The *Daily Mail* carried a comment piece, which discussed UK attitudes towards animal testing: *The truth is sentiment plays a big part in the campaign against animal testing. We have a perverse and illogical attitude to animals, favouring the fluffy and the cute over the less photogenic... A prejudice against science itself also plays a part. To many people, 'science' equals pollution, destruction of the environment and 'playing God'. That is until they need a lifesaving operation... it is quite possible that Huntingdon Life Sciences will go into receivership. If so, this is a victory for the anti-democratic, single-issue protestors ...and a defeat for rational debate. Not one scientist I have ever spoken to likes the idea of animal testing. All would leap on an alternative if one were available.* (*Daily Mail*, 18.1.2001, 254)

6.1.32 2002

6.1.32.1 Summary UK press coverage of animal testing from 2002 presented the following trends:

- 2002 saw several national and EU level announcements of legislation recommendations on animal testing which dominated coverage
- Disputes between science bodies and animal rights campaigners were carried out in many newspaper letters' pages
- The views of animal rights activist groups continued to be widely reported, particularly in the regional press
- Balanced pro-testing views were heard in op-ed and comment pages

6.1.32.2 Major stories from 2002 Animal testing coverage was dominated by The European Commission's Europe-wide ban on animal testing for cosmetics: *The sale of virtually all animal-tested cosmetic products will be banned in Britain and the rest of Europe from 2009...There are however a few caveats...which animal rights campaigners have branded as loopholes. There are, they say, 14 different categories of animal tests and yesterday's agreement initially covers 11 of the 14.* (*The Guardian*, 8.11.2002)

The BUAV also gained a lot of coverage in the locals, presenting the EC ban as a sign of their successful lobbying. This 'story' was syndicated to many local newspapers and therefore received a significant amount of coverage.

The *Independent* reported the Royal Society's line on animal testing, as reported to the House of Lords in February 2002, countering their pro-testing view with that of the animal lobby. Middle ground was suggested: *With such entrenched views it may seem difficult to see a way out of the impasse, but there is common ground. Both the BUAV and the Royal Society agree that better alternatives to animal experiments need to be developed...Both the Society and the BUAV endorse the principle of the 'three R's' – enshrined in UK legislation – which means that every effort must be made to replace the use of live animals by non-animal alternatives; to reduce the number of animals used in research to the minimum required for meaningful results; and to refine the procedures so that suffering is kept to a minimum*" (*The Independent*, 1.2.2002)

The *Evening Standard* carried an op-ed from social commentator journalist David Aaronovitch, a pro-medical testing piece backed engaging with ethical and moral issues, whilst not shying away from stating that: *...2,714,726 scientific procedures using animals were carried out in the year 2000 and picking up on the inherent cultural relativism of the argument: this may be speciesist, but crocodiles don't ask permission before they catch their dinner. And true, it could be that we take life too easily and that –*

like the Native Americans – we should thank every animal we use. (The Evening Standard, 17.1.2002)

The issue continued to be debated in the letters pages of both national and regional newspapers.

The *Belfast Telegraph* reported on a BUAV member who worked undercover in a Cambridge University lab, 'exposing': *the cruelty going on and showing vivisection for what it is...forcing Cambridge University to state that it was taking the matter 'extremely seriously' and had launched a full-scale inquiry into the claims. (Belfast Telegraph 25.5.2002)*

6.1.33 2003

6.1.33.1 Summary UK press coverage of animal testing from 2003 presented the following trends:

- There was continued political discussion of European and national legislation on animal testing
- Anti-animal testing campaigns continued to receive widespread coverage
- There was some indication that pro-animal testing campaigners were making themselves more actively heard, in response to the widespread coverage of animal rights campaigns. Coverage featured a number of 'backlash' articles

6.1.33.2 Major stories from 2003 The *Telegraph* carried a comment piece arguing that: *Drugs for humans should be tested on humans. (Daily Telegraph, 11.10.2003)*

The FT discussed EU policy on animal testing: *The overall policy of the European Commission is to reduce, refine and replace animal testing data...we should not forget that animal testing sometimes is the only means to get the necessary information on the risks to human health and the environment. At present, we are unwittingly and in an uncontrolled way testing chemicals on both humans and animals. This is clearly unacceptable. (FT, 20.10.2003)*

A lot of the regional press, including the *Western Daily Press* and the *Western Morning News* (Plymouth – *Vivisection is merely trickery by scientists 7.1.2003*) reflected an anti-animal testing position. For example, in the *Western Daily Press* a feature reporting the EU legislation banning animal testing for cosmetics and the sale of cosmetics tested on animals was dominated by complaints about the time it took for EU politicians to take on board public opposition to animal testing for cosmetics.

October saw actress Jane Asher representing the pro-animal testing Coalition for Medical Progress: *Alternatives to animal testing need to be developed faster – The development of alternatives to the testing of medicines on animals needs to be accelerated, according to a Home Office report...the committee's main proposal – that a new centre be established to press the agenda of the 3R's. The 3Rs is the science world's shorthand for the drive to refine scientific procedures; reduce the numbers of animals used in testing; and replace them, wherever possible, with alternatives. (FT, 21.1.2003)*

Amanda Platell in *The Evening Standard*: *Animal tests are worth it -I heard the softly spoken Professor Colin Blakemore on the radio yesterday calling for Tony Blair to reaffirm the Government's commitment to the use of animal testing for medical*

science...refused a knighthood because he uses vivisection in his work and has the guts to stand up and say so, the guts to make the argument for animal testing. (Evening Standard, 23.12.2003)

6.1.34 2004

6.1.34.1 Summary UK press coverage of animal testing from 2004 presented the following trends:

- There was some discussion of the balance between human and animal clinical trials, making the link between reduced animal testing and the need for improved human testing
- There was continued condemnation of 'anti-science' culture; animal testing continued to be reported as an issue which affected the UK in terms of economics, development and finance as well as animal rights
- Pro-testing voices continued to make themselves heard in the press. Many supporters of testing were contributing to the debate anonymously, however, for fear of intrusive or violent reprisals from animal rights extremists
- There was some suggestion that a particularly anthropomorphic culture of animal-loving in the UK lay behind the ongoing controversy over animal testing

6.1.34.2 Major stories from 2004 The government announced plans to crack down on animal rights extremists, broadly supported by high profile voices such as Anita Roddick. In April: *New EU laws mean rise in animal lab testing – A new row over animal testing broke out today after it was revealed that millions more laboratory tests will be carried out on dogs, rabbits and rodents. The government is backing moves to adopt a Europe-wide standard test for potentially harmful chemicals in products such as detergents and shampoo... A spokesman for Defra said the Government supported the scheme but would try to ensure animal experiments were kept to a minimum: 'We agree with the aims of this proposal but we are carrying out a public consultation...'* (Evening Standard, 5.4.2004)

The *Times* reported on the problems associated with organising clinical trials: *A quarter of clinical trials are abandoned because there are too few recruits.* (*Times*, 26.5.2004)

The *Sunday Times* discussed Labour's stance: *It said it was 'the only party to trust on the issue of animal welfare'. Yet at the same time it was also wooing drug companies such as Pfizer and Novartis...Labour's attempt to face both ways was bound to end in tears* (*Sunday Times*, 1.8.2004)

Colin Blakemore, MRC: *'there are still things that must be studied in a living organism, and the MRC believes animal experiments are essential in the fight against Aids, cancers, and genetic and psychiatric disease... Lord Winston, Imperial College: 'there needs to be clearer communication for the public about how valuable it is. Many people have no idea what's going on because so few scientists are prepared to put their head above the parapet.* (*Independent*, 30.7.2004)

Robert Cogswell, spokesman for Speak (an animal rights group): *There is a misconception that animal rights activists are anti-science. We're pro-science but anti using animals for humans.* (*Belfast Telegraph*, 30.7.2004)

The *Financial Times* reported on the cultural nuances of British attitudes towards animals: *Testing times for science in the battle to keep public support ...An Oxford*

university animal welfare researcher, who is afraid to give her name, says legislation is not enough to change a 'fluffy bunny culture' that she says begins with anthropomorphic animal characters in children's books and is reflected in schools where animal rights are taught without reference to the benefits of vivisection. Although legislation has a part to play, what we really need to do is change the culture of this country (FT, 31.7.2004)

6.1.35 2005

6.1.35.1 Summary UK press coverage of animal testing from 2005 presented the following trends:

- Dramatic direct action from animal rights extremists shocked the public this year and dominated UK press coverage. Reports of intimidation, violent threats, and even grave robbing received widespread coverage
- Press opinion generally condemned the extreme actions of animal rights campaigners, but continued to present balanced coverage, presenting both moderate pro-testing and anti-testing views
- The pro-testing movement continued to maintain a strong presence in the national press, although as before many supporters of animal testing preferred to remain anonymous for fear of being targeted by animal rights extremists

6.1.35.2 Major stories from 2005: The *Guardian* reported on a £20,000 inquiry funded by the Academy of Medical Sciences, the Medical Research Council, the Royal Society and the Wellcome Trust, into the use of monkeys in medical and biological research: *The wide-ranging inquiry ... will gather evidence from animal rights campaigners as well as animal researchers, but is primarily aimed at establishing the scientific basis for using non-human primates in research in light of rapid recent developments, The Guardian report concluded with a comment from a Speak representative who suggested that the inquiry was a 'fudge on the part of the vivisection industry (The Guardian, 23.3.2005) (The inquiry was due to report in early 2006).*

The *Sunday Times* reported under the headline: *Intimidation...threats of violence...grave-robbing, the targeting of a Staffordshire farm breeding guinea pigs for scientific research by animal rights protestors, coming down wholly on the pro-testing side, and on the side of local residents (Sunday Times, 24.4.2005).*

The development of an £18m biomedical research centre at Oxford University continued to receive press coverage, with contractors targeted by animal rights protestors: *The vivisectionist vs. the animal activist; one says his research transforms lives. The other has endured prison. (The Independent, 10.4.2005).*

The *Observer* reflexively reported on the problems of reporting contentious topics, such as those surrounding UK debates about animal testing: *Journalists striving to be balanced and fair are used to accusations of bias when their writing doesn't chime with the views of a particular pressure group or lobby... (The Observer, 16.1.2005)*

6.1.36 News sources used in the analyses

Aberdeen Evening Express
Aberdeen Press and Journal
Bath Chronicle
Belfast News Letter (Northern Ireland)
Belfast Telegraph
Birmingham Evening Mail

Birmingham Post
 Blackpool Gazette
 Brighouse Echo
 Bristol Evening Post
 Burnley Express
 Carmarthen Journal
 Cornish Guardian
 Cornishman
 Coventry Evening Telegraph
 Daily Mail (London)
 Daily Post (Liverpool)
 Daily Record
 Daily Star
 Daily Telegraph
 Daventry Express
 Derby Evening Telegraph
 East Grinstead Courier
 Eastern Daily Press
 Essex Chronicle
 Evening Chronicle (Newcastle, UK)
 Evening Gazette
 Evening Herald (Plymouth)
 Evening News (Edinburgh)
 Evening Standard (London)
 Evening Times (Glasgow)
 Express
 Express & Echo (Exeter)
 Falkirk Herald
 Fife Free Press
 Financial Times (London, England)
 Gloucester Citizen
 Gloucestershire Echo
 Grantham Journal
 Grimsby Evening Telegraph
 Guardian
 Guardian Unlimited
 Herald (Glasgow)
 Herald Express (Torquay)
 Hull Daily Mail
 Independent on Sunday (London)
 Kenilworth Weekly News
 Kent and Sussex Courier
 Lakeland Echo
 Lancashire Evening Post
 Lancaster Guardian
 Leamington Spa Courier
 Leicester Mercury
 Lincolnshire Echo
 Liverpool Daily Echo
 Llanelli Star
 Lynn News And Advertiser
 Mail on Sunday (London)
 Manchester Evening News

Microscope
 Mirror
 Morecambe Visitor
 Morning Star
 News of World
 North Devon Journal
 Northern Echo
 Nottingham Evening Post
 People
 Scotland on Sunday
 Scotsman
 Scunthorpe Evening Telegraph
 Selkirk Weekly Advertiser
 Sentinel (Stoke)
 South Wales Echo
 South Wales Evening Post
 Star (Sheffield)
 Sun
 Sunday Express
 Sunday Herald
 Sunday Life
 Sunday Mail
 Sunday Mercury
 Sunday Mirror
 Sunday Telegraph(LONDON)
 Sunday Times (London)
 Sunderland Echo
 Sussex Express
 Times (London)
 Times Educational Supplement
 Times Higher Education Supplement
 Travel Weekly
 UK Newsquest Regional Press - This is Black Country
 UK Newsquest Regional Press - This is Bradford
 UK Newsquest Regional Press - This is Brighton and Hove
 UK Newsquest Regional Press - This is Buckinghamshire
 UK Newsquest Regional Press - This is Cheshire
 UK Newsquest Regional Press - This is Cotswolds
 UK Newsquest Regional Press - This is Dorset
 UK Newsquest Regional Press - This is Essex
 UK Newsquest Regional Press - This is Gwent
 UK Newsquest Regional Press - This is Hampshire
 UK Newsquest Regional Press - This is Herefordshire
 UK Newsquest Regional Press - This is Hertfordshire
 UK Newsquest Regional Press - This is Lake District
 UK Newsquest Regional Press - This is Lancashire
 UK Newsquest Regional Press - This is Local London
 UK Newsquest Regional Press - This is NorthEast
 UK Newsquest Regional Press - This is Oxfordshire
 UK Newsquest Regional Press - This is Trafford
 UK Newsquest Regional Press - This is West Country
 UK Newsquest Regional Press - This is Wiltshire
 UK Newsquest Regional Press - This is Wirral

UK Newsquest Regional Press - This is Worcestershire
UK Newsquest Regional Press - This is York
Wakefield Express
Wales on Sunday
Warwick Courier
Wellington Weekly News
West Briton
West Sussex County Times
Western Daily Press
Western Mail
Western Morning News (Plymouth)
Whitby Gazette
Worksop Guardian
Yorkshire Evening Post
Yorkshire Post

6.2 French media coverage 2000-2005

6.2.1 Biotechnology

French biotechnology press coverage in the 2000-2005 period fell into two fairly equal parts - coverage of medical applications and coverage of agricultural applications. Reports focused on ethics, legality and public awareness, with one eye continually kept on international opinion and legislation. Biotechnology investment and worldwide research trends also received coverage. The most hotly debated issues were GM, human cloning and stem cell research.

Coverage of the GM debate moved from being overwhelmingly negative in 2000 to a more balanced representation in 2005. However, GM remains a controversial subject in France. Coverage of the organic farming debate shifted over the years from focusing on organic agriculture as an environmental issue to focusing on organic food as a lifestyle issue, and there are points at which the GM debate is conflated with the organic food debate. The activities of a vocal anti-GM environmental movement were widely and consistently reported over the five year period.

The debate on cloning became increasingly sophisticated over the five years as a distinction was made in the public mind between reproductive and therapeutic cloning. Widespread condemnation of reproductive cloning was accompanied by an interest in the potential benefits of therapeutic cloning. The Catholic Church made clear its condemnation of human cloning, and the cloning debate received most widespread coverage in the Catholic press. In 2005 France rejected a UN declaration which sought to ban all human cloning.

6.2.2 2000

6.2.2.1 Summary French press coverage of biotechnology issues in 2000 presented the following trends:

- Widespread public and press mistrust of GMOs. Coverage of the GM issue was almost entirely negative, with little space given over to discussion of potential benefits.
- A particularly ethically sensitive debate on human cloning, influenced strongly by the Catholic Church.
- An active and influential environmental lobby movement in France reported as becoming increasingly vocal in the GM debate.

6.2.2.2 Major stories from 2000 *Le Figaro* suggested that the French may be more timid and less forward-looking than the English, Dutch, Belgians and Italians about the possibility of human cloning research. From this group, the French government is the only one to have withheld authorization for scientists to create human embryos for research purposes only. The article pointed out that reproductive cloning is an unpopular idea in France, and raised questions about possible dangers if therapeutic cloning is “not taken seriously.” Ethical issues about the cloning of embryos were also discussed.

GEE (Groupe Européen d’Ethique des Sciences et des Nouvelles Technologies/ European Group of Scientific and New Technological Ethics) was explained in

Europolitique. Its role is to advise the European Commission, European Parliament and the Conseil des Ministres on the ethical issues surrounding new scientific and technological developments. Their current focus is on stem cell research, and the *eventual long term consequences, for individuals and society, of stem cell research and its applications.*

La Croix documented the state of fear and distrust in Italy as regards GM food, mentioning public fears that GMOs pose health dangers in the long term and that they could *profoundly upset the planet's biological equilibrium.*

Advances in the authorization of genetically modified organisms after a new European law was passed has pleased biotech manufacturers, reported Agence France Presse. EuropaBio, the European Association of Bio-industries was reported to be pleased, and said, *it's about GM regulation which provides clarity. Consumers will now see more benefits of genetically modified plants.* Many environmental groups, however, were disappointed. Friends of the Earth lamented what they call 'genetic pollution', and Greenpeace lobbied French ministers on the issue.

The role of environmental groups and protestors in the GM debate was discussed in Liberation, and Greenpeace's power and influence on the GM debate in France was also reported. Past demonstrations were discussed, including one at the opening of the International Biosafety Conference in Montreal, and elsewhere disruption of GM soya deliveries and field protests. L'Union Fédérale des Consommateurs - Que Choisir' (The Federal Union of Consumers- What to Choose) was also a major voice in anti-GM campaigns. La Confédération Paysanne (Countryside Confederation) aimed to prevent biotech manufacturers from seizing control of farmers worldwide, notably in developing countries.

A discussion forum which took place in the Centre Pompidou in Paris concluded that cloning may be '*acceptable,*' even if not instantly desirable, reported La Croix. However, the majority of participants agreed that therapeutic cloning must be distinguished from reproductive cloning.

The Prime Minister, Jacques Chirac, decided to revise French law regarding bioethics. Issues such as cloning, stem cell research and disease treatment were up for re-evaluation, reported Liberation.

La Croix reported that '*human embryo research is one the most ethically sensitive subjects of the moment.*' The interdict on therapeutic cloning, decided on by a small majority in the European Parliament, was discussed at length.

Le Figaro reported on the uses of stem cell research, and added, '*stem cell research arouses not only a large interest in terms of the possibilities for therapeutic cloning that it opens, but offers also an alternative to therapeutic cloning without posing the ethical dilemmas raised by embryo modification.*'

Agence France Presse reported the Italian Minister of Health's decision to give the thumbs-up to stem cell research. The article pointed out that '*the minister's decision may arouse numerous reactions due to the enduring influence of the Catholic church.*'

Agence France Presse discussed a recent report written by a group of European biotech experts, in which it was agreed that *'stem cell research opens very promising therapeutic perspectives, but must be handled with prudence.'*

The importance of careful management and surveillance of GM crops was discussed in Liberation. Jean-Claude Hubert, director of a microbiology lab in Strasbourg, argued in the article that scientists have very little knowledge about the potential long-term environmental and health risks of GM crops.

6.2.3 2001

6.2.3.1 Summary French press coverage of biotechnology issues in 2001 presented the following trends:

- Biotechnology coverage focused mostly on the GM debate, although there was steady coverage of developments in cloning research.
- Public biotechnology projects, including European conferences and government initiatives, were widely reported.
- The distinction between therapeutic and reproductive cloning was given some attention in the press. The cloning debate became increasingly sophisticated as the separation between these two kinds of research and their associated ethical issues was explored in more depth.

6.2.3.2 Major stories from 2001 The European Commission organised a conference on life sciences and biotechnology with the aim of encouraging large scale and constructive public debate on biotechnology in Europe. NEWS Press reported that the Conference took place in Brussels in September 2001.

The Minister of the Economy launched an extensive, multi-million franc project called Biotech 2002, with the aim of enabling France to become the European leader in the field of biotechnology between now and 2006, surpassing the work of Germany and Britain, reported Le Point.

Cancer researchers in Norway were exploring new methods of evaluation and analysis of carcinogenic factors, including experimentation with stem cell technology, reported Vigie Medecine-Pharmacie.

La Croix reported on the work of Advanced Cell Technologies (ACT) in the field of therapeutic cloning. According to the ATC scientists, the major significance of this project is that the nucleus of the specialized cell is able to reprogram itself. Their eventual aim is to transplant stem cells from cloned embryos into ill people to develop cures for various illnesses, and ATC confirmed that it has no wish to create clones of human beings.

La Croix reported on the plan of a group of over 100 international scientists, lead by four French Nobel Prize winners, to make public a petition demanding that embryonic stem cell research is authorized immediately in France in order to allow further research into its therapeutic potential.

La Croix discussed George Bush's decision to use federal funds in order to perform stem cell research. This was contrary to the public expectation that Bush would oppose the research in order to retain his support from the Catholic community.

The article also reported that Nancy Reagan is in favour of stem cell research but that the Catholic Church in America is strongly opposed.

Mark Mulloch Brown, the administrator of PNUD, Programme des Nations Unies pour le Développement (Program of Unified Nations for Development) said in *Le Point* that *'biotechnology offers the only and best method available of feeding the world's poor.'* He added, *'there hasn't been a single death which can be attributed to GM food.'* The article suggested that it would be wrong to condemn genetically modified food without knowing enough about it.

British politician John Prescott raised controversy at an international biotechnology conference in Bangkok with a speech that prompted 'violent' reactions from anti-GM protestors, reported *Agence France Presse*. *'I reject violence, intimidation and the general mentality of these protestors,'* said Prescott. *'We must respond to the real concerns of the public and deliver clearer information on the subject. Biotechnology has the potential to bring us great benefits and I think everyone agrees with that.'* In response, Jan van Aken of Greenpeace International argued that arguments for GM technology are based on *'doubtful scientific principles.'*

A *Les Echos* journalist asked *'are politicians right to say no to GMOs and wait for proof of their safety or should they commercialize GMOs until we know that they're harmful?'* The author expressed doubts about pledges to *'feed the world,'* arguing that 99% of GM activity is taking place in industrialized countries.

6.2.4 2002

6.2.4.1 Summary French coverage of biotechnology issues in 2002 presented the following trends:

- The distinction between therapeutic and reproductive cloning was emphasised further in coverage of the cloning debate.
- National restrictions on cloning were widely discussed, with great interest taken in the stances of other countries on cloning, particularly Belgium, Germany, the US and the UK. The story of an allegedly cloned child born in the US raised substantial debate.
- A steady stream of coverage on general biotechnology issues continued, including reports on legal and funding issues.
- Organic food was widely discussed. Press coverage this year looks at organic food as a lifestyle issue as well as an environmental one.

6.2.4.2 Major stories from 2002 The French Government, along with the German government, proposed partial restrictions on cloning, focusing on reproductive cloning. Spain, The Philippines and the US want a complete ban on all forms of cloning, reported *La Presse Canadienne*.

A sensational story about the alleged birth of a child through reproductive cloning in the US was published in *Le Temps*. The child was said to be a clone of her mother, developed because her 'father' was infertile. The article's tone was sceptical, referring to the alleged birth as *'a fairground illusion.'* The author added, *'one thing is certain. The almost unanimous condemnation of reproductive cloning does not involve therapeutic cloning.'*

Vigie Strategie et Politique Technologique reported that The Canadian Health Research Institute would finance stem cell research, but only under strict

guidelines. It would not finance any research involving the creation of human embryos for cloning, nor would it finance embryo fertilization for uses other than IVF.

A report published by L'Agence Française de Sécurité Sanitaire des Aliments (AFSSA) (The French Agency of Food Safety) declared that organic food is healthy, reported Le Figaro. The article held that, against a background of food scares this was *'welcome news'*. However the article pointed out that many hold we do not know if organic food provides health benefits *'superior'* to non-organic crops.

Le Figaro reported that biotech funding is diminishing. NASDAQ Biotech saw decreases of 16.2% last year and accepted the same cut at the beginning of the present year. However, these cuts were reported to be unlikely to continue over coming years.

Le Figaro reported that, *'worried about food quality, authenticity, safety and preserved taste, half of the French population are regular or occasional consumers of organic produce.'* The market for organic products was evaluated at 2.3 billion Euros. The principle reason was concern over health risks, along with concern about the lack of taste of GM food. Supermarkets have cottoned on to the trend and widened their ranges of organic produce. The supermarket Carrefour started an organic food initiative, and calls organic food, *'a real lifestyle choice which goes beyond food.'*

NEWS Press warned that *'the biotechnology sector needs to make sure that patents on biotech inventions are correctly applied,'* following a report from the European Commission. The author held that, *'a clear and fair regime of patents, applied in a coherent fashion, is essential if we are going to fully exploit the medical, environmental and economic potential of biotechnology in an ethically tense domain.'*

Liberation reported on the human cloning controversy. It challenged the 'universal' opinion that *'everyone is against human cloning,'* and that *'human cloning is banned almost everywhere,'* pointing out that only around 30 countries have adopted a law banning human cloning. Although George Bush has said he is against human cloning, there is no law in America pronouncing it illegal. Liberation described this as 'incompetence' although the author acknowledged that a legal decision on the issue had not yet been reached in France.

6.2.5 2003

6.2.5.1 Summary French coverage of biotechnology issues in 2003 presented the following trends:

- Organic food as a lifestyle choice was still being discussed widely. General debates about organic farming were replaced with more specific concerns about where to buy organic and organic food certification procedures.
- Discussion of cloning continues. The 2002 story of an allegedly cloned child born in the US continued to attract comment.
- Coverage of general biotechnology issues continued steadily, with some focus on public biotechnology awareness events, debates and opinion polls.

6.2.5.2 Major stories from 2003 Reasons for buying organic food (improved taste, better nutritional value, environmental benefits) were discussed in Le Figaro, and recommendations made for how consumers can be sure that what they are buying is organic, including looking for the AB logo (Agence Bio, a public interest group).

The controversy over a baby supposedly born from human cloning in America continued to be discussed in *Liberation*. The journalist wrote, *'do you take this announcement seriously?'*

Le Point also discussed the issue, saying that *'the cloned child shatters humanity.'* The writer said that the development brings about 'shivers of science-fiction,' and posed many questions regarding how her conception could have been possible, asking *'is she really human?'* The question of whether other scientists will want to repeat the 'miracle' was discussed.

Companynews reported on a recent London conference where main actors in the biotech sector assembled to launch a new event: International Biotech. The exhibition received 1700 visitors in two days. Subjects such as licensing, biopartnering, biofinancing and bioinformatics were discussed.

Vigie Agronomie et Industrie Alimentaire discussed the principle uses of biotechnology: medicine and food, and informed the reader of a debate lead by Life Science Austria on the subject, which took place in Vienna. 81% of people questioned during the debate were opposed to food produced using agrobiotechnology. 80% of people felt under-informed on the subject. On hearing the results, LISA decided to organize another debate on biotechnology.

La Croix reported that *'the Church's point of view as regards cloning is neither political nor strategic, but moral and doctrinal.'* The article re-emphasised the Catholic Church's strong condemnation of human cloning.

Le Conservatoire National des Arts et Métiers (CNAM) announced a new program of upcoming debates. The first was called *'tomorrow: clones?'*, and involved a group of scientists and key figures from the public debate on cloning, including Rene Frydman, Didier Sicard, Michel Revel and Genevieve Delaisi.

6.2.6 2004

6.2.6.1 Summary French coverage of biotechnology issues in 2004 presented the following trends:

- Developments in cloning research this year fuelled coverage of the cloning issue. Reports also focused on legality, ethics and national restrictions on cloning.
- Coverage of GM was mostly negative. Opinion polls suggested that the French public were generally opposed to use of GMOs in farming, and reports suggested that planting of experimental GM crops is in decline.

6.2.6.2 Major stories from 2004 In response to new European regulations on GM food labelling, Greenpeace intensified their anti-GM campaign. They launched a new website, *'www.detectivesOGM.org,'* to act as a product guide, and organised 'guided visits' to supermarkets to explain to consumers where GM products can be found and how to avoid them, reported NEWS Press.

La Tribune announced that *'the European Commission has permitted, for the first time in five years, imports of genetically modified foodstuffs, BT 11 maize produced by the Swiss group Syngenta.'* Concurrently, a survey revealed that 76% of French people were 'quite' or 'completely' opposed to GM.

Le Figaro reported on a European decline in the planting of experimental GM crops and argued that the GM debate had never been more heated. Adeline Farelly of Europabio, an organization representing European biotech firms, said, *'obviously, there is a lack of consumer trust towards GM, which reduces market potential for enterprises.'*

The legality of cloning was discussed in Agence France Presse, and international differences were discussed. The French parliament adopted a law on the 9 July banning reproductive cloning. Laws in Sweden, Belgium and Brazil were also noted.

Le Temps reported a double first in South Korea: researchers successfully obtained cloned human embryos which had developed to the blastocystic stage, and also created a line of stem cells which can be used in any human tissue. (Note that this research was subsequently discredited in 2005) Le Figaro also reported on the findings, adding that *'the team obtained the necessary authorization from the university's ethical committee.'*

La Croix also reported the new findings, focusing on the research's potential for curing disease. However, the writer also worried that this might aid scientists who envisaged a child being born from reproductive cloning.

Vigie Strategie et Politique Technologique reported an article published after a World Economic Forum Conference by Lord May, President of the Royal Society, who denounced *'these people who are engaged in practices known to be medically risky, scientifically doubtful and socially unacceptable,'* calling them *'the cowboys of cloning.'*

6.2.7 2005

6.2.7.1 Summary French coverage of biotechnology issues in 2003 presented the following trends:

- General coverage of biotechnology issues suggested that investment is on the increase, and reported on developments in international biotechnology research.
- The GM issue continued to be widely reported. Coverage was less negative following a statement from Chirac supporting research into GM. Coverage of the GM debate was regularly conflated with coverage of the organic farming debate.
- France voted against a UN declaration which would ban all human cloning. International policy on cloning continued to receive coverage.

6.2.7.2 Major stories from 2005 Investir Hebdo reported on Ernst and Young's claims that for the first time since 2000, biotech investments have overtaken IT investments.

Le Temps discussed new developments in biotechnology and genetics taking place in Andhra Pradesh, India, sometimes also called 'Genome Valley.' India is currently responsible for only 2% of the global biotech industry, but the author argues that this is about to change. The country already has 40 national research centres which employ 15,000 scientists.

L'Humanite, in an article called *'pourquoi tant de haine contre les OGM?' (why so much hate towards GM?)* argued that *'the use of GM doesn't pretend to resolve all the world's food and agriculture problems, but it can bring about new and effective solutions'*

for old problems, which have never been so bad. GM crops allow significant reductions in the use of pesticides and herbicides.' The writer adds, *'no-one can prove the health benefits of organic produce. In all objectivity, GM crops don't seem catastrophic.'*

Agence France Presse discussed Jacques Chirac's opinions on GM. Chirac has condemned the demonization of GM and celebrated the work of those researchers who are making efforts to publicly promote their work. Researchers said that they hoped that the President's intervention would help to improve awareness of the 'real stakes' of GM research.

The UN made a declaration against cloning, inviting member states to disallow all forms of human cloning due to *'risks that can impair human dignity.'* The declaration attracted 84 favourable votes, 34 against and 37 abstentions. France voted against, along with Belgium, Spain, Holland, Britain, Brazil, Canada, China, India and Japan. Many of the favourable votes came from largely Catholic countries such as Croatia, Ireland, Italy, Poland, Portugal and Slovakia, as well as the USA, Mexico and the Philippines. Many Islamic countries abstained, although Saudi Arabia and the United Arab Emirates voted in favour. (La Croix)

Following the UN declaration on human cloning, Xinhua News Agency reported that Belgium has reaffirmed its support for therapeutic cloning.

6.2.8 Nanotechnology

French press coverage of nanotechnology during this period started off on a highly positive note. Coverage from 2000 to 2002 was almost universally positive, focusing on potential applications and economic opportunities brought by nanotechnology developments. There was an overall sense of excitement, and nanotechnology was typically presented in a scientific or economic/industrial frame. Much of the economics coverage presented nanotechnology research as an international race in which Europe must work hard to maintain its position.

The early coverage was also notable for its 'sci-fi' tone, and for the fact that most articles were prefaced with a brief outline of nanotechnology. This suggests that nanotechnology was being presented at this stage as a technology of the future rather than the present.

The tone of nanotechnology coverage shifted towards the negative in 2003, and for the first time this year nanotechnology was presented as an environmental story in the mainstream press, as well as a science or economics story. There was some suggestion that nanotechnology was 'the new GM', as environmental pressure groups voiced their distrust. This is accompanied by substantial coverage of research and the need for research into nanotechnology's risks and dangers.

Towards 2005, nanotechnology coverage became more balanced. Sensational concerns ('grey goo') continued to be reported, but this material was balanced out by reports of public consultation exercises and the economic implications of international nanotechnology strategies. Overall, coverage towards the end of this period displays a cautious optimism, looking ahead to potential applications and benefits while calling for improved research into risks and dangers.

6.2.9 2000

6.2.9.1 Summary French press coverage of nanotechnology in 2000 presented the following trends:

- A generally positive approach to nanotechnology, with coverage looking at the potential for research to create new jobs and stimulate the economy as well as scientific applications. However, the prevalence of sci-fi references suggested a perception of nanotechnology as belonging more to the future than the present
- A focus on exciting potential applications of nanotechnology, particularly in medicine and computing.
- A continued international outlook, particularly to the US, and an emphasis on competition between industrialised nations in nanotechnology research. Coverage of international research also tended to report on funding.
- Some general discussion of 'pros and cons' and philosophical issues. The pros tended to focus on the possibility of exciting applications, while the cons tended to be fairly vague, based around concerns about 'playing god'.
- Most articles on the subject began with a brief definition of nanotechnology, suggesting that it was still seen as a new and little-understood topic.

6.2.9.2 Major stories from 2000 Les Temps reported on the increasing number of technology parks, referring to the 'stupendous growth' of parks hosting nanotechnology research. The article focused on the capacity of such developments to create new jobs.

In La Tribune Francis Garnier, the director of CNRS' Laboratory of Molecular Materials, discussed potential medical applications of nanotechnology, including combating the transmission of HIV through blood transfusions to haemophiliacs.

SDA reported on the concerns of Bill Joy, director of the research organisation Sun Microsystems, about the possible risks associated with nanotechnology. He discussed what he called the '*uncontrolled development of technology*,' saying, '*the technology of the 21st century- genetic, nanotech, and robotic- is so powerful that it can generate new categories of accidents and abuse.*' Joy went on to add that '*nanotechnology could clearly have military and terrorist implications.*'

A number of articles reported on worldwide developments in nanotechnology, with a particular focus on the US. For example, Liberation described nanotechnology advances and research as a '*national priority*,' in the US and claimed that the '*race is on*' for new findings among all industrialized countries. 'Buckyballs,' spherical carbon molecules, were said to be being created by American scientists in order to respond to the new demands of nanotechnology research.

America's changing budget for nanotech development and research in 2001 was examined in Veille Technologique. Nanotechnology was said to have been made a priority, a position reinforced by the launch of the NNI (National Nanotechnology Initiative), with a budget in the region of \$497 million for nanotechnology alone.

La Tribune discussed the widening range of nanotechnology applications, including possible medical applications such as restoring impaired vision and to allow paraplegics to walk again.

Agence France Presse reported on a new method of making data storage systems one hundred times more powerful using nanotechnology in development at IBM. The research brought together electronics, chemistry, molecular biology and nanotechnology. Currie Munce, director of research at IBM, said, *'Numerous practical considerations must be taken into account before this new process is adapted for the commercialisation of new disks, but in the laboratory it's a very interesting and promising development.'*

Liberation debated the pros and cons of nanotechnology research and attempted to answer the question, *'doit-on le faire ou pas?'* (Should we do it or not?) On the plus side, the writer discussed the paths that nanotechnology open: exciting new applications in computing and medicine. However, the author also suggested that nanotechnology research brings with it a risk of *'getting too close'* to the molecular basis of life.

Liberation acknowledged that public opinion on nanotechnology is dramatically varied, and argued that the reason for this is the incredibly fast speed at which technologies are developed. The author wrote, *'genetic engineering will allow us to cure numerous illnesses and to prolong life expectancies. The possibility of industrially creating products to the scale of an atom will provide us with many new opportunities, extensively and cheaply.'*

Several articles pondered the philosophical and ethical side of nanotechnology. In Liberation, Daniel Parrochia said that *'nanotechnology pushes back the known world,'* and quoted Descartes and Camus in his arguments against *'the abuse'* of nanotechnology.

Science-fiction references are prevalent. One writer said, *'the sketchbooks of researchers now resemble science-fiction books. In them, we find machines to scour arteries, gene-correctors and things to kill viruses and tumours.'*

6.2.10 2001

6.2.10.1 Summary French press coverage of nanotechnology in 2001 presented the following trends:

- Coverage this year continued to be highly positive about the possibilities opened up by nanotechnology. A substantial amount of coverage was given over to positive new developments and potential applications, ranging from everyday applications like street lighting to developments in medicine and computing technology.
- Substantial coverage was devoted to the economic and industrial potential of nanotechnology. Many reports looked internationally, detailing nanotechnology research budgets worldwide and in many cases portraying nanotechnology research as an international 'race'. Concerns were voiced that European nanotechnology R&D may lag behind the US and Japan, and that within Europe France may have been lagging behind Germany due to disparities in nanotechnology research funding.
- New developments in France also received some coverage, looking into the nanotechnology 'scene' in French universities, investment of French companies and the development of new nanotechnology research groups in France.
- Coverage of applications focused more on everyday and medical applications and less on 'sci-fi' possibilities.

6.2.10.2 Major stories from 2001

Les Echos discussed the potential range of nanotechnology applications. Michel Orrit, director of NOI (Nano-Objets Individuels) said that the range of research is diverse. Possibilities discussed included the use of nanotubes for street lighting in Japan. The same article pointed out that, although the governmental budgets for nanotech research for Japan, Europe and the USA were roughly equal (in the region of \$120 million), nanotechnology is the first scientific revolution since the Second World War in which America has not been the clear leader. Despite its three major nanotech centres, France is thought to be far behind Germany, which is investing ten times more in this area.

Les Echos discussed a range of nanotechnology applications and developments, including optics, cosmetics, health, the environment, glass making, textiles, paints, concrete and new photographic emulsions.

Le Monde Du Renseignement talked about the use of nanotechnology in military operations. Reported that nanotechnology can be utilised in various different arenas to capture and quantify information that in turn can be amalgamated with other information systems in to create a holistic and independent complex intelligence system.

Journal du Net, JDN Solutions discussed the opportunities which nanotechnologies present in the creation of artificial intelligence systems, which have become a big investment area. Xilinx, Motorola and Altera are now producing chips using nanotechnology. Already partially in use by NASA, such systems could allow users to treat information up to as many as 1000 times faster than non-nano-technological appliances. It claimed that artificial intelligence genetic programming has '*many glorious days ahead that are limited only by the imagination of those scientists working on these projects.*'

Le Temps detailed the history and success of the silicon circuit. However the article states that this success was doomed to be short-lived since scientists were unable to miniaturise such apparatus any further until Harvard researchers created the first integrated silicon circuit with nanotube transistors. Nanotechnology applications currently in development will enable smaller circuits to provide more power and productivity. Due to the expense of such methods, however, these projects may not be viable on the economic market - larger circuits are much cheaper to produce.

New nanotech companies are discussed: Nanophase Technologies, Carbon Nanotechnologies or Zyvez in the States, Nanox in the UK, PlasmaChem in Germany and Lightyear Technologies in Canada. At least two French companies are being created: Nanoledge in Montpellier and another company (as yet unnamed) in Toulouse.

Japan's influence is reported to be increasing. An article in Les Echos claims that the country invested \$300 million in 2000. However, French research is also becoming more influential, particularly the team of Christian Joachim of CNRS. Future objectives include super-computers and robots which can heal. The article says, '*even if such objects never become more than fiction for scientific, technical, economic or ethical reasons, numerous less ambitious developments will definitely appear.*' [206]. There is no nanotech research domain which is not covered by the Japanese, and often in the position of leader. Researchers have benefited from new systems of priority financing since the late 80s. Particularly well-known researchers

are Hiroyuki Sakaki of the University of Tokyo and Yanagida Toshio of the University of Osaka. Fujitsu Laboratories has just announced the creation of a centre dedicated to nanotechnology.'

Les Echos notes that in 2001 the US budget for nanotechnology doubled (US\$422 million). Alain Thorel complains that if such trends continue, Europe will have great difficulty in catching up. He states that huge technological disparities between the USA and Europe could have long-term negative consequences for Europe.

Le Monde Du Renseignement discusses the "battle" over nanotechnology. The USA is thought to have substantially invested in the field in order to ensure its supremacy - the budget for 2001 is cited as 490 million dollars. Firms across Europe, realising the potential market for nanotechnology, are starting to invest large sums into research, including Henkel in Germany and (then) Glaxo Wellcome in the UK. The European Union, increasingly aware of the potential for nanotechnology, has decided to invest 225 million euros over the space of 5 years via the PCRD programme which has a total budget of 13.5 million euros for the period of 1998-2002.

Agence France Presse describes Dvornikovo, a city north of Moscow where nanotechnology research is taking place. The article states that Dvornikovo is one of the few places in Russia that refutes the nation-state's 'disastrous' scientific reputation. Apparently groundbreaking work is taking place in the Dvornikovo research centre, but budgets are minimal and many scientists leave due to the fact that they are paid a salary of about 100 dollars. However, those who stay, argues the director of the Scientific Research Centre, Vladimir Khadichevski, do so out of true love of science.

The teaching of nanoscience and nanotechnology in France has increased widely in the past five years in many universities and engineering schools. Training specifically dedicated to nanotech has been created, with specific Masters courses in many cases, for example at the Université Paul-Sabatier in Toulouse. Toulouse has been identified by the CNRS as an emerging centre of nanotech research.

A new research group, 'Commissariat à l'énergie atomique (CEA)' has been created in Grenoble, combining L'institut National Polytechnique de Grenoble, the University and local economic directors to become the head of the national network for the research of micro and nanotechnologies. The group will involve 3,500 people: researchers, manufacturers, students and managers.

La Tribune describes the oscillating nature of the biotechnology and nanotechnology markets. These are apparently hard to pin values on, due to yo-yo movements that even the US is unable to stabilise. There are complaints that the lack of transparency in the biotech and nanotech markets is the cause of confusions in the sector and unstable market pricing.

6.2.11 2002

6.2.11.1 Summary French press coverage of nanotechnology in 2002 presents the following trends:

- A positive focus on 'grand plans' for nanotechnology, amid claims that nanotechnology will change the future of medicine, computing and manufacturing.
- Potential applications of nanotechnology are discussed in detail, including everyday applications (street lighting, batteries) and medical developments.
- Significant coverage of national and international nanotechnology funding strategies. International coverage is often framed in terms of a 'race' between industrialised nations to be at the forefront of nanotechnology research.
- Investment is discussed at length, and nanotechnology is reported as a business issue as well as a science issue.

6.2.11.2 Major stories from 2002

Les Echos discusses nanotechnology in grand terms, saying it has *'the potential to change humanity.'* It reports on a nanotech conference organised in the USA to unite the best scientists in the field and the managers of start-up companies engaged in the manufacture of commercial products using nanotechnology, which will be the first event of its kind.

Nanotubes are discussed in many articles. Les Echos reports that the makers of cars, planes and surgical equipment will be able to create new materials which we can *'barely dream of'* today. The newspaper also discusses *'nano-implants,'* which can be inserted into the human body in order to reduce fractures. Other possibilities for nanotubes are discussed in Vigie Matériaux, including *'components for energy storage and conversion, sensors, light sources, screens, nano-metric semi-conducting components and soundings.'* The possibility of using nanotubes for lithium batteries is also considered. Le Point also discusses potential uses for nanotubes, including astronauts' suits, the cords on tennis rackets, treatments for cancer and billposting screens.

The significance of the NNI (National Nanotechnology Initiative) is discussed in Vigie Matériaux.

A positive approach towards nanotechnology is taken by Le Point, which points to the fact that *'financers are continuing to invest, even in periods of crisis' as 'proof' that nanotechnology has a 'big future'.*

Nano-industry is taking shape in Switzerland. Existing companies (such as Nestle and Swatch) and new start-ups (such as Montena) are introducing new nanotechnology research projects. However, PME Magazine reports that *'Switzerland risks missing the boat in terms of nanotechnology. It could be about to repeat the mistake that it made with microelectronics after the Second World War, when it lost its lead in research. Despite the country's talents in nanotechnology, the problem is a lack of funding.'*

'High-tech and biotech have lost their monopoly on future investments,' reports La Presse Canadienne. Nanotechnology has allegedly taken over, as George Bush increases his spending budget for nanotech research to US\$679 million, an increase of 17%. The author argues that *'Extreme miniaturisation could create a market of \$700 billion,'* and compares the development of nanotechnology to the creation of the internet, in that both became an object of *'exacerbated infatuation.'* However, in an interview with John Roy of Merrill Lynch, quoted from La Tribune, the scientist says, *'investors in this action are awaiting the facts and proof that nanotech applications are realistic.'*

6.2.12 2003

6.2.12.1 Summary French press coverage of nanotechnology in 2003 presents the following trends:

- The overall tone of coverage is negative for the first time in this five-year period.
- Environmental pressure group campaigns calling for restrictions or bans on nanotech research are given a lot of coverage, with some suggestion that nanotechnology is 'the new GM'. Writers are picking up on the mood of increased mistrust, and nanotechnology is increasingly presented as an environmental as well as a science/technology or business issue.
- Reports of research into dangers and health risks are also reported widely.
- However, given the increase in negative coverage there is also a steady stream of positive reporting which focuses particularly on practical and manufacturing applications of nanotechnology.

6.2.12.2 Major stories from 2003 Les Echos claims that, *'like GM, nanotechnology seems a dream for some, a nightmare for others.'* Associations like ETC (Action Group on Erosion Technology and Concentration) in Canada are calling for a ban on nanotech research until alleged health and environmental risks have been evaluated more thoroughly. Greenpeace is also advocating *'choice among citizens'* on the subject. Patrick Bernier of CNRS says that his team are investigating the potential toxicity of some nanotech elements.

Vigie Médecine-Pharmacie reports, *'After their campaign against genetically modified organisms, environmental organisations are preoccupying themselves more and more with nanotechnology. The most virulent groups are demanding a moratorium and are hoping for an international ban on nanotech research. Their fears are essentially based on nanoparticles' potential impacts on the environment and public health.'*

A report is being published by The Royal Academy of Engineering, reports Vigie Opto-Electronique, which will study on the potential benefits and problems associated with nanotechnology. It is going to identify the environmental, health, security, ethical and social implications of the research. Both Greenpeace and the ESRC are also publishing reports on the subject.

Les Echos reports on new possibilities for nanotechnology in manufacturing. Nanoparticles which are capable of completely blocking ultraviolet radiation could be incorporated into the production of sun creams. In addition, a Californian organisation, Hybrid Plastic, has just created a new material, NanoBond, which can be directly incorporated into the production of plastics to improve their lightness and resistance. Nanobond is said to be the most important chemical invention since Kevlar, from Dupont in 1965.

Mikail Roco, the director of the National Nanotechnology Initiative, is quoted in Les Echos as saying that in the long term, nanotechnology will allow us to meet the basic needs of the worlds' population, citing examples like provision of clean water, and the potential for using nanotubes to provide better treatment for Diabetes. Specific applications involving nanotubes and buckyballs are mentioned.

6.2.13 2004

6.2.13.1 Summary French press coverage of nanotechnology in 2004 presents the following trends:

- A continued focus on environmental concerns and campaigns on nanotechnology, along with public concerns about safety and regulations.
- An otherwise positive tone of coverage, much of which looks at potential applications in medicine and manufacturing.
- National and European initiatives are reported on, as are findings from research and public consultations.
- Overall, a more balanced presentation, with more space given to research findings and details of public consultations, and less given over to opinion.

6.2.13.2 Major stories from 2004 Le Figaro asks, *'is nanotechnology going to create a new dynamic in the fight against cancer?'* A specific budget has been set aside for this research in France. The article claims that nanotechnology could be used to investigate tumours and the appearance of even very weak cancers, for example in the blood., which would enable medics to catch cancer at a very early stage.

Le Figaro describes nanotechnology as a similar subject to so-called *'frankenfoods,'* and reports on public worries about the lack of regulation on nanotech research. The article discusses the alleged threat of a new type of chemical pollution caused by the release of nanoparticles into the environment. Pat Mooney, the director of ETC (an environmental pressure group) says, *'nanotechnology could, one day, help to considerably reduce the cost of the production of solar energy, to purify water and to clean up environmental contaminations, but researchers have to be careful.'*

The initiative 'Nano de 'Autriche' (Nano of Austria) was officially launched on the 1st March 2004, reports Vigie Stratégie et Politique Technologique. This is a program of support for nanosciences and nanotechnology in Austria.

The Conference NanoCommerce 2004 took place in October in Chicago, bringing together major figures in the American research and industry, reports Les Echos.

ZDNet France News, reports that the Brussels Commission has just launched a consultation on *'the influence of nanotechnology in Europe.'* The objective is to assemble all the information collected by European Projects on nanotech and to gather opinions and propositions from people in the industry, researchers and citizens. The Commission suggests that *'this consultation will be a source of inspiration for future initiatives in Europe.'*

Le Temps reports on the findings of a joint nanotech research report by The Royal Society and the Royal Academy of Engineering. Ann Dowling, the director of the study group says, *'Most research sectors don't pose a risk as the nano-components involved are fixed in the products.'* The report adds that there is little reliable information on nanoparticles which many believe could cause harm to the human body.

6.2.14 2005

6.2.14.1 Summary French press coverage of nanotechnology in 2005 presents the following trends:

- A continued focus on public fears about nanotechnology, with the terms "Grey/Green Goo" and "nanophobia" appearing for the first time. Coverage of this apprehension is tempered with calls for a balanced approach to new technologies.

- Discussion of national and international nanotechnology research strategies, including details of British funding and job creation in Germany.
- Wide coverage of the results of the European Nano-forum, which calls for more investment in research in Europe along with more research into potential risks. This emphasises further the calls for a balanced attitude towards nanotechnology.

6.2.14.2 Major stories from 2005 La Croix reports that '*the GM Scenario is repeating itself*,' and mentions 'Grey Goo', a phenomenon whereby nanomachines allegedly become independent and start reproducing themselves, and Green Goo, whereby new materials '*attack nature*.' The term '*nanophobia*' is coined. The article calls for a balance between scientific, civic and ethical spirit on this issue.

According to a report written by Edelgard Bulmahn, federal minister for education and research, discussed in Vigie Strategie et Politique Technologique, 10,000 jobs could be created in the nanotechnology industry in the next two years in Germany.

The NanoForum network has, between August and October 2004 conducted a survey on developments in nanosciences and nanotechnology, supported by the European Commission. 720 people responded to a questionnaire (scientists, journalists, manufacturers etc). The survey's conclusions included the following: nanotechnology will have a significant impact on European people's lives over the next 10 years; Europe is seen to be behind the US in terms of nanoscience research and transfer or nanotechnology to industry; more European framework funding should be devoted to nanotech research, and environmental, health and safety risks should be incorporated into research at an earlier stage, with a particular focus on filling the 'knowledge gap' about nanoparticles.

Nanotechnology in Britain is examined in Vigie Strategie et Politique Technologique, with reference to Lord Sainsbury's announcement that £90 million will be spent in the next six years on micro and nanotechnology research.

6.2.15 Nuclear energy

French press coverage of the nuclear energy issue in the period between 2000 and 2005 started off negative and became slightly more positive towards the end of the 5-year period. This change was most likely due to an increased French political focus on improving nuclear waste management strategies and involving the public in consultations.

Nuclear waste management was the single most significant topic, and in some cases completely dominated the year's press coverage. Most coverage of the issue focused on France's alleged lack of a coherent waste management strategy, and on calls for France to develop a publicly available national inventory of radioactive waste sites.

Coverage maintained an international focus, continually examining other countries' nuclear energy and waste management strategies.

There was a steady stream of low-level radioactivity scare stories, which remained constant across the five years. These typically involved some radioactive material being found in a local environment like a school or rubbish dump, where the actual risk involved was fairly negligible.

Nuclear energy is discussed as possible low-carbon alternative energy source. Coverage of the nuclear energy issue is framed on both sides by environmental concerns – on the one hand the wish to reduce France’s carbon emissions and on the other a concern about the environmental impact of using more nuclear energy. However, confusion prevails about the potential environmental impact of nuclear, and much of this confusion hinges, again, on the issue of waste management.

6.2.16 2000

6.2.16.1 Summary French media coverage on nuclear energy from 2000 presents the following trends:

- The discussion of nuclear power is framed between on the one hand the acknowledged need for France to reduce its carbon emissions and on the other hand widespread anxieties about safety and waste disposal.
- The lack of a publicly available national inventory of nuclear waste in France causes some concern, and adds to general safety worries.
- France’s lack of a national inventory of waste sites also fuels discussion about France’s place in the international nuclear ‘scene’.
- An overall sense of confusion over nuclear energy, particularly about safety, environmental impact and comparisons between nuclear and ‘alternative’ energy sources in reducing carbon emissions.

6.2.16.2 Major stories from 2000 Les Echos discusses the lack of a national inventory of nuclear waste in France. L’Agence Nationale de la Gestion des Déchets Radioactifs (ANDRA) (National Agency of Radioactive Waste Management) has said it can’t compile one until 2003. Les Echos states that complaints have been made as regards this lack of inventory for there is neither a record of the existing nuclear waste nor its level of danger. The writer asks, *‘why has France, a country known for its nuclear power, fallen behind Great Britain, which, rarely though-t of as a nuclear country, already possesses a public inventory which can be consulted by everyone?’*

Les Echos discusses some forthcoming changes to nuclear legislation. The current law on nuclear material is to be changed to a series of regulatory decrees. The minister of the environment, Dominique Voynet, says he hopes to gain complete control of the issue of nuclear safety.

La Tribune discusses the nuclear energy question. Christian Pierret, the Secretary of State for industry, wants to reduce nuclear energy production from 80% to 50% following Germany’s shutdown of 19 nuclear power plants. However, the pro-nuclear lobby argue that nuclear power stations are still the most cost-effective way to produce electricity. The author discusses the implications of abandoning nuclear power in light of the Kyoto agreement. Both sides agree that security must be improved since it appears that it will be impossible for France to completely halt nuclear power production, and the writer concludes that *‘it is important that France makes an effort on this subject, as until now we have not really had our foot on the international ladder.’*

The abandonment of nuclear power in Germany is discussed in Les Echos. The red-green coalition is hoping to close down the 19 existing nuclear power stations over a period of 3 years. Nuclear research will continue despite the closures, but natural gas is now the preferred energy source in Germany. The author points out that the abandonment of nuclear power may prevent Berlin from honouring its international agreements on atmospheric pollution.

Les Echos asks, *'do we necessarily have to be anti-nuclear if we are environmentalists?'* The author presents some surprising facts, e.g. civil nuclear power, in its entire history, has killed less people than a single week of traffic in Europe and coal power stations eject more radio-activity into the environment than nuclear power stations.

La Tribune says, *'the important thing is to figure out what can replace nuclear power.'* We are reminded that France has no petrol, and very little gas. 'Clean' energy and improved energy management are thought to be the solution, and the author points out that wave power is already being exploited in France. However the Secretary of State for Industry still considers nuclear energy as the best means of distributing electricity across French households and suggests instead a varied package of diversified energy-producing activities.

Le Figaro argues that, while the debate on nuclear waste is becoming increasingly heated, no-one knows exactly how much needs to be stored or transformed in France due to the lack of an accurate national nuclear waste inventory. Yves Le Bars, President of ANDRA insisted yesterday that an inventory be created. Should the Government approve the project then the first inventory of its kind will be published in 2003. However this inventory will not list the different types of waste nor give an idea of the future amount of nuclear waste that shall be produced. On the other hand the inventory will enable the Government to be more effective in its decision-making processes and management of current nuclear waste.

6.2.17 2001

6.2.17.1 Summary French media coverage on nuclear energy from 2001 presents the following trends:

- The possibility of a French national inventory of nuclear waste continues to be widely discussed.
- Coverage mostly focuses on nuclear waste management. The tone is negative, with most coverage displaying some disappointment and worry about the lack of a coherent nuclear waste management strategy in France.
- The possibility of recycling waste is discussed, and some space is given over to scare stories about discoveries of radioactive materials in the environment and particularly the workplace.

6.2.17.2 Major stories from 2001 Le Figaro writes *'at the end of the 1980s there was no centralised, exhaustive document detailing the distribution of radioactive waste in France.'* The French government has already allocated 1.5 million Euro from the 2002 state budget to the creation of such a document. Meanwhile over 10,000 tons of highly radioactive nuclear waste is still being stocked until a solution is found as to how to dispose of this.

Nuclear waste categorisation is discussed in Les Echos. Waste is categorised in virtue of its radioactivity - very weak, weak, medium and strong - and the remaining duration of its radioactivity - short (less than 30 years) and long (more than 30 years). The possibility of 'recycling' nuclear waste is also discussed.

Europolitique says that a new report on nuclear power judges the existing program of nuclear fusion inadequate as it does not cater for the needs of minor projects which take place in smaller institutions. France estimates that the creation of better networks and communication could resolve the problem. The report gives

details of how new strategies could be put into place, and points towards a 'European culture of safety.'

La Tribune says that *'not far off 15 billion francs have been spent in less than 10 years to get rid of several thousand metres square of nuclear waste. However, many worry that radioactive residue may remain for thousands of years. Since 1992 scientists have been working flat out to find ways to completely get rid of it.'* However so far no concrete results have been arrived at although progress is being made. Patrice Bernard, director of nuclear development and initiative at the CEA, says *'in 2006 we will present parliament with a range of scientific solutions.'* The CES dedicates a budget of more than 400 million francs a year to this research.

The management of nuclear waste, irrespective of a country's energy politics, is becoming a *'headache for everyone,'* reports La Presse Canadienne. The importance of inventories for nuclear waste, particularly geographically-based ones, is reiterated. The author points out categorisations of waste tend to differ across countries. Deep geological storage of waste is also discussed.

The dangers of radioactive metals are discussed in Le Temps. The dangers of these radioactive metals to the health of Swiss soldiers in Kosovo are detailed. Along with mines, they are the principal danger that soldiers have to face in this area. The article also describes the ailments and health problems faced by French and American soldiers exposed to nuclear activity in the Balkans. Although no direct links have been found between the cases of soldiers with leukaemia, cancer and exposure to nuclear activity it would seem that a general paranoia is setting in about soldiers working in this area of the world. Prompted by the latter the Head of Swisscoy has insisted that all Swiss soldiers returning from Kosovo and Bosnia are to have in-depth health check-ups upon their return. One question remains unanswered: *When did the General Major realise that uranium bombs were being used in Kosovo?*

La Tribune worries that *'the existence of radioactive waste may be forgotten by authorities,'* reminding readers that radioactive products are all around us (for instance, in americium lightning conductors from the 30s). One organisation's awareness-raising campaign on the risks associated with radium is mentioned. The author says *'the risk is real.'* Abandoned radioactive industrial sites are also seen as a danger. Michelle Rivasi, a socialist deputy insists that all nuclear waste has to be tracked down and centralised in one location so as to ensure transparency all along the line.

6.2.18 2002

6.2.18.1 Summary French media coverage on nuclear energy from 2002 presents the following trends:

- There is a strong international outlook in coverage this year. International nuclear energy and nuclear waste management strategies are widely discussed.
- Nuclear waste and its management are still major preoccupations. The entirely negative coverage of previous years balances out slightly, as EC and national initiatives to tackle the problem of nuclear waste management are met with relief by the press.
- Scare stories about radioactive material being found in unlikely public places continue to receive coverage.

6.2.18.2 Major stories from 2002

Agence France Presse reports that *'China has announced that preliminary construction has begun on a new nuclear power station in eastern China after several years of prevarication over the future of nuclear power in China.'* However, the author also discusses the range of alternative energy technology being developed in China, including thermal and hydraulic.

Le Temps asks, *'where can radioactive waste be buried in Switzerland?'* CEDRA (National Cooperative for the Disposal of Radioactive Waste) claims that their projects are *'technically possible but held back by politics.'* Research to find a suitable site is still going on. At the moment, the author claims, no-one knows exactly how to tackle the problem.

NEWS Press reports that *'the European Commission has launched a project with the aim of creating a network of organisations to deal with the management of radioactive waste in Europe.'* Its objective is to improve co-operation in research on this area. *'It's an important stage in the elaboration of a better system for managing nuclear materials,'* said Philippe Busquin, the European Commissioner of Research.

The importance and dominance of nuclear power in France is discussed in News Press. Nuclear constitutes 75.6% of all energy produced in France, but only 17% of power produced in the world. Many French people felt that renewable sources will be insufficient to meet France's energy demands but fears about nuclear energy, partly generated by catastrophes such as Chernobyl, also persist. The author argues that the main concern in France is the management of nuclear waste. France is still unclear about whether or not to follow Germany's lead and bring about the demise of nuclear power by 2018. The author concludes that the best solution looks like combining nuclear power with sustainable development and alternative power sources in the short term.

Liberation discusses the dangers of radioactive waste, going into detail about working conditions and precautions for people working with such waste. The article uses such evidence to evince the jeopardous nature of nuclear power stations as well as the long term dangers of nuclear waste for the general public since as yet no method has been discovered by which to dispose of nuclear waste in an entirely safe manner.

Greenpeace have been demonstrating about radioactive waste, reports NEWS Press. They are lobbying the French minister of ecology and sustainable development regarding the attitude of French authorities on the subject. The demonstration took place in Paris and police quickly intervened.

Sud Ouest reports that radioactive substances have been found by some technicians in a school near La Rochelle. Concern was shown after a number of students and teachers in the school contracted serious diseases such as cancer although the risk was purported to be at minimum. Local authorities have requested that a plan be put in place to track down and deal with these radioactive substances to minimise all risks since it is not clear what the source of these is. Similarly, Le Figaro reports that radioactive waste containing thorium has been found in the basement of a scientific research institute in Rennes. The area has been cordoned off and the contamination removed, but the real concern is for the health of researchers who have been working in the building for nearly thirty years. However, the authorities claim that there is no danger.

6.2.19 2003

6.2.19.1 Summary French media coverage on nuclear energy from 2003 presents the following trends:

- Anti-nuclear protest and the opinions of pressure groups receive some coverage.
- Nuclear waste storage is still the biggest and most widely discussed issue, with coverage regularly featuring calls for an improved national waste management strategy. The potential cost of such strategies is also discussed.
- Nuclear waste management also receives some community-oriented coverage, with reports focusing on the effects of nuclear waste on particular regions of France.
- Overall the tone is fairly negative.

6.2.19.2 Major stories from 2003 Francoise Chappaz of WWF Switzerland says in *Le Temps*, ‘*we do not have the right to produce radioactive waste which we do not know how to get rid of.*’ The article argues that the question of nuclear waste management remains entirely open. ‘*Provisional solutions exist, but nothing is definitive. No-one knows where the material can be stored, and all projects so far have been failures.*’

NEWS Press reports that the European Commission has adopted two proposals to equip the EU with a community approach to the safety of nuclear power stations and the treatment of nuclear waste. The Commission is reported to have noted that laws which oversee nuclear activity and funding allocated to research on nuclear waste management are insufficient.

‘*Le nucleaire? Non merci,*’ was the message put forward by a group of anti-nuclear protestors who demonstrated outside the ANDRA (National Agency for Radioactive Waste Management) laboratory. The atmosphere was reported to be hostile.

Agence France Presse discusses nuclear waste storage problems. More than 400 stores of radioactive waste stored in Dessel in Belgium are now considered more dangerous than previously believed. The author argues that a better solution for the management of radioactive waste is desperately needed, and many worry that the costs of future operations may be very high. *Le Soir*, which is quoted, says ‘*it will probably be necessary to turn to foreign countries for support.*’

The impacts on the local community of a new nuclear waste storage plan in the village of Morvilliers are discussed in *Le Figaro*. These are argued to not be too severe as it will only stock ‘*very weakly radioactive*’ material.

Agence France Presse says, ‘*a team of Russian scientists left the port of Vladivostok after having performed research regarding potential places for the storage of chemical and radioactive waste in the sea in Japan.*’ The importance of effective storage ‘boxes’ is reiterated, as previous models have reportedly been deficient. One of the team said, ‘*if the containers begin to open at the same time, it would be a real catastrophe.*’

6.2.20 2004

6.2.20.1 Summary French media coverage on nuclear energy from 2004 presents the following trends:

- Some discussion of nuclear waste management technology such as element separation.
- Widespread coverage of future French legislation on nuclear waste management. Proposals for new legislation are put forward this year, although concrete proposals are not put in place. These developments are welcomed by press at large.
- Scare stories about radioactive material in everyday contexts continue to receive coverage. Most of the reported situations pose only limited dangers.

6.2.20.2 Major stories from 2004

Les Echos discusses the state of nuclear waste storage in the USA, with particular reference to the Manhattan Project facility at Hanford, which remains the biggest storage site for radioactive waste in the country. However, the Supreme Court has said that the Federal American State must have it completely cleaned up by 2028, with a budget of 100 billion dollars. The idea of separating elements is discussed, a new technology which is thought to be an excellent step forward in this area of work.

Agence France Presse reports on the French government's promise that a new law concerning radioactive waste will be presented to parliament at the beginning of 2006, without revealing what sort of solutions the proposal will suggest. A consultation with the government will be held prior to its release.

On the same subject, Le Figaro says, *'a projected law on radioactive waste will be presented to parliament before 2006. It is not certain whether or not a solution for the storage of radioactive waste in the long term will be presented, or whether the government will give rise to a new period of reflection based on new studies.'* Patrick Devedjian, the delegated minister of industry, said, *'a solution must be sorted out. The debate must take place, but I don't want to jump the gun with any concrete plans.'*

Le Figaro reports that some radioactive material has gone missing in a demolition site in Saint-Etienne-de-Remiremont. It contained Radium 226, a naturally radioactive substance. Although not overtly dangerous, it must be handled by professionals. Another scare story about radioactive lightning conductors, which are a feature of many Belgian houses, is recounted. The newspaper states that young children were found playing with radioactive lightening conductors and that the latter have to be removed from houses since they present a real risk to the general public alongside certain smoke detectors which contain radioactive materials.

A similar incident is described in Sud-Ouest, in which a clockmaker disposed of Radium 226 by mistake in his bin. The response of authorities has been criticized, as they were slow to act, and called the matter *'complicated.'*

Le Figaro reports *'Within the space of five hours, the experimental reactor Phebus, installed in the CEA site in Cadarache heated and irradiated a sample of 20 stems of combustible uranium. This experiment was used to simulate the behaviour of the core of a nuclear reactor so as to predict consequences in case of a serious accident. This experiment is one in a series of studies which since 1993 have as their goal to measure the risks and consequences of radioactive danger. So far the main worry is the risk posed by radioactive products seeping out into the environment.'*

6.2.21 2005

6.2.21.1 Summary French media coverage on nuclear energy from 2005 presents the following trends:

- Discussion turns back to global warming, after a long period of focus on nuclear waste management. There is widespread discussion of the possible role of nuclear energy in lowering France's carbon emissions, accompanied by some scepticism about the safety and environmental worth of such a strategy.
- National nuclear public consultation and engagement initiatives receive positive coverage.
- Possibilities for waste management continue to be discussed.

6.2.21.2 Major stories from 2005 The initiative of storing radioactive waste underground is explored in *Liberation*, which calls the spaces '*building sites, mines and laboratories all at the same time.*' The author argues that such spaces will have to be closely monitored for safety. *Agence France Presse* also discusses the issue, quoting a recent government report which says that '*geological storage (unavoidable), separation of elements (ultimate objective) and general storage are the three constructs which must exist in the future law about the long term management of nuclear waste in 2006.*'

Les Echos says '*faced with the threat of global warming, should we promote nuclear energy?*' The author argues that consumption of fossil fuels must be decreased, and this calls for all energy resources which do not increase carbon levels to be called upon, i.e. renewable and nuclear. But if more nuclear energy was used, what would be the price? '*Would it really be worth it?*' the author asks, after discussing the potential need for a 600 million Euro investment in nuclear resources. The Minister of Industry's plans to increase the use of nuclear power are currently facing considerable pressure from the Health Minister. The latter argues that the risks incurred by the use of nuclear energy in case of an accident in the power plant, are a foreboding omen for the general health of the French public.

A European nuclear physics project, *Spiral-II*, has just received the thumbs-up from the government. This project aims to produce and study '*exotic*' radioactive nuclei, and should help to improve existing understanding of nuclei in general, as well as nucleosynthesis. (*Agence France Presse*)

Le Temps reports that The Authority on Nuclear Safety (ASN) has decided to put the national plan for the management of radioactive waste up for discussion on its website. The public will have the opportunity to read the document and make comments. It is thought that this debate will raise interesting material for the government to consider.

A new report has been presented to the public on the subject of dismantling nuclear installations and the management of radioactive waste. This project has been set up in order to make such processes more transparent for the average citizen. It is said that '*In order for this project to be successful it is necessary to ensure that processes are lucid and that actions in terms of communication to the general public are reinforced.*'

Liberation asks, '*is the government taking radioactive waste seriously?*' The government's slowness in making fixed plans is highlighted; in particular since December 2003 the failure to re-elect a president for ANDRA (the national

agency for nuclear waste management) is emphasised. Further criticism has also been hitting the government's lack of response and action to the report on the national inventory of nuclear waste. It would seem that feuds between various Ministers (Industry, Research, Ecology) are halting any advancements in a field that should be at the top of the agenda. It would seem that ANDRA is stuck in a state of lethargy since its administrative council have not held a meet since 2003 and no new leader has been elected to run it.

6.2.22 Assisted Reproduction

French press coverage of assisted reproduction did not change dramatically between 2000 and 2005, although the debate became more sophisticated and technically informed towards the end of this period. IVF was reported as a science/technology issue, a health issue, a moral issue and also as a family/social issue. The following features were evident:

A fairly even balance between positive and negative coverage. Alongside substantial coverage of health risks and moral questions associated with IVF, substantial space was also given to family-oriented reports and success stories.

Willingness on the part of the press to fully engage with specific and complicated moral and ethical questions about IVF. This was constant throughout the five-year period, although increased reporting on technical scientific details about IVF towards 2005 also made the ethical debate more technical.

A happiness to report on specific scientific details about IVF and associated treatments, along with an increasingly sophisticated handling of statistics and conflicting scientific reports.

A continued "looking outwards" to international cases, attitudes and legislation, partly influenced by a number of sensational international cases from this period.

IVF being framed as a "family" issue, but there with very little coverage of implications for "non-traditional" families, e.g. gay couples.

6.2.23 2000

6.2.23.1 Summary French press coverage of IVF in 2000 presents the following trends:

- Public controversy over IVF in Switzerland, ignited the actions of pressure group "L'Initiative pour une procréation respectant la dignité humaine", and receives a lot of coverage this year. The Swiss government eventually votes to allow the continued use of IVF treatment and sperm donation.
- A number of campaigns in France and in Switzerland receive some attention, including campaigns against sperm donation. It appears that French public opinion generally supports the availability of IVF, but these high-profile campaigns have led to extended discussion of the specific ethical issues and health considerations associated with assisted reproduction.
- There is some coverage of differences, including health risk factors, between IVF and non-IVF children, suggesting an overall conception of IVF children as somehow "different".

6.2.23.2 Major stories from 2000

The alleged anti-IVF atmosphere in France could lead children born through IVF to feel rejected by society, claims Le Temps.

A pressure group, '*For procreation respecting human dignity*,' present their moral arguments against external procreation techniques in SDA. Marlies Naef-Hofmann, vice president of the committee, argues that current law governing the use of embryos contains loopholes which constitute monstrous discrimination against those living with a disability. The group is participating in an initiative which aims to ban '*external procreation*'.

The pressure group, '*For procreation respecting human dignity*,' is campaigning against the use of sperm donors, reports Le Temps. The group hopes that one day, '*scientific progress will allow us to come to the aid of infertile couples without resorting to IVF*.'

Infertile couples will be able to continue to use IVF and sperm donors in Switzerland, reports SDA. The Swiss electoral body rejected the proposals of the '*L'Initiative pour une procréation respectant la dignité humaine*' at 71.6%. If the proposed changes had been accepted, Switzerland would have been the only the second country in the world to ban IVF, after Libya.

6.2.24 2001

6.2.24.1 Summary

French press coverage of IVF in 2001 presents the following trends:

- A continued focus on specific moral questions associated with assisted reproduction.
- The emergence of two strands of press coverage. One focuses on couples' struggles to have children and the positive role that IVF can play. The other focuses on controversies over the legality of practices like freezing embryos, and debates about moral and legal issues associated with assisted reproduction.
- Debates on IVF in the US receive substantial coverage this year, due partly to the emergence of some ethically complex cases and developments. The particular scientific climate there, with a pioneering research culture on the one hand and a powerful conservative religious lobby on the other, lends a particular interest to IVF stories from the US for the French media.

6.2.24.2 Major stories from 2001

The moral aspects of embryo freezing are discussed in detail in Liberation. The author asks questions such as '*is it right for twins embryos resulting from IVF to be separated and born at different times, and perhaps even in different families in the case of embryo donation? Is it fair for children conceived through IVF to know that they have biological siblings elsewhere who were donated as fertilised embryos?*'

Detailed and emotional case-studies appear in Le Temps of couples going through IVF in a desperate effort to conceive, discussing the '*bereavement*,' of not being able to have children.

La Presse Canadienne reports that a private American research group has paid twelve women to donate 162 eggs, which will be fertilised with the sperm of anonymous donors in order to obtain embryos for stem cell research. The debate is highly intense in the US. Scientists argue that these cells are full of promise as regards the treatment of presently incurable diseases (either through cellular

therapy or genetic therapy), whereas pressure groups claim that the research is inhumane. The article suggests that this kind of activity is probably taking place elsewhere in secret.

La Croix discusses the practice of freezing embryos. Couples have four options: to use them to attempt another pregnancy, to give them to another couple, to donate them for research (which simply entails observing the embryo) or to authorise their destruction. The article claims that there is some ambiguity about the law, which may have led to embryos being destroyed without the parents' permission.

6.2.25 2002

6.2.25.1 Summary French press coverage of IVF in 2002 presents the following trends:

- Substantial positive coverage following the 20th birthday of the first French "test-tube" baby. This includes documentation of an increase in the use of IVF treatments and calls for the re-evaluation of some commonly held beliefs about the potential dangers of IVF.
- General discussion and examination of the health risks correlated with IVF, along with some discussion of the ethics of studies which compare IVF and non-IVF children.
- Coverage of international research, case studies and legislation continues, with a particular focus on Britain, (perhaps partly due to the dramatic IVF 'mix-up' case there) and the US.
- Some discussion of the risks associated with IVF and with multiple births, including the need to separate the two factors but also to be fully aware of both.

6.2.25.2 Major stories from 2002 The 20th birthday of the first French test-tube baby, Amandine, was reported in several papers, including La Croix, Agence France Presse and Sud-Ouest. The coverage universally described Amandine in glowing terms and emphasised her health. La Croix stresses that children born from IVF are '*exactly like other children conceived in the traditional way.*'

In the same article, La Croix discusses potential correlations between IVF and children's health in later life, arguing that certain studies have shown that children born using IVF are often more intellectually advanced than their peers, although this is typically due to environmental rather than medical factors. The paper asks whether IVF children should really be studied so closely, and whether it is necessary to compare them with 'normal' children.

Liberation features an article on Australian research which argues that IVF children could be twice as likely as non-IVF children to suffer from major disabilities.

Liberation argues that many couples are specifically asking to have twins when having IVF without adequate awareness of the problems associated with multiple pregnancies. The author discusses a Swedish study which concludes that IVF children, many born as part of multiple pregnancies, are more prone to neurological disorders than non IVF children. 'It's the first slightly worrying study concerning IVF children,' remarked Francois Oliiviennes, a gynaecologist in Clamart.

In 1998, 13, 453 babies were born through IVF in France, 18% of the total number of births that year. Agence France Presse reports that this number has increased due to improved IVF centre facilities and a new technique of 'micro-injection.'

La Croix reports on La Catho in Lille, the first Catholic medical establishment to have permitted IVF in France, on the following three conditions: that it involves a 'stable' couple, that the egg and sperm are their own and not donated, and that only one fertilised embryo is used. La Catho's directors say that it cannot 'abandon' infertile couples, even if its practices have caused controversy.

Vigie Medecine-Pharmacie reports on Britain's progress in therapeutic cloning research, which will concentrate on fertility problems, embryonic fertilisation and development, the improvement of treatments against infertility and improved understanding of the causes of congenital malformations and miscarriages. Liberation also reports on US developments in human embryonic cloning research.

6.2.26 2003

6.2.26.1 Summary French press coverage of IVF in 2003 presents the following trends:

- Public consultation exercises and public debates receive some coverage. The French press itself is playing a significant role in the public debate by continually discussing the ethical and moral issues associated with IVF.
- Ethical questions are still predominant. In particular, the practice of reimbursing couples for IVF treatment sparks a moral debate about the right to have a child.
- Specific scientific developments and research results are discussed in the mainstream press. Statistics about health risks are reported along with discussion of new IVF methods, all of which suggests that the debate is becoming more technical as the press and public become increasingly well-informed.

6.2.26.2 Major stories from 2003 An article from Le Temps stresses that IVF children are no different from 'normal' children. The author argues it is imperative that IVF and all the social and ethical questions it raises are taken seriously.

Switzerland, like France, Germany and Belgium, is considering reimbursing couples for rounds of IVF. The question '*do we have the right to have a child?*' is discussed.

Le Figaro discusses the potential risks associated with IVF. Doctors in Amsterdam have found five cases of retinoblastoma in two years among IVF babies. However, more research is needed to establish a direct link. The author discusses the need to follow the progress of IVF children, and argues that the real risk associated with IVF is of multiple pregnancies.

An article in Liberation claims that the risk of 'malformation' is 1.2% for a non-IVF pregnancy and 2.4% for an IVF pregnancy.

The renowned initiator of IVF in France, Rene Frydman, has inspired a French TV film, '*Les Enfants du Miracle*,' (Miracle Children) on the subject, reports L'Humanite.

Le Temps discusses moral questions associated with IVF: Do we consider infertility as an illness? Do we consider having children as a right? Is it society's job to decide? These questions are publicly discussed as part of an initiative called 'Publifocus.'

In Liberation, an interview with Bob Edwards, a medic involved with the conception of Louise Brown, it is suggested that many people are open to the idea of surrogacy and of gay couples using IVF.

The ICSI method, whereby a single sperm is directly injected into an egg, is discussed in Le Figaro.

6.2.27 2004

6.2.27.1 Summary French press coverage of IVF in 2004 presents the following trends:

- Specific and detailed coverage of IVF treatments and associated issues continues. Scientific research is given extensive coverage, with the press clearly happy to handle new statistics and conflicting scientific advice.
- Some coverage leans to the philosophical, including discussions about the status of the embryo and the morality of so-called 'ante-natal adoption'.
- There is a fairly even balance between positive coverage (a rise in use of IVF, success stories) and negative (dangers including multiple births, suggestion of high failure rates).

6.2.27.2 Major stories from 2004 Liberation discusses the practice of freezing embryos, and claims that there are around 200,000 frozen embryos in France, a figure which increases by 20,000 every year. Between 5 and 10% of those will be donated to other couples. The author points out that in France there is no consensus on the philosophical status of the embryo, and argues that the law is '*absurdly strict*' with cases of surrogacy. He comments on our '*obsessional worry*' about not interfering with pregnancies or embryos.

Liberation also suggests that making parents choose the future of their fertilised embryos (use them, donate them to research or to other couples) is too demanding and can create 'Sophie's Choice' scenarios. Many parents, if deciding not to use their fertilised embryos, may feel pressured to donate them to other couples as a form of 'ante-natal adoption' rather than donate them to science for 'observation.' The morality of this is discussed.

The need for the creation of new IVF clinics is discussed in La Presse Canadienne. Between 10 and 15% of couples will be apparently face fertility problems - does this justify opening a new clinic in Auvergne?

New rules regarding IVF have been published by the Human Fertilisation and Embryology Authority, as reported by Vigie Medecine-Pharmacie. They are accompanied by information for parents about the medical and psychological problems associated with multiple births.

The 'injustice' of IVF working for some couples and not others is discussed in Liberation, and the actual process of IVF described. The article also mentions that renowned French medic Francois Olivennes intends to launch research on ovary transplants to give hope to women who have been made infertile by chemotherapy.

An article in Vigie Medecine-Pharmacie claims that embryos producing the most HLA-G, a soluble molecule known for its role in improving tolerance of the womb environment, are the best candidates for IVF cycles.

La Presse Canadienne claims that we are too ambitious about the possibilities of IVF, and the unfortunate truth is that only 20% of treatments actually work.

6.2.28 2005

6.2.28.1 Summary French press coverage of IVF in 2005 presents the following trends:

- An outward focus on the international IVF debate, particularly in Croatia, Romania and the UK. This coverage focuses on the way moral questions are handled abroad, as well as specific case studies.
- Continued specific coverage of scientific developments in the field of assisted reproduction.
- Controversy was fuelled by the birth of a child to a 67 year old Romanian woman. Coverage was almost universally negative, portraying the case as 'going too far' given the health risks.

6.2.28.2 Major stories from 2005 Agence France Presse discusses the ongoing debate in Croatia on IVF. The Catholic Church there has apparently described IVF as '*a serious crime against human life.*' Croatian gynaecologist Damir Butkovic claims that '*the irresponsible behaviour of young people*' is the principal cause of infertility.

The disappearance of more than 500 frozen embryos in Zagreb suggests that illegal IVF treatments are taking place, reports Agence France Presse. Croatia has been comparatively slow to adopt laws on assisted conception. The Croatian Minister of Justice, Vesna Skare-Ozbolt, declared, '*Croatia is one of the last European countries to judicially regulate this very sensitive domain from a medical and ethical point of view.*'

Vigie Opto-Electronique reports on the British IVF 'scandal' of 2002, when a woman was inseminated with the sperm of a man who was not her husband, and gave birth to a mixed-race baby although the couple were both white. This sort of error has given rise to a new governmental recommendation which says that two doctors must witness each IVF treatment to avoid mistakes. A scheme involving electronic markers is also being discussed.

'*Infertility has become more of a men's problem than a women's problem,*' according to new statistics published in Copenhagen after an international scientific conference, reports Agence France Presse.

Vigie Medecine-Pharmacie discusses a new technique of performing IVF treatment involving the insertion of a small catheter into the uterus to control the number of sperm which can enter.

The birth of the child of a 67 year old Romanian woman after medically assisted procreation is met with dismay in the medical world. Many doctors say that the procedure should not have been followed through as the risks were enormous, reports Le Figaro. Michel Tournaire, a Parisian IVF specialist, said '*from time to time, doctors involved in reproduction latch on to fantastical desires which are not reasonable or sensible.*'

La Croix reports on the institution of a new public bioethics body, which, under the authority of the Health Minister, will monitor activities and research in assisted procreation, prenatal diagnosis, genetics, organ donation and embryonic research. The article points out that this is the first time a public body has been instituted specifically to work on bioethics.

6.2.29 Coverage in *Le Monde* 2005

Material from *Le Monde* was not available from LexisNexis. Instead, articles were downloaded from the newspaper's internet site, and are reviewed below:

6.2.29.1 Biotechnology *Le Monde* points out how the public's perception of science and technology has changed during these last few decades. *Le Monde* claims that, for businesses, companies and the public powers in place, biotechnology now comprises the nucleus of a highly competitive and lucrative arena offering many new economic and business possibilities. However *Le Monde* states that researchers are now forced to come up with novel ideas to persuade investors to fund their projects, ideas that echo societal concern with the ethical concerns over new technologies. For example, those seeking sponsors for their nanotechnology projects might emphasise their potential for the treating of severe illnesses such as cancer or cerebral infections.

Despite *Le Monde*'s assertions that public opinions are changing vis-à-vis science and technology; despite their claims that scientists no longer sit in an ivory tower but are now involved in a highly important and developing new economy, *Le Monde* claims that public opinion towards biotechnology remains controversial and ambivalent. *Le Monde* argues that, according to their statistics, people have become more open-minded towards such new technologies in the last two decades however mixed feelings towards new technologies are said to be on the rise as biotechnology is equated to be a zero-sum arena.

The high risk factor which the public deems inherent to biotechnology and other new technologies, *Le Monde* claims, is responsible for their mistrust in such domains as well as the broken promises and recent scandals which appear to 'de-legitimise' the belief in scientists and their research. Biotechnology for example, *Le Monde* claims, is also associated with bioterrorism. OGMs (GMOs) are held to be incapable of completely eradicating world hunger. Since the 80s scientists have been claiming the creation of new miracle cures, using biotechnology, but the production of such medicines has decreased rather than increased and results have not been sufficiently positive to persuade the general public of their utility.

Le Monde suggests that civil society is not sufficiently well-informed of the processes involved in biotechnology and that more transparency is needed. Meanwhile, *Le Monde* claims that, as the economic possibilities of new sciences such as biotechnology become increasingly profitable, the two domains (economics and science) find themselves inextricably entangled and distant from civil society.

Le Monde suggests that when it concerns biotechnology it is not a question of merely weighing risks versus benefits but also of examining socio-economic aspects such as: who will be making such products? Who will be reaping the profits? How will risks be managed and minimised?

Le Monde suggests that a dialogue needs to open up between the scientific community and the general public so that the latter is better informed of the processes going on and able to halt undesirable research or practices. Le Monde argues that it is necessary to encourage civil society to make choices rather than adhere to the atmosphere of political laissez-faire which prevails today.

As for the Government's attitude towards biotechnology, Le Monde states that following the OPECST report drafted by Jean-Yves le Déaut, the French Government fears being left behind in biotechnological advances as it was in the sphere of IT. 'Brain drain' and a lack of resources are deemed responsible for France's lack of progress as compared to other European countries such as Germany. The area thus appears to be one marked by polemic.

6.2.29.2 Environment Le Monde argues that societal attitudes towards the environment have never been as pronounced as they are today. Le Monde talks about a double realisation which has recently taken place: the realisation of our impact on the dynamics of the biosphere and the realisation that we are completely dependent on the dynamics of the biosphere. This, Le Monde argues, has led to the new pan-global objective of sustainable development, biodiversity: preservation of our planet for future generations.

Le Monde states that such issues involve three different dimensions: the economic, the social and the environmental. In the work place, Le Monde states, new moves are being made to ensure that businesses are socially responsible and receptive to the need to preserve our environment.

The goals, Le Monde asserts, of sustainable development are to: ensure that economic and social progress continue however all-the-while ensuring that the natural and energy resources of our planet are preserved.

Le Monde claims that despite government initiatives, such as the 21 Committee which aims to promote sustainable development in a whole panoply of diverse domains such as: businesses, public and private associations, media groups etc, efforts in France are inferior to those in the UK, Spain, Germany, Italy and other European countries. Le Monde asserts that France still has a long way to go but that rules and regulations regarding the environment such as ecotax are not applied stringently enough by the Government. Le Monde suggests that the Government's attitude is too lax towards such issues and that striving for maximum economic profit still supersedes environmental concern despite quotas and charters put in place to curb environmental damage and degradation.

Le Monde suggests that the French Government, despite its supposed efforts to foster co-operation with developing countries and encourage them to use 'green' strategies, is unable to be sufficiently pro-active within the borders of its own territory. Le Monde affirms that there is a large gulf between the environmentally-friendly slogans and discourse of the French Government, and the politics and practices actually implemented. Le Monde declares that the efforts and actions of the French Government are 'microscopic' in comparison to those needed to ensure the present and future well-being of the country and our planet.

6.2.29.3 **IVF** Cloning is seen as one of the most problematic arenas together with IVF, however Le Monde states, that French firms are demanding the right to use the above-mentioned alongside IVF techniques in order to be able to benefit from the

aspired socio-economic benefits. Le Monde hints at the pressure being put on the Government by the scientific and business community to be able to use such techniques.

Another area of worry in this domain is the legal statue of someone born by IVF and the rights this individual may have; how 'human' they are. It would seem that any living being has a right to a legal statue says Le Monde and that ethical questions such as this one cannot get in the way of IVF research which must progress. Le Monde argues that public opinion is now moving away from worrying about questions regarding the ethicalness of using embryos instead, Le Monde asserts, the questions we must now address are: what are the goals of research carried out using IVF, what are the results and what is the methodology behind such studies?

Le Monde states that IVF studies are capable of shedding new light on and solving the mysteries of immunology, Cancer and other severe illnesses and thus provide very real beneficial potential however such studies are still in their early stages. Le Monde notes how in general attitudes towards IVF have radically improved due to the possibility that researchers may find treatments for cancer and other immunology-related illnesses and that successes in research tend towards confirming the positive public opinion of the good use of IVF technology.

Le Monde suggests that a new law opening up ethical and medical questions in the domain of IVF (in hospitals etc.) to those of a non-medical background is as much a help as a hindrance. This law implies that families are now allowed to get involved in decision-making as concerns their loved ones, etc.

Le Monde asks how easy it is to apply such new rights in a 'real' context stating that sometimes, the latter might lead to increased tension and possibly judicial action between Doctors and their patients. Le Monde would appear to argue that ethical dimensions involved in IVF have become even more contentious since the new law as this allows non-experts and those involved in treatment to have their say in the process. Le Monde suggests that the domain of IVF is becoming even more controversial. The French Minister of Health is reported as having said that couples and doctors must display wiser behaviour vis-à-vis the use of artificial insemination methods as these may stem from personal desires rather than having the best interests of the child at heart. Le Monde reports that the Minister is said to have wished to remind the French public that the IVF methods may sometimes lead to frightening and unexpected results such as premature births, triplets, quadruplets etc., cerebral illnesses and other often major malformations in IV babies. Le Monde reminds the reader that IVF often prioritizes and sanctifies the wishes of parents, over the safety of babies whose health may be jeopardised by such techniques. On the other hand, Le Monde quotes a female gynaecologist as stating that IVF is not that commonplace in France and that due to regional differentiations some patients may find themselves having to wait a very long time for treatment. She emphasises the frustration of sterile couples and their need to make their own choices.

Overall Le Monde presents IVF as being a highly problematic topic full of ambiguities and ethical issues. Le Monde suggests that more trustworthy information and transparency are required by the public in this domain.

- 6.2.29.4 Nuclear energy** Le Monde affirms that nuclear energy is once again gaining ground in France as an energy source: it produces no CO² emissions and given the current fears as regards climate change offers possibilities to reduce coal, petrol and gas use. Nuclear energy is fast becoming a very viable option in the face of the environmental constraints put in place by the Kyoto Treaty which limit the amount of emissions a nation-state can produce. What with such measures as well as rising petrol prices, the French together with other world Governments, are increasingly worried about their energy resources, states Le Monde; nuclear energy appears to be a solution then. China and India are reported to be hiking up their use of nuclear energy substantially. Le Monde argues that if nuclear energy is still hitting the headlines it is due to the lack of progress as concerns renewable energy sources (e.g. sun, wind etc). Le Monde states that the Green Party's protest against the use of nuclear energy has to be ignored as the risks involved in the use of nuclear power are infinitely smaller than those which may imperil the planet should other traditional methods be used.
- 6.2.29.5 Nanotech** Le Monde takes a positive view on nanotechnology which, it argues, has kept its promises. Le Monde says that microsystems relying on nanotechnology have already demonstrated their success and that many of these are already in use such as the shock receptors to be found in air-bags or the micromirrors in video projectors. Le Monde points out how soon nanotechnology will enable satellites to be much at least 2 tons lighter than their predecessors. Later, Le Monde states, nanotechnology will be used to create nanosatellites, about one metre squared in size to circulate the earth. Le Monde sees scientific advances in nanotechnology as environmentally friendly and space/time minimizing in terms of testing. It is in the arena of healthcare Le Monde states, that the most progress is being made right now: DNA tests and other projects are making ground. Le Monde overall takes a very optimistic stance on the use of nanotechnology.

6.2.30 News sources used in the quantitative analyses

Agence France Presse
 Alertes
 Caractère
 EuroNews - Version Française
 Europolitique
 La Croix
 La Nouvelle République du Centre Ouest
 La Tribune
 Le Figaro
 Le Figaro Économie
 Le Point
 Le Télégramme
 Le Temps
 L'Entreprise
 Les Echos
 L'Expansion
 L'Express
 L'Humanité
 Libération
 Lire
 L'Ordinateur Individuel
 News Aktuell Suisse

Nouvelles Tele-Radio (NTR)
Paris-Normandie
PR Newswire Europe (French)
Renseignor
Revue Experts
SDA - Service de base français
Stratégies
Sud Ouest
Sud Ouest Dimanche

Material from Le Monde was not available from LexisNexis. Articles downloaded from the newspaper's web site have been analysed separately.

6.3 German media coverage 2000-2005

6.3.1 Biotechnology

German biotechnology coverage from 2000-2005 is divided between agricultural (GM) stories and medical (stem cell, cloning, genome) stories. In general, both are framed in terms of global economics and the need for German competitiveness, and nationally in terms of on-going political, environmental and ethical debates, led by parliamentarians, an influential religious lobby and various interest groups. Medical applications (stem cell, cloning and genome) tend to be discussed in terms of well-established and complex ethical and moral debates, whilst agricultural applications tend to be discussed within the frame of economics and environment.

The press coverage of ethical debates surrounding stem cell research, and gene therapy are sophisticated, and generally well-balanced.

Coverage also indicates an awareness in Germany of the ethical debates and legal decisions being made in other EU countries during the period, and this is often reported in critical comparative terms by the German press.

6.3.2 2000

6.3.2.1 Summary German press coverage of biotechnology from 2000 presents the following trends:

- There is a fairly even split between coverage of medical and agricultural applications of biotechnology.
- Medical applications tend to be addressed as moral issues, as well as health or science, whereas agricultural applications will be covered as an environmental and political issues, as well as science. Both medical and agricultural stories are also addressed in economic terms, addressing worries that Germany may be “left behind” if it does not fully embrace biotechnology.
- A certain amount of coverage is given to the financial development of the biotechnology sector in Germany and abroad, with biotechnology generally being described as a “boom” sector. There is some discussion of the legality of gene patenting.
- An international focus is evident this year, particularly on the UK due to new UK legislation on therapeutic cloning and the recent deciphering of the human genome.
- Political coverage tends to be balanced, featuring calls for balanced debate and public consultation.

6.3.2.2 Major stories from 2000

General Issues *Frankfurter Allgemeine Zeitung*: Biotech companies are achieving very high share sales. Biotechnology is described as a “strong player”, particularly around Berlin, but also growing around Munich. Concerns are raised about having enough experts and researchers to support the growing sector.

Berliner Zeitung: Reports that the Biopatent law which would support the patenting of genes in Germany has been criticized by Prime Minister Schroeder. Critics from science, all parties and churches have been calling for a law on patenting of new

products and technologies rather than the genes themselves which EU guidelines recommend.

Süddeutsche Zeitung: Reports that, although expectations in the biotech-industry are high, it will be years before any profit-making results can be expected. The author argues that rather than hastily throwing products onto the market and encouraging fears associated with these, we must give biotechnology time to develop.

Süddeutsche Zeitung: Argues that biotechnology in Germany is booming since research restrictions were relaxed in 1993 and a federal competition sought the most biotech-friendly region in Germany.

NZZ: Claude Longchamp of the GfS-market research institute has studied the acceptance of gene technology in Switzerland. The technology is accepted by the majority for medicinal purposes, but rejected in foods. Attitudes are based less on personal experience and knowledge and more on expectations of the future. Equally rejected was the possibility of genetically “embellishing” humans.

NZZ: Reports on a debate between Utilitarian and Kantian ethicists on the uses and misuses of gene technology. Questions include : *Is there any point in seeking for a common ethic in this question at all? Or are our ethics themselves genetically programmed?*

Tages-Anzeiger: Reports the Green Party has agreed to support legislation on patenting organisms under the condition that the government has EU guidelines in Brussels reviewed. Under new EU guidelines patents can now be given for animals and genes. EMP Breyer does not understand why the Greens do not join the Netherlands in handing in an appeal to the EU courts.

Süddeutsche Zeitung: Reports that the biotech-region in Munich is booming. Companies are complaining about a lack of potential employees, even paying removal costs to attract employees.

Süddeutsche Zeitung: The parliamentary commission on “Law and Ethics in modern medicine” calls for a review of the biopatenting legislation. Greens advocate a moratorium and prohibition of substance-patents. The Netherlands as well as Italy are appealing against the EU biopatent guidelines and France is also considering legal action.

Tages-Anzeiger: Reports that the Green party is no longer principally against gene technology. They support applications in medicine, but reject the determination of a child’s sex through genetic manipulation, and call for assurances that insurance companies will not misuse genetic information to the detriment of their clients. The Greens also warn against a lack of consumer choice between GM and non-GM food crops and want to introduce a full-scale labelling system.

Berliner Zeitung: Jens Katzek, once leader of BUND, an NGO campaigning against gene technologies, is now employed by the biotechnological industry. He says he found less fundamentalism and more rational debate within the industry than among environmentalists. He now believes the benefits and dangers of

biotechnology have to be assessed on a case by case basis and not rejected out of hand.

Spiegel: Biotechnology is experiencing a goldrush says *Spiegel* editor Ulrich Schaefer. Over the last 5 years the political atmosphere towards biotechnology has radically changed from hostility to encouragement. Nonetheless, PM Schroeder and health minister Andrea Fischer still want a public debate and to set ethical limits to research. Much less acceptance is found for “green” biotechnologies, GM food and the patenting of GM organisms or genes, and the industry fears a complete blockade by the Green Party, though this seems increasingly unlikely.

Medical Applications *Frankfurter Allgemeine Zeitung*: German scientists are part of the team which has successfully decoded a chromosome responsible for many genetic illnesses such as Down-Syndrome. This is said to open the way for a whole range of exact diagnoses and treatments. The author argues that beyond these positive achievements, knowledge about an individual’s genetic make-up must be handled with the greatest care, and that every individual must be given the right to access, or not to access, this knowledge.

Frankfurter Allgemeine Zeitung: Health minister Fischer (Green Party) has warned against any rushed decision about embryonic cloning in response to the recommendation of a British commission of experts to support the practice for research purposes in Britain. Fischer warned that benefits must be judiciously weighed against potential dangers. Hoppe, president of the German association of doctors warned the UK against any isolated initiatives and accused the commission of being led by economic considerations. The German bioethics commission showed mixed reactions to the UK report.

Frankfurter Allgemeine Zeitung: The author argues that the ideas of the British commission of experts on human cloning must be intensively discussed, as they reflect a world view which “makes everything available.” The author goes on to point out that, meanwhile, 200000 “surplus” embryos created through in-vitro fertilisation have been discarded; unused.

Rheinfalz: Argues that therapeutic cloning is forbidden in Germany for good reason. The author holds that in therapeutic cloning human embryos are debased to useful materials and objects, and that the human embryo must be respected in every stage of development.

Offenbach Post: Argues that “it is high time for a social debate on therapeutic cloning in Germany. Every new development requires ethical evaluation. If politicians do not insist on international treaties on the topic, the temptation to continue these dubious experiments will surely grow. Frankenstein is knocking on the door. But the dignity of humankind must be left untouched.”

Financial Times Deutschland: Argues that the British decision to allow therapeutic cloning has made the question of who creates life an economic one, and that we need international ethical standards for dealing with this technology.

Frankfurter Allgemeine Zeitung: Discusses technical aspects of the cloning/stem cell debate. Author points out that the ethical and juridical crux of therapeutic cloning is that it depends on using 5-7 day old embryos. Unlike in the UK, US and other countries, embryo-experiments after the first division of cells are forbidden in

Germany. In-vitro fertilisation in Germany is not allowed to produce surplus embryos, though the import of embryos is not restricted. Alternatives to IVF are discussed, including history and associated risks.

Frankfurter Allgemeine Zeitung: Oliver Bruestle, researcher at Bonn University, pleads for stem cell research in order to develop better organ transplants, grown from the patient's own cells. He argues that we can only come to a well-rounded appraisal of the ethical issues through systematic research in Germany, and that this research needs strict guidelines, which however must not hinder patient access to beneficial technologies.

Frankfurter Allgemeine Zeitung: Jeremy Rifkin believes the consequences of the UK decision to support embryo cloning are far-reaching and catastrophic. He makes the following points: *"Civilisation and social order is based on the family, but whose child is an embryo clone? How do we stop the industry producing whole armies of 'perfect' soldiers and sportsmen? Human cloning is the beginning of a new, fearsome era in which we are faced with the question of who can play God. We need an international treaty against human cloning with strict punishments for those who defy it."*

Frankfurter Allgemeine Zeitung: Dietmar Mieth, moral philosopher at the university of Tuebingen, argues that the right to life has already been undermined by abortion. He does not believe that the right to health or possibilities of future benefits legitimize denying embryos the right to life.

Frankfurter Allgemeine Zeitung: Reports that the European Commission is undecided on how to react to the developments in Great Britain and that so far there are no EU guidelines on the use of embryo cells and therapeutic cloning.

Hamburger Abendblatt: Asks, *is everything permissible which is possible? That in other countries facts are already being created rather than debated does not answer this question for Germany. We need an extensive social debate on the issue.*

Neue Zuercher Zeitung: Reports that the biotechnology sector is hoping for big profits since the deciphering of the human genome. However, the author argues that the road to profit-making products is a long one. In future patients will be given tailor-made medication and everyone may be able to carry not only their blood group pass, but their personal gene-pass once analysis has become cheaper. Points out that only two dozen biotech firms in Europe and the US are making profits at present.

Welt am Sonntag: Claims that the DNA of zebra fish and humans is 90% identical. The pharmaceutical firm Artemis in Cologne is using this fact to test medication on zebra fish. Projects such as these will be presented at the world congress on biotechnology 2000 in Berlin.

AFP: Reports that France is preparing legislation on embryo research. The suggested measures categorically forbid reproductive cloning, but would allow for therapeutic cloning with surplus embryos from in-vitro fertilisations.

Agence France Presse - German: Reports that the president of the German Catholic bishops, Karl Lehmann has criticized the UK recommendation for therapeutic cloning as a worrying decision. He called on the *"particular historical guilt and*

responsibility of Germany to protect human life", and to accept economic costs if necessary.

Frankfurter Allgemeine Zeitung: Minister of Rheinland-Pfalz Beck (SPD) has warned against any hurried decisions on the topic of therapeutic cloning in the wake of the British decision. Uldall pointed to the Greens' rejection of gene technology as a reason for Germany's lag in international competition. The protestant bishop of Berlin, Huber, also warned against "a mentality that set no limits to the manipulation of human life."

Frankfurter Allgemeine Zeitung: PM Blair believes gene technology to be the decisive technology of the 21st century. Blair warns against the rejection of science and argues for a balanced debate. Blair's government will support therapeutic cloning and he praises biotechnology as a weapon against deadly illnesses and an environmentally friendly technology. The Human genetics commission insures that civil society will also have a voice in any decisions, and reproductive cloning is categorically forbidden in the UK.

Agricultural Applications *Tages-Anzeiger*: Claims that many newly developed foods, often finding their way from the health food shop to supermarket shelves, are often polluted with genetically modified substances. The foundation "Waretest" (product quality control) has found these in 31 out of 82 test samples, particularly in soya and maize products, leading to demands by Greenpeace, the Green Party and other consumer groups for closer controls and compulsory labelling.

Lausitzer Rundschau: Argues that politicians have failed on the topic of gene technology and scientists have long-since outrun them in their laboratories. Points out that EU guidelines do not specify what sort of labelling is required for products containing GM crops.

Agence France Presse - German: Critics of GM-food warn that the new genes may influence digestion and create new, possibly harmful substances or allergies. "Stiftung Waretest" is demanding halving the 1% hurdle on GM-food labelling.

Agence France Presse - German: Reports that Monsanto GM-maize has been certified for sale in Switzerland by the Swiss ministry of health, though the sowing of GM crops is still prohibited there.

Agence France Presse - German: Reports that 60% of Europeans are against gene technology in supermarket food. Meanwhile, agricultural industry representatives are arguing that GM crops are environmentally friendly.

Agence France Presse - German: Reports that in 1997 and 1998 parliament and referendums rejected a gene-protection-initiative which would have strictly prohibited any GMO production or distribution. The new law lays down extensive restrictions on research and production, though it leaves open the question of patenting organisms.

Agence France Presse - German: Reports that the SAG (Schweizerische Arbeitsgruppe Gentechnologie) has accused the Federal council of putting the interests of business before the protection of humans and the environment by not passing a moratorium on GM products. They have threatened a new civic

initiative to push for a referendum. Nonetheless the new law increases the responsibilities of producers for any ill-effects. Speakers in the industry and agriculture said they were satisfied with the new law, which requires certification of any GM products.

Süddeutsche Zeitung: The Fraunhofer Institute reports that biotechnology can replace environmentally harmful production processes, but this potential has been little used so far. Genetically modified enzymes could save energy and resources in the production of textiles, foods, chemical products and medication. The ministry for the environment says that these benefits must be weighed against the possible dangers of using GM enzymes.

Süddeutsche Zeitung: Reports that researchers at the Ludwig-Maximilian University in Munich have developed fluorescent genetic markers that have the potential to facilitate pest-control in the future.

Frankfurter Allgemeine Zeitung: Reports that in the conflict over legislation on gene technology the EU has begun the mediation process between the EU ministerial conference and European parliament. The parliament is demanding 29 changes in the reform programme for guidelines on GMO. Issues discussed include the liability of producers as well as public participation in licensing decisions.

Hamburger Abendblatt: Reports that the Hamburg Institute for Hygiene has found traces of GM substances in unlabelled products. EU guidelines do not require labelling if the substance content is below 1%. Consumer organisations criticized the guidelines as loose and unsafe.

Süddeutsche Zeitung: Claims that in almost any Christmas confectionary GM substances can be found. Fairtrade manufacturers "gepa" presented the first guaranteed GM-free chocolate in Germany. Environment minister Juergen Trittin tested the chocolate, arguing that he supports consumer choice.

Tages-Anzeiger: BSE-tests for animals above 30 months have been made compulsory, although the responsible institutes lack facilities and personnel. Minister of Agriculture Funke wants to compensate farmers to 70%.

6.3.3 2001

6.3.3.1 Summary German press coverage of biotechnology from 2001 presents the following trends:

- This year's coverage devotes more space to medical applications than to general biotechnology.
- Coverage of the debate on stem cells and cloning is highly politically focused, looking particularly at the stances of the major German parties. Bund debates are followed closely, as are European Parliament debates.
- Coverage of the stem cell debate regularly calls on the views of the heads of research organisations and politicians.
- Some hope is expressed that recent work on the human genome will open up new opportunities for German research, as well as paving the way for life-saving medical applications of gene technology.
- The debate on cloning and stem cell research continues to be discussed as an ethical issue rather than as a purely scientific one.

6.3.3.2 Major stories from 2001

Süddeutsche Zeitung: Interviews Ernst-Ludwig Winnacker, who is president of the DFG (the largest German research organisation) and has been heavily involved in the genetics debate for the last year. A cardinal has called him a cannibal and the DFG has received murderous threats, Winnacker complains. He argues that both he and his colleague Markl are essentially engineers rather than philosophers and neither are capable of engaging in a true ethical debate.

Frankfurter Allgemeine Zeitung: Reports on the arguments of scientists Bruestle and Wiestler for using embryo stem cells for research in Germany. Research with adult stem cells, they argue, will not deliver the results and treatment possibilities of embryo stem cells, and if Germany does not allow this possibility, the country will lose its pioneering position in biotechnology.

Frankfurter Allgemeine Zeitung: : Kiel University intends to import embryo stem cells. The CSU (conservative party in Bavaria) and Green Party have rejected this move, arguing that it is illegitimate to present German society with facts while discussion about the desirability of stem cell research is still in full swing. However, minister of justice Daeubler-Gmelin said the import was not illegal.

Frankfurter Allgemeine Zeitung: Reports that the CDU is split on the issue of stem cell research and in particular the question of legalising diagnostic screening before implanting embryo cells. Koch, Teufel and Merz oppose Ruettger's white paper that would allow for limited diagnostic screening. They argue that screening would put doctors and parents in the position of deciding over the life and death of a child.

Spiegel: Reports that the SPD is also split over the issue of stem cell research and diagnostic screening, with Daeubler-Gmelin warning against it, Bulmahn supporting it and PM Schroeder sitting on the fence. The issue will be debated in parliament on the 21st of May. The PM hopes that economic arguments for and against the issue will be seen as legitimate and that Germany will be able to rid itself of the shadow of Nazi-eugenics and discuss the issue like any other country. Opponents of the technology fear that once the first step is made, the flood gates to science without ethical limits will be opened.

FOCUS: Reports that a couple travelled to Stockholm in order to have their immuno-deficient foetus injected with healthy stem cells, and that they now have a healthy child as a result. Alternatives to using embryonic cells for research are being sought, but the possibilities of therapy through embryo research are much praised, as is pre-implantation diagnostic screening.

Frankfurter Allgemeine Zeitung: : The European parliament has rejected a proposed paper on the practice and consequences of human genetic research. Though a majority voted against the determination of appearances through genetic screening, no consensus could be found on the trade of embryonic cells, beyond the recognition that an international treaty is needed. Nor did they agree to withhold EU funds from embryo stem cell research.

Frankfurter Allgemeine Zeitung: : The parliamentary ethics commission has issued a statement supporting the import of embryo cells for research, under strict conditions. The embryos may only originate from unsuccessful fertilisations and require the assent of the parents while the trade must not result in any financial

benefit to them. The commission has however refused to issue a recommendation to the parliament.

Frankfurter Allgemeine Zeitung: : The president of the medical association Hoppe has expressed the opinion that embryo stem cell research should only be considered once the research possibilities on adult stem cells and cells from the umbilical cord have been exhausted. The DFG has shown itself satisfied with the recommendation.

Frankfurter Allgemeine Zeitung: : The EU patenting agency in Munich has given a US firm the patent on the gene thought to be responsible for breast cancer. Greenpeace and the organisation "No patent on life" have protested and the European parliament is considering an appeal against the decision.

Frankfurter Allgemeine Zeitung: Ulrike Riedel, who was head of the department of medical law in the health ministry until she was made redundant because of her restrictive attitude towards gene technology, explains the legal situation of stem cell research and diagnostic screening. According to her, the embryo is fully protected by the constitution and may at no stage be used for other purposes than creating life. She argues that, in 1990 when the law for the protection of embryos was passed, there seemed to be a social consensus on the issue which now no longer exists due to the huge advances and promises of biotechnology.

NZZ: The House of Lords has decided with a large majority to support therapeutic cloning, under the condition that ethical and legal aspects will be reviewed by a commission and that the government passes a law explicitly forbidding the cloning of humans. The opposition was headed by lords representing the churches.

Frankfurter Allgemeine Zeitung: The shares index for biotech companies has fallen by a quarter after the hype of the decoding of the human genome. Nevertheless, the prognosis for future profits is positive.

DPA: : The government has passed a resolution to cease supporting GM-crops while massively funding research in medical gene technology. The CDU/CSU accused the government of inconsistency in their policy towards biotechnology.

Spiegel: Argues that the deciphering of the human genome opens up endless possibilities for treating illnesses such as AIDS. However, these hopes will take decades to realize.

Welt am Sonntag: : Claims that the human genome project, in which German scientists played a small part, has now opened new possibilities for rivalling US advances in biotechnology and new medical treatments. In the past these advances were inhibited in Germany by the long-lasting ethical debate on genome research. The ethical dilemmas presented by embryo research and diagnostic screening await the decisions of the newly formed national ethics commission.

Die Zeit: : Stanford professor Karlin has accused genome pioneer Craig Venter of doing a "shoddy job" in decoding the human genome. According to Karlin the hype around biotechnology does not reflect the poor record in delivering usable results and profits.

6.3.4 2002

6.3.4.1 Summary German press coverage of biotechnology from 2002 presents the following trends:

- Coverage of stem cell and cloning research continues to be framed in ethical terms, while general biotechnology is reported on in terms of economics and science. Stem cell research and cloning receive more coverage.
- The ethical debate on medical biotechnology applications becomes increasingly philosophical. This may partly be due to the recent institution of the German national ethics council.
- Concerns are voiced that German biotechnology research has fallen behind the rest of the world, partly due to restrictive legislation.
- Papers continue to report on political developments and legislation nationally, in Europe and internationally. Particular international developments continue to be reported.
- Overall, coverage is divided between fears about Germany's place in the world biotech "scene" and ethical debates over the wisdom of embracing (particularly medical) biotechnology research.

6.3.4.2 Major stories from 2002

Frankfurter Allgemeine Zeitung: Claims that the pharmaceutical industry is awaiting the coming parliamentary debate on biotechnology with impatience. Gene technology research is said to be in the hands of a few small companies. Argues that in the 90s Germany lost its position in genome research due to ethical concerns of the government and public and has never regained its place in biotechnology.

Frankfurter Allgemeine Zeitung: Kantian and Utilitarian philosophers are cited in a debate over whether an embryo is a person and deserves full protection as such.

DPA: : Gunter Stock, head of pharmaceutical company Schering, has voiced the opinion that the parliament urgently needs to legalize stem cell imports if Germany is not to lose scientists and its economic position in pharmaceuticals. Stock believes there is no time to loose.

AFP - Germany: Reports that the EC is seeking to encourage biotechnology in Europe. It advocates the extended training of workers in the field.

NZZ: Reports that Swiss law does not allow the production of embryos for research purposes, and that surplus embryos are required to be destroyed. Argues that additional legislation is required to regulate stem cell research.

Frankfurter Allgemeine Zeitung: : Simitis, member of the National Ethics Committee, argues that he is against diagnostic screening as it would lead to designer-babies being created.

Frankfurter Allgemeine Zeitung: : Bruestle's application to import the first embryos for stem cell research has been licensed by the Robert-Koch Institute in Berlin. The import is subject to strict restrictions, such as the necessity for embryos to originate from failed in-vitro fertilisations and to have been produced before 2001.

Agence France Presse - German: Reports that the European parliament has passed a resolution requiring all products containing more than 0.5% GM substances to be labelled. The resolution still awaits agreement by member countries.

Frankfurter Allgemeine Zeitung: Reports that the World Gene Technology Fair in Toronto was poorly attended by German politicians. Investment in the field has slowed and there are rumours of the “bio-bubble” bursting in the near future. A consolidation of the market is the prognosis, threatening many smaller companies.

Frankfurter Allgemeine Zeitung: Reports that the EU has adopted Germany’s restrictions on embryo research, while other countries like Singapore and the UK have fewer restrictions. Meanwhile firms in Germany are focusing on research with adult stem cells, which are argued to promise the same research possibilities as embryonic stem cells.

Frankfurter Allgemeine Zeitung: Reports that at the world gene technology fair, head of the US BIO-association called for international treaties on stem cell research and the inclusion of developing world countries in reaping the benefits of the research. Meanwhile, the author argues that the fair shows biotechnology to no longer be an exclusively American business.

NZZ: Claims that there is no unified European line on gene technology legislation. While Germany’s laws are highly restricted, the UK’s are thought to be very permissive. In some European countries there is no legal provision at all on the issue, though there are moves towards legislation.

NZZ: The Swiss federal council is hurrying through legislation on embryo stem cell research. This was apparently pushed into action by a Geneva firm applying for a licence to import embryo cells for research purposes. So far there has been little public discussion of the issue in Switzerland, unlike in Germany, although a debate is expected in the near future. It is likely that the council will legalize research with surplus embryos, while forbidding cloning and production for research purposes.

Süddeutsche Zeitung: In an article debating the philosophical right to life, it is argued that in-vitro fertilisation was a first step to denying the embryo’s right to life. The import of embryo stem cells is deemed hypocritical, and the current decision on imports is judged to be a certain step towards producing embryos for research purposes in Germany itself.

Frankfurter Allgemeine Zeitung: : The Italian health minister Sirchia has condemned the alleged cloning of a human being by Italian doctor Antinori. Antinori denies doing anything illegal.

Frankfurter Allgemeine Zeitung: Argues that the parliamentary decision to allow the import of embryo stem cells is illegal, because it contradicts the constitution which does not allow for the destruction of embryos under any circumstance.

AFX: US farmers report on their negative experiences with GM-crops in Switzerland, where legislation on GM-crops is pending. Greenpeace warned that Switzerland should not give up its positive GM-free image.

Frankfurter Allgemeine Zeitung: Churches and disability associations have warned against the import of embryo cells for research purposes. In their view this is a first step to a science unbound by ethical considerations.

Frankfurter Allgemeine Zeitung: Australian researchers have found a gene that can make smallpox overcome vaccines in mice with fatal consequences. Scientists in the US have already debated the question whether such dangerous knowledge should be made freely accessible.

Associated Press: The European patent office has restricted the patent issued to Edinburgh University for several embryo stem cells. The ministry of justice and Greenpeace celebrated this as a victory against the commercialisation of genes.

AFX: Reports that the Swiss parties are divided on the issue of stem cell research. While liberals and scientists support the research, mainstream parties demand strict controls and the Green party rejects it.

AFX: Swiss Researchers and industry figures have given warnings about the economic disadvantages of prohibiting GM products that will shortly be discussed in parliament.

AFX: Reports that the EU has reached a compromise whereby no funds will go into stem cell research until the end of the year. Cloning will categorically not receive EU funding.

AFG: Green gene technology expert Andrea Fischer has said she does not see the necessity for embryo stem cell research. She intends to fight efforts to legalize imports of such cells.

Die Zeit: Reports that patents on GM medication will start running out in 2004. Microbiologist Huub Schellekens warns that the consequent flood of cheap copies cannot be considered with the identical product. Reports that a recent GM-medicine for liver deficiency from Johnson & Johnson was recently shown to damage certain patients severely.

Die Zeit: Reports that Israel is developing trans-genetic bacteria and viruses allegedly for use in chemical warfare, the Sunday Times has reported. A British Medical Association report from 1999 had apparently already warned of this possibility.

6.3.5 2003

6.3.5.1 Summary German press coverage of biotechnology from 2003 presents the following trends:

- Coverage is evenly balanced this year between medical and agricultural applications of biotechnology.
- The philosophical debate over medical applications continues to be highly sophisticated. The core of the debate lies between the idea of respect for life and the possibly life-saving applications of stem cell research.
- There continues to be an outward focus on international legislation and specific developments in stem cell and cloning research and GM agricultural technology.

- Coverage generally suggests that European popular opinion is strongly against the use of GM in agriculture, although this opposition is balanced with the fear that Germany biotechnology research will fall behind the rest of the world.
- Sensational stories, such as the US Clonaid case, receive attention but the coverage itself tends to avoid sensationalism.

6.3.5.2 Major stories from 2003

Frankfurter Rundschau: The pros and cons of GM-crops are debated by Jens Katz and Andreas Troge. *Do we know enough about GM-crops and their effects? Can organic farmers claim compensation for GM-contamination?* Katz believes there is enough evidence that present GM-crops are perfectly safe while Troge wishes to conduct more tests.

Frankfurter Allgemeine Zeitung: : Reports that, like the French and German parliaments, the US congress has prohibited cloning, even for therapeutic or research purposes. Green representative Loske welcomed the decision and said it could eventually lead to a desirable world-wide interdiction of cloning.

Frankfurter Rundschau: Reports that GM crops have become increasingly unprofitable for the large fields dominating the technology since the health scares and BSE crisis of the 90s, and that the pharmaceutical industry has severed its bonds with agro-industry in consequence.

Frankfurter Allgemeine Zeitung: : A second licence to import embryo cells for research has been given to scientist Herscheler who hopes to study stem cells in the heart.

Frankfurter Allgemeine Zeitung: : Reports on the announcement of a second cloned baby from the Raelian sect in the Netherlands. Raelians believe cloning enables eternal life. The parents of the first clone baby are subject to a court hearing on whether they can retain guardianship of the child, charged with neglecting their parental duty by risking severe genetic damage to the child.

Frankfurter Allgemeine Zeitung: : The US is threatening to appeal to the WTO against the EU's moratorium on the import of GM foods. However, the decision whether to appeal has been postponed while seeking allies for the war on Iraq. Argues that future EU regulations may well remove the bone of contention.

Frankfurter Allgemeine Zeitung: : Greenpeace and Marburger Bund (a medical association) have strongly protested at rumours that Bruestle handed in a patent application on embryo cells and transplantation processes in 1999. The organisations find it unacceptable that profit is made from embryo cells.

Süddeutsche Zeitung: Walter Hauser, head of the centre for new technologies at the Deutsches Museum, Munich, believes the greatest forward steps will come from software and nanotechnology rather than biotechnology in the foreseeable future. He advises that the best background for jobs in these fields are provided by classic natural sciences.

Süddeutsche Zeitung: Reports that the share index for biotech companies has sunk dramatically since the initial euphoria of deciphering the human genome, and that new scientific questions make quick profits look increasingly doubtful.

Frankfurter Allgemeine Zeitung: Reports on the opinion of the notorious gynecologist Antinori, who does not believe that the Raelian sect has managed to clone another baby. They have refused any scientific evidence so far.

Frankfurter Allgemeine Zeitung: Simitis, of the national Ethics Committee, says no-one in the committee suggests legalizing unrestricted diagnostic screening. The committee will present two alternative suggestions on the issue.

Agence France Presse - German: New minister of justice Zypries has suggested that unimplanted embryos do not necessarily fall under the guarantees of constitutional protection. Green party speaker Loske said Zypries' statement was an unnecessary devaluation of human life and that the government had already made a good provision for limited research on imported embryos.

Agence France Presse - German: In the Swiss region of Lindau experiments with GM-crops have been licensed, against the wishes of Greenpeace and the group 'Lindau against genetechnology'. The experiments were at first rejected by the ministry of agriculture and environment, but later permitted under strict conditions.

Agence France Presse - German: The permission for conducting a GM-crop experiment in the region of Landau has been withdrawn following an appeal by GM opponents. The federal court criticized the licencing process and said that the opposition had not been given a chance for legal action.

AFX Swiss: Clonaid is being investigated by the US food and drug administration (FDA) on their claim of producing a cloned baby. The Raelian sect making the claim has so far refused to allow genetic tests to be carried out on the baby or to reveal its whereabouts. Under US law human cloning is not illegal, but requires the permission of the FDA.

AFX Swiss: The existence of a cloned baby by the Raelian sect is still shrouded in mystery after a first court hearing against Clonaid. A further hearing is to take place in early 2004.

Spiegel: Reports that 70% of European consumers are against GM-foods, despite there being allegedly little evidence to support the claim that GM-foods are harmful. In the US GM-crops are routine, but in Europe there has been a moratorium on introducing new GM-crops since 1998, provoking outrage in the US.

Spiegel: The Korean scientist Woo Suk Hwang has announced the first successful cloning of human embryo cells. His results were published in the American journal *Science* and celebrated by German researchers (later discredited). East Asia is fast becoming the star of genetic research, leaving German scientists such as Bruestle left behind. On the other hand, Bruestle claims to feel encouraged by the supportive comments of PM Schroeder.

Agence France Presse - German: The Swiss group "Yes to Life" are demanding a referendum on the new embryo research regulations, claiming they are both immoral and illegal under Swiss law.

Agence France Presse - German: Reports that the German consumer minister Kuenast is fighting for strict controls and labelling of GM-foods as well as the liability of GM-farmers for any damage incurred. She was criticized by the president of the farmer's association who accused her of wanting to halt GM-crops in Germany and of making unrealistic demands on farmers.

Agence France Presse - German: Vice-Chancellor Fischer has voiced his support for the restrictive legislation on embryo stem cell passed by parliament. Meanwhile in the federal state Mecklenburg-Vorpommern farmer's associations and environmental organisations are demanding GM-free agriculture.

Tages-Anzeiger: Reports that Simonetta Somaruga, from the coalition opposing the new embryo research law argues that the law will make women into "egg cell producers", while Felix Gutzwiller supports embryo cell research as promising huge advances in medicine and enhancing the scientific status of Switzerland.

NZZ: Verena Schwander, co-architect of the law on embryo cell research looks closely at the constitution, which opponents of the law claim protects embryos' human dignity and guards against research on embryos. She concludes that the constitution does not forbid the use of surplus embryos for therapeutic research.

Frankfurter Allgemeine Zeitung: Claims that embryos are fast becoming not only an object of research but a natural resource, and points out that discussion about research limits on embryos are prominent in the US presidential campaign. The EU is sharply divided on the issue. The author argues that it is questionable whether Germany will be able to withstand the pressure generated by other countries' scientific advances in the field, which may eventually necessitate the production of embryos for research purposes in Germany.

Frankfurter Allgemeine Zeitung: Reports that biotechnology is receiving a boost in Austria with its first commercial biotech company, Intercell. However, progress from research to industry is still slow and Austria is said to lag behind the international biotech scene.

NZZ: The referendum of the 2nd July has supported the new Swiss abortion law, which allows women to abort in the first 12 weeks of pregnancy. The author asks, do those who advocate abortion contradict themselves by rejecting embryo research? Argues that Habermas' argument that embryo research will fundamentally change our conceptions of human dignity is valid, but that it is doubtful whether negative attitudes towards embryo research are as prevalent as claimed.

Frankfurter Allgemeine Zeitung: Reports that in Saxony-Anhalt GM-crops are kept secret, while an anonymous GM farmer claims his neighbours have nothing against his methods. Meanwhile, a test field was destroyed by activists. A Greenpeace speaker denied they had participated, but showed "understanding" for the sabotage.

Frankfurter Allgemeine Zeitung: Reports that Pompidou, head of the European patent agency, believes firmly that the general public is able to make informed decisions about rejecting and accepting technologies. He is very excited about the future of nanotechnology, but holds more restrictive views on patents for embryos

and stem cells, as requested by German scientist Bruestle. On the other hand, he also holds that denying patents in the fields will discourage investors.

Die Zeit: Claims GM crops have few chances on the European market. Argues that even in Britain, considered to have the most open attitude towards new technologies in Europe, two out of three tested GM-crops have not been judged an improvement on conventional crops. Meanwhile activist Bové, who sits in prison for destroying a field of GM-crops is celebrated as a folk hero in France. The EU has issued new guidelines, lowering the limit of GM-substances in foods to 0.5%, above which labelling is required.

6.3.6 2004

6.3.6.1 Summary Coverage of biotechnology in 2004 generally presents the following trends:

- There appears to be a focus on medical technologies and investment, with biotechnology being reported in an economic frame.
- Comparison with biotechnology industries in other countries in terms of Germany's international competitiveness.

6.3.6.2 Major stories from 2004 *Börse Online*: Reports on this year's excellent development of biotechnology funds. Oyster Biotechnology and DG Lux Lacuna Biotech are among the top performers. While mid and small cap funds feature larger potentials, but hold greater risks, blue chips are less volatile, but offer a smaller potential.

Länder und Märkte: Reports on Australia's success as one of the leading biotechnology nations. Growth rates in the biotechnology sector are significantly higher than the average Australian economic growth. University research institutes collaborate closely with private companies, working in all areas of biotechnology with a special focus on medical biotechnology. The success is largely contributed to the government's and the states' support programmes.

Börse Online: Reports that business analysts expect a 15-20% increase in performance in the biotech sector. Profits through new medicines, product licences, and positive clinical data are the main factors for the increase in market value. Most of the profit-making companies in 2005 are from the mid-cap sector. Compared to the US market, however, lack of funds remains a problem for European biotechs.

Die Welt: Comments on the possibilities of initial public offering for biotechnology companies. Developed medicines that are ready to go on the market are sought after, not technologies. The investors want to see finished products, Willex-boss Olaf Wilhelm claims. While in Switzerland the conditions are excellent, in Germany there is no understanding of biotechnology business plans, an Austrian investor complains.

Welt am Sonntag: Reports a boom in biotechnology shares after two years of misery. The development of medicines in the treatment of different forms of cancer made an important contribution to the latest success. 'Biotechnology is a growth-industry that supplies', Mirco Scherer from GPC argues. The amount of approved biotech-medicines is expected to double until 2008.

6.3.7 2005

6.3.7.1 Summary German press coverage of biotechnology from 2005 presents the following trends:

- International coverage focuses particularly on the US and Bush's veto on publicly funding stem cell research. Much of the coverage focuses on the contrast between this public veto and the lack of legislation on private sector research in the US.
- There is continued ethical discussion about stem cell research, which includes debates about legality and constitutional legitimacy as well as purely ethical questions.
- General biotechnology issues are typically reported as economics stories.
- Conflicts in parliament are widely reported, as are pressure group initiatives and public consultation/ polls on biotech issues.
- Coverage is overall fairly balanced, with a focus on moral qualms about medical applications and pressure group initiatives on the one hand, and political and economic stories focusing on Germany's place in the world biotechnology market on the other.

6.3.7.2 Major stories from 2005 *Tages-Anzeiger*: Argues that Bush's veto on funding stem cell research with federal money does not mean that such research is strictly controlled in the US. On the contrary, each state has its own regulations and in some human cloning is not punishable. The author argues that if Bush controlled research with legislation he would do more to protect embryos than the veto does.

OTS: Claims that the newly founded German Federal Foundation for the Environment has a very positive record so far, financing hundreds of research and thousands of educational and protection projects.

NZZ: The National Academy of Sciences has issued guidelines for private research on embryos in the US. While publicly funded research has been vetoed by President Bush, the private sector is subject to little or no restriction, depending on the state. The guidelines advise against cloning, against paying cell donors and advocate seeking donors' consent for research on their cells.

NZZ: Argues that, despite the referendum passing the new Swiss embryo research law, the question of whether the law is constitutionally legitimate remains. Questions focus primarily on what 'human dignity' encompasses, as well as whether embryos produced for reproduction may be diverted into research.

Spiegel: Argues that the biotech industry is guaranteed to make huge profits while traditional pharmaceutical companies languish under expiring patents. Claims that already the most promising medications are being produced by small biotech companies, especially in the US.

Tages-Anzeiger: The initiative 'gentech-free' has proposed a referendum on an embargo on GM-crops in Switzerland. Claims that despite large scale growth, the GM-industry is in a crisis as it is largely unacceptable to European consumers.

NZZ: Reports that the biotech industry has recovered from the huge drop in the shares index in 2001 and 2002 and looks a safer investment than the ailing pharmaceuticals industry.

Hamburger Abendblatt: PM Schroeder has advocated the relaxation of restrictions on embryo stem cell research. He asked whether Germany would in all seriousness consider banning life-saving medication if this was developed through embryo research elsewhere. He was criticized by Green speaker Volker Beck and CDU MP Rachel. A survey by the research group 'Wahlen' revealed that 40, 6 % of Germans supported more freedom in embryo research, while 28,3 % rejected it. Men in particular were in favour of liberalising guidelines (49.9%).

6.3.8 Nanotechnology

German nanotechnology coverage from 2000 – 2005 generally reports on nanotechnology in a positive light – as the 'next big thing', both in terms of applications (medical and industrial) and investment.

As nanotechnology is a new science, Germany has yet to establish a thorough debate on risks, ethics and social implications. Coverage tends toward caution, and there is some concern expressed in the press that Germany, unlike the US and UK, has not engaged in government-led debate on nanotechnology and its risks and benefits.

The investment potential of nanotechnology, and Germany's particularly strong research in this area receive significant coverage.

There is in general a shift in coverage over the period from almost wholly positive coverage with an emphasis on "sci-fi" applications, to an increasingly cautionary approach. This is perhaps a result of the "nano-boom" not occurring as quickly as predicted.

6.3.9 2000

6.3.9.1 Summary Coverage of Nanotechnology issues in 2000 generally present the following trends:

- Positive coverage of nanotechnology as the next big thing in science and in turn the next big thing for investors.
- Coverage of international high-profile scientists' warnings about the potential risks of nanotechnology.

6.3.9.2 Major stories from 2000 *Frankfurter Allgemeine Zeitung*: Reports that Bill Joy, founder of Sun Microsystems, has rejected the nanotechnologies he himself helped to create, fearing that intelligent and feeling machines might turn against their human creators. However, the author argues that thinking machines are not programmed for evolution and survival, as humans are, and that any real danger would come from machines programmed by inimical humans.

Frankfurter Allgemeine Zeitung: Reports nanotechnologists "expect the third industrial revolution." Three pioneers in the field, Merkle, von Her and Freitas discuss the possibilities that Bill Joy's apocalyptic visions have warned against. Merkle believes attempts to prohibit research are dangerous, rather than the controlled support suggested by the Foresight Institute.

Frankfurter Allgemeine Zeitung: Reports that physicist Richard Feynman and Eric Drexler of the Foresight Institute imagined a world in which material objects can be structured on a molecular level, leading to far-reaching social changes. Drexler

saw the dangers of these possibilities of his research, but continued with it nevertheless, believing that the greatest danger lies in the possibility of intentional misuse. For this reason Drexler founded the Foresight Institute to encourage debate about the consequences of new technologies. The Institute has recently published provisional guidelines on the use of nanotechnology, already beginning to be used by the industry.

6.3.10 2001

6.3.10.1 Summary Coverage of nanotechnology issues in 2001 generally present the following trends:

- Positive coverage continues to portray nanotechnology as exciting new science.
- A significant amount of coverage frames nanotechnology in investment terms.
- At the same time this positive coverage is countered by scare stories concerning the unknown risks and dangers.
- Hypothetical applications in medicine and industry receive some coverage in the press.

6.3.10.2 Major stories from 2001 *Süddeutsche Zeitung*: Reports that the European Research Framework is setting many of its hopes on nanotechnology. In 2003-6 the Commission has allocated 3 billion euros to the field. High hopes for mini-computers and cancer therapy are raised, but detractors such as Bill Joy warn against the technology's destructive capacities. The author argues that, just as in genetics, it is the government's duty to determine the direction and limits of research in the field.

Boerse Online: Reports that nano-technology represents an attractive field of investment to German shareholders. "We are at the beginning of a new industrial era", James Ellenbogen, director of research at Mitre, a US-based institute of science, says. The possibilities of application seem endless, reaching from innovations in computer technology, to the production of new materials and surfaces, and improvements in medical technology. Although there is huge economic potential, the author argues that it will take at least five, more realistically 15 years, to develop high-quality products ready for mass production.

Financial Times Deutschland: Nano-technology is expected to create the next boom in stock exchange, although only vague estimations can be made regarding the nano-potential – a 2001 study by the American National Science Foundation predicts a long-term turnover of \$700 to 800 billion. However, experts expect a rather slow progress in economic impact of nano-technologies. So far there are few companies working in this area, most of these still dealing with basic research, and it will take time to develop marketable products. Another problem is that research in nano-robotics is too expensive to be financed by becoming a PLC. "You will need investments of billions of dollars. Mainly this will be translated into action by several global players", Helmut Schmidt of the Institute of Nano-Technology, Saarbruecken, claims.

Neue Zürcher Zeitung: In response to Bill Joy's debate about the risks of robotic, genetic, and nano-technology, Heinrich Rohrer, one of nano-technology's pioneers, weighs the possibilities and dangers of technological progress, using nano-technology as an example. He appeals against constraining thoughts, as every new development creates hopes, but also fears. Despite the dangers, technological

developments can bring countless positive outcomes to mankind that should not be dismissed. Instead, efforts must be directed at directing the impacts of progress into an appropriate direction.

Börse Online: Just as during the dotcom boom, these days large numbers of companies try to win investors' attention by using the catch-phrase 'nano'. To date, however, shares in genuine nano-technology companies do not exist in Germany. Companies such as Degussa or Henkel offer products that contain nano-particles, but nano-technology does not play a significant role in any of the PLCs enlisted at present. Tim Harper, editor of the email nano newsletter TNT, advises to be cautious: "We are in the same situation where the internet scene was in 1990. It is difficult to predict if a company will become another ebay, or a flop." Investors have to consider that this is a business that is yet to develop.

Frankfurter Allgemeine Zeitung: George Whiteside, an eminent professor of chemistry at Harvard University and practicing nano-technologist tries to reconcile Bill Joy's und Ray Kurzweil's positions, who last year initiated a fervent debate on the future of technological progress. He would like to see a constant progress in nano-technology, but is concerned about the possible creation of a new form of life that might be able to reproduce itself. Instead of introducing strict control mechanisms, however, Whiteside appreciates the open dialogue between science and society as the best way to address the potential dangers of nano-technology.

Frankfurter Allgemeine Zeitung: The process of miniaturization in micro-electronics is progressing constantly. The American scientist Charles M. Lieber now reported his team's latest success in the development of producing extremely small building elements for semiconductors from silicium-nano-wires that could serve as the basis of nano-electronic or photonic circuits.

DPA-AFX: According to experts from the fields of biology, chemistry and physics, nano-technology will create new possibilities for medical diagnosis and treatment, such as bio-chips to screen blood for diseases. Nano-technologist Hans-Joachim Galla argues that nano-bio-technology led to significant successes in the production of artificial organs and skin. But a break through of nano-bio-technology is only to be expected in the next decade, Frank Schroder-Oeynhausen, director of the Muenster-based company CeNTech GmbH, maintains.

6.3.11 2002

6.3.11.1 Summary Coverage of nanotechnology in 2002 generally presents the following trends:

- Positive coverage of Germany's well-established research and application base in nanotechnologies.
- Balanced reporting, the influence of Crichton's doom-mongering 'Prey' is countered in the German press by scientists speaking out against such scare stories.

6.3.11.2 Major stories from 2002 *Frankfurter Allgemeine Zeitung:* Reports that the Green Party has shown no hostility towards nanotechnology. The author argues that usually the party advocates what it calls sustainable technologies, often feeding on popular fears. However, in the case of nanotechnology after a long session with scientists Party advocates

supporting further research into the area. Claims that the party may have been won over by the potential for eco-friendly applications of nanotechnology.

Labo - Magazin für Labortechnik: In Germany, nano-technology is based on fundamental scientific-technical research that is well-established and internationally competitive. Building on this excellent starting position the Ministry of Education and Research (BMBF) will support research and development in nano-technology and its applications through a strategy of 'strengthening the strengths', and laid out a framework for action. The goals are to develop marketing and employment potentials of nano-technology, to further qualifications and encourage young scientists, and to initiate a societal discourse on the possibilities, perspectives and dangers of nano-technology.

Focus-Money: 'The new knowledge on the tiny nano-structures of materials will revolutionize industry', Frank zur Nieden, expert on risk capital at Sal Oppenheim, claims. The few existing listed nano startup companies offer their shareholders opportunities similar to the early phases of biotechnology. Market forecasts are impressing –the American Nano Business Alliance for example estimates that nano-products already meet a transaction volume of 45,5 billion dollars, and the turnover is expected to increase to at least 700 billion dollars in 2010. Some experts, however, warn investors to be cautious. 'Market growth can only be predicted once the market is defined', Simon Waddington from Polytechnos cautions, 'and we're not that far, yet'. Large increases in turnover are expected in the chip industry in particular.

Frankfurter Allgemeine Zeitung: In popular novels, such as Michael Crichton's latest work 'Prey', nano-technology is portrayed as a horror scenario of mutant micro robots escaping from the laboratory, with incalculable effects for the population. But few people know what nano-technology actually entails. Helmut Schmidt, professor of material sciences and director of the institute of new materials, university of Saarbruecken, criticizes horror scenarios as well as outsized hopes. The author explains possible uses of nano-technology in the industrial field – in dirt resistant paint, scratch-resistant surfaces, - and in biomedicine, underlining the positive potential of nano-technology.

6.3.12 2003

6.3.12.1 Summary Coverage of nanotechnology in 2003 generally presents the following trends:

- Environmental groups come out in the press with a cautionary voice.
- There is a shift generally, from finance and investment sources also, to a cautionary approach to nanotechnology.
- 'Heavyweight' academics' voices are heard in the media, suggesting the need for balance and clarity in the presentation of nanotechnology and its applications to the public.

6.3.12.2 Major stories from 2003 *Frankfurter Allgemeine Zeitung*: Argues that recent popular culture such as the films 'Hulk' and 'AI' have fanned fears around nanotechnology, and that while both the US and UK government is effectively addressing these fears and inviting public discussion, with few exceptions Germany has done nothing to address them. The author claims that nanotech presents a very lucrative market that Germany would do ill to miss out on through mismanaging public perceptions.

NZZ: Argues that discussion about the uses and dangers of nanotechnology is not taking place in Switzerland, despite heavy investment in the field and that this is in contrast to the US and the UK. Pressure groups such as ECT have called for a moratorium on the technology until its effects on humans and environments have been assessed.

DPA: : Reports that Japan is set to invest heavily in nanotechnology and bioinformatics, where it has so far lagged behind Europe and the US. The market is predicted to expand hugely in the next decade.

Frankfurter Rundschau: Argues that the scare story of Michael Crichton's recent novel 'Prey' cannot become reality due to physical constraints according to the biophysicist Wolfgang Heckl. He stresses that these fears nevertheless need to be addressed by scientists and government alike.

Frankfurter Allgemeine Zeitung: Nanotechnology is predicted to be the technology of the future, receiving huge sums of money for research. Environmental organisations however have begun to warn against its dangers, which they argue remain largely unresearched. While scare stories about self-reproducing mini-robots abound, more serious concerns have been raised about the capacity of nano-particles to enter the bloodstream.

Die Welt: a report by the research ministry of the army has warned that nanotechnology could undermine the balance of nuclear military powers in the world and lead to a new arms race.

Financial Times Deutschland: Reports that nanotechnology has come under criticism from groups such as the Canadian ETC, who demand a moratorium on production of commercial nanotechnology until more is known about its dangers, for example the capacity of nanoparticles to penetrate the skin in sun creams.

Süddeutsche Zeitung: Argues that nanotechnology is already in full use in everyday life, as in computer systems. An article in *Science* discusses the potential dangers. Although billions are being invested in the industry, ETC argues that only 5 million are being invested in researching potential dangers.

NZZ: Ortwin Renn, Professor of risk management at the University of Stuttgart discusses public perceptions of nanotechnology, arguing that the public is not fundamentally hostile to science but has legitimate fears about potential dangers, raised by disasters such as asbestos. Fears are also raised by the ideas of artificial intelligence and ecological risks. Argues that most people have little idea about the uses of nanotech, but that firms and researchers would do well to show their sensibility towards general fears and to stress the social uses of nanotechnology.

Stuttgarter Zeitung: Eric Drexler, head of the Foresight Institute, has focused his critique of nanotechnology on its potential toxicity, which he claims has been demonstrated in animal tests, rather than on his previous concerns about self-reproducing robots. Reports that the ministry of research will shortly publish several reports on the risks of nanotech in response to public rejection of the technology.

6.3.13 2004

6.3.13.1 Summary Coverage of nanotechnology in 2004 presents the following trends:

- In general, coverage continues to report on nanotechnology as an exciting emergent science, and subsequently an emergent investment area.

6.3.13.2 Major stories from 2004 *Labor Praxis*: Reports on the history of the development of nano-technology from medieval techniques of glass melting, explains the main concepts of nano-technology, and illustrates some of its possible applications as instruments of adsorption, catalysts and sensors. The main goal of nano-technology research is stated to be the use of nano-particles as high-quality building blocks of smallest function units that have precisely defined fields of activity.

CHEManager: Reproduces a statement by George M. Whitesides, professor of chemistry at Harvard University and distinguished pioneer of nano-research, on the future of nano-research in the coming years. Whiteside is confident that a revolutionary nano-technology will develop that will rest on fundamentally new techniques and will create products that we cannot even imagine today. Contrary to media expectations the first commercial applications will not be in the realm of nano-electronics, but rather in the development of new materials. According to Whiteside the main risk in nano-technology will arise from the enormous increase in capacity of data storage and transmission which will allow the collection of large amounts of information on individuals, thus compromising the right to privacy protection.

Börse Online: Reports a massive increase in market value of stocks related to nano-technology after George W. Bush authorised a 3.7 billion dollar investment in nano-tech research. Acknowledging the enormous potential of nano-technology, the author nevertheless warns investors to be cautious and gives some examples of companies that have failed to make profits.

Neue Zürcher Zeitung: Reports on Switzerland's efforts to become one of the world's leading countries in nano-tech research, after having failed to recognize the potential in the development of micro-technology before. Therefore, the country now invests heavily into nano-research. The establishment of nano-sciences in Switzerland's education and research landscape and the strengthening of the Swiss economy through the development of new nano-technologies are the main goals of the government programme.

Frankfurter Rundschau: Reports that nano-technology has become an important field for military research. The US Ministry of Defense, for example, will invest 260 million dollars into nano-research in 2004. The stated goal is to enhance the army's vigour and speed in battle. Research is focused on the improvement of soldiers' survivability, and on the development of new systems of energy provision, of sensors to detect biological and chemical weapons, and of communication and data provision techniques. At the same time, the Institute for Soldier Nanotechnology's research is explicitly directed towards 'dual use', i.e. military as well as civil applications. This dual use approach allows the US industry to have a head start in nano-technology, a development Germany should become aware of.

6.3.14 2005

6.3.14.1 Summary Coverage of nanotechnology in 2005 generally presents the following trends:

- There is some coverage of the need for broad and balanced public understanding of nanotechnology and its applications; the UK's Nanojury being cited as an example.
- Coverage is generally balanced, with attempts made to counter the scare-story aspects of some nanotechnology reporting.

6.3.14.2 Major stories from 2005 *Frankfurter Allgemeine Zeitung*: Reports that the term 'nano' is regularly appearing in high street advertising, although only 50% of Germans have even a vague idea of what it means. Argues that the industry needs an extended public debate on nanotechnology in order to avoid the negative connotations associated with gene technology and nuclear energy. In the UK a path-breaking initiative is bringing Greenpeace, the ministry of defence (sic.) and the general public to the discussion table in order to come to a popular evaluation of nanotechnology.

Die Welt: Argues that nanotechnology is the technology of the future, but that investment and share indexes have fallen recently, leaving the field extremely volatile. While long-term prospects look extremely good, fast profits are not yet on the horizon.

NZZ: Astronomist and physicist Martin Rees warns that scientific advancements will destroy humanity in the near future. While he judges the threat from nanotechnology to be comparatively low, he argues that nuclear bombs or viral warfare may wipe out humankind.

The author points out that little is yet known about the risks of nanotechnology, and large organisations such as Greenpeace have not decisively rejected the field so far. The industry is determined not to be a victim of the fears generated by gene technology and nuclear energy, and dialogue is the magic word while the toxicity of nano-materials is still in question.

6.3.15 Nuclear energy

German press coverage of nuclear issues from 2000 – 2005 generally focuses on Germany's decommissioning programmes. Germany's decision to abandon nuclear power in 2000 means that there is little debate in the press over the relative merits of nuclear energy – that debate, in terms of environmental risk, has been had, with decommissioning scheduled to be complete by 2020.

Under Germany's new political administration (from 2005) the nuclear decommissioning timeline has, however, been challenged. This perhaps reflects a similar shift in debate to the shift that occurred in UK and Italian debates on nuclear energy in the same period. A new debate has opened up which reconsiders the nuclear option in terms of the looming energy crisis and the Kyoto protocol. Noticeably, there is a significantly low level of financial and investment reporting on the nuclear issue.

There is significant focus in the German press on the development of alternative 'green' energy sources, in a lot of cases this is framed in terms of economic /

business opportunities for Germany. Nearby countries' (e.g. Russia, Bulgaria) plans for the development of nuclear power stations also receive substantial coverage.

6.3.16 2000

6.3.16.1 Summary Coverage of nuclear issues for 2000 generally presented the following trends:

- Coverage of the decommissioning programme, and its timeline.
- Nuclear power framed in terms of this new government legislation, environmental risk and the search for alternatives.
- Coverage of the transportation of nuclear waste.

6.3.16.2 Major stories from 2000 *AFX*: Reports that the red-green coalition is deliberating its position in negotiations on nuclear energy. These negotiations will aim to achieve an agreement on a time framework for decommissioning nuclear power stations.

Tages-Anzeiger: Reports on a recent Greenpeace study, which states that Russia does not need to rely on nuclear energy if oil and gas pipe leaks were repaired. Huge leaks of oil and gas are allegedly polluting vast areas and leading to illnesses and a low life expectancy in these regions. Greenpeace speaker Bussau called on the industrial nations to contribute financial aid to repairing pipelines. Meanwhile Russia is apparently planning 6 new nuclear reactors for 2005.

NZZ: Reports that several NGOs and Churches have formed a coalition to support environmental legislation envisioning a turn away from nuclear energy and toward renewable energies.

6.3.17 2001

6.3.17.1 Summary Coverage of nuclear issues for 2001, generally presented the following trends:

- Debate over the timeline and degree of decommissioning occurring in Germany continued, along with a framing of this in terms of environmental issues.
- The influence of the national Green lobby on the issue.

6.3.17.2 Major stories from 2001 *Frankfurter Allgemeine Zeitung*: Reports that the cabinet has passed an agreement with the nuclear energy industry to complete the closure of all German nuclear power stations within 32 years. Environment minister Trittin has also assured there would be no more nuclear waste transports beyond July 2005. Environmental NGOs, NABU and BUND criticised the decision for not reducing nuclear energy in the near future and demanded an immediate shutdown of reactors.

Süddeutsche Zeitung: Reports that renewed transports of nuclear waste from La Hague to Gorleben have been announced for this year. However, the federal state Niedersachsen hopes the energy company Castor itself will carry some of the cost of protecting the transport against the massive protests it has attracted over the last three years.

NZZ: Reports that a Russian nuclear power station and nuclear waste store were threatened by a forest fire, which was brought under control by firemen and the army.

6.3.18 2002

6.3.18.1 Summary Coverage of nuclear issues in 2002 generally showed the following trends:

- Debate over the decommissioning timeline continued.
- Nuclear issues framed in terms of risk and safety.

6.3.18.2 Major stories from 2002 *Frankfurter Allgemeine Zeitung*: Reports that PM Schroeder has made sustainability a centre piece of his energy policies in the run-up to the elections, while the opposition (CDU/CSU) has accused the government of returning to the past by abandoning nuclear energy.

AFX: Reports on a referendum, which will be able to veto Swiss parliamentary decisions on permanent disposal sites for nuclear waste. Two referendums on a moratorium on nuclear energy as well as an extra tax on nuclear energy are proposed for 2003.

Frankfurter Allgemeine Zeitung: Reports that the last radioactive fuel rods from the nuclear power station Muelheim Kaerlich are being disposed of. Although the power station was switched off in 1988, it will be a decade before it can be demolished, as further nuclear waste has to be disposed off in an emergency bunker.

6.3.19 2003

6.3.19.1 Summary Coverage of nuclear issues in 2003 generally showed the following trends:

- Issues surrounding nuclear proliferation were high on the agenda for the German press in 2003.

6.3.19.2 Major stories from 2003 *Stern*: Reports on the work of Corey Hinderstein, a political scientist who works for the Washington Institute of Science and International Security (ISIS), focussing on 'proliferation' – the illegal spread of weapons of mass destruction. Along side famine and poverty, the proliferation of weapons of mass destruction is considered as one of the largest threats of the globalized world. 'The proliferation of these weapons can only be delayed, but not prevented,' the German Bundesnachrichtendienst BND maintains, and security experts expect that there will be an attack with weapons of mass destruction within the next ten years. 'We cannot promote war as a strategy for disarmament', German foreign minister Joschka Fischer declares. 'We need an efficient non-proliferation and control regime.'

Frankfurter Rundschau: Reports on George W. Bush's bill for a new generation of nuclear warfare that was passed in the senate's committee for armed forces. According to this scheme the development of new forms of nuclear weapons is supported, and a change in Washington's nuclear strategy is promoted that allows for the possibility of preventive nuclear attacks, if the existence of or the pursuit for weapons of mass destruction is suspected in an enemy country. These developments are strongly criticized for increasing the likelihood of the deployment of nuclear weapons in future conflicts. If this bill was passed the project of nuclear disarmament could be declared dead.

Frankfurter Allgemeine Zeitung: Reports on the population's resistance to the close-down of Bulgaria's only nuclear power plant Kosloduj, which used to be a

source of pride for the Bulgarian people, representing national autonomy and progress. An action group for the conservation of the power plant was formed and demonstrations are held frequently. In light of positive reports on the plant's security, some critics allege that the EU wants to drive the country into an energy-dependence.

Süddeutsche Zeitung: Argues that the problem of proliferation has gained importance since nuclear material from the former Soviet Union is illegally sold on the black market. Reacting to the growing number of countries striving to become a nuclear power Washington now pushes the development of new nuclear weapons, instead of furthering nuclear disarmament. One of the greatest achievements in the politics of armament is at stake: the non-proliferation treaty.

6.3.20 2004

6.3.20.1 Summary Coverage of nuclear issues in 2004 generally present the following trends:

- Issues surrounding decommissioning in Germany continue to receive press coverage.
- There is some reflection in the press on the acceleration and recommissioning of nuclear power in several countries.
- There is a shift in debate which might suggest a reconsideration of Germany's explicit and absolute decommissioning of nuclear facilities.

6.3.20.2 Major stories from 2004 *Frankfurter Rundschau*: Interview with Green Party representative and former federal minister for environment, Juergen Trittin, about Germany's programme of nuclear power phase-out. Trittin argues that the erection of new nuclear power plants is uneconomic. Nuclear power, he claims, is dependent on massive subsidies, and alternative energy generation is economically much more efficient. Furthermore, a solution for the disposition of nuclear waste has still not been found. An extension of present nuclear power plants' running time would lead to the withdrawal of investments into alternative energies and consequently to a problem of energy provision after the existing nuclear power plants have been closed down.

Stuttgarter Zeitung: Comments on the erection of a new nuclear power plant in Flamanville, France. While other countries phase-out their use of nuclear power, France starts it all over again. The majority of the village supported the plans for the new plant because of the massive investments it brings to the region, despite the fears the memory of the Tschernobyl disaster provokes.

NZZ am Sonntag: Reports on the recent economic success of Areva, the world's largest producer of nuclear power plants, which profits from a new interest in nuclear energy. An increasing amount of countries, including Russia, Brazil, France, South Africa, India, Thailand and Indonesia accelerate their nuclear programmes or plan to start new ones. Areva meets resistance from Greenpeace, and from France's old nuclear magnates, but has been able to negotiate this successfully.

Frankfurter Rundschau: Comments on the newly arising discussions about Germany's nuclear power phase-out. Nuclear opponents were able to prevail, and nuclear power generation was decided to be discontinued and replaced by alternative energy. But the old fronts in the battle against nuclear power are

revived, since the planned phase-out is challenged by calls for an extension of operating-time of existing plants.

6.3.21 2005

6.3.21.1 Summary Coverage of nuclear issues in 2005 generally present the following trends:

- The shift in the debate in Germany continues, with the possibility for a renewed (lengthened) timeline for recommissioning discussed.
- There is some coverage of so-called 'green' alternative energy sources.

6.3.21.2 Major stories from 2005 *SDA - Basisdienst Deutsch:* Reports that energy generating companies' calls for new nuclear power plants in Switzerland are met by nuclear opponents. The formation of another massive anti-nuclear-power movement similar to that in the 1970s, however, is not expected, as the fear of a reactor accident has decreased. and risk awareness has changed towards social problems such as unemployment. Greenpeace president Heini Glauser calls for a medium-term promotion of decentralized gas power plants.

Frankfurter Rundschau: Recounts how in 1996 in the small German village of Schoenau nuclear opponents demonstrated against the local energy supplier 'Kraftuebertragungswerke Rheinfelden' and managed against all odds to put through a public decision to buy the local electricity network. They founded their own power supply company based on the provision of 'green', i.e. nuclear-free energy. Today, this is Germany's third-biggest provider of 'green electricity'.

Frankfurter Rundschau: Comments on the work of Regina Hagen, coordinator of Inesap, an international union of engineers and scientists promoting a world free of nuclear weapons. The NGO calls for an international prohibition of nuclear weapons, similar to the existing ban on chemical and biological weapons, but had little success. Instead, the non-proliferation treaty is challenged again.

6.3.22 News sources used in the quantitative analyses

Agence France Presse - German
 Associated Press Worldstream - German
 Berliner Morgenpost
 Berliner Zeitung
 Bunte
 Der Spiegel
 Deutsche Verkehrszeitung
 Die Presse
 Die Welt
 Die Zeit
 DPA - AFX
 EuroNews - Deutsche Version
 Financial Times Deutschland
 Frankfurter Allgemeine Sonntagszeitung
 Frankfurter Allgemeine Zeitung
 Frankfurter Rundschau

General-Anzeiger (Bonn)
Hamburger Abendblatt
Impulse
Kress.de
Lebensmittel Zeitung
Maschinenmarkt Spezial
Neue Zürcher Zeitung
NZZ am Sonntag
OTS Originaltextservice
SDA - Basisdienst Deutsch
SonntagsZeitung
Spiegel
Stern
Stuttgarter Nachrichten
Stuttgarter Zeitung
Süddeutsche Zeitung
Tages-Anzeiger
Versicherungsmedizin
Versicherungsrecht-Rechtsprechung
Versicherungswirtschaft
VWD Wirtschaftsnachrichten
Welt am Sonntag
Werben und Verkaufen
Wirtschaftblatt
Wirtschaftsprüfungsgesellschaft.

6.4 Italian media coverage 2000-2005

6.4.1 Biotechnology and IVF

Italian biotechnology press coverage from 2000 to 2005 fell into two clear parts – coverage of medical applications and coverage of agricultural applications. Coverage of medical applications tended to focus on ethical debates, while coverage of agricultural applications typically focused on policy and public opinion. GM reporting leaned towards a food/farming angle rather than a strong environmental angle, although there was some coverage of the environmental debate, particularly in political reporting.

Coverage did not change substantially over the five year period, although public events and announcements like the first human embryo cloning by ACT in 2001 had some influence on news coverage.

The ethical debate over medical applications of biotechnology focused on human cloning and embryonic stem cell research. The influence of the Vatican was evident in most of this discussion, and coverage was fairly balanced, typically representing views from all sides of the debate. A distinction was made in most reporting between medical biotechnology applications like pharmacogenetics and the more morally controversial human cloning and embryonic stem cell research. The overall consensus in Italy appears to be in support of medical biotechnology while drawing the line at these particular technologies, but the ethical debate is as yet unresolved.

General biotechnology coverage focused quite heavily on economics, and concerns were repeatedly voiced about Italy 'falling behind' the rest of the world in biotechnology research. Biotechnology was typically presented as a growth area with great potential for Italy, and substantial coverage was devoted to calls for improved government strategies on biotechnology research and industry.

6.4.2 2000

6.4.2.1 Summary Italian press coverage of biotechnology in 2000 presents the following trends:

- Coverage of biotechnology falls into two main sections – medical and agricultural. Medical biotechnology reports tend to focus on ethics, policy and public opinion, while agricultural reports will often focus on the impact of biotechnology development on national and international economics and industry, as well as looking at public opinion and policy issues.
- Much of the coverage from this year is positive about biotechnology in general, going so far as to warn against the dangers of Italy lagging behind in biotechnology research due to restrictive regulations and a “confused” government position. This support wavers, however, when it comes to more controversial medical applications like human cloning and embryonic stem cell research.
- Coverage of ethical issues often focuses on the ideal role of regulatory bodies, along with other public institutions like the Roman Catholic Church and bioethics committees.
- Substantial coverage is given to the distinction between stem cell research using embryo cells and stem cell research using adult cells. There is some

consensus among commentators that adult stem cell research will be the “way ahead” for Italy, allowing research to continue while ethical decisions about embryonic research are made.

- Coverage of GM tends to be quite positive about its potential, while reporting on negative public opinion.

6.4.2.2 Major stories from 2000

Il Sole 24 Ore 13/2/2000. The author describes many of those who make calls to restrict stem cell research as “ignorant”. In his opinion, thanks to scientific research and biotechnology we will overcome ethical problems and the conflict between opposing fundamentalist positions. He argues that abuses have always existed, but that this is precisely why stem cell research should be correctly regulated, rather than ostracized.

Il Sole 24 Ore 23/2/2000 *Punto di vista*. The article condemns the character of the interventions taken by different heads of institutional organizations in Italy on biotech issues, accusing them of acting emotionally and in ignorance where they have been acting in an informed and responsible way. Giovanni Berlinguer, the head of the National Bioethics committee, is accused of conceiving the committee’s role as that of controlling and repressing biomedical research. The author argues that Berlinguer should think of bioethics as an opportunity to promote greater knowledge and freedom of choice in society, and as an opportunity to find solutions to medical and agricultural problems.

Il Sole 24 Ore 7/5/2000 *Biotechnologie*. Mario Capanna, *L’Italia viva. Viaggio nel Paese dell’impegno e della speranza*. The article is a criticism of Mario Capanna’s recent anti-biotech book. In the book, biotech is described as the most extreme and dangerous form of capitalism. The authors argue that, for example, GM crops could solve a number of developing world hunger problems, with a knock-on effect on morbidity and birth rates. The journalists agree with Capanna in his call for improved education of scientists in Italy (not just technical, but also moral) and lament the fact that the current Minister for Agriculture (Pecoraro Scanio) is anti-biotech.

Il Sole 24 Ore 22/5/2000 *I progressi della biologia molecolare stanno cambiando sotto molti*. The article reviews the impact of biotech on the pharmaceutical industry. It argues that positively, biotech medicines and compounds work with the genetic makeup of the patient to target ailments more effectively, with fewer side effects, but that the new generation of medicines are more expensive, which means that it will be a long time before national health services can use them. Concludes that ultimately biotech medicines will have to be assessed one by one, weighing each one’s pros and cons.

Il Sole 24 Ore 18/7/2000 *Produttori USA pronti allo sbarco*. This article looks at the growth and consolidation of the GM industry in the USA, and the growth opportunities it may have in Europe (should Europeans accept GMOs). Despite intense competition, and because of increasingly averse public opinion toward GM food, the main GM seed producers have created the Council for Biotechnology Information, in order to inform the public and assuage their fears on the effect of their products.

Il Sole 24 Ore 25/7/2000 *Ricerca, sviluppo: Oggi a Bruxelles imprenditori italiani da Prodi*. Dompe, the president of Assobiotech, claims that every time one talks about biotech in Italy, the discourse takes an ‘extremist’ turn, and that the biotech issue

is further clouded by a confused government approach. This is detrimental both for consumers, who are not properly advised and informed, and for businesses, as the environment is not conducive to attracting the investment required for research. He calls for the set-up of a European agency in charge of monitoring biotech investments and developments across Europe, to ensure that Italy does not miss out on the global opportunities offered by this sector.

Il Sole 24 Ore 17/8/2000 Solo così la scienza può progredire e arrivare a risolvere i limiti. The author writes that the two major ethical positions on stem cell research (those who are against it as they consider embryos a human being versus those that see stem cell research as the most promising avenue for the cure of diseases) are legitimate and understandable. It reviews how the UK government plans to approach stem cell research, how the government has managed debates and consensus around it, and what authorities have been appointed to monitor and regulate it. The article then contrasts the UK approach to that of Italy, arguing that if one day it becomes possible to work with adult stem cells (as opposed to those taken from embryos), scientific progress will have overcome the moral objections that currently paralyze countries such as Italy. Claims that in Italy, avant-garde biotech research is being asphyxiated by fundamentalist positions, by bioethics 'conjured out of thin air', and by politicians indifferent to biomedical developments.

La Stampa 17/8/2000 Una soluzione al problema di coscienza. The article reports excerpts of an interview with Eduardo Bonicelli, director of the S. Raffaele Molecular Biology lab. Whilst he says it is absurd to outlaw therapeutic human cloning, he says that research with adult stem cells is just as promising. Human cloning, using left-over embryos from in-vitro fertilization procedures, involves social and ethical issues, which don't apply to adult stem cell research. Bonicelli says he doesn't know what position Italy will take with regards to stem cell research. He draws an analogy with GM foods: once upon a time, GM scientists were hailed as the saviors of the hungry masses in the 3rd world; today, public opinion is against them (and GM food).

SDA - Servizio di base in Italiano 24/8/2000 Clonazione: Vaticano - gravemente immorale usare embrioni. The Vatican announces it is firmly against any kind of human cloning, whether therapeutic or reproductive. It argues that not even ends such as scientific progress or curing diseases justify the abuse of human life, represented by the embryo, and holds that adult stem cells, not embryo cells, should be used instead.

La Stampa 25/8/2000 Embrioni congelati: inchiesta sui laboratori. The article reports on the first Italian investigation into cloning. Because the country lacks any laws or regulations regarding human cloning, fertility clinics are not bound to say what they do with surplus fertilized eggs. The article also gives excerpts of an interview with the owner of one of the major chains of fertility clinics. He welcomes the regulation, as long as it protects the privacy of donors and patients, and also mentions that adult stem cell research (less controversial than embryo research) will allow many medical advances.

Il Sole 24 Ore 25/8/2000 Polemiche dopo l'apertura della Casa Bianca. The US decision to finance and regulate human stem cell research has caused reactions in the US and across the world. In the US, conservatives such as senators G.W. Bush and Sam Brownback condemned the decision. Outside the US, the Vatican

condemned stem cell research on human embryos as an attack on human life and dignity; what makes embryo research even more ethically deplorable is the fact that similar research can be conducted on adult stem cells. Bishop Elio Sgreccia, VP of the Pontificia Accademia per la Vita and director of Bioethics at the Catholic University, says he suspects stem cell research is the outcome of financial utilitarianism – money, not the quest for human health, drives experimentation with embryos. The UK welcomed the US decision, saying that – as long as there are firm regulations – it will allow considerable medical advances.

La Stampa 1/9/2000 *Cloneremo tutto meno l'uomo* The article reports excerpts on interviews with newly-registered 19 and 20-year old medical students, and their opinions on biotechnology. They are clear: all technology which can better the life of men is morally right and useful, except human cloning. Research has to be monitored and put to the service of humanity: they are in favour of GM crops, but against cloning.

Il Sole 24 Ore 3/9/2000 *Xenotrapianti: quando l'etica non fa bene alla ricerca*. The article, pro-biotech and pro-stem cell research, argues that the shortage of organs for transplants can be structurally solved thanks to biotechnology. Also argues that therapeutic cloning to obtain stem cells, is a promising, quick and safe research route which promises to deliver significant results, of benefit even to those who morally oppose the technology. Xenotransplants (for example, using pig organs) whilst judged morally acceptable by Catholics, is a riskier technology. According to the author, this contrast shows how the more promising technique (stem cell research) and its rejection by Catholics is forcing research into a certain direction. In other words, ethics should not 'force' science toward the 'right' course of action, but simply bar scientists from doing morally wrong things.

La Stampa 8/9/2000 *L'Europa mette fuori legge la clonazione, Vince la mediazione di Forza*. The article comments on the EU's narrow vote to ban human cloning. The comment of one of the parliamentarians who voted for this ban is "we've finally demonstrated that ethics count in politics".

Il Sole 24 Ore 8/10/2000 *Bioteologie*. The article reviews the outcome of a 1999 survey of European opinion on biotech. Europeans are apparently unwilling to accept the risks associated with new biotechnologies, unless the technologies are obviously and immediately useful as well as morally acceptable. Most interviewees say they do not have enough information on the issues discussed. Anti-biotech respondents use environmental groups as their main information source, whereas other respondents say their most trusted information sources are newspapers, doctors and consumer associations and that thereafter, they rely on information from the government and industry.

Il Sole 24 Ore 5/11/2000 *Un appello degli scienziati*. The results of the survey 'Bioteologie e opinione pubblica in Italia' show that most Italians are against biotech, whilst at the same time being under-informed on the subject. The author argues that what is even more worrying is the anti-biotech position taken by government agencies, arguing that Italian agro-biotech research is at a crisis point as researchers are being asked to renounce to their professionalism in order to obtain funds. Countries like Germany and France as just as cautious as Italy with regards to GMOs, not allowing GM food to be sold to consumers; yet this hasn't bigoted them against conducting further tests and research in the agro-biotech

field. The author argues that, in Italy, ideological prejudice is conditioning scientific methodology.

Il Sole 24 Ore 29/12/2000 Frontiere della medicina: si chiama TNSA la nuova tecnica. The article positively discusses the ‘Made in Italy’ practice of adult stem cell research (TNSA). It emphasizes how TNSA is an entirely Italian approach, instead of human embryo cloning (adopted in the UK). An expert committee, presided over by Dulbecco, found that using adult stem cells for medical research was the optimal compromise for catholic and non-catholic members of the panel, arguing that this “revolutionary technology” provides scientific answers amid a still-open moral debate.

6.4.3 2001

6.4.3.1 Summary Italian press coverage of biotechnology from 2001 presents the following trends:

- Press coverage of medical applications focuses on cloning this year. There is an international focus, particularly on the US, where ACT announced the first human embryo cloning in November. The Italian health minister’s decision to authorise animal cloning provides further material for the debate.
- Coverage of US biotechnology also discusses new legislation brought in on publicly funded stem cell research.
- General biotechnology is reported on in economic and industry terms, partly in response to a report from Ernst and Young which suggests that biotechnology will be a “huge opportunity” for Italy.
- Coverage of medical applications also involves a technical and highly involved ethical debate.

6.4.3.2 Major stories from 2001 *Il Sole 24 Ore 1/7/2001 Uno studio dimostra che una varietà transgenica della pianta reduce.* The article reviews the outcomes of different studies on GM crops. The first study, conducted in Holland on GM maize, shows that although it is less efficient than Monsanto reports, it also allows for the use of less herbicide. The other two studies (both from the UK) are more ambivalent on the efficacy of GM crops, maize in particular. The author’s conclusion is that there is no sense in giving a blanket approval to all GM crops, or banishing them: they have to be considered on a case by case basis, bearing in mind that GM technology can be advantageous for some aspects (e.g. reduced herbicide use) and not in others.

Il Sole 24 Ore 25/3/2001 Convegno sulle staminali: Il padre della pecora spiega perché. Stem cell research and its therapeutic applications have created huge expectations in both the general public and in scientific communities. The article is in part written by Ian Wilmut, the ‘father’ of Dolly the sheep, who gives his opinion on human cloning. He argues that human cloning for reproductive purposes is too fraught and morally dubious, and at this moment in time irresponsible. Wilmut thinks, however, that therapeutic cloning will have real, positive outcomes, but wants to disassociate this kind of research from the negative associations of human reproductive cloning.

Il Sole 24 Ore 27/4/2001 Nel 2000 le imprese del Vecchio continente sono cresciute. The article positively discusses the growth of the biotech industry in Europe, arguing that the growth rates in this sector allow Europe to approach US competitiveness levels, discussing which countries have the advantage (e.g.

Germany) and outlining how biotech and other high-tech industries like nanotechnology can work together.

La Stampa 1/8/2001 USA: *Clonazione fuorilegge, stop alla ricerca*. The article reviews the US Congress's approval of a bill designed to outlaw all stem cell research, whether destined to human cloning or to therapeutic uses. In the Congress's opinion, the moral and ethical issues raised by human cloning are such that they cannot be ignored, even for the sake of science and medicine. The author (ironically) comments that the anti-abortionist faction has won and that, for once, the American Congress and the Vatican spoke with one voice: they both condemn human cloning. The ruling approved a total ban on cloning outlined in the Human Cloning Prohibition Act, but was amended to allow federal funding for research on existing stem cells, but not to the extraction of stem cells from new embryos.

Il Sole 24 Ore 1/8/2001 *La Camera ha votato la legge*. The US Senate has approved the bill that outlaws all human cloning. This bill is seen as excessively restrictive by scientists, the biotech industry, and some parliamentarians. Bush's position takes account of the pressure exerted by religious groups and conservatives.

Il Sole 24 Ore 2/8/2001 *Punto di vista*. Sebastiano Mafettone argues that what happens in the US has a knock-on effect in the rest of the world, hence why the outcome of the proposed US Senate bill to outlaw human cloning (whether for therapeutic or reproductive purposes) should carefully be monitored by Italians too. The bill does not distinguish between different kinds of cloning, despite the fact that these distinctions are highly significant. Therapeutic cloning is plausible both in terms of financial returns and medical benefits.

Il Sole 24 Ore 2/8/2001 *Dopo il voto emergono timori di fughe di cervelli*. The US senate's decision to outlaw stem cell research (an initiative full of ethic, moral, scientific and theological implications) will have a profound impact for those labs and scientists in the US who are already working with cloning. Doctors especially fear that research may be shut down in promising fields. The Israelis have recently announced a breakthrough, using stem cell research, in cultivating insulin; G.W. Bush will have to decide and justify whether he will give funding to further medical research.

Il Sole 24 Ore 11/8/2001 *Alla gente il compromesso piace*. G.W. Bush has authorised US public funding for stem cell-research with cells derived from placentas, umbilical cords, adult human stem cells or animal stem cells. In this way he has navigated the delicate debate opposing science and ethics. American policy is in line with international trends, which allow research within limits. To define US rules on scientific, technological, and ethical issues, Bush will create a bioethics advisory board for the US president.

Il Sole 24 Ore 18/11/2001 *Bioetica: L'ultimo libro di Demetrio Neri (La Bioetica in Laboratorio)*. The author comments on Demetrio Neri's new book on stem cell research and the role of bioethics, part of which focuses on how different countries handle bioethical issues. He argues that the Anglo-Saxon model, unlike the Italian one, is consultative: a wider discussion takes place, aiming for consensus, rather than denying stem cell research on metaphysical or ideological bases. The book also argues that surplus fecundated eggs from in-vitro fertilization should be used for stem cell research.

La Stampa 26/10/2001 *Sirchia: Si agli animali clonati made in Italy*. Girolamo Sirchia, Health Minister, has given the go-ahead for animal cloning from January 2002. This has generated mixed reactions: a Green Party senator calls him 'Frankenstein's disciple' saying genetic manipulation is obviously one of the Health minister's priorities. Scientists, on the other hand, welcome the decision as a means to allow Italy's research sector to compete with other countries, and look forward to receiving government funding.

La Stampa 21/11/2001 *Vaticano: clonazione un atto del maligno*. Discusses the debate on human cloning and embryonic stem cell research. According to the Vatican, cloning is 'an act of the devil', exploits human beings and is supported by scientists and businessmen motivated by hidden economic gains. On the other hand, the Health Minister Sirchia – whilst opposed to human cloning - has authorised animal cloning while calling for the institution of a bioethics committee to "reassure the nation".

La Stampa 26/11/2001 *Il Biologo Carlo Redi: Questo e' un grande passo in avanti*. The article reports responses to the announcement of the first human embryo cloning by ACT, an American firm. Carlo Redi, a biologist of the University of Pavia, calls it a 'great leap forward', whilst acknowledging that it will raise many ethical problems. Other scientists, like Francesco D'Agostino, president of the national bioethics committee, compare such experiments to those of Nazi scientists. The head of the Green Party, Peciraro, calls cloning 'scientific adventure-ism', and the Health Minister Rosi Bindi says she is shocked at the announcement of human cloning, as it is forbidden by the Oviedo convention. The Vatican also condemns cloning as 'a symbol of humankind gone crazy'.

SDA - Servizio di base in Italiano 26/11/2001 *Clonazione: coro di critiche ma c'e' chi difende*. Following the announcement by the American company ACT of human cloning, there has been an alleged 'worldwide chorus of opposition' led by Bush. The US government, the WHO, the Vatican, the Orthodox Church, the Italian government and the EU all condemn cloning. However, there are also elements in favour of the announcement, such as controversial gynaecologist Antinori, some members of the EU parliament and other scientists and geneticists. Overall the author says that the announcement has been greeted very 'coldly'.

La Stampa 26/11/2001 *Il 'no' del ministro della salute*. The article reports excerpts of an interview with Girolamo Sirchia, Italy's Health Minister, and his comment on ACT's announcement that they succeeded in cloning human embryo cells. According to Sirchia, human cloning even for therapeutic ends is a danger to humanity, which needs to be stopped before it gets out of hand; it's a dangerous path. He argues that the US experiment has no therapeutic validity and that the power of technology has to be balanced by a sense of responsibility. Sirchia says that simply because a technique has some 'supposed' benefits, this does not authorise its use, as this would open the floodgates to all kinds of abuse and morally debatable practices.

Il Sole 24 Ore 27/11/2001 *Intervento*. Francesco D'Agostino, a genetic researcher, comments on ACT's announcement that they have cloned human cells, and on Renato Dulbecco (a nobel prize winner)'s comments that the furore surrounding this announcement is 'much ado about nothing'. D'Agostino is anti-cloning. He says that the difference between therapeutic and reproductive cloning is irrelevant, if the means used to achieve it are "immoral". Creating a human clone

means a human being has been brought to life and manipulated in the interests of other human beings. He argues that this violates both non-religious ethics (the Kantian principle of 'treating others as an end in themselves, not simply as a means to something') and religious & Christian ethics.

Il Sole 24 Ore 27/11/2001 Embrioni: ricerca. The article discusses reactions to the ACT (Advanced Cell Technology) embryo cloning. G.W. Bush squarely condemned human cloning as morally wrong, and there's a bill pending approval at Senate to outlaw all cloning (including therapeutic cloning). The debate around ACT's announcement is not only ethical, but also political and financial: a lot of investment has gone into biotech companies.

Il Sole 24 Ore 12/12/2001 Il biotech e la genomica in particolare sono settori molto promettenti. Biotech, new materials technology, IT and telecoms are described as the sectors which will be at the heart of the world economy. Although the EU and Italy are described as lagging behind the US in some aspects of biotech research, there are promising scientists working in Europe, winning recognition and prizes for their breakthroughs. Renato Dulbecco expresses his hopes for future research, but at the same time says there is no need for human cloning. The article also discusses GM crops: their possible advantages, their effect on the environment, and how the allocation of patents for GM crops will work.

Il Sole 24 Ore 17/12/2001 Biotech ultima chance del rilancio italiano. In comment on an Ernst & Young report on the status of the biotech industry in Europe, biotechnology is reported to be a huge opportunity for Italy. The article argues that Italy can close its research gap with European countries and become competitive in the biotech sector.

Il Sole 24 Ore 30/12/2001 Staminali. The author discusses stem cell research, describing it as promising, but at the same time arguing that its applications may fall short of what's expected from the technology. However, it is argued that the main issue for stem cell research isn't its applications, rather it its social implications. The pluralism of western society does not allow for a single answer to the bioethical problems stem cell research raises. Europe's governing bodies have responded by imposing an untenable and sterile 'lid' on these issues, hesitating between defining stem cell research as a sin or a crime. This uncertainty further has contributed to the under-financing of science: although stem cell research is commercially attractive, businesses will not invest in a climate of regulatory uncertainty. The author argues that if it weren't for the improper use of the term 'therapeutic cloning', which smacks of living photocopies of people, stem cells and their clinical applications could offer an unexpected point of reconciliation between the scientific and social communities.

6.4.4 2002

6.4.4.1 Summary Italian press coverage of biotechnology in 2002 presents the following trends:

- General biotechnology continues to be reported in terms of economics and industrial development, looking particularly at Italy's place in biotechnology R&D in comparison with the rest of the world.
- Comment remains generally positive, although some medical applications (embryonic stem cell research, cloning) are controversial.

- There is some disagreement as to what Italian public opinion on GM actually is. Some polls suggest that the public is generally against GM, while others have suggested the opposite. This fuels balanced newspaper coverage of the GM issue, outlining “pros and cons” and representing views from both sides of the debate.
- Debate continues about medical applications, much of which focuses on the role of advisory bodies and on the role and place of bioethics as a discipline.

6.4.4.2 Major stories from 2002

Il Sole 24 Ore 25/1/2002 Biotecnologie. The article reviews the reasons for Europe’s interest in the biotech industry, and why it is trying to catch up with American research. The author argues that, amongst the opportunities offered by a flourishing biotech sector are economic growth, quality of life, and social mobility. The article then goes on to review why the European biotech sector is less advanced than the American one: it is geographically more fragmented across different EU countries, there are less ‘leader’ companies, it needs to consolidate. Italy is thought to be lagging behind the rest of Europe in the number of new biotech patents and in its selection mechanisms for new researchers and enterprises.

SDA - Servizio di base in Italiano 27/2/2002 Clonazione, GB: via libera definitivo a terapeutica. This article discusses the UK’s position on stem cell research, contrasting it with the US’s more conservative position, and underlining how the Anglican Church has also been involved in the British decision. The House of Lords is reported to hold that stem cell research (on adult or embryo cells) must be rigidly controlled and regulated, but that there is no ‘ethical difference’ between the use of embryos for in-vitro fertilization or for therapeutic cloning.

La Stampa 4/3/2002 Le biotecnologie necessitano di regole. Francis Fukayama argues that biotechnology needs to be regulated for the sake of justice and ethics. A sound evaluation of the consequences of regulation (and its contrary, no rules at all) is necessary as both scenarios have pros and cons. He argues that, whereas extreme regulation is influenced by ignorance and lobbies it is also true that unbridled science is dangerous. Fukayama contrasts science (which he characterises as a-moral) vs. society (with complex, varied moral needs).

Il Sole 24 Ore 5/4/2002 I nuovi distretti europei. The EU’s 4th research programme signals out biotech as the ‘cusp’ of the high tech sector, underlining its importance as a motor of economic growth, development and competitiveness in Europe. Four main geographic areas in Europe where biotech is well developed will be singled out and encouraged to work together to strengthen the sector.

Il Sole 24 Ore 11/4/2002 Scontro con i Nobel. The US senate is about to discuss a bill penalising all human cloning, even for therapeutic purposes. G.W.Bush supports this bill, whilst over 40 nobel laureates have signed an opposing document saying that such a bill would definitively kill any chances to find new cures for Alzheimers and Parkinsons disease. The Italian scientist Severino Antinori has supposedly already started human cloning experiments. The article is quite neutral about the debate.

Il Sole 24 Ore 26/5/2002 Convegni: Vaccini, antigeni, farmaci e altri prodotti che verranno. The article reports an interview with Cinzia Caporale, organizer of a biotech symposium in Rome around the themes of “sociopolitics and bioethics” and “scientific issues”. She describes how biotechnology and biomedicine are

developing techniques to solve a variety of international medical problems, while arguing that the sector is underfinanced and nearly 'clandestine' in Italy.

Il Sole 24 Ore 28/6/2002 Dompe', Sirchia: Assobiotech sollecita le imprese a investire. About two-thirds of Italians have a moderately positive view of biotech, according to Assobiotech. Dompe, the President of Assobiotech, says that national institutions and the government should develop a long-term vision of new technologies, bringing together public opinion, scientists, administrators, entrepreneurs and other to understand citizens' preoccupations and to explain, case by case, why new technologies are important. He discusses the role of media and business in this communication process. However the Green Party leader, Pecoraro Scanio, claims most Italians are opposed to GM foods.

La Stampa 15/10/2002 Scienza e morale: religione e regole, un documento per non ostacolare. Starting from a discussion of a document on bioethics published by La Consulta Laica di Bioetica di Torino, the author discusses the state of bioethics in Italy. In his view, the document shows that an agreement on bioethics must be reached by consulting all citizens (religious or not) as members of a liberal state. The main task of bioethics should be to critically reflect on the new horizons of life opened by scientific research, including an ethical understanding of the opportunities and risks involved.

La Stampa 20/11/2002 Medicina: buone prospettive dall'ingegneria dei tessuti. The article positively discusses advances in research on adult stem cells for the treatment of heart disease. Although still in an experimental phase, these treatments are said to be very promising.

Il Sole 24 Ore 12/12/2002 La sfida dell'universita: Obiettivo la lotta al cancro. The article discusses Stanford University's decision to undertake stem cell research just a day after Jacques Chirac called for the end to cloning at a UN assembly. Stanford's decision has several implications: it divides religious advocates and scientists; it opposes democratic California to conservative senators (and G.W. Bush) in Washington; and it creates an opposition between the innovative Silicon Valley culture (from which Stanford draws much of its funding) and more conservative cultures elsewhere.

Il Sole 24 Ore 13/12/2002 L'inchiesta: opinioni a confronto. The article summarises interviews about the advantages and disadvantages of GM foods and crops with Maarten J. Chrispeels (Director of Molecular Agriculture at the University of California) and Marcello Buiatti (Professor of Genetics, University of Florence, and scientific advisor for the Italian government's research plan). Whereas Chrispeels favours GM and challenges many of the objections raised, Buiatti advocates caution from reliance on GM foods and points out the failings of GM technology so far. He does, however, advocate further research in this field.

La Stampa 28/12/2002 I rischi e le promesse della sperimentazione. The article argues that what is technically possible and morally feasible, in the field of cloning, has to be sanctioned by ethics and law. The author claims that there is little legal cloning regulation, and that laws are urgently needed worldwide because, although the use of cloning for stem cell research promises to cure a variety of ailments, there are always extremists who are willing to go beyond what is morally permissible, thereby increasing the public's confusion on what the medicinal uses and benefits of stem cell research are.

La Stampa 28/12/2002 *La studiosa della commissione bioetica: Una reazione alla censura.* The article reports a short interview with Cinzia Caporale, Bioethics Professor at the University of Siena and member of the Italian National Bioethics committee. In her view, the public often has an a priori negative opinion on all that is related to biotechnology and genetic therapy. She argues that bioethics is here to widen freedom, give reassurances and find solutions.

6.4.5 2003

6.4.5.1 Summary Italian press coverage of biotechnology in 2003 presents the following trends:

- Coverage of GM is mixed. There is substantial positive coverage of GM's potential for economic development and also for addressing developing world food problems. Some commentators even accuse Italy of being overly anti-GM. This is balanced with reports of unsuccessful GM crop trials in the UK, which generate ambivalent comment.
- Medical applications continue to attract a lot of ethically-focused coverage, which follows the stances of the major political parties and public institutions on cloning and stem cell research. The coverage is fairly balanced, on the one hand reflecting overall public concern about the boundaries of life, and on the other hand displaying enthusiasm about the potential medical applications of new biotechnologies. Comment is presented from both sides of the debate.
- General biotechnology continues to be reported in economic and industrial terms. There is an evident worry that Italy is falling behind the rest of the world in biotechnology research.

6.4.5.2 Major stories from 2003 *La Stampa* 1/2/2003 *Lettere: Agricoltura transgenica.* A reader (Sergio Dompe', President of Assobiotech) writes in to *La Stampa* to argue his pro-GM and biotech stance, arguing that the benefits of GM crops and biotech must obviously exist, or countries as diverse as China and the US would not invest time and money in them. GMs represent a valid help for farmers and for Italians who appreciate good cuisine. He argues for research freedom and the balanced assessment of biotech's potential.

Il Sole 24 Ore 14/2/2003 *Biotech.* Discusses China's GM agriculture. China is the fourth country in the world by GM crop surface area, but its GM cultivations are generally destined for internal consumption whilst non-GM crops are exported to Europe and Japan (as foreign customers resist GM food). The Chinese government finances research into more than 60 different varieties of GM seeds.

Il Sole 24 Ore 12/6/2003 *Rapporto Ernst Young.* A summary of the Ernst & Young report on the bright future of biotech firms in Italy and Europe.

La Stampa 13/7/2003 *L'analisi di uno dei maggiori esperti di biotecnologie applicate all.* 'GM agriculture does not destroy typical agricultural products on the contrary some strains of plants can only be saved from fungi and viruses thanks to gene modification.' This is the opinion of Francesco Sala, a prolific author and expert on GM topics, interviewed in the article. He criticises Italy for being inflexibly anti-GM in its laws and stance.

La Stampa 24/7/2003 *Le critiche della consulta laica di torino alla legge sulla fecondazione assistita.* The approval of the assisted reproduction law (which prohibits any kind of cloning even for research) is the inspiration for the article's

discussion of science and ethics. It argues that secular ethics must be based on a continuous interaction between scientific research and traditional ethical thought. The article runs through the arguments given by La Consulta Laica di Bioetica di Torino defending the need for stem cell research; its arguments are all ethically-focused, defending stem cell research as a technique not aimed at producing clones or altering family patterns, but at widening our understanding of human beings.

Il Sole 24 Ore 24/7/2003 Intervento. The author (Mel Sembler) claims that Italy is lagging behind Europe in the biotech and GMO sector, and that politicians use citizen's fears about what they eat to distance themselves from biotech science ("political hysteria"). He holds that GM scaremongers often know very little about science and agriculture, and that governments should empower their citizens to choose what to consume by providing them with adequate information based on facts.

Il Sole 24 Ore 25/7/2003 Bioetica: Spagna autorizza uso medico cellule embrionali. Reports that Spanish law now allows the use of stem cells derived from human embryos (left over from assisted reproduction endeavours) for scientific research. Left-wing politicians welcome the new law, whereas the Catholic Church criticises it. Joseph Maria Simon (Presidente Medici Cristiani di Catalogna) says that it will be impossible to monitor the scientific use of embryos, so the new law seems designed to be contravened.

La Stampa 4/8/2003 Il testo attende solo l'approvazione del Papa: Cibi transgenici. The article discusses the Vatican's position on GMOs. The Vatican is against human cloning, whilst biotech developments from plants and animals are welcomed because they help fight problems like hunger and starvation. GM food should be labelled as such and made available to developing nations only once their ethical stance (toward GMOs) has been assessed. The precautionary principle, under which the Vatican operates, requires cautious assessments to avoid health risks or otherwise.

La Stampa 13/8/2003 Gran Bretagna. The successful cultivation of stem cells in the lab, whilst acclaimed by scientists, is condemned by pro-life activists. The article underlines the science required to produce these stem cells and the fact they can give way to 'miraculous' treatments for currently incurable diseases.

Il Sole 24 Ore 15/8/2003 Le priorit  dell'Unione Life sciences and biotech are key to the EU's objective of making Europe "the most dynamic and competitive knowledge-based economy". The author proudly writes that Italy is one of the main parties elaborating a biotech strategy for itself and for Europe, to increase their competitiveness. This is seen as a difficult task, as there are several issues to be faced, from patents to ethics.

La Stampa 3/9/2003 Il 10 Settembre a Parigi l'UNESCO organizza un incontro per discutere. This article is by Matsuura Koichiro, Director General of the UNESCO International Bioethics Committee, on human cloning. He is against reproductive cloning and calls for further debate on therapeutic cloning. He argues that human cloning is an ethic, cultural and political issue and that scare stories should not interfere with the real problems associated with cloning. The ethics of science and technology is one of UNESCO's priorities: bioethics must take into account both cultural differences and a pragmatic approach to scientific progress.

Il Sole 24 Ore 14/9/2003 L'eccesso di precauzioni uccide la voglia di sapere. This article is a critical attack on the current conception of bioethics. The author argues that bioethics is seen as a 'defensive' means by many Catholics and by environmental & anti-globalization movements, who call for a 'precautionary principle' in the assessment and application of science and technology. The author is against this stance, arguing that scientists shouldn't have to defend themselves from the accusation that they damage moral values. He holds that bioethics has undermined faith in science and scientists and has failed to build a bridge between science and society.

Il Sole 24 Ore 17/10/2003 Biotech si o no: I risultati di uno studio indipendente. The article reports on the outcome of a 3-year GM crops trial in the UK. Two out of three GM crops sowed were judged to be more environmentally harmful than their traditional counterparts. The results of the trial are expected to influence Tony Blair's pro-GM stance, and were also linked to Monsanto's closure of a research office near Cambridge.

Il Sole 24 Ore 6/11/2003 Intervento. The author (Umberto Rosa) says that biotechnology offers great opportunities but requires new business structures and cultures able to support it. He argues that Italy requires more long-term planning to set up a financial infrastructure benefiting biotech enterprises. 'Bioiniziativa' (a committee created by Assolombarda and Finlombarda) aims to translate biotech research into business.

Il Sole 24 Ore 22/11/2003 Biotech: In arrivo i vaccini orali derivati da vegetali geneticamente. Biotech is described as a promising sector for the development of vaccines, and Italy is decided to be amongst the pioneering countries in the pursuit of biotech opportunities. Silvio Berlusconi himself has declared that any past delays or "lagging behind" must be overcome to achieve EU goals. According to Leonardo Santi (Comitato nazionale per le biotecnologie e la biosicurezza) biotech can also help combat bioterrorism.

La Stampa 24/12/2003 L'esperimento choc della setta dei raeliani: Il compleanno di Eva. This article discusses the alleged 1st birthday of the first human clone announced by an American sect (the Raelians), and presents the views of some scientists, most of whom believe that the cloning was a hoax. The group of scientists also condemn human cloning for reproductive ends, whilst celebrating the advances in human embryo cloning for stem cell research and therapeutic ends.

6.4.6 2004

6.4.6.1 Summary Italian press coverage of biotechnology in 2004 presents the following trends:

- A new law on Italian GM agriculture generates further discussion of GM. Responses to the law, which requires farmers of GM crops to take precautions against cross-contamination, are varied. Some see it as a substantial development, while others argue that restrictions leave Italy way behind the rest of the world in biotech development. Coverage presents no clear consensus.
- The UK HFEA's decision to allow human embryo cloning at Newcastle University adds fuel to the cloning debate. Coverage is balanced and represents views from both sides of the debate. Comparisons are made

between the legislative process in the UK and in Italy. The influence of the Vatican is evident throughout the debate.

- Reports generally suggest that the scientific consensus in Italy supports medical applications of biotechnology but that this support does not extend to cloning research.
- International policy on cloning is discussed. There is some discussion of the “Anglo-Saxon” approach to biotechnology legislation, suggesting that there is a specifically Anglo Saxon approach to bioethics and presenting different views on the validity of this approach.

6.4.6.2 Major stories from 2004 *Il Sole 24 Ore 4/1/2004 Bioetica: Paolo Vezzoni fa il punto sulla liceità della ricerca.* The article reviews some of the moral issues raised by Paolo Vezzoni’s book: “Si può clonare un essere umano?” It argues that the mass media tend to focus on the sensational aspects of stem cell research and its therapeutic benefits, without realizing that there is still a lot of work to be done before these benefits can be reaped. The author argues that religion will play a crucial role in the future of therapeutic cloning (cf. US evangelical minorities and their opposition to stem cell research).

Il Sole 24 Ore 15/1/2004 Il rapporto. The article underlines the economic benefits of the biotech industry in Italy. The author argues that there are many qualified science graduates in Italy and that biotech research would produce high value-added innovations which can then be exploited by industry.

Il Sole 24 Ore 13/2/2004 Medicina: Ricercatori coreani e statunitensi sono riusciti a ottenere. Discusses the work of Korean stem cell researchers (later discredited), claiming that this research will one day allow us to re-build damaged human tissue. However the article also discusses ethical implications: when does life begin? Are the embryos used for research “alive”? Different religious views on these issues are also discussed.

Il Sole 24 Ore 5/4/2004 Intervista: Dompe, Assobiotech. Interviews Sergio Dompe’ (Assobiotech president), who argues that the Italian government must invest in biotech companies. The article also reviews the risk and profitability of biotech businesses and start-ups.

Il Sole 24 Ore 11/5/2004 Agricoltura: alla vigilia del via libera Ue a un nuovo mais. The article reviews Italy’s GM stance prior to a European decision on the subject. The author argues that whether GM organisms are a health risk or an agricultural benefit is hard to tell, as there are few long-terms studies on their effects. The article opposes Nelson Marmioli (Università di Parma), who sustains that preventing contamination between GM and GM-free crops in Italy is nigh impossible, and Roberto Defez (CNR Napoli) who says more research is needed.

Il Sole 24 Ore 13/5/2004 Innovazione. The article discusses the Ernst & Young “ReFocus” report on the development of biotech across Europe. The report claims that biotech is the new cornerstone of European medical advances and the new “global health economy”. The article then proudly compares the solidity of the biotech industry in Italy, which has grown without much state funding, with the rest of Europe.

Il Sole 24 Ore 13/5/2004 Scenari. Review of the flourishing biotech industry in the Far East (Japan, Korea and China). A SARS vaccine and 4 AIDS vaccines are

currently being trialled in China. The article claims that, because of its huge population the Far East is well positioned to become a research pole in the near future.

Il Sole 24 Ore 13/5/2004 Terapia. Claims that biotech pharmaceuticals have helped millions of people back to health, and altered patient treatment, and that the integration of research centres and hospitals/ centres for the recovery and treatment of patients both reduces costs and provides a better treatment quality.

La Stampa 10/7/2004 A Parigi passa la legge sulla Bioetica: Studi dell'embrione Via libera. The article asks Carlo Flamigni, a "pioneer of assisted reproduction", to comment on the new French laws allowing stem cell research. In his view, it is a positive development. Italy's position (against human embryo cloning) is untenable; "Italy always lags behind everyone else" (in scientific research and in the use of new treatments).

ANSA Notiziario Generale in Italiano 11/8/2004 Clonazione terapeutica: si dividono. Public opinion on therapeutic cloning is divided. Catholics and some scientists (Francesco D'Agostino, Giuseppe Del Barone, Rita Levi Montalcini) are against it, their arguments being that embryos are alive and that Anglo-Saxons tend to put bio-ethical considerations on hold because of the promise of financial rewards emerging from stem-cell research applications. Radicals, left-wing exponents, and other scientists are pro stem cell research, trusting science to find cures to illnesses. Italian scientists are therefore divided too, on the ethics and regulation of stem cell research.

ANSA Notiziario Generale in Italiano 11/8/2004 Clonazione: la mappa di quella terapeutica. The article reviews different ways of obtaining stem cells: from human embryos, from adult cells, or from non-fertilized eggs (the implication being that, in the first case, the embryo dies). The third way was suggested in 2000 to the Italian Health Minister Veronesi.

ANSA Notiziario Generale in Italiano 12/8/2004 Clonazione: le fabbriche di embrioni nel mondo. Whilst Britain, China and Singapore have clear laws and guidelines allowing human cloning for research purposes, stem-cell research is still undertaken in many other countries without laws or controls. This article reviews the status of stem cell research in several countries. Carlo Alberto Redi of the University of Pavia says this kind of research will continue and that the best solution would be to use existing cell lines and to finance and regulate research.

Il Sole 24 Ore 12/8/2004 Medicina: Il Regno Unito autorizza l'Università di Newcastle. The article reviews the HFEA's decision to allow the University of Newcastle to clone human embryos for therapeutic research aims. The article underlines how the HFEA studied the scientists' research proposal, labs, CVs, etc. and had them assessed by academics and other authorities before giving its permission. Italian scientists are divided on human cloning: Giuseppe Novelli is pro the HFEA's decision, saying the progress of science cannot be stopped just because we are afraid of 'clone pirates or photocopied babies', whereas Rita Levi Montalcini says she disagrees with the HFEA's decision.

La Stampa 13/8/2004 Il premio nobel per la medicina: Clonazione umana: Dulbecco. The article gives excerpts of an interview with the Italian Nobel laureate Renato Dulbecco. The stem-cell method developed by the Newcastle team does not, in his

view, incur any ethical problems. He thinks Italy should allow stem cell research, because of its benefits. The Pope also condemns stem cell research, but many of the 80 scientists of the “Pontificia accademia delle scienze” (the Vatican’s committee to discuss scientific issues) are divided on the issue.

La Stampa 14/8/2004 *Il dibattito dopo il sì inglese alla sperimentazione il responsabile.* This article gives excerpts of an interview with Professor Stojkovic from the University of Sheffield on the extraction and use of stem cells from human embryos. It compares two techniques to extract stem cells (a British and a Korean one) saying both create and destroy human embryos. Religious and anti-abortionist groups hold that embryos are live human beings, while some scientists think adult stem cells should be enough for research. Professor Stojkovic says the way research is conducted in Europe (as opposed to the US) is correct: his team has to request authorization from a central government authority, which consults with all parties. He argues that the UK is not authorising stem cell research simply to be more commercially competitive than other EU countries.

Il Sole 24 Ore 19/8/2004 *Il futuro del biotech: Nella prima intervista a un giornale italiano.* Interview with Hugh Grant, head of Monsanto. The interviewer presents Mr. Grant with the main arguments against GM for him to refute (e.g. safety issues; intellectual property on food; cost of GM seeds; whether they need to be re-purchased every year by poor farmers). Mr. Grant says it’s up to Europe to decide whether to “lag behind” or “give its farmers and consumers the freedom to choose beneficial technologies” (i.e. GM crops).

ItaliaOggi 8/10/2004 *Il transgenico parte, ma non subito.* This article reviews the consequences of a new law on GM agriculture. The law will punish those who do not take precautions to avoid contamination of traditional crops with GM material. Individual regions have to decide how to manage border cultivations, as 13 Italian regions have already declared themselves GM free and will pass regional laws against GM agriculture.

Il Sole 24 Ore 18/10/2004 *Assemblea generale.* Reports that the UN is to debate and regulate stem-cell research. Some countries oppose human cloning (e.g. UK, Belgium), but approve of therapeutic cloning. Maurizio Balistreri says that Europe has a more secular approach than the US: embryos should be protected, but research should not be influenced by intransigent religious groups. The article then reviews the positions on stem-cell research of Italy, Germany and France more in depth.

ANSA Notiziario Generale in Italiano 19/10/2004 *Usa: voto domani Washington a Onu per bando clonazione.* The article discusses the UN session during which member states will vote on human cloning. On one hand there’s the US, Costa Rica, Italy, and other countries, who want human cloning to be totally prohibited; on the other side there’s the UK, Belgium and other nations wanting to regulate human cloning so it can be used for stem cell research and therapeutic ends only.

ItaliaOggi 12/11/2004 *Ogm: dal 2006 ok alle coltivazioni.* The article reviews the laws allowing GM agriculture from the end of 2005. It reports the minister Alemanno as saying “we made it”, very satisfied with the fact that finally the laws allowing GM crops in Italy have been approved.

Il Sole 24 Ore 13/11/2004 Agricolture hi tech: Per molti ricercatori il decreto Alemanno resta. The article discusses the impact of the Alemanno decree on GM agriculture in Italy. Businesses and scientists alike think that it increases controls and costs, putting Italy 10 years behind other countries in its trials of GM crops.

6.4.7 2005

6.4.7.1 Summary Italian press coverage of biotechnology in 2005 presents the following trends:

- General biotechnology coverage continues to feature calls for improved, “joined up” government strategies for biotechnology development, and expressions of worry about Italy’s position in international biotechnology research.
- Discussion of Italian public opinion on biotechnology is dominated by the publication of *Observa*’s “Science and Society” report. Public consultation initiatives are welcomed by the press. Discussion of public opinion is balanced overall.
- A distinction between general medical applications of biotechnology and the morally controversial extremes of human cloning and embryonic stem cell research continues to be emphasised in coverage of medical applications.
- International reports focus on the UK and USA, comparing legislation on medical biotech applications with that in Italy. Korea also receives some attention due to the later discredited research of Dr Hwang Woo Suk.
- The ethical debate over cloning and stem cell research continues, and is reported on in a balanced and technically sophisticated way. However, the debate has not developed or moved on substantially from previous years.

6.4.7.2 Major stories from 2005 *ItaliaOggi 26/1/2005 Transgenico, arrivano regole certe.* The article reviews the regulatory framework for GM crops and agriculture in a neutral, legalistic style.

Il Sole 24 Ore 28/1/2005 Il dibattito sul referendum: Sondaggio Censis. Discusses survey results which show that the majority of Italian doctors are pro stem-cell and biotech research and innovation, but are against human and animal cloning. Despite their faith in progress and research, doctors consistently emphasise the need for an independent authority, modelled on the National Committee for Bioethics, responsible for deciding on the limits of stem cell implementation etc.

Il Sole 24 Ore 31/1/2005 Italia: Ottava per numero di societa, sesta per farmaci. Article claims that Italy has a growing biotech/ biomedical sector, following the general European trend, but that it may lag behind in the GM sector, due to the new Alemanno decree on the co-existence of GM and GM-free cultivations. Roberto Gradnik, the new president of the Assobiotec group, criticised the new law.

Il Sole 24 Ore 31/1/2005 Bruxelles pronta a raddoppiare I fondi. The article claims that Europe’s competitiveness in the biotech sector is jeopardised because of the lack of a coherent regulatory framework and of funding. Divergences in opinion on biotech, from GM crops to life sciences, mean that the USA is much more advanced in funding, developing and patenting technologies.

La Stampa 9/2/2005 Gli embrioni non saranno usati per la riproduzione. Ian Wilmut, having obtained an authorization from the Human Fertilization and Embryology

Authority for therapeutic cloning, points out that he is against human cloning, and that the research is aimed at finding a cure for motor-neuron disease.

Il Sole 24 Ore 10/2/2005 Ricerca: ecco i magnifici undici. Eleven new industrial poles have been set up in Italy, some focusing on nanotech and biotech. Most of these are in the centre and south of Italy, bringing funding to under-developed regions.

Il Sole 24 Ore 12/3/2005 Finanza per la medicina. La ricerca sulle malattie da invecchiamento Argues that investing in biotech firms and research that focuses on illnesses that affect elderly people can be profitable, given the demographics of western countries.

ANSA Notiziario Generale in Italiano 11/3/2005 Compito AIFA e' aiutare i medici nelle scelte. Claims that the majority of doctors reportedly trust biotech medicine. The role of AIFA (Agenzia Italiana del Farmaco) is to provide doctors with information on all pharmaceuticals and medicines, so that doctors can chose the best course of action. It also plans to run campaigns educating citizens on the correct use of pharmaceuticals.

ANSA 14/3/2005 Biotech, aumenta richiesta informazione dai cittadini. Reports on Observa's survey, which shows that Italians want more information on biotech. They consider pollution more worrying than biotech but are believe that issues with moral implications should be covered more by the newspapers and TV. The government is opening the Biblioteca Chigiana so that the public can have access to its biotech information resources, and will be discussing sending out a flyer to each household at Bionova. Piero Angela, a TV science host, voices her support of this idea.

Il Sole 24 Ore 15/3/2005 Il 68% dei cittadini e' favorevole alla ricierca sulle cellule. Reports the results of Observa's Science in Society survey on biotechnology. Responsible for this survey are Massimo Bucci, Federico Neresini and Giuseppe Pellegrini. It shows that the majority of Italians are for stem cell research to develop new medical therapies but are against reproductive cloning. Renato Dulbecco says that the scientist's role is to determine the reach of new technologies and that citizens must chose whether to implement them or not, as it's an ethical issue.

Il Sole 24 Ore 17/3/2005 Intervento. Positive discussion of pharmacogenomics (the tailoring of existing medicines to individuals and illnesses, via new cell and molecular therapies), which is seen as one of the most immediate and useful applications of genetic research. Reports that the population of Sardinia is thought to be genetically "uncontaminated", offering a great field for research, and that IBM is installing a Blue Gene supercomputer at Hospital S. Raffaele (Milan) for the genomic study of its population.

Il Sole-24 Ore 21/4/2005 Solo fondi privati sulle staminali. The newspaper declares that "fortunately" president Bush has only been able to limit federal financing of stem cell research, and not state or local funding. It reports that pharmaceutical companies, to protect their public image and to avoid potential backlash from religious activist groups, often sub-contract stem cell research to small, independent companies that can benefit from different sources of financing and that are not subject to as much public scrutiny.

Il Sole 24 Ore 19/5/2005 Dagli studi di base ai primi test clinici. The “Advances in Stem Cell Research” conference discussed the difficulties in putting stem cell research into practice (the cultivation of cells; the effects on patients). The article is science-focused and fairly neutral.

ANSA Notiziario Generale in Italiano 19/5/2002 Staminali: dopo infarto c'è aiuto spontaneo per riparare. Scientific article reporting that new technologies and the use of stem cells from bone marrow could help assist in heart attack recovery.

Il Sole-24 Ore 20/5/2005 Avanza la clonazione terapeutica. The article reviews the “therapeutic cloning” advances by Dr. Hwang Woo Suk in Korea (later discredited). The technology used by Dr. Hwang is described as “ethically” different from that used in other stem-cell research, as uses “left-over” embryos from assisted reproduction, which would otherwise be disposed of. The article also reports the views of therapeutic cloning objectors.

Il Sole-24 Ore 21/5/2005 Embrione clonato anche in Europa. Alison Murdoch, of the University of Newcastle, comments (on the Italian referendum on assisted reproduction) that the scientific details of stem cell research are too complex for most people to understand, and that therefore a “yes” or “no” outcome to the referendum is too simplistic. Experts should debate the issues first. She points out that the UK Parliament, following substantial expert advice and debate, has decided to progress with stem cell research, holding that its benefits outweigh ethical worries.

La Stampa 21/5/2005 I dubbi del biologo non sono riusciti a estrarre cellule staminali. Edoardo Boncinelli, professor of Biology at S.Raffaele (Milan), comments on the British and Korean advances in stem cell research. His comment, in view of the Italian June referendum on assisted reproduction, is that adult stem cell research does not pose ethical problems.

Il Sole-24 Ore 28/5/2005 Le parole. Glossary of terms of relevance to the June referendum on assisted reproduction, from Bioethics to Surrogate mothers.

Il Sole 24 Ore 4/6/2005 La ricerca ha bisogno delle embrionali. Following the outcome of the referendum on assisted reproduction and the changes in Italian law on embryo research, the article defends the new scope for stem-cell research. It explains the difference between stem cells and other embryonic cells, referring to scientific sources (“as recent articles published in the most prestigious scientific magazines show”). The end of the article lists 2 pro-stem cell research testimonials: Renato Dulbecco and Rita Levi Montalcini.

ASA 7/6/2005 Documento scienziati UE su staminali. This article details the manifesto made by EU scientists in support of their Italian colleagues, who may be faced with government prohibitions from undertaking further stem cell research. The manifesto details scientific grounds in support of research, mindful of other opinions. Signatories include: Renato Dulbecco, Rita Levi Montalcini, Austin Smith (University of Edinburgh), Catherine Verfaillie (University of Minnesota), Yann Barrandon (Technical Institute of Lausanne), Margaret Buckingham (Pasteur Institute).

La Stampa 11/6/2005 Il direttore del laboratorio di biologia molecolare e genetica umana, Roberto Colombo. The director of the Molecular Biology and Human

Genetics lab, Roberto Colombo, explicitly states that obtaining stem cells for research means killing the human embryos they are taken from. He states that “citizens have a right to know” that furthering stem cell research implies killing millions of embryos, and questions whether citizens have been provided with sufficient information to make an informed choice prior to the referendum.

ANSA Notiziario Generale in Italiano 14/6/2005 Staminali: Schroeder per liberalizzazione ricerca. Schroder declares himself in favour of stem-cell research, saying that it is our duty to find cures and alleviate human suffering while we have the opportunity to do so. The German Green party opposes him by shifting the discourse from opportunities to bioethics, arguing that embryos are not a product for research.

ANSA Notiziario Generale in Italiano 20/6/2005 Staminali, ovociti e sperma artificiali da embrionali. This article reports the advances in reproductive and genetic technology from the University of Sheffield, helping infertile couples and extending the fertile period of women. It also reports on the views of opponents, who see these studies as ‘horror scenes’ leading to the production of abnormal human embryos or clones.

Il Sole 24 Ore 23/6/2005 Clonazione scommessa coreana. The article discusses Dr. Hwang Woo-Suk’s success as a top researcher and scientist at Seoul National University (later discredited). His stem-cell research work, in collaboration with Ian Wilmut and Gerald Schatten, hasn’t faced many legal limitations, as the Korean government sees the development of therapies and remedies through stem-cell research as an economic development opportunity for Korea, especially in the absence of significant international competition. Objections have been raised by the Korean bioethics association, NGOs, some academics, and some Korean Catholics (which have a different view on stem cells from the majority of Buddhists and Confucians in Korea), following international ethical debates. The new 2005 Bioethics and Biosafety act regulates stem cell research in Korea.

6.4.8 Nanotechnology

Italian press coverage of nanotechnology from 2000 – 2005 generally portrays the science as ‘the next big thing’. The press deals with medical and industrial, commercial applications, from the everyday to the sensational. A lot of coverage is framed in economic and investment terms.

There is some reflection on the nanotechnology research climate in Italy. It is repeatedly suggested that Italy might be lagging behind the rest of Europe in nanotechnology research, said to be hindered in part by an ‘anti-science’ Vatican.

Later in the period, the institution of collaborative forums to discuss the costs and benefits of nanotechnology received coverage. The media’s approach to nanotechnology was also reflexively examined, as coverage of the science became more measured in comparison with the sensationalist reporting of previous years.

6.4.9 2000

6.4.9.1 Summary Coverage of nanotechnology from 2000 presents the following trends:

- Nanotechnology is portrayed as 'the next big thing', and there are calls for further investment for development in Italy.
- Reports of nanotechnology developments overseas receive substantial coverage.
- Industrial and medical applications are both generally reported in a balanced way.

6.4.9.2 Major stories from 2000

La Stampa 17/05/2000 'Tecnologie di frontiera: la rivoluzione dei 'nanotubi'. Reports on the 'revolution of carbon nanotubes', tiny hollow cylinders with a diameter of a few nanometres, made of perfect carbon hexagons. They were discovered in 1991 by Japanese researcher Sumio Iijima, are extremely firm but can also be flexed without breaking. Possible applications include 'nanosyringes' to inject molecules directly inside living cells. They also allow for the production of ultra-light and super-resistant material. Article reports that Japan and the US are investing a lot in nanotechnology research, while Italy and the EU for the moment just sit and watch.

La Stampa 17/09/2000 'Al centro ricerche Fiat: Mi sposta quell'atomo?' Article opens with the image of a car that changes its colour in an instant. It reports on joint venture between FIAT's research centre and American enterprise NanoWorld Project for a program of research and development on application of nanotechnology on cars, to be carried out at FIAT's Turin headquarters. It also discusses other applications, outside the motor industry, in the production of materials absorbing polluting substances, or medical 'micro-plaques' that could repair heart damages, or hordes of nanorobots constructing whole buildings out of powdered raw materials.

Il Sole 24 Ore 28/02/2000. Reports on the annual conference of the American Association for the Advancement of Science, where it was pointed out that, in a few years, nano-machines could be realised. These would work on a molecular scale, that is on sizes a million times smaller than a human hair. Numerous researchers confirmed the rapid developments being made on nano-machines, such as molecular engines and auto-assembling materials. Possible applications include ultra-powerful computers, data storage at a higher density, and 'clever' membranes able to open and close their pores depending on the identity of the molecules reaching them.

Il Sole 24 Ore 21/06/2000 'Scenari Hi-Tech – Lo sviluppo delle nanotecnologie renderà...' Interview with Richard P. O'Neill, president of 'The Highlands Group', a consulting agency based in Maryland, after his establishment of 'The Highlands Forum', aimed at liaising between scientific researchers, politicians, and civil society. O'Neill's main concern is for the development of nanotechnologies. He describes potential applications for household appliances (self-repairing fridges), PCs (self-built, defect tolerant 'nano-computers'), medicine and health (nano-computers applied to genetic engineering).

6.4.10 2001

6.4.10.1 Summary Italian news coverage of nanotechnology from 2001 presents the following trends:

- Continued positive coverage of nanotechnology's potential in science and business.

- Press coverage featured many explanations of what nanotechnology is, and what its potential commercial applications are.

6.4.10.2 Major stories from 2001

La Stampa 09/05/2001 'Nano macchine'. Presents nanotechnology as the 'real' next big thing in new technology. Article refers to nanotechnology as a potential 'magic wand' that could create anything you might want: ultra-light and super-strong materials, computers a thousand times more powerful, science fiction type drugs, and even human organs. Also includes interview with Piero Perlo, Italian representative for the EU nanotechnology program. Perlo points to current applications of nanotechnology to filter water, convert solar energy into electricity, control the release of drugs in the human body.

Il Sole 24 Ore 29/06/2001 'Ultrapi piccolo, nella UE si investe ancora poco'. Opens with the creation - at the University of St. Andrew's - of microscopic manipulators, something like 'atomic forceps', that can rotate objects the size of a micron and could then be used in bioengineering for the manipulation of chromosomes. Article claims that research on nanotechnology, strong in the US and Japan, has recently aroused interest in Europe and now nanotechnologies are an absolute priority for the European Commission. Its impact would regard the science of materials, production processes, nanoelectronics and pc technology, medicine and health, but also biotechnologies and agriculture. Article points to the interdisciplinary nature of research of nanotechnology, which includes physics, biology, chemistry, and material science.

La Stampa 06/06/2001 'Ricerca avanzata verso machine in miniatura'. Article describes possible future scenarios. Affirms that in a few years nanotechnology could turn current micro-computers into 'nano-computers' the size of a watch, but also more powerful and possibly just as expensive. Also, we could have, under our skin, a proper medico-clinic 'nano-laboratory'. Measuring cholesterol and insulin levels, blood pressure and heartbeat frequencies, hormone levels and their quality. These applications, however, can only be realised through collaboration between engineers, physicists, chemists, and biologists. The EU, however, seems to lag behind, but article praises recent establishment of Euspen, the European Society for Precision Engineering and Nanotechnology.

Il Sole 24 Ore 31/01/2001 'Nanotecnologie, la via tutta italiana punta alla ricerca'. Describes fundamental characteristic of nanotechnology as the ability to work at the level of single molecules. Article lists possible application in biotechnology (bio-catalysis, diagnostics, systems for controlled release of drugs), microelectronics (high integration systems, new communication systems), new materials, and manipulation and characterisation methods. It therefore praises decision by CNR, the National Research Council, to initiate an inter-university research project on nanotechnology.

Il Sole 24 Ore 05/04/2001 'Finanza & High Tech'. Describes how major companies and organisations are turning to nanotechnology. This is the case with Nasa, working on microrobots, but also optics companies, such as Cisco, who are applying Mems technology (microelectromechanical system) to their products. Article points to the presents of at least three companies with the prefix 'nano' on the Nasdaq stock market: Nanometrics, Nanogen, and Nanophase. In the industrial sector, Jmar technologies (semiconductors), Caliper (medical analysis microchips), and Affimetrix are all turning to nanotechnology. Also reports on the

flourishing of discussion around investment in nanotechnology on the web, as with the website www.nanoinvest.com.

6.4.11 2002

6.4.11.1 Summary Coverage for nanotechnology in 2002, generally presents the following trends:

- Positive coverage of nanotechnology's commercial applications and the need for investment in the sector.
- Very little overall coverage of the issue.

6.4.11.2 Major stories from 2002 *Stampa 30/1/2002 Un anno dalla scoperta del genoma, cosa cambia nella lotta al cancro.* Excerpts from an interview with Prof. Pellici, Director of the Experimental Oncology department of the European Institute for tumour studies. He discusses the uses of nanotechnology in deciphering the human genome and establishing which genes are responsible for cancerous mutations. Nanotech is portrayed as beneficial, helpful technology.

Il Sole 24 Ore 28/6/2002 Nanotecnologie. Claims that over the next few years the nanotechnology sector is forecast to boom, thanks to promising new advances and EU investment. The article looks at some of the new developments and projects in place. The end of the article warns students against over-specialising in the nanotech sector, arguing that this could lead to a future surplus of specialists. The author mentions the sci-fi possibility of self replicating "nanobots", but overall is very positive about the future of nanotechnology.

6.4.12 2003

6.4.12.1 Summary Coverage of nanotechnology for 2003, generally presents the following trends:

- More in-depth discussion of the risk / benefits of nanotechnology as an emergent science, considerations of its commercial applications; hyped and less hyped.
- Reflection on developments in nanotechnology research in other EU countries.

6.4.12.2 Major stories from 2003 *Il Sole 24 Ore 18/2/2003 Ma il mercato deve attendere.* Excerpts from an interview with Christine Peterson, head of the Foresight Institute for nanotechnology research. She describes 'nanotech' as a fashionable word that impresses consumers and defends the "immense possibilities" of nanotech. Peterson dismisses suggestions that nano-bots might one day take over the world, or that this technology may be used by terrorists.

Il Sole 24 Ore 13/9/2003 Frontiere: Secondo il direttore del laboratorio Nasa. Excerpts from an interview with Meyya Meyyappan, director of the NASA Ames Centre for Nanotechnology. The interviewer asks whether nanotechnologies will create an investment 'bubble', what their environmental impact will be, and what the future is like for the nanotech sector. The scientist says the future is bright and calls for public and scientific involvement in this new "industrial revolution".

Il Sole 24 Ore 19/10/2004 Dialoghi con la societa': Le nanotecnologie hanno messo in allarme. The author argues that Italy is not yet as alarmed by nanotech as the US, where - especially after Bill Joy's alarmist article in 'Wired' and Michael Crichton's

novel 'Prey' – the US Nanotechnology Initiative has earmarked a budget to study the social and ethical implications of nanotech. However, the British government, the Royal Society, scientific journals and EU politicians are all arguing that nano-particles need to be assessed for negative side effects before they are destined for mass-production. Overall, the article is positive about the perceived potential of nanotech, once the technology to deliver such benefits is in place.

Il Sole 24 Ore 6/11/2003 Nanotecnologie sotto controllo. Claims that nanotech is a developing sector, both promising and threatening. The author argues that scientists must learn from the mistakes made with GMOs, and study in advance the negative environmental impact of nanotechnology. If this is achieved, nanotech seems to be a field with great environmental and technological promise.

6.4.13 2004

6.4.13.1 Summary Coverage of nanotechnology in 2004, generally presents the following trends:

- Reflection on Italy's nanotechnology research industry.
- Reflections on the need for regulation on nanotechnology research.
- A general development – in line with the increased debates in civil society generally - of press coverage calling for further, more detailed assessment of the risks and benefits of nanotechnology, along with further discussion of these risks and benefits.

6.4.13.2 Major stories from 2004 *Il Sole 24 Ore 3/2/2004 Business di domani.* Reports that nanotechnology promises to be an “industrial revolution”, improving our lives in many ways (health, transport, technologies, etc). The article outlines some “sci-fi” scenarios, describing the impact nanotech may have on our lives. The last sentence in the article suggests that the main ethical issue is whether nanotech machines will be built in such a way as to have a conscience.

Il Sole 24 Ore 15/7/2004 Sotto la lente. The article reviews the status of the nanotech industry in Italy: its growth, funding, and centres of excellence for research (Lecce-Nnl, Pisa-Nest, S3 di Modena, Tasc di Trieste).

Il Sole 24 Ore 15/7/2004 Serve piu aggregazione. The article is pro-nanotech and pro-collaboration between government, industry and research. It argues that the current nanotech situation in Italy, whilst providing some encouragement, is disaggregated and lacking direction, and the EU's “Towards a European strategy for nanotechnology” has not found many centres of excellence in Italy. To remedy this situation, Nanotec-It has been launched. The latest Nanotec-It survey results could be used as a basis for a future Italian nanotech policy, bringing together businesses and researchers.

La Stampa 12/8/2004 Il futuro tra noi, la nuova rivoluzione industriale tecnologica. The author argues that nanotech will change all aspects of our life. Ezio Andreta (Industrial Technology Director at the EU) says “nanotech is not sci-fi, but the new industrial revolution, the new renaissance”. While the US is heavily investing in nanotech, Philippe Busquin, EU research commissioner, has presented “Vision 2020 - Nano-electronics at the centre of change”. The author presents the negative side of nanotech as its lack of regulation and current ties with major commercial interests, arguing that this makes researchers less willing to discuss their research

with the public and other scientists. The author also argues that nanotech can place huge, devastating powers in the hands of a few individuals.

6.4.14 2005

6.4.14.1 Summary Coverage of nanotechnology in 2005, generally presents the following trends:

- Reflections upon Italy's approach, in terms of investment and debate, toward nanotechnology specifically, and the applications of science more broadly.
- Several pieces picked up on the fact that the commercial applications of nanotechnology, previously touted to the public by the press, were in fact a long way off.

6.4.14.2 Major stories from 2005 *Il Sole 24 Ore 28/1/2005 Medicina: Inaugurato vicino a Roma un centro per la produzione di nanomolecole.* Nanotech is described in the article as “one of the most fertile areas of research”. The Health Minister, Girolamo Sirchia, criticised those who are against new technologies for making Italians “ridiculous in the eyes of the world”. He claims that entrepreneurs and businesses can count on the government's support in their pursuit of nanotech research. The article explains the benefit of nanotech in the delivery of medicines.

Il Sole 24 Ore 10/2/2005 Ricerca: ecco i magnifici undici. Eleven new industrial poles have been set up in Italy, some focusing on nanotech and biotech. Most of these are in the centre and south of Italy, bringing funding to under-developed regions. The author positively links new technologies with development.

La Stampa 2/3/2005 Appuntamento il 7 marzo al Politecnico di Torino: Frontiera nanotech The Politecnico di Torino has organised a task force to coordinate and bring together all scientific and academic activities relating to nano-science and nanotech, arguing that these fields promise to have a huge impact on our lives and activities.

La Stampa 27/4/2005 Il secolo delle nanotecnologie. Enthusiastic review of the history and development of nanotechnologies (“exceptional qualities” “extraordinary opportunities”), and of their possible future, based on Vito di Bari and Paolo Magrassi's book “2015 – weekend in the future”. The author argues that, contrary to popular opinion, most nano-technologies cannot currently be commercialised. The article also criticises “current modern habits, reflected by the media: we want the impossible today.”

Milano Finanza 21/5/2005 Benvenuti nella nano-farmacia. Presents nano-pharmacological and medical developments (e.g. drug delivery systems, video cameras, cancer treatments, diagnostics, etc.) in a positive light, as methods designed to help a variety of human ailments.

La Stampa 13/7/2005 Ingegneria su scala atomica. Reports that nanotech applications are starting to become reality. The Nanoforum in September will bring together many different fields involved in nanotech. Paolo Milani (Centro interdisciplinare materiali e interfacce nanostrutturati) says Italy has a minor role in the nanotech sector because it lacks a central nanotech research centre. Biotech is more developed: Leonardo Vingiani (Director of Assobiotech) discusses funding programmes for new biotech firms to set up in Italy.

6.4.15 Nuclear energy

Italian press coverage of nuclear issues from 2000 – 2005 is framed around nuclear power gaining ground as an energy option. The pros and cons of nuclear are increasingly discussed in the press as its profile rose on the political agenda, and the government's position became increasingly pro-nuclear. There is a significant amount of coverage which compares Italy's position on nuclear to that of other EU countries, as well as the US, and considers the nuclear option in the context of the Kyoto agreement and the need for carbon reduction.

The political left has long been anti-nuclear in Italy, and there continues to be reporting of local-level demonstrations against the construction of new nuclear power stations, reprocessing plants and the like, as well as the Italian Green party's anti-nuclear line. 2005 sees calls for a national referendum on the issue.

Coverage is generally balanced, and assesses the nuclear option in terms of environmental risk, economic benefit/ necessity, global competitiveness, and the demands of the Kyoto protocol. Of note is the tendency of a lot of the Italian press to reflect upon the debates being conducted in other EU countries, notably Germany, France and the UK, on this particular issue.

6.4.16 2000

6.4.16.1 Summary Coverage of nuclear issues in 2000 generally presents the following trends:

- Significantly, the German decision to abolish nuclear power receives a substantial amount of coverage, and reflection in the Italian press.
- The anti-nuclear and Green lobby in Italy receive some coverage, with calls to finding alternative energy sources in light of the predicted global energy crisis.
- Reflection upon the Italian governments energy policy more widely receives coverage.

6.4.16.2 Major stories from 2000 *La Stampa* 16/06/2000 'Quando la sinistra italiana amava l'atomo'. Traces the development of an anti-nuclear stance in the Italian left. The article suggests that the Italian left was once, in the 1960s, in favour of the use of nuclear energy. A culture of the 'civil' use of nuclear power was developing, supported by the communist and socialist parties and by liberal-progressive movements such as 'Gli Amici del Mondo' (Friends of the World). In the 1970s, however, this movement starts to crumble and anti-modern tendencies to develop, which oppose the construction of 20 new nuclear stations. Demonstrations take place in Rome, while the Rome-Genoa railway is blocked. This anti-nuclear movement reaches its apex in 1987, when Caludio Matrelli's socialist party decides to support the referendum.

La Stampa 28/06/2000 'Quanto costa alla Germania l'addio all'atomo..'. Reports on the agreement signed between German chancellor Schroeder and German industrialists for the gradual abolition of nuclear energy. The article comments that the decision might be more of a political concession to the Green party, so as to ensure a stronger government, than a technical, economic, environmental or social decision. Indeed, nuclear stations contribute to about one third of the

overall electricity requirements. Germany will join Austria, Greece, Portugal and Italy and will have to face the costs of alternative electric energy costs.

Il Sole 24 Ore 16/06/2000 'Assegnata alle centrali una vita operativa di 32 anni: le ultime'. Reports on the compromise reached by Schroeder, whereby nuclear stations will have an operative life of 32 years, as opposed to the 35 years proposed by German industrialists. The article also reports opposition leader Angela Merkel's comment that were her Cdu-Csu to return to government, it would immediately stop the closure of the nuclear plants. *Il Sole* comments that this scenario is highly probable and that in fact only a part of the 19 nuclear stations will be actually closed in the next twenty years. The day before the agreement, energy prices had already risen, even if the titles of German energy companies Veba and Viag signalled an increase.

La Stampa 16/06/2000 'Noi, pionieri verdi'. Interview with Minister for EU Policies and long-time environmentalist Gianni Mattioli. Mattioli comments positively on Germany's decision to abandon nuclear energy, and affirms that the Italian Greens, 15 years before Schroeder's compromise, had already denounced the main problems with nuclear energy, namely radioactivity as a routine condition, nuclear waste disposal and safety. Comparing France and Germany, Mattioli admits that the choice to cut on nuclear energy was more economically viable in Germany, where nuclear stations contribute to 39% of energy production, while in France they account for 80%. He finally calls for a stronger emphasis in Italy on solar energy and hydrogen.

6.4.17 2001

6.4.17.1 Summary Coverage of nuclear issues in 2001 generally presents the following trends:

- Continued reconsideration of the nuclear energy option for Italy.
- Nuclear facility safety concerns following 9/11.
- Coverage of US President Bush's pro-nuclear line.
- Coverage of developments in nuclear energy policy overseas.

6.4.17.2 Major stories from 2001 *Il Sole 24 Ore* 08/05/2001 'Politiche energetiche – I blackout in California hanno cambiato l...' Comments on the electric crisis that caused a major blackout in California's Silicon Valley and which exposed a "chronic shortage of energy". The immediate effect was a change in the opinion of the general public towards nuclear energy. An opinion poll carried out by Associated Press in April 2001 revealed that half of the US population is in favour of nuclear energy, as opposed to 46% only two years before. The article comments that Americans are starting to acknowledge the benefits of nuclear power, but this is a difficult process in a country with a strong anti-nuclear movement. This is to do both with the 1979 accident in Three Miles Island, Pennsylvania and with the economic failure of nuclear power. Investment in nuclear energy have in fact caused incredible losses, due to higher construction and maintenance costs. In California, however, nuclear plants have been banned since the 70s. One of the solutions might be the construction of nuclear stations in neighbouring Nevada or Arizona, who would then export their energy to California.

La Stampa 18/11/2001 'L'allarme attentati incrina la ripresa dell'industria dell'atomo'. Claims that one could observe a revival of the case for nuclear energy with

improvements in the safety of nuclear stations, the destruction of Saddam's arsenal in the Gulf war, the energy crisis in California in late 2000, a pro-nuclear Bush administration in the US and the opening of 24 new reactors in the last five years. Articles maintain that this movement came to halt as a result of 9/11 terrorist attacks, which have caused costs to rise due to additional safety measures, insurance policies, transportation and disposal of nuclear waste. One of the biggest threats is theft, with 1704 thefts or 'disappearances' of radioactive sources since 1986 in the US only.

La Stampa 24/10/2001 'L'Europa: vulnerabili al terrore centrali nucleari e allevamenti'. Reports on the alert, launched by the European parliament in Strasbourg and by the meeting of the European Agriculture Ministers, for terrorist actions with 'bomb-airplanes' and bacteriological attacks on the 'food chain', particularly against livestock-farming. Several MEPs have asked all member states to adopt measures like France's, who has protected with missile batteries its centre for the disposal of radioactive waste in La Hague, Normandy. These centres, like the one in Sellafield in Britain, contain around 10,000 tonnes of nuclear fuel and more than 100 tonnes of plutonium. Green MEPs have also advanced to set up no-fly zones above all nuclear sites.

Il Sole 24 Ore 10/04/2001 'E l'amministrazione punta molto sulle centrali nucleari'. Comments on the new line on nuclear energy decided by the Bush administration, which signals a change with respect to the US nuclear policy of the past 20 years. Bush's new energy plan includes the development of nuclear stations, as well as an increase in the internal production of oil and natural gas. This new strategy stands in sharp contrast with that of the previous Clinton administration, but also with that advanced by Bush when electioneering. Vice-President Dick Cheney has also pointed to the merits of nuclear energy in fighting global warming. The article comments that his line stands in contrast with the decision by the US government to lift limits on CO₂ production and not to sign the Kyoto agreement.

6.4.18 2002

6.4.18.1 Summary Coverage of nuclear issues in 2002 generally presents the following trends:

- Continued framing of the nuclear power option framed with regards the demands of the Kyoto protocol.
- A widely reported public opinion poll indicating a vast majority of the Italian public as being against the re-commissioning of nuclear power stations in the country.
- Continued debates over the merits, risks and benefits of nuclear power.

6.4.18.2 Major stories from 2002 *Il Sole 24 ore* 12/03/2002 'Futuro Energetico – Per realizzare il protocollo di Kyoto.' Claims that denuclearization and the Kyoto agreement are two incompatible 'green' goals for the EU. The latter nowadays imports half of its energy, with a rate of dependence of 70% for gas, 90% for oil and 100% for carbon. A 'clean' form of energy, with nuclear power the EU would save about 312 million tonnes of CO₂ emissions every year, that is 7% of its greenhouse gases. If the existing nuclear stations were to be shut down, it would be impossible to meet the Kyoto goals. The article gives the example of Sweden, the first European country to give up on nuclear power, with a referendum in 1980, and that is now dependent on electricity produced by carbon plants in Denmark and Germany. Ultimately,

renewable forms of energy would not herald the ‘miracle’ and Kyoto cannot wait, hence a call for opening to nuclear power

Il Sole 24 Ore 05/06/2002 ‘Si’ all’elettricità verde anche pagando di più’. Comments on an opinion poll commissioned by Sole 24 Ore, according to which 79% of the interviewees would turn down the hypothesis of re-opening nuclear power stations in Italy. A vast majority, 76.8%, would also be against the opening of Italian nuclear stations abroad. On the contrary, 78.6% would be willing to pay more on their electricity bills for ‘green’ energy, such as solar or eolic. Article observes that this willingness might enable Italy to raise 180 million euro every year that could be spent to finance the construction of solar and eolic stations. Italians’ ‘no’ to nuclear power the article traces back to doubts on security in the general public and among experts.

Il Sole 24 Ore 23/02/2002 ‘Per la commissario Loyola de Palacio l’Europa non può più rinunciare al nucleare.’ Starts with EU Commissioner for Energy Loyola de Palacio’s statement that Europe cannot give up on nuclear energy, if it wants to meet the goals of the Kyoto agreement. Rest of the article discusses the problems with nuclear energy, starting with the real costs of dismantling, the vulnerability of big installations after 11/9, the need for centralised organisation. This is confirmed by the re-discovery of nuclear energy in countries such as India or China. Also in Europe, only France and Finland seem to focus on nuclear power, while Britain seeks alternative sources and Sweden and Germany are undergoing a gradual dismantling of their nuclear power plants. Finally the costs of nuclear waste disposal are high, as most of the world’s nuclear waste is dealt with only by British Bnfl in Sellafield and French Cogema in Normandy.

Il Sole 24 Ore 06/06/2002 ‘Energia – Il premio Nobel Rubbia: all’Enea stiamo cercando la...’ Interview with Physics Nobel laureate Carlo Rubbia, who invites caution on a comeback of nuclear power in Italy and on a law bill that would grant permission to build nuclear stations abroad. The problem for Rubbia is not one of safety, the real problem on a global scale is nuclear waste disposal. His Enea, the National Council for technology, energy and the environment, is currently working on a system to burn this nuclear residues, which currently amount to 200,000 tonnes. Rubbia also points to the positive applications of the atom in medicine, namely for curing cancer and Alzheimer. In Italy, there is, however, a normative vacuum claims Rubia, which hinders the development of nuclear pharmacology.

6.4.19 2003

6.4.19.1 Summary Coverage of nuclear issues in 2003 generally presents the following trends:

- Reporting of public protest against various nuclear installations in Italy.
- A nationwide blackout in September renewed the debate over nuclear power in terms of the global energy crisis.
- In-depth debate over the contradiction of Italy’s reliance on nuclear energy produced in France, and general anti-nuclear public disapproval.

6.4.19.2 Major stories from 2003 *La Stampa 17/11/2003 ‘In corteo i 10 mila abitanti del Metapontino a Scanzano’.* Reports on the mobilization of around 10,000 people from several municipalities of the Metapontino area against the construction of a nuclear waste depot near Scanzano Jonico, in the Basilicata region. The heart of the protests is the road 106, linking the Calabria and Puglia regions, which has been blocked by truck and

tractors. Students from the Metapontino area Scanzano's mayor Mario Altieri and don Filippo Montemurro, parish priest of Scanzano, also mobilised and took part in the demonstrations. Also comments on the activity of MPs Antonio Melfi and Antonio Di Sanza, both belonging to the governing coalition, who decided to found a cross-party movement to defend the Metapontino territory from the "attacks" of their own leader Berlusconi.

Il Sole 24 Ore 19/11/2003 'La protesta di Scanzano – Il business delle Scorie'.

Comments on the high costs of constructing a deep, 'geologic' nuclear waste depot near Scanzano, which should cost around 2 billion euro, considering years of research and testing. Article also comments on how Italians pay more on their electricity bill, to cover the costs of nuclear waste disposal, which are often covered by the state in other European countries. An extremely brief 'nuclear season', terminated in 1986, costs Italy around 11 billion euro, with costs likely to increase if the 'geologic' depot project continues. Article concludes that only countries with a significant nuclear production can seriously realise projects of 'geologic' nuclear waste disposal, and that the one in Scanzano might be the first such depot in Europe.

La Stampa 01/10/2003 'Dopo il blackout – Il nucleare? Non e' piu' quello di ieri'.

Comments on how the Italian referendum not only blocked nuclear power-stations, but also hindered research on nuclear reactors and nuclear waste disposal. It also investigated the need for nuclear power after a major nationwide power blackout in September 2003. Professor Ricci of the Italian Nuclear association suggests that new generation nuclear reactors are much safer than any other industrial plant and that ideally nuclear power should make up 15-20% of Italy's energy sources.

La Stampa 29/09/2003 'Storia di una consultazione che divenne (quasi) caccia alle streghe'. Traces the history of the 'antinuclear' movement in Italy back to 1987, when nuclear power stations were closed down and banned as a result of a referendum. At the time, the antinuclear movement was supported by the socialist party led by Claudio Martelli, many members of the communist and radical parties and by the Greens, who lived a 'golden period'. The fundamental contradiction, however, is that nuclear power disappeared from Italian production, only to come back in the form of consumption of energy produced by mainly French nuclear power stations. The rise of antinuclear discourse is also traced back to the apocalyptic incident of Chernobyl in April 1986 and, before, to the partial core meltdown at Three Mile Island in 1979.

6.4.20 2004

6.4.20.1 Summary Coverage of nuclear issues in 2004 generally present the following trends:

- Continued debate of nuclear power as an energy option, especially in light of the global rise in oil prices.
- Coverage of Italian government's authorisation of companies to manage and produce nuclear energy overseas, which is seen by some press as another step in the move toward broader reconsiderations of the nuclear power option for Italy.

6.4.20.2 Major stories from 2004 *Il Sole 24 Ore 08/09/2004 'E il rincaro del petrolio fa tornare in scen il nucleare'.* Reports on how rises in oil prices make for a comeback of the 'nuclear option' in

Italy. Scientists of the Italian Nuclear Association claim that renewable energy is but a partial and highly expensive solution, while carbon is a useful 'complementary' source. Nuclear energy is thus the answer, especially when nuclear power is a few metres away from the Italian border, in neighbour countries that provide Italy with energy at a cost which is 60% higher than the average of other European countries. Minister for productive activities Antonio Forzano also claims that abandoning nuclear production was a mistake and that now the problem lies in convincing the general public.

La Stampa 15/02/2004 *'I misteri del burattinaio della proliferazione nucleare'*. Tells the story of Abdul Qadeer Khan, father of the Pakistani atomic bomb, and of his deals with Libya, North Korea and Iran. Article traces the history of the Pakistani atom bomb back to the 70s when Khan was hired by the Physics Dynamic Research Laboratory in the Netherlands. In 1976, forced to leave the country by the Dutch secret services he established, back in Pakistan, the AQ Khan laboratories, the heart of the Pakistani nuclear program. In this period, Khan shares, for the first time, his expertise in other countries. The first deal was with North Korea, who revealed secrets about its missiles in exchange for Khan's nuclear 'know-how'. Further deals took place with Libya and Iran. *La Stampa's* stand is that all of this could not have happened without the consent of the government in Islamabad, and that current Pakistani president Musharraf is trying to 'sell' the story of Khan as a genius who sold his soul for money.

La Stampa 06/09/2004 *'L'Italia chiede una riunione dei ministri dell'energia per affrontare...'* Starts from the assumption that oil costs force Italy to consider alternative energy sources. Reports Minister Marazno's call for a meeting of all Energy Ministers to tackle the question of the cost of petrol. Minister for Innovation Lucio Stanca also called for a new, 'corrective' referendum on the use of nuclear power. He stated that Italy now has several nuclear power stations only 200 kilometres away from its border and that having nuclear power almost on its territory, it does not even benefit from it. Green leader Pecoraro Scanio counters this comments and maintains that a call for the use of nuclear power signals the complete failure of the government's energy policy.

Il Sole 24 ore 22/09/2004 *'In attesa di un ripensamento Enel e Sogim entrano nei programmi'*. Interprets the government's authorisation for Italian companies to manage and produce nuclear energy abroad as a first step towards a comeback of atomic energy in Italy. Article reports on Italy's Enel's possible nuclear collaboration with France's Edf and its likely modernisation of two old electronuclear reactors in Slovakia. Also reports Italy's Sogin work on Russian nuclear submarines and atomic power stations in Russia, Armenia, Ukraine, and Kazakhstan.

Il Sole 24 Ore 08/09/2004 *'Consensi dei partiti della maggioranza'*. Reports on favourable comments by members of the governing coalition on the use of nuclear energy. Alleanza Nazionale's Adolfo Urso, deputy minister for productive Activities, claims that the country's sensitivity on the topic is now different and that Italy can again discuss the nuclear option. Forza Italia's Roberto Tortoli also comments that Italy's renunciation to nuclear power will cost the country 360 dollar per person in terms of adaptation to the conditions set out in the Kyoto agreement.

6.4.21 2005

6.4.21.1 Summary Coverage of nuclear issues in 2005 generally presented the following trends:

- 2005 continued to see the press addressing nuclear energy as a viable option, though it is discussed in relatively balanced terms, with calls for a nationwide referendum on the issue. The last referendum on nuclear power in Italy in 1987 (directly following Chernobyl), saw the decision made to decommission Italy's nuclear power stations.
- Assessment of the risks and benefits of nuclear power receive more in-depth coverage, following the Berlusconi government's pro-nuclear line, which has pushed debates up the political agenda. January saw collaboration between France's EDF and Italy's own ENEL sanctioned.
- The debate is re-framed to address high energy costs in Italy being in part responsible for its lack of competitiveness, nuclear being re-cast as an alternative.

6.4.21.2 Major stories from 2005

ANSA Notiziario Generale in Italiano 7/01/2005 'Nucleare: Il terrorismo ne minaccia lo sviluppo'. Claims that terrorism might hinder the construction of new nuclear power stations. Identifies three specific risks: 1. theft of plutonium during processing or transportation, to be used in the production of weapons of mass destruction; 2. attacks on nuclear power stations; 3. suspicion around some countries, namely Iran and North Korea, who might hide the construction of nuclear arms with the production of nuclear energy.

Il Sole 24 Ore 27/03/2005 'Inchiesta – Teheran sostiene la necessita' di sviluppare l'energia ma...' Investigates the question why Iran should develop a nuclear energy program in an interview with Hossein Kazempour, Opec governor in Iran and consultant to the government. He claims that Iran's foreign currency revenues depend on oil for 85% and Iran needs its oil for exportation. At the same time Iran's own energetic consumption in the past 5 years has risen by 7% each year. The top priority would thus seem energetic independence. Authors ask whether Iran would, however, resist the temptation of a nuclear bomb, once able to produce nuclear energy. Kazempour answers that Iran signed the Nuclear Non-proliferation Treaty and invites Americans and British to take part in joint ventures on nuclear power.

ANSA Notiziario Generale in Italiano 15/06/2005 'Nucleare: Nuovo referendum? Si, no; Micciche' rilancia.' Reports proposal by Minister for Development and Territorial Cohesion Gianfranco Micciche' for a new referendum on nuclear power in Italy. Ministers for the Environment, Altero Matteoli, and innovation, Lucio Stanca also push for serious discussion on nuclear power. Micciche' backs up his claims in terms of higher safety in nuclear power stations, reduction of costs and Italy's energetic dependence. Members of the opposition and environmental groups are reported to comment negatively on Micciche's proposal and point in the direction of solar energy and hydrogen.

Il Sole 24 Ore 10/02/2005 'L'opinione / Lo scienziato verde'. Interview with Mathematical Physics Professor Massimo Scalia, also Green MP for 14 years and at the forefront of the battle against nuclear power in the 80s. Scalia points to the two major limits of third generation nuclear production: recycling of nuclear waste and real costs of the nuclear production cycle. The safety requirements of a nuclear power station would be so high to create a cost barrier. He claims that

Italy's answer to environmental degradation should lie in sectors such as transportation, industrial production and domestic heating and that we should follow Germany and Austria in the use of solar panels and eolic energy.

ItaliaOggi 29/01/2005 'L'Italia e l'opzione nucleare' Comments on the 'nuclear option' in Italy, after PM Silvio Berlusconi re-opened the debate around nuclear power-station and after the Italy-France summit on 25 January, which sanctioned the collaboration between Italy's Enel and France's Edf on the production of 'super-safe' nuclear reactors. The author claims that Italy fell behind in the nuclear sector and that high energy costs are currently to blame for Italy scarce industrial competitiveness. Conclusion is that with fundamental technological innovations, new options, such as the use of nuclear power, must be considered in Italy.

6.4.22 Coverage in *Corriere della Sera*

Material from *Corriere della Sera* was unavailable in the LexisNexis database. To remedy this articles were downloaded from the newspaper's web site and assessed separately.

6.4.22.1 Nuclear **Nuclear waste** Starting in 2003 with the case of the Southern Italian village of Scanzano Ionico, *Corriere della Sera* also deals with issues around the disposal of nuclear waste. The newspaper provided wide coverage of protests - by local authorities, villagers and environmentalist organisations - against the construction of a site for the disposal of nuclear debris in the area. It also described the process whereby the Italian government ultimately modified the text of its law bill and decided to carry out further assessment before deciding on the construction of such nuclear stocking complex in Scanzano. The media exposure received by the protesters in *Corriere della Sera* did not, however, turn into a clear editorial line. The above was in fact balanced by comments in favour of the construction of the site as in Sergio Romano's description of the Italian public opinion as 'schizophrenic' - Italians are criticised for demonstrating against nuclear waste in one's region, when they would also contest environmental norms that could 'harm' local industries.

Nuclear energy The newspaper reviewed the recent discussion on the Kyoto agreement at the last, enlarged session of the G8 in London in November 2005 (outside MESSENGER time frame), where the use of nuclear and carbon power was advanced as a viable option. Italy and its minister for productive activities, Claudio Scajola, declared the need to go beyond alleged prejudices against nuclear and carbon energy, while the then German minister for the environment, Jurgen Trittin, was reported to have dismissed nuclear and carbon power as 'dirty'. *Corriere della Sera* continued in its reporting of this renewed interest in the use of nuclear power in Italy, as with Prime Minister Berlusconi's claim that nuclear power plants could be the solution to Europe's energy requirements. With general elections drawing closer, in late November 2005, the newspaper's treatment of the issue of nuclear energy took the form of a political debate, as opposition leader Romano Prodi declared that aeolic and solar energy are the only solutions to energy problems, as nuclear power would not currently offer sufficient safety guarantees. Comments sections in *Corriere della Sera* gave room for discussion outside political coalitions, as in Alberto Ronchey's remark that Italy cannot wait any longer for the introduction of nuclear power.

6.4.22.2 Biotechnology – Stem cell research, cloning, IVF

The new law on assisted reproduction In the period under scrutiny, *Corriere della Sera* reports the presentation and then the approval of a new law bill on assisted reproduction, based on a text originally produced in 1999. After its approval, the law bill was made the subject of an abrogative referendum, in which Italians were asked to answer a series of questions on specific aspects of the bill, including the use of human embryos for scientific testing and research and the possibility of heterologous in vitro fertilisation (IVF), which were both prohibited under the new 2004 law. *Corriere della Sera* followed the debate around these issues, starting as early as 2001 with an interview to the then health minister Girolamo Sirchia. On the pages of *Corriere della Sera*, the discussion is from the start fairly detailed. In his interview, Sirchia is in favour of the use of stem cells of the post 'primitive' kind - those that can generate all kinds of human tissue- while he opposes experiments on the embryo.

When, in 2004, the new law is finalised, *Corriere della Sera* devotes a lengthy, in-focus article to its description, including those measures and prohibitions that would later be the subject of the 2005 referendum. The newspaper's line continues to be detailed and informative, rather than opinionated. Among the aspects of the law described are the ban on embryos' cryoconservation and killing and the absolute prohibition of any kind of testing. This goes together with a restriction on any form of eugenic selection of gametes and embryos, as well as human cloning operations through the transferral of the nucleus or early fission of the embryo.

Corriere della Sera's treatment of issues around biotechnology in Italy is carried out in a constant dialogue with news and reports on stem cells, cloning and IVF in other countries. In 2003, the newspaper publishes a summary of the legislation on assisted reproduction in Austria, Germany, the UK, Spain, Sweden, and France. Similarly, news of animal cloning include the horse Prometea in Italy in 2003 and the dog Snuppy in South Korea in 2005. These articles generally stop at the level of reporting. In September 2005, however, *Corriere della Sera* comments the news from England of an authorisation granted to researchers at the University of Newcastle for the cloning of a human embryo for the study of genetic pathologies of maternal origin. The article now includes a section named *perplexità*, perplexity, in which both Doctor Giovanni Neri of Rome's Università Cattolica and Mosignor Elio Sgreccia of the 'Pontificia Accademia per la Vita' (the Papal Academy for Life) criticise the decision of the British Human Fertilisation and Embryology Authority.

The referendum and after. This article comes after the abrogative referendum and follows in the line of a series of other pieces that appeared in *Corriere della Sera* before the consultation. In the months preceding the referendum, the newspaper provided, in fact, a space for discussion in which representatives of both sides were given a chance to express their opinion. On 20th May 2005, Mosignor Sgreccia and Francesco D'Agostino, president of the national committee on bioethics are given the chance to comment on the cloning of stem cells in Seoul, an act which they deem abominable and useless. On 30th May 2005, Doctor Giuseppe Remuzzi of Bergamo Hospital writes a rejoinder to Mosignor Sgreccia, in which he questions the notion that a fertilised egg is treated like a human being. *Corriere della Sera* also provided an arena for political discussion around the referendum, as with the publication of a letter by Walter Veltroni, mayor of Rome and former MP for the post-communist 'Democratici di Sinistra', who favours the abrogation of sections of the law bill in the referendum.

Corriere della Sera's contribution to the debate on bioethics does not stop to the specific questions of the referendum and, in February 2005, they publish in their science section an essay by Francis Fukuyama. He discusses the presence of transhumanist lobbies, whose ideas might lead to an ultimately illiberal society, in which a privileged few will be able to become 'something better', thus posing questions as to the rights of those left behind. In June 2005, after the referendum, an article appears on a group of 110 disobedient Italian doctors, who in fact question the idea of a "deregulation lobby", or a "dictatorship of pseudoscience".

Corriere della Sera thus continues its treatment of questions around biotechnology also after the referendum, reporting once again on developments abroad. This is the case with their interview top Korean scientist Woo Suk Hwang in October 2005, which describes the faith of Hwang in stem cell research and the opening of a "stem cell bank" in Seoul. Similarly, in July 2005, the newspaper reports on the introduction of therapeutic cloning in Spain.

GMO In the period under scrutiny, *Corriere della Sera* covers extensively questions around the use of Genetically Modified Organisms (GMOs). In a 2002 article, *Corriere della Sera* reports that, for protesters, GMO food is the "food of Frankenstein", that monsters are so created which fill up the "supermarket of experimentation". They point to the risks of unknown allergies, when 50 million hectares of land are now used for transgenic products, such as maize or soy. Luca Colombo of Greenpeace is quoted saying that contaminated Mexican maize represents a threat to the species and those multinational corporations that have bought up patents for GMO plants will lead to increased poverty. The article, however, also points to the hopes that reside in the use of GMOs, as when the Food and Agriculture Organisation claims that biotechnologies can increase food security, or EU studies confirm that GMO plants do not represent a health hazard.

Corriere della Sera also covers extensively protests by organisations of local growers and agricultural industries against a law bill on the coexistence of transgenic, conventional and organic cultivations. The issue is often portrayed as a clash between the US - often supported by the Italian government - and the European Commission, led by Italian Romano Prodi. In a 2003 article, *Corriere della Sera* reports on President Bush's call on Europe to end its opposition to biotechnologies and its alleged boycott against US-made GMOs on the European market. We are also told that GMOs could trigger 'development' in African countries, who cannot invest in GMO production, possibly due to EU closure. The newspaper's line is not clear-cut, but its extensive coverage of protests by local growers suggests a concern for local agricultural production. This ambivalence is mirrored in the science sections of the paper, which see neutral reports as to the pros and cons of plants with modified DNA. US government sources, EU studies and environmentalist organisations like Greenpeace and Italian Legambiente are cited, for example, in a November 2004 article. The editorial line would seem to suggest a focus on consumers and potential health hazards, as tumours and allergies - that is the "safety" of GMOs. A December 2005 article deals, in fact, with popular reactions to the question of GMO foods. A survey by the Movimento Difesa del Cittadino (Movement for the Protection of the Citizen) would show that Italians are generally apprehensive about the safety and quality of their food; they would often read labels carefully, question their doctors and search the internet. In the article, *Corriere della Sera* is concerned with the opposing forces of optimism and alarmism, thus showing an ultimate concern for consumer rights.

Following its neutral line, *Corriere della Sera* also shows attention for legislative developments abroad and the foreign press. In 2005, the newspaper discusses a report by the British Independent on Sunday on a secret dossier of Monsanto about damages to mice that were fed GMOs. The year before, *Corriere della Sera* publishes another article on GMO rice in China, which ways up the needs of a country with more than a billion inhabitants against threats of toxicity, announced by Greenpeace.

6.4.22.3 Environment Articles in *Corriere della Sera* on environmental questions centre on the ratification of the Kyoto agreement, which often goes together with a discussion of pollution and the reduction of CO₂ emissions in Italian main cities. The newspaper seems to sympathise with the need for a reduction of atmospheric pollution and positively reports the use of the system of "targhe alterne", alternating car plates, whereby only cars whose plate terminates with either an even or uneven number can circulate.

In a dialogue with international politics, articles have also focused on the relationship between Activists and multinationals. In 2002, *Corriere della Sera* reports on protests by Greenpeace at the World Business Council for Sustainable Development (Wbcsd) against the emission of greenhouse gases and those multinationals like ChevronTexaco, DaimlerChrysler, Honda, Michelin that would contribute to it. *Corriere della Sera* often relies on reports by environmental organisations for its own articles. In Newton, one of the scientific magazines of the *Corriere della Sera* group, a December 2005 article refers to "shocking results" from an analysis commissioned by an environmentalist organisation as to the emissions produced by industries in the production of goods for the Christmas presents market. Once again, *Corriere della Sera* seems to be concerned with an informed account for Italian consumers, rather than following a clear editorial agenda.

6.4.22.4 Nanotech Articles in *Corriere della Sera* engage very little with the downsides of nanotechnology. The coverage of the subject is not extensive, while the reports are generally hopeful, if not enthusiastic. Those articles found are mostly from 2005 and define the future of medicine as nanoscopic. One of these articles includes an interview with an Italian researcher working in the US, on the occasion of the 2005 Breast Cancer Symposium in San Antonio, Texas. He describes the uses of nanotechnology for early diagnoses of breast cancer and for cures that are better targeted. A more obvious optimist ethos characterises another article from June 2005 on the use of 'nanosensors' to better understand single human brain cells. The article is titled 'Ci guarirà domani' (tomorrow, this will cure us) and advances that this technology could lead to solutions for Alzheimer and Parkinson syndromes. A similarly optimistic article reports the construction of a 'nano-robot' in Israel, which could 'swim' through the human body'.

6.4.23 News sources used in the analyses

AFX - PMF
 CompanynewsGroupe
 Guida Normativa
 Il Sole 24 Ore
 Italia Oggi
 La Stampa

Lavoroggi
MF
Milano Finanza
News Aktuell Svizzera
SDA - Servizio di base in Italiano

Coverage of Italian media by LexisNexis was more limited compared with that of other countries. Material from Corriere della Sera was downloaded from the newspapers' web site and analysed separately.

6.5 Spanish media coverage

6.5.1 Biotechnology

6.5.2 *El Pais*

The coverage of issues related to biotechnology, bioethics and genetically modified products in *El Pais*, while providing a generally well-balanced view of the arguments involved, is cautiously positive.

The majority of articles present the debate in a relatively objective manner, providing significant information for arguments on both sides of controversial issues. More often than not, however, articles related to biotechnology feature more positive than negative information, and the language used is seldom if ever sensational in tone. Rather the more opinionated articles on issues such as bioethics, human cloning and GM products are discussed in fairly literary, philosophical terms.

While in this sense the majority of articles maintain a positive tone, many are underscored with scepticism and caution about the possible misuses of biotechnology and the need for precautionary measures to be set in place. Rather than being critical of the notion of biotechnology in principal, *El Pais* journalists appear to be mostly concerned with the ethics of its practice.

6.5.2.1 Some key points *El Pais'* coverage of embryonic stem cell research, human cloning and related subjects is seldom in line with the Church's official opposition to these areas of biotechnology (this goes hand in hand with the Church's condemnation of Spain's decision to make homosexual marriage legal in June 2005). A number of authors point to the continuing secularisation of Spanish society to explain this rift with the Vatican, while highlighting the fact that bioethical debate needs to confront the "spiritual vacuum" that this secularisation has caused if the social aspect of public opinion related to biotechnology is to be better understood. This point is often emphasised along with the claim that an absence of spirituality or morality, apparently characteristic of Spanish postmodernity, leaves biotechnology open to potential abuses from the governments and big business interests involved.

The overwhelming majority of academic/industry figures and organisations featured in biotechnology articles maintain a positive and progressive perspective on biotechnology. In particular, articles often support the the advancement of biotechnology and biomedicine but within strict guidelines that will ensure its ethical development, a view proposed by Marcelo Palacios, director of the International Society for Bioethics. Other frequently cited bodies and individuals who share this view are Ana Sanchez Urrutia at the Observatorio de Bioética y Derecho de la Universidad de Barcelona and the Centro Nacional de Biotecnología in Madrid. Articles often deal with the dialogue between these figures and the government in reassessing how biotechnology should be developed, in both legal and ethical terms.

Genetically modified products receive a similarly positive treatment, although given the poor public image of GM foods globally articles are often underscored with uncertainty as to the long-term public and environmental costs of Spain's high level of GM production. Again, regulation, through bodies such as the

Comisión Nacional de Biovigilancia, is seen as paramount in the development of GM products. In particular, the issue of cross-breeding or ‘contamination’ of conventional crops appears to be a recurrent theme.

6.5.3 *EL Mundo*

The general tone of articles in *EL Mundo* that discuss biotechnology, bioethics, and GM products is positive, although a number of articles express negative, speculative opinions as to the possible future implications of bioscience. A number of articles emphasise the need for the biotechnology debate to be based upon existing scientific fact rather than accepted opinion.

Several authors suggest that the Spanish public is poorly informed and generally ambivalent about complex, controversial issues such as embryonic stem cell research or GM food. Many articles, while essentially positive, tread a cautious middle ground between the extreme pessimism of environmental groups and the optimism of the majority of academics and industry sources quoted. Most authors lean towards the latter, emphasising the potential and existing benefits of both GM products and genetic research, but few are outspoken proponents of either.

6.5.3.1 **Some key points**

Underlying this cautious acceptance of biotechnology is a general concern that neither genetic research nor GM production is sufficiently regulated by the government or by the relevant independent organisations. Concerns are voiced that biotechnology will spin dangerously out of control unless its development is tightly regulated. Public figures such as medic Marcelo Palacios, who are featured prominently in the articles, emphasise this point.

Overall, *EL Mundo* journalists appear more certain of the benefits of embryonic stem cell research and cell cloning than they are of genetically modified crops and food. While several articles speculate about the possible future misuses of genetic information and the ethical problems of human cloning and “designer” babies, most restate the opinions of prominent scientists in the field who argue in favour of genetic research. This in opposition to the views expressed by the Church. Catholicism remains extremely important in Spain, but while opinion is doubtless informed by this, most writers attempt to frame their arguments in the context of rational scientific and/or humanist arguments, rather than in the language of religion.

Several writers stress the need for Spain to maintain a key position in biotechnology, both in scientific and economic terms.

Genetically modified products receive a slightly cooler, if still generally positive treatment. This is perhaps not least because debate over embryonic stem cell research and other related topics remains essentially abstract for most people, while genetically modified food and crops have a far more direct impact on the daily lives of the public. The positive aspects of GM products emphasised in *EL Mundo* include improvements in food supply nutrition and the possibility of creating robust crops that will assist in reducing hunger in the developing world.

The major negative concern related to GM products that recurs in the articles is the danger of cross-fertilization or “contamination” between GM and conventional or organic crops. The widespread commercial use of transgenic crops in Spain has

raised fears that conventional crops will be adversely affected, and that there is little or no indication as to what the long term consequences of this might be.

Other concerns include the allergic reactions that new crops might cause, and the danger that genetically modified crops will increase the resistance of micro-organisms to existing antibiotics.

6.5.4 *ABC*

Commentary on biotechnology in *ABC* is divided between generally positive treatment of genetic research and much less favourable coverage of agricultural genetic modification. Some articles do provide positive information on the nutritional and economic benefits of GM crops and food, but these are overshadowed by a larger number of articles that detail public discontent and unease at the increasing amount of commercial GM production in Spain. As with other major Spanish newspapers, *ABC* presents a contrast between generally positive information being provided by scientific and academic sources and negative public perceptions of genetically modified crops and food.

Articles relating to ethically problematic areas of biotechnology consistently make a distinction between government-sanctioned embryonic stem cell research, supported by key figures in bioethics and biotechnology, and human cloning for reproductive purposes, which is widely condemned by Spanish scientists.

6.5.4.1 **Some key points**

The main concern related to genetically modified crops recurring in *ABC* is the risk of transgenic crops “contaminating” traditional or organic crops through cross-fertilisation. Reports on this issue typically emphasise the fact that Spain is Europe’s largest commercial producer of GM foods.

While the potentially damaging consequences of high levels of GM production are emphasised, some articles underline the increased economic competitiveness that GM crops allow.

Research using cells from frozen embryos is generally treated positively, with a number of articles highlighting calls from scientists for more economic and political support for genetic research.

Other issues raised in relation to biotechnology include the right of parents to choose the sex of their children and the issue of accessing genetic information in order to measure susceptibility to hereditary diseases. The former is presented as being supported by bioethics experts, but only permissible for medical reasons. The issue of the misuse of genetic information is treated with great caution.

6.5.5 *Nanotech*

6.5.6 *El Pais*

Almost all of the articles reviewed begin with a brief description of nanotechnology, which perhaps suggests that nanotechnology is seen as a ‘new’ subject that readers will be unfamiliar with.

The overwhelming majority of the articles reviewed are very positive about the potential benefits that nanotechnology may bring to all areas of life. In particular articles focus on the notion that nanoscience may be used in the development of renewable energy sources, and that pollution will decrease as companies gain more control over their means of production, atom by atom. Nanotechnology is also discussed in relation to medical advancements and the use of nanorobots to combat viruses, bacteria and cancer.

Some attention is given to the fact that nanotechnology is at a nascent stage and must still be developed if it is to be properly understood and utilised effectively. Some articles, while still positive, are more sceptical of the actual potential of nanotechnology, highlighting the fact that many of the claims made of nanotechnology are yet to be carried out in practice.

6.5.7 *EL Mundo*

Nanotechnology receives a very positive and optimistic treatment in *EL Mundo*. Perhaps more than anything, the articles reviewed tend to concentrate on the potentially massive economic benefits of developing nanotechnology to create more effective and competitive products. A number of articles discuss the need to invest in the long term rewards of the “new industrial revolution” that nanotechnology represents, while slightly more cautious articles report on the fears that the current nanotechnology boom will implode as did the “dotcom” boom at the end of the 1990’s. Stanley Williams is one scientist mentioned who fears that the potential benefits of nanotechnology will be hijacked by business interests only interested in nanoscience for economic reasons.

A number of articles relate to the more fantastic uses of nanotechnology to create nanobots and nanosensors within the human body. Specific areas include the use of nanobots to prolong human life, to eradicate tumours, to repair damaged nerves, and to sense irregularities in the heart. Coverage of these topics is generally well-balanced, with most articles including the opinions of scientists who are slightly more sceptical about the current possibilities of nanotechnology.

Some articles deal with the potential risks that nanotechnology may bring when used in medicine and in products such as clothing. Major concerns include the possible respiratory or skin problems resulting from contact with nanotechnology.

As in *El Pais*, many of the articles begin with a short definition of what nanotechnology is, again suggesting that nanotechnology is seen as a growing, but relatively unknown and/or little understood phenomena amongst the Spanish public.

6.5.8 *ABC*

Of the few articles relating to nanotechnology in *ABC* that were available for review, most present a positive image of nanotechnology. Echoing opinions voiced in other national newspapers, the articles reviewed focus on the massive economic potential of nanotechnology and on its possible uses in medical science. Several articles deal with recent scientific innovations such as biochips, nanosensors and nanosatellites, none of which are discussed in negative terms. Some articles do however touch on the negative side of nanotechnology, with articles reporting on

the need for nanotechnology to be regulated if it is to be used widely in the production of consumer goods.

6.5.9 Nuclear energy

6.5.10 *El País*

Overall the coverage of nuclear energy in *El País* is quite well-balanced, with arguments being presented by spokespeople both for and against the use of nuclear power. However, the majority of articles reviewed tended to lean towards arguments against nuclear power rather than in favour of it. While proponents of nuclear power are featured in the newspaper, greater weight is often placed on coverage of the arguments against its use. This is in line with the current socialist government's plans to eliminate the use of nuclear power in Spain over the next 20 years (as proposed by the Consejo de Seguridad Nuclear (CSN) (the Committee for Nuclear Safety)).

6.5.10.1 Some key points

Several articles highlight the fact that the issue of nuclear power is of particular significance in Spain, given the recent increases in the country's energy requirements and the need for Spain to drastically reduce its greenhouse gas emissions in accordance with the requirements of the Kyoto Protocol. There is little disagreement that this is in fact the case, but the opinions presented as to how these two goals should be achieved are often starkly contrasted.

Those in favour of promoting nuclear energy, such as then-vice president of the European Parliament Alejo Vidal-Quadras argue that using nuclear power is the only way to maintain energy output while reducing greenhouse gas emissions. In one of the articles reviewed José Montilla, minister for Industry, Tourism and Commerce, argues that it would be "foolish" for Spain to turn its back on nuclear power, given that it presents the only viable solution to Spain's energy crisis. Joaquim Corominas, a researcher for the Instituto de Ciencia y Tecnología Ambientales de la Universidad Autónoma (The Institute for Environmental Science and Technology) is also presented as being in favour of nuclear power, arguing that it is "safe, fast and cheap", a view shared by Popular Party member José Folgado. Javier Vega de Seoane, president of the Committee for energy of the Circulo de Empresarios (the Circle of Businessmen), argues for nuclear energy on the basis that new technological advancement and increased security have made nuclear energy a safe and viable option and the only way to significantly reduce greenhouse emissions. The British scientist James Lovelock is featured in numerous articles as a proponent of nuclear power on similar grounds.

Those opposed to nuclear power are often featured in the concluding paragraphs of articles, perhaps adding a certain amount of weight to their arguments over those in favour of nuclear energy. The arguments against using nuclear power neatly contradict those put forward by its proponents, as is the case with Izquierda-Verde (Left-Green) spokesperson Joan Herrera's condemnation of the security of nuclear sites. Using the example of Vandellòs II, a Spanish nuclear power plant in Tarragon, Herrera argues that Spain's nuclear facilities are less secure than ever before, particularly considering the current geo-political climate. The threat of terrorist attacks, alongside environmental risks and the question of economic and political viability (particularly in the developing world) are major concerns of those opposed to nuclear energy. In addition to this, several articles highlight the fact that renewable energy sources, while being less reliable, are far more attractive

than the nuclear option. Both the current socialist government and green political groups are featured as proponents of sustainable energy. Greenpeace also appears as a group strongly opposed to nuclear power in Spain, arguing that Spanish nuclear power plants are dangerously outdated.

6.5.11 *EL Mundo*

Of the articles reviewed in *EL Mundo* that relate to nuclear energy, the majority emphasise the negative aspects of nuclear power rather than its potential benefits. Some industry figures and politicians in favour of the development of nuclear energy are featured, but normally within articles detailing popular opposition to the continued use of nuclear power, particularly in relation to larger environmental activist groups such as Greenpeace, and with respect to the Zapatero/Socialist government's 2004 campaign promise to phase out the use of nuclear power in Spain.

6.5.11.1 **Some key points**

Of the articles reviewed, several relate to anti-nuclear environmental activism. Greenpeace is featured in a number of articles where protests have been organised at nuclear power plants in order to put pressure on the Zapatero government to fulfil its promises on nuclear energy. One such protest is reported to have taken place at the Vandellòs-2 power plant in Tarragona; another at the Garoña nuclear centre in Burgos, and a third at Zorito, Spain's oldest nuclear installation. Greenpeace argue that both Garoña and Zorito present serious safety risks commensurate with Chernobyl, and that the Consejo de Seguridad Nuclear (CSN) (the Ministry for Nuclear Security) is turning a blind eye to these issues. Spokespeople for the plants, such as Antonio Cornadó (for Garoña), are featured in the articles, arguing that safety concerns have been blown out of proportion. However, far more space is given to environmentalists such as Carlos Bravo, Greenpeace spokesperson for nuclear issues in Spain. As these articles deal with the Zapatero's failure to fulfil his promises on nuclear energy, the government receives a moderately negative treatment.

Elsewhere, however, articles report the commitment of the Zapatero government, alongside green political parties, to replace nuclear energy in Spain with more sustainable sources over the next 20 years.

Scientists, including Professor Valeriano Ruiz, director of the Universidad de Sevilla, and José Ramón Morales, of the Centro Español de Información del Cobre (Spanish Centre for Information on Copper), are featured as proponents of renewable energy sources over the continued use of nuclear energy. They argue that because nuclear fusion is still too distant a goal for scientists, and because of the risks of nuclear fission, resources should be focused on the development of renewable energy sources. In particular articles highlight the significance of developing wind power in Spain. It is reported that Spain is the second largest producer of wind power in the world.

Several articles deal with (pre-2004) government support for the use of nuclear energy. In particular Loyola de Palacio, vice-president of the European Commission for Transport and Energy, is mentioned in a number of articles. Proponents of nuclear energy argue that the current situation in Iraq, disasters such as the sinking of the *Prestige*, and increasing demands for energy in Spain make it impossible for nuclear energy to be ruled out altogether.

6.5.12 ABC

Issues related to nuclear energy are related in a generally positive tone in the articles reviewed in ABC. In general articles take a pragmatic view of the topic, placing weight in the argument that Spain's current energy needs leave the country with little option but to consider an increase in the use of nuclear energy. Several articles emphasise the fact that fears over the transport and storage of nuclear waste are unfounded, while others argue that Spain must adopt nuclear energy if it is to maintain economic competitiveness.

- 6.5.12.1 Some key points** In a number of articles the Consejo de Seguridad Nuclear (CSN) (The Council for Nuclear Safety) is quoted as supporting the continued use of nuclear energy, underlying the fact that nuclear power is both safe and "clean". Maria Teresa Estevan Bolea, former president of the CSN, supports this view, as does Loyola de Palacio, president of the European Commission. Other figures and organizations in favour of nuclear energy mentioned in the articles include the Circulo de Empresarios (The "Circle of Businessmen"), the Sociedad Nuclear de España, Jose Montilla, Minister for Industry, and Francisco Javier, director of the Instituto para la Diversificación y Aborro de la Energía (IDAE) (Institute for the Diversification and Conservation of Energy).

Several articles argue that it is no longer politically correct to favour nuclear energy, and suggest that the "taboo" status of nuclear power hinders rational debate of its potential benefits.

As is the case in relation to greenhouse gas emissions, environmentalists are portrayed in some articles as an elitist minority who impose their views on the rest of Spain. Articles dealing with protests undertaken by environmentalists, particularly in relation to the passage of a "nuclear train" (a train loaded with nuclear waste) from Germany to Spain in 2001, create a generally negative, radical image of those opposed to nuclear energy.

6.5.13 Environmental issues

6.5.14 El Pais

Environmental issues such as climate change and the greenhouse effect receive considerable coverage in *El Pais*, most if not all of which is negative. Coverage is highly critical of Spain's environmental policy, emphasising its reputation as an environmentally irresponsible country within the international community.

Spain's participation in the Kyoto Protocol and other international environmental agreements is argued to have been hampered by the inability of Spanish governments to meet the targets set for them. This is reflected in many of the articles related to climate change in *El Pais*, a large proportion of which present climate change and the greenhouse effect as serious and imminent problems that must be confronted.

Scientists and mainstream left-wing environmental spokespeople who are outspoken on the issue of climate change receive generally positive coverage, while environmental activists and those proposing more radical solutions to the problem of climate change are less favourably treated. Private business interests are often

portrayed in a negative light, but are seldom mentioned specifically. Above all, the Spanish government is blamed for not tackling climate change effectively. Spanish consumers themselves are seldom mentioned.

6.5.14.1 Some key points Other than the activities of Greenpeace, environmental activism in Spain receives relatively little coverage. What coverage it does receive often concentrates on the inability of environmental groups to organise effectively or to focus their political agendas. This was seen to be the case particularly in the Basque country, although recently environmental activists are reported to have become more organised under the banner of the nation-wide group *Ecologistas en Accion* (Environmentalists in Action). *Ecologistas en Accion* is mentioned in a number of articles, and is portrayed as being the most respected and effective environmental activist group in Spain at present. Issues of concern to *Ecologistas en Accion* include climate change, the development of high-speed trains in Spain, and the Plan Hidrológico Nacional (a hydroelectric project involving the Ebra Canal).

Spain's numerous regional and national Green parties are given considerable coverage, most of which is generally positive. A considerable number of articles portray the green movement as diffuse and disorganised, with political in-fighting diverting energy away from the key points of their agendas. Aside from this, however, the green movement receives support for its commitment to social change and sustainability.

In mainstream reporting of national politics, environmental issues are often portrayed as forming part of a larger agenda of social change aimed at improving the quality of life in Spain. Articles emphasise the socialist and radical democratic traditions of which green political groups are a part, and portray the green movement as a growing and significant force on the Spanish political map. Some key figures and groups include Joan Saura, president of *Iniciativa per Catalunya-Verds* (Catalonia Green Initiative), David Hammerstein, leader of *El Verds d'El País Valencia* (the Valencia Greens) and *la Federacion los Verdes-Izquierda Verdes* (the Green-Left Federation).

The overwhelming majority of articles related to climate change and greenhouse emissions deal with daily reports of excessive ozone levels in particular urban areas. These articles report incidents when the *La Consejería de Medio Ambiente* (the Ministry for the Environment) is required to inform the public of potential health hazards resulting from ozone levels that exceed recommended limits. Most emphasise the fact that ground ozone levels are getting steadily worse, impacting climate change and increasing levels of respiratory and cardiovascular illness. Longer feature articles also deal with this theme, highlighting the fact that Spain has failed to live up to the requirements of the Kyoto Protocol and produces some of the highest levels of ground ozone in Europe.

Climate change and the greenhouse effect are also discussed more generally in relation to their impact on the environment. Millan Millan, director of the *Centro de Estudios Ambientales del Mediterraneo (CEAM)* (Centre for Environmental Studies of the Mediterranean) is one of a number of experts quoted who warn of increases in temperature, rising sea levels and the inundation of coastal areas, an increased risk of forest fires and more violent shifts in weather (particularly in relation to the Mediterranean phenomenon of the "gota fría", a cold, rainy period in September/early October).

As suggested above, the Spanish government is strongly criticized for its 'laissez faire' attitude to environmental issues. This criticism is particularly strong in articles from before May 2004, at which point Jose Maria Aznar's Popular Party (PP) relinquished control of the government to the Socialist Party under Jose Louis Rodriguez Zapatero. The Estrategia Nacional del Clima (National Climate Strategy), a loose regulatory framework that was never fully implemented, is reported as being characteristic of the Popular Party's approach to environmental issues. Aznar's government is repeatedly criticized for putting the interests of business ahead of long-term sustainability. It is likely that the drop in negative coverage of the government after 2004 reflects not only the political leanings of *El Pais* but also the renewed commitment of the socialist government to environmental change. However, while criticism diminishes after March 2004, it is still prevalent, with articles continuing to highlight the need for drastic improvements to the government's regulation of emissions.

6.5.15 *EL Mundo*

A large proportion of the articles reviewed in *EL Mundo* relating to environmental issues are negative in tone and highlight the fact that environmental conditions are worsening in Spain and around the world. Several articles adopt a more optimistic approach to new legislation and environmental initiatives, but the majority agree with those of other major national newspapers in their condemnation of current environmental conditions.

As in other newspapers, the excessive ground ozone levels recorded in urban areas of Spain is recurrent theme in articles relating to the environment. Numerous articles report the daily occurrence of ozone levels reaching proportions that are potentially dangerous to public health. Rather than concentrating on the effects of climate change on the environment, these articles focus on the medical problems that greenhouse gases can cause, particularly those related to respiratory diseases and cardio-vascular conditions. In relation to this, several articles highlight the issues of traffic and congestion in urban areas; this is a problem recognised both by the Consejo de Medio Ambiente (The Ministry for Environment) and environmental activist groups such as Ecologistas en Accion. Ecologistas en Accion are also mentioned in connection to plans to extend and widen existing motorways, which they oppose.

- 6.5.15.1 Some key points** The hole in the ozone layer features prominently in a number of articles, particularly in relation to the polar ice caps and the potential effect that this may have on global climate change. More generally climate change is discussed in terms of increasing temperatures, more frequent natural disasters and extreme weather conditions, famine and crop failure, and the spread of tropical diseases (particularly in relation to "El Nino"). While one article reports on scientific findings that suggest greenhouse gas emissions have reduced, the majority emphasise the negative implications of present environmental conditions.

Environmental activists and green political movements receive a more positive treatment in *EL Mundo* than in other national newspapers. In particular, the national environmental group Ecologista en Accion, led by Juan Garcia, receive favourable coverage on a wide range of issues. The arguments of Ecologistas en Accion appear quite frequently in articles related to climate change, and are seldom contrasted with opposing arguments from the government or industry.

The Kyoto Protocol features quite prominently in the articles reviewed, although not always in a positive context. Most articles make mention of the potential benefits of the Kyoto Protocol, but highlight the fact that the realities of its implementation are quite far removed from what it sets out to achieve. Some concern is raised about the potentially damaging effects that the restrictions of the Kyoto Protocol will have on Spanish business interests. More generally, articles make note of the fact that Spain falls particularly short of the expectations set out in Kyoto Protocol. Scientists including Antonio Ruiz de Elvira, head of the department of Physics at the Universidad de Alcalá, attributes this not only to Spain's recent economic growth and consequent energy requirements, but also to "diffuse" emissions from private cars and homes and the government's failure to confront environmental issues effectively.

This emphasis on the Spanish public to reduce greenhouse gas emissions is echoed by the minister for the Environment, Elvira Rodriguez, in her presentation of the Estrategia de Lucha frente al Cambio Climático (the Strategy to Combat Climate Change). Coverage of this new initiative on behalf of the government suggests their renewed commitment to combatting climate change, but also points to the need for Spanish consumers to "adopt a more ecological mentality" in their daily lives. This is in stark contrast to the debate as it is presented in *El País*, where articles tend to place responsibility with the government rather than the public.

6.5.16 ABC

The articles reviewed in ABC are generally negative in their portrayal of the current state of the environment in Spain. Climate change and the greenhouse effect are identified as being particularly problematic for Spain, given its geographical position and its poor standing among European countries on environmental issues. Several articles highlight the connection between climate change and extreme weather conditions, suggesting that continued global warming will lead to an increase in floods and heat waves. The potential damage of climate change to Spain's coastal areas is also mentioned, particularly in relation to the tourist industry. Interestingly, these slightly more sensationalist, negative representations of climate change in Spain are not reflected in the newspaper's coverage of the government's attempts to deal with environmental issues. On the contrary, several articles highlight reforms and initiatives that have been undertaken to tackle environmental concerns. Reporting on the creation of the Oficina de Cambio Climático (Office for Climate Change), the reform of the Consejo Nacional del Clima (previously the Office for Climate Change), and the implementation of the Plan Nacional Forestal (a forest regeneration project) all suggest that the government (the pre-2004 government of Jose Maria Aznar) is engaging actively in environmental issues.

- 6.5.16.1 Some key points** Coverage of the Kyoto Protocol is generally negative, with several articles arguing that it will be difficult and/or useless for EU countries to agree on suitable limits to greenhouse gas emissions only to consistently exceed those limits. Others argue that the Protocol is contradictory and doomed to failure (as one writer comments, "el camino del Infierno está empedrado de buenas intenciones" – the road to hell is paved with good intentions). In keeping with this tone, reporting of the Kyoto-related La Haya conference on climate change in 2001 highlights the lack of agreement between European nations on the subject of regulating emissions. Another articles deals with concerns over the impact of the Kyoto Protocol on the

competitiveness of Spanish business, particularly in relation to the ceramics industry.

Environmental activism and “green” political groups are generally portrayed negatively, although Greenpeace receive some more balanced coverage. Environmentalists (such as Ecologistas en Accion) are accused of placing environmental concerns above all other issues, including national interests. In a related article environmentalists are portrayed as an elitist minority forcing their agenda on the Spanish majority, with negative results. The writer argues that Spain’s energy industry needs to grow, but has been sabotaged by the green movement.

Other issues raised include the impact of air travel on greenhouse gas emissions, the role of recently flourishing economies, such as that of China, on global climate change, and the negative impact of climate change on the developing world.

There were limited resources from the Spanish press available on LexisNexis, in this case, articles were sourced directly from newspaper archives on the following websites:

ABC: <http://www.abc.es/>

El Mundo: <http://www.elmundonewspaper.com/>

El Pais: <http://www.elpais.es/>

6.6 Sample matrix for media analysis

The table below shows part of a matrix used in the frame analysis of UK media science coverage.

MORAL relaxed/loose/lax for/tale/of/fibre	ETHIC work * UNHEALTH	IMMORAL * * DISEASE	UNETHIC * * ILLNESS	AGAINST NATURE * * MEDICINE forensic/sports/tra vel/dental/tropical/ veterinary	TAMPERING WITH NATURE * * HYGIEN	HUMANE * * society DRUG	PLAYING GOD * * VACCIN	GOD thank sake/only/rest INFECTION	PLAY GOD * * DISEASE
mental/occupation al interest/clubs/and safety/& safety/food/store/f ood store/care/board/a uthorities/chief/aut hority	* interest/obsession/ attitude/views/sign	*	mental		dental/personal	*	*	*	*
COMMERCE	ECONOMIC	MULTINATIONAL	CORPORATE	PROFIT pre tax/pre- tax/net/operating/r ecord	INDUSTRIAL	TRADING	LOBBY	PROFIT	VESTED INTEREST
chamber of/e-	macro/micro	*	*		*	*	middle/middle-	*	*
	recovery/zone/mir acle/crisis/crime/s anctions/boom/tro ubles/downturn/ins tability	*	citizenship/govern ance/debt/clients/r estructuring/financ ier	margin	building/sites/archi tecture/studies/pro perty/conflict/relati ons/unrest/revoluti on/park/production /town/espionage/e state/tribunal/actio n/conflicts/strife/he artlands/strikes	*		*	*
RISK	DANGER	UNSAFE	SCARE	SAFETY	ALARM fire/smoke/fire/intr uder/burgular/secu rity	WORR	PRECAUTIONARY PRINCIPLE	*	*
credit	housing/child	*	*	*		*	*	*	*
*	fraud	money	tactics	house/and safety/& safety	clock/system	*	*	*	*
TERROR	HIJACK	DIRTY BOMB	WRONG HANDS	WEAPON	CRIMINAL	WAR ON TERROR	NUKE	NUCLEAR WEAPON	CRIMINAL
*									
FARM	the story/the agenda/the debate AGRICULT	CROP	*	ORGANIC	court	*	*	*	*
wind/turbine/funny house/labourers	*	cream of the circle	*	*	*	*	*	*	*
ENVIRONMENT	* regulatory/secure/ economic/working/ built/funding/comp etitive/work	PLANET	GREEN	ALTERNATIVE ENERGY	DEGRADATION	POLLUTION	RENEWABLE ENERGY	ENVIRONMENTA L	SUSTAINABLE DEVELOPMENT
*	*	Blue	*	*	social/societal/res ource	*	*	*	*
REGULATION	AUTHORIT Human Fertilisation and Embryology/Huma n Fertilisation & Embryology	LEGISLAT	light/goddess/tea/ Property SELECT COMMITTEE	REFERENDUM	WHITE PAPER	LEGISLAT	MORITORIUM	PERMIT	PROHIBIT
conflict/university/i nstitutional/market	*	*	*	*	*	employment	*	*	*
MIRACLE CURE	MODERN MIRACLE	MIRACLE OF MODERN	MIRACULOUS	MAGIC BULLET	MIRACLE economic	HOLY GRAIL	CURE-ALL	PANACEA	BREAKTHROUG H
*	*	*	*	*	*	*	*	*	*
EXPERIMENT	HYPOTHE	CORRELAT	PEER REVIEW	PEER-REVIEW	EMPIRIC	QUACKERY	PSEUDOSCIENCE	SCIENTIFIC	PRECAUTIONAR Y PRINCIPLE
*	*	*	*	*	*	*	*	*	*
GRASS-ROOTS	ACTIVIS	GRASSROOT	GREENPEACE	FRIENDS OF THE EARTH	PROTEST	PROTESTS	PROTESTING	PROTESTED	*
*	*	*	*	*	*	*	*	*	*

The computer program requires three rows of input data to define each frame. The first lines, shown in the box above in upper case, contain the principal keywords associated with each frame (only the first ten are shown here). The following lines enable the program to eliminate the keywords if they occur in an inappropriate context. Thus, in the case of the first 'moral' frame, the occurrence of 'moral(s)' is

not counted if the words 'relaxed', 'loose', 'lax', etc. occur immediately prior, as shown in the second row. Similarly, the occurrence is skipped if words such as 'tale' or 'fibre' follow 'moral(s)'.

Developing such matrices is time consuming and requires careful reading and qualitative analysis of a substantial corpus of material. The aim is to achieve the smallest set of keywords, with relevant means of avoiding ambiguities, as possible.

The first few trials involve running the program using texts which have previously been analysed by hand and comparing the results. Subsequent 'honing' of the matrices is undertaken until no further improvement can be achieved.

Later versions of the matrices are checked by examining articles that have been identified as having a strong frame – i.e. high frequency counts of associated word and phrases – and undertaking additional inspection of these to ensure that they have, indeed, been correctly identified. Only at this stage is the matrix deemed to be 'ready for use'.

It is the case, of course, that computer analyses of this type will never be able to detect all the nuances of a piece of media coverage, particularly those that indulge in a degree of irony. It is also very difficult to distinguish in some cases between positive and negative valences – an article that criticises, say, the involvement of multi-national corporate interests in an area of science and technology, will be treated as the same as one which is strongly supportive of such interests. This, however, is not such a serious issue as it sounds. The aim of the analyses is to determine the frames of discourse that are evident – not necessarily to identify the side of the argument favoured by journalists and commentators. That is a task more effectively achieved through qualitative analysis, as summarised in the relevant sections for each country.

The problems of translation of matrices into other languages, and the issue of conceptual equivalence, have already been noted in Section 3.2.1 above. The principle, however, is the same for each language, involving progressive refinement of the keywords and their disambiguators. Within the time frame of the MESSENGER project we have done what we can to develop working models for the more significant European languages. Further work is clearly required to develop them further.

6.7 Source code for the SIRC *FrameCoOccur* program

This main analysis program is written in Visual Basic.net and the source code is available from the MESSENGER web site at <http://www.messenger-europe.org>

```
Imports System.IO, System.Text
```

```
Public Class Form1
```

```
    Inherits System.Windows.Forms.Form
```

```
    Dim BigString As New StringBuilder
```

```
    Dim StopFlag As Boolean = False
```

```
#Region " Windows Form Designer generated code "
```

```
#End Region
```

```
    Private Sub MenuItem1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MenuItem1.Click
```

```
        Dim iniFileName As String
```

```
        iniFileName = "c:\messenger analysis 2\CoOccurence.ini"
```

```
        If File.Exists(iniFileName) Then
```

```
            'Read in configuration
```

```
            FileOpen(1, iniFileName, OpenMode.Input)
```

```
            TextBox1.Text = LineInput(1)
```

```
            TextBox2.Text = LineInput(1)
```

```
            TextBox3.Text = LineInput(1)
```

```
            FileClose(1)
```

```
        Else
```

```
            MsgBox("No ini file found")
```

```
        End If
```

```
    End Sub
```

```
    Private Sub MenuItem3_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles mnuOpenKeys.Click
```

```
        OpenFileDialog1.Filter = "Csv files (*.csv)|*.csv"
```

```
        If OpenFileDialog1.ShowDialog() = DialogResult.OK Then
```

```
            TextBox1.Text = OpenFileDialog1.FileName
```

```
        End If
```

```
    End Sub
```

```
    Private Sub MenuItem4_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MenuItem4.Click
```

```
        FolderBrowserDialog1.ShowDialog()
```

```
        TextBox2.Text = FolderBrowserDialog1.SelectedPath
```

```
    End Sub
```

```
    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Button1.Click
```

```
        Dim i As Integer
```

```
        Dim j As Integer
```

```
        Dim k As Integer
```

```
        Dim l As Integer
```

```
        Dim m As Integer
```

```

Dim ExcludedWords As Integer = 0
Dim KeysFile As String
Dim InputDir As String
Dim OutputFile As String
FileClose(1) 'Just to be sure
KeysFile = TextBox1.Text
InputDir = TextBox2.Text
OutputFile = TextBox3.Text
'Clear Labels
ClearLabels()
'#####
'#          Call subroutine to write new ini file          #
'#####
Writeln()
'#####
'#          Set up keyword array and keyword counter      #
'#####
Dim KeysArray(100, 100) As String
Dim KeyWordCount(40) As Integer
Dim KeyWordTot(40) As Integer
'Set all keyword counts and totals to zero
For i = 1 To 40
    KeyWordCount(i) = 0
    KeyWordTot(i) = 0
Next
'Set all keywords to "*" initially - needed to determine end of keyword list later
For i = 1 To 100
    For j = 1 To 100
        KeysArray(i, j) = "*"
    Next
Next

Label9.Text = "Exclusions"
'#####
'#  Read in keywords and associated 'before' and 'after' exclusions  #
'#####
'
Dim KRows As Integer
Dim KCols As Integer
Dim KeyString As String
Dim KWordParts() As String
Dim InstString As String
Dim BeforeString As String
Dim AfterString As String
Dim InstParts() As String
Dim BeforeParts() As String
Dim AfterParts() As String
Dim WordLine As String
Dim AWordParts() As String
Dim BWordParts() As String
Dim SpacePos As Integer
'Set the size of these arrays to suit the matrix
Dim BeforeWords(50, 50, 50) As String

```

```

Dim AfterWords(50, 50, 50) As String
'Set all 'before' and 'after' words to "" initially
For i = 1 To 50
    For j = 1 To 50
        For k = 1 To 50
            BeforeWords(i, j, k) = ""
            AfterWords(i, j, k) = ""
        Next k
    Next j
Next i

FileOpen(1, KeysFile, OpenMode.Input)
KRows = 0
Do While Not EOF(1)
    KRows = KRows + 1
    KeyString = LineInput(1)
    'Split the keyword string into its parts separated by a comma
    KWordParts = Split(KeyString, ",")
    'The number of columns in the input matrix is determined by the first row
    If KRows = 1 Then
        KCols = KWordParts.GetUpperBound(0) + 1
    End If
    'Store the identified keywords
    For i = 0 To KCols - 1
        KeysArray(KRows, i + 1) = KWordParts(i)
        Label3.Refresh()
        Label3.Text = KeysArray(KRows, i + 1)
    Next i
    'Read the 'before' exclusions associated with the keywords
    'These consist of groups of words separated by a "/"
    BeforeString = LineInput(1)
    'Split the 'before' strings into its parts separated by a comma
    BeforeParts = Split(BeforeString, ",")
    'Read the 'after' exclusions associated with the keywords
    'These consist of groups of words separated by a "/"
    AfterString = LineInput(1)
    'Split the 'before' strings into its parts separated by a comma
    AfterParts = Split(AfterString, ",")
    'Split the 'before' and 'after' strings into their parts separated by "/"
    'NB Split arrays start at 0
    For i = 0 To KCols - 1
        If BeforeParts(i) <> "" Then
            WordLine = BeforeParts(i)
            BWordParts = Split(WordLine, "/")
            For j = 0 To BWordParts.GetUpperBound(0)
                BeforeWords(KRows, i + 1, j + 1) = BWordParts(j)
            Next
        End If
        If AfterParts(i) <> "" Then
            'Parse string of After Words
            WordLine = AfterParts(i)
            AWordParts = Split(WordLine, "/")
            For j = 0 To AWordParts.GetUpperBound(0)

```

```

        AfterWords(KRows, i + 1, j + 1) = AWordParts(j)
    Next j
End If
Next i
Loop
MsgBox("Rows " & KRows & " - Cols " & KCols)
FileClose(1)
Dim NumBefore As Integer
Dim NumAfter As Integer
'#####
'# This section checks the keywords and associated before and after words by #
'# writing them to a file if the Boolean TestMatrix is set to TRUE. The program #
'# then terminates #
'#####
Dim TestMatrix As Boolean
TestMatrix = False
If TestMatrix Then
    FileOpen(2, "c:\messenger analysis 2\gbiocheck1.txt", OpenMode.Output)
    For i = 1 To KRows
        For j = 1 To KCols
            If KeysArray(i, j) <> "*" Then
                PrintLine(2, KeysArray(i, j))
            End If
            'Check if any before words
            If BeforeWords(i, j, 1) <> "*" Then
                'count number of before words
                NumBefore = 0
                For k = 1 To 50
                    If BeforeWords(i, j, k) <> "*" Then
                        NumBefore = NumBefore + 1
                    End If
                Next k
                If NumBefore > 0 Then
                    For k = 1 To NumBefore
                        PrintLine(2, "Before " & BeforeWords(i, j, k))
                    Next k
                End If
            End If
            'Check if any after words
            If AfterWords(i, j, 1) <> "*" Then
                'count number of before words
                NumAfter = 0
                For k = 1 To 50
                    If AfterWords(i, j, k) <> "*" Then
                        NumAfter = NumAfter + 1
                    End If
                Next k
                If NumAfter > 0 Then
                    For k = 1 To NumAfter
                        PrintLine(2, "After " & AfterWords(i, j, k))
                    Next k
                End If
            End If
        Next j
    Next i
End If

```

```

        End If
    Next j
    PrintLine(2, "*****")
Next i
FileClose(2)
MsgBox("Ending at Test")
End
End If

```

```

'#####
##

```

```

'#                End of Test Section                #

```

```

'#####
##

```

```

'Set up array to hold the co-occurrence counts and set all to 0

```

```

Dim KeyMatrix(KRows, KRows) As Integer

```

```

For i = 1 To KRows

```

```

    For j = 1 To KRows

```

```

        KeyMatrix(i, j) = 0

```

```

    Next j

```

```

Next i

```

```

Dim TextLine As String

```

```

Dim KeysCount(KRows) As Integer

```

```

Dim InputFile As String

```

```

Dim LCount As Integer

```

```

Dim StartIndex As Integer

```

```

Dim Files() As String

```

```

Dim InFile As String

```

```

Dim FileCount As Integer

```

```

Dim HasContext As Boolean

```

```

Dim SkippedFiles As Integer = 0

```

```

Dim Procfiles As Integer = 0

```

```

FileCount = 0

```

```

'Identify files in InputDir

```

```

Label3.Refresh()

```

```

Label3.Text = "Counting the number of files to process - Please Wait"

```

```

Files = Directory.GetFiles(InputDir, "*.txt")

```

```

MsgBox("There are " & Files.Length & " files to process")

```

```

'#####

```

```

'#                Process input files                #

```

```

'#####

```

```

For Each InFile In Files

```

```

    FileClose(1)

```

```

    FileOpen(1, InFile, OpenMode.Input)

```

```

    FileCount = FileCount + 1

```

```

    Label6.Refresh()

```

```

    Label6.Text = Files.Length - FileCount & " files to go"

```

```

    If BigString.Length > 0 Then

```

```

        BigString.Remove(1, BigString.Length - 1)

```

```

    End If

```

```

'Read second line to get title of newspaper

```

```

Dim Title As String
TextLine = LineInput(1)
Title = LineInput(1)
'skip next 5 lines in files
For i = 1 To 5
    TextLine = LineInput(1)
Next i
Do While Not EOF(1)
    TextLine = LineInput(1)
    'Call CleanString to get rid of crap in TextLine
    StringClean(TextLine)
    BigString.Append(TextLine & " ")
Loop
'Check if article contains reference to the specific areas of science -
'always the first 1 sets of lines of the Keys Matrix
HasContext = False
For i = 1 To 1
    For j = 1 To KCols
        If KeysArray(1, j) = "*" Then Exit For
        If InStr(BigString.ToString, KeysArray(i, j), CompareMethod.Text) > 0 Then
            HasContext = True
            Exit For
        End If
    Next j
Next i
Dim French As Boolean
French = False
'Check if the article is in proper French - ie has accents
If HasContext Then
    If French Then
        If InStr(BigString.ToString, "é", CompareMethod.Text) > 0 Or InStr(BigString.ToString, "â",
CompareMethod.Text) > 0 Or InStr(BigString.ToString, "à", CompareMethod.Text) > 0 Then
            HasContext = True
        Else
            HasContext = False
            Label10.Refresh()
            Label10.Text = InFile & " no accents"
        End If
    End If
End If
'If these are German papers check to exclude 'AFX' - financial info only
Dim German As Boolean
German = True
If German Then
    If InStr(Title, "AFX", CompareMethod.Text) Then
        HasContext = False
        Label10.Refresh()
        Label10.Text = InFile & " AFX skipped"
    End If
End If
If HasContext Then
    'Set keyword counts for this article to zero
    For i = 1 To KRows

```



```

    KeyWordCount(i) = 0
Next
'#####
'#          Look for keywords          #
'#####
Dim FoundExclude As Boolean
Dim CompareString As String
Dim KPos As Integer

For i = 1 To KRows
    For j = 1 To KCols
        StartIndex = 1
        KPos = 1
        If KeysArray(i, j) <> "*" Then
            Do While KPos > 0 And KPos + Len(KeysArray(i, j)) < BigString.Length
                KPos = InStr(StartIndex, BigString.ToString, KeysArray(i, j), CompareMethod.Text)
                '#####
                '# Check for exclusions using 'before' and 'after' words #'
                '#####
                If KPos > 0 Then

                    'Check for before words
                    NumBefore = 0
                    'Count how many 'before' words we need to check
                    k = 1
                    Do While BeforeWords(i, j, k) <> "*"
                        If BeforeWords(i, j, k) <> "*" Then
                            NumBefore = NumBefore + 1
                            k = k + 1
                        End If
                    Loop
                    'Check for 'after' words
                    NumAfter = 0
                    'Count how many 'after' words we need to check
                    k = 1
                    Do While AfterWords(i, j, k) <> "*"
                        If AfterWords(i, j, k) <> "*" Then
                            NumAfter = NumAfter + 1
                            k = k + 1
                        End If
                    Loop

                    'If we have anything to do here ...
                    If NumBefore > 0 Then
                        'Check each 'before' word
                        k = 1
                        Do While FoundExclude = False And k <= NumBefore
                            'Find position of previous word(s)
                            'Note that this position must be >= to the length of the
                            'before' word
                            l = KPos - Len(BeforeWords(i, j, k)) - 2
                            If l <= 0 Then l = 1
                            CompareString = Mid(BigString.ToString, l, KPos - l + 1)

```

```

        'See if the BeforeWord is contained in the string preceding the keyword
        If InStr(CompareString, BeforeWords(i, j, k), CompareMethod.Text) <> 0 Then
            FoundExclude = True
            ExcludedWords = ExcludedWords + 1
            Label9.Refresh()
            Label9.Text = ExcludedWords & " Excluded Before "
        End If
        k = k + 1
    Loop
End If
'If no BeforeWords have been found then check AfterWords
If NumAfter <> 0 And FoundExclude = False Then
    k = 1
    Do While FoundExclude = False And k <= NumAfter And KPos +
Len(AfterWords(i, j, k)) + 2 < BigString.Length
        'Find position of following word(s)
        'Find next space
        SpacePos = InStr(StartIndex + 1, BigString.ToString, " ", CompareMethod.Text)
        CompareString = Mid(BigString.ToString, SpacePos + 1, Len(AfterWords(i, j,
k)) + 1)

        If InStr(CompareString, AfterWords(i, j, k), CompareMethod.Text) Then
            FoundExclude = True
            ExcludedWords = ExcludedWords + 1
            Label9.Refresh()
            Label9.Text = ExcludedWords & " Excluded After"
        End If
        k = k + 1
    Loop
End If
If FoundExclude = False Then
    'Add to store for this article
    KeyWordCount(i) = KeyWordCount(i) + 1
End If
FoundExclude = False
StartIndex = KPos + Len(KeysArray(i, j)) + 1
End If
Loop
Else
    Exit For
End If
Next j
Next i

Label3.Refresh()
Label3.Text = "Processed " & InFile
Procfiles = Procfiles + 1
Label7.Refresh()
Label7.Text = Procfiles & " files processed"
'Add to store of co-occurences
For i = 1 To KRows
    If KeyWordCount(i) > 0 Then
        KeyWordTot(i) = KeyWordTot(i) + 1
    End If

```

```

        For j = 1 To KRows
            If i <> j Then
                KeyMatrix(i, j) = KeyMatrix(i, j) + (KeyWordCount(i) * KeyWordCount(j))
            End If
        Next
    Next
End If

Next InFile

FileClose(2)
FileOpen(2, OutputFile, OpenMode.Output)
Print(2, "^")
For i = 1 To KRows
    Print(2, KeysArray(i, 1) & "^")
Next
PrintLine(2, "")
For i = 1 To KRows
    Print(2, KeysArray(i, 1) & "^")
    For j = 1 To KRows
        Print(2, KeyMatrix(i, j) & "^")
    Next j
    PrintLine(2, "")
Next i
'Write extra stuff required by MDS program
PrintLine(2, "Means" & "^" & "0")
PrintLine(2, "StdDev" & "^" & "0")
PrintLine(2, "No.Cases" & "^" & Procfiles)
PrintLine(2, "Matrix" & "^" & "2")

PrintLine(2, "")
FileClose(1)
FileClose(2)
MsgBox("FINISHED!")
End Sub

Private Sub MenuItem6_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
End Sub

Private Sub FolderBrowserDialog1_HelpRequest(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles FolderBrowserDialog1.HelpRequest
End Sub

Sub WriteIni()
    FileOpen(1, "c:\messenger analysis 2\CoOccurence.ini", OpenMode.Output)
    PrintLine(1, TextBox1.Text)
    PrintLine(1, TextBox2.Text)
    PrintLine(1, TextBox3.Text)
    FileClose(1)
End Sub

Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles
MyBase.Load
End Sub

Sub StringClean(ByVal TextLine)
    'Get rid of crap in TextLine
    Dim i As Integer

```

```

Dim NewTextLine As String = ""
For i = 1 To Len(TextLine)
    If Asc(Mid(TextLine, i, 1)) <> 160 Then
        If Mid(TextLine, i, 1) <> " " Then
            NewTextLine = NewTextLine & Mid(TextLine, i, 1)
        ElseIf i > 1 And Mid(TextLine, i - 1, 1) <> " " Then
            NewTextLine = NewTextLine & Mid(TextLine, i, 1)
        End If
    End If
End If
Next
TextLine = Trim(NewTextLine)
End Sub
Sub ClearLabels()
    Label3.Refresh()
    Label3.Text = ""
    Label5.Refresh()
    Label5.Text = ""
    Label6.Refresh()
    Label6.Text = ""
    Label7.Refresh()
    Label7.Text = ""
    Label8.Refresh()
    Label8.Text = ""
    Label9.Refresh()
    Label9.Text = ""
    Label10.Refresh()
    Label10.Text = ""
End Sub
Private Sub Button2_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
    StopFlag = True
End Sub
End Class

```

6.8 SIRC consultees

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Juliet Upton, Chair of the Committee, THE SCIENCE, TECHNOLOGY, ENGINEERING AND MEDICINE PUBLIC RELATIONS ASSOCIATION (STEMPRA).

Claudia Urschbach, Content & Development Manager, ALPHAGALILEO.

Johan Vanhemelrijck, Secretary General, EUROPABIO.

Vladimir Vicklicky, Vice-Chairman, RESEARCH AND DEVELOPMENT COUNCIL, OFFICE OF THE GOVERNMENT OF THE CZECH REPUBLIC.

Jan Visser, President, LEARNING DEVELOPMENT INSTITUTE (LDI).

Bob Ward, Senior Manager, Policy Communication, ROYAL SOCIETY.

Emma Weitkamp, Senior Lecturer, UNIVERSITY OF THE WEST OF ENGLAND.

Bernd Wirsing, Responsibility for content, MAX PLANCK.

Michel Włodarczyk, Deputy Secretary General, FOLKUNIVERSITETET.

Stephen Woolgar, Professor of Marketing, SAÏD BUSINESS SCHOOL,
UNIVERSITY OF OXFORD.

Giuseppe Zaffuto, Senior Project Manager, EUROPEAN JOURNALISM CENTRE
(EJC).

6.9 Sample SIRC outline consultation protocol

MESSENGER – Science institutes etc.

INTRO – explanation of the MESSENGER project.

- Could you provide a brief description of your organisation and its role?
- What channels do you use to communicate scientific advice to the wider public?
- From your point of view what are the most effective channels of communication for the scientific community?
- Generally, what is your experience in dealing with the media?
- Have you experienced any differences between the broadcast and print media?
- How do you try to ensure that the communication/reporting is accurate and balanced and the potential for misinterpretation is minimised?
- In your opinion, what sources of information do you think most influence the public's attitude towards scientific issues?
- In your opinion, at what point in the development of new scientific approaches should communication with the public begin?
- To what extent are new scientific developments raising moral/ethical/religious issues? What are these and how should they be addressed?
- How do you try to communicate the risks/benefits of scientific innovation?
- What is the potential for misreporting risks?
- What level of trust do you think the public have regarding the communications that you provide?
- Do you have any concerns about the ways in which scientific issues are reported in the media? What are they?
- What means of redress do you have when misreporting of your material occurs?
- How do you perceive the role of civil groups such as NGOs in promoting greater openness and public discussion about the choices presented by scientific developments? Do you engage with them directly?
- Do you use any guidelines when preparing science communication materials? If so, how useful are they? If not, would such guidelines be useful?

6.10 ASCoR consultees

6.10.1 Government

Peter Van Dolen, director at the Expert Center for Risk and Crisis Communication (ERC), Department of Internal Affairs.

Hans Siepel, former Communication official at the Department of Internal Affairs.

Frank Havik, (former journalist) senior communication advisor at the Expert Center for Risk and Crisis Communication (ERC), Department of Internal Affairs.

Ernst Jan Peters, Communication officer with the City Council of Apeldoorn.

Diederik Samsom, Member of Parliament for the PvdA, former campaigner for Greenpeace.

6.10.2 Science

Wouter Jong, senior consultant at the Crisis Research Team (research and consultancy in the area of safety and crisis management).

Werner Overdijk, director Crisisplan BV (consultancy and training in crisismanagement for government en corporate business).

Peter Zwamborn, professor at the Electromagnetics Group Technical University Eindhoven. Project manager of the TNO COFAM research on UMTS (2003).

Keimpe Wieringa, Teammanager Air Quality and European Sustainable Development at the Planning Bureau for the Environment and Nature (MNP).

Hugo Priemus, professor at the Faculty of Technology, Policy and Management, Delft University of Technolog.

Roel Coutinho, professor at the Center for infectious diseases at the Institute for Public Health and the Environment (RIVM).

Henriette Schatz and André Krom, resp. Director Social Signalling and Debate, Project manager Rathenau Institute (Technology Assessment).

Hans van Breugel, Communication Advisor and editor KNAW Research (Royal Dutch Academy for Science).

6.10.3 Media

Hans van Maanen, freelance science journalist, columnist de Volkskrant, teaches Science Journalism at the Erasmus University Rotterdam.

Margriet van der Heijden, science editor, chairman of the Association of Science Editors.

Kees Schaepman, journalist (Broadcasting organization VPRO), former chairman of the Dutch Union for Journalists.

Ron Fresen, political reporter at the NOS journaal (Daily news at the public broadcasting organization NOS).

Wim Köhler, science editor at NRC Handelsblad.

6.10.4 Stakeholders

Laurence van Gelderen, Issue-manager Mobile Phones and Health at KPN and Steve Hufton, Communication Officer at KPN.

Bert Regeer, Head of Global Communications Planning and Operations, Shell International BV.

Joris Wijnhoven, consultant at the Association for the Defence of the Environment.

6.11 European Press Councils – Contact details

- ▶ **BELGIUM** – Raad voor de Journalistiek (Press council for the Flemish-speaking part of the country)
 Mr Eric Brewaeys (President); Flip Voets (Secretary general and ombudsman)
 Internationaal Perscentrum, Residence Palace – lokaal 3/217, Wetstraat 155, 1040 Brussels, Belgium
 Tel: 32 2 230 27 17, Fax: 32 2 230 36 88, Email: info@rvdj.be, Web: www.rvdj.be
- ▶ **BOSNIA & HERZEGOVINA** – Vijeće za Štampu (Press Council)
 Ms Ljiljana Zurovac (Director), Vijeće za Štampu, Trampina 8, 71000 Sarajevo, Bosnia & Herzegovina.
 Email: vzs@bih.net.ba, Web: www.vzs.ba
- ▶ **BULGARIA** – National Council for Journalism Ethics
 Ms Dorothea Pandova-Gargova (Executive Director), 44 Cherni vrah Blvd, Sofia 1407, Bulgaria.
- ▶ **CYPRUS** – Epitropi Dimosiographikis Deontologias (Media Complaints Commission)
 Mr Andreas Mavrommatis (Chair); Petros Petrides (Secretary general), 8 Markou Drakou Avenue, P.O. Box 27858, 1102 Nicosia, 2433 Cyprus.
 Tel: 00 (357) 2 67 25 95, Fax: 00 (357) 2 67 25 95; (357) 22 86 20 01.
 Email: epidideo@cytanet.com.cy; petros@simerini.com, web: <http://www.cmcc.org.cy>
- ▶ **DENMARK** – Pressenaevnet (Press Council)
 Mr Niels Grubbe (Chair); Anna Helene Noer (Legal secretary).
 Gyldenlovesgade 11, 4, 1600 Copenhagen V, Denmark.
 Tel: 00 45 33 15 55 64; 00 45 72 26 89 71, Fax: 00 45 33 15 84 64.
 Email: sekr@pressenaevnet.dk; ahn@pressenaevnet.dk, web: www.pressenaevnet.dk
- ▶ **ESTONIA** – Pressinõukogu (Press Council)
 Mr Sulev Valner (Chair); Maige Prööm (Managing secretary)
 c/o Estonian Newspaper Association, Pärnu mnt 67A, 10134 Tallinn, Estonia.
 Tel: 372 646 3363, Fax: 372 631 1210,
 Email: pn@eall.ee. web: www.eall.ee/pressinoukogu/index-eng.html
- ▶ **FINLAND** – Julkisen Sanan Neuvosto (Council for Mass Media)
 Mr Olli Mäenpää (Chair); Ilkka Vanttinen (Secretary)
 Mariankatu 26 B 10, 00170 Helsinki, Finland.
 Tel: 358 9 13 57 494, Fax: 358 9 278 1031.
 Email: pirkko@jsn.fi, ilkka.vanttinen@jsn.fi. web: www.jsn.fi
- ▶ **GERMANY** – Deutscher Presserat (Press Council)
 Mr Lutz Tillmans (Managing Director); Ella Wassink (assistant)
 Gerhard-von-Are Strasse 8, (P.O. Box) Postfach 7180 – 53071 Bonn, 53111 BonnGermany
 Tel: 00 49 228 985 720, Fax: 00 49 228 985 7299.
 Email: info@presserat.de, web: www.presserat.de
- ▶ **ICELAND** – Sidanefnd Bladamannafélags Islands (Ethics Committee of the Union of Icelandic Journalists)
 Mr Kristinn Halgrímsson (Chair), c/o The Union of Icelandic Journalists, Sidumula 23, 108 Reykjavík, Iceland.
 Fax: 354 55 391 77 & 354 5521 331
 Email: bi@press.is
- ▶ **ITALY** – Discipline Commissions of the Ordine Nazionale dei Giornalisti (National Order of Journalists)
 Felice Maselli (Secretary general), Lungotevere de' Cenci 8, Roma 00186, Italy.
 Fax: 00 39 06 688 04 084
 Email: femasel@tin.it ; odg@odg.it, web: www.odg.it

- **LUXEMBOURG – Conseil de Presse (Press Council)**
 Mr Joseph Lorent (President); Fernand Weides (Vice-President)
 24 rue du Marché aux Herbes, 1728 Luxembourg, (P.O. Box) BP 1584, 1505 Luxembourg, Luxembourg.
 Tel: (352) 22 23 11, Fax: (352) 22 23 40
 Email: secretariat@press.lu, web: www.press.lu
- **LITHUANIA – Commission of Ethics of Lithuanian Journalists and Publishers**
 Mr Gintaras Songaila (Chair); Egidija Leveikaite (Assistant)
 A. Vivulskio g. 23, 03114 Vilnius, Lithuania
 Tel: 370 5 213 55 60, Fax: 370 5 233 79 04
 Email: gintaras_songaila@takas.lt, vtv@iti.lt
- **MALTA – Press Ethics Commission**
 Mr Malcolm Naudi (Chair); Joe A. Vella (General Secretary), Bjorn Ole Austad (Honorary Secretary)
 Institute of Maltese Journalists, P.O. Box 412., Valetta CMR 01, Malta.
 Tel: 00 356 21 243 211 and 00 356 7942 4555, Fax: 00 356 21 249 290
 Email: institute.of.maltese.journalists@gmail.com, mjnaudi@timesofmalta.com, web: www.maltapressclub.org.mt
- **NETHERLANDS – Raad voor de Journalistiek (Press Council)**
 Mr J. B. Fleers (Chair); Mrs D.C. Koene (Secretary)
 Joh. Vermeerstraat 22, 1071 DR Amsterdam, The Netherlands.
 Tel: 00 31 20 673 57 27, Fax: 00 31 20 679 9065.
 Email: raad@rvdj.nl, web: www.rvdj.nl
- **NORWAY – Pressens Faglige Utvalg (Press Complaints Commission)**
 Per Edgar Kokkvold (Secretary general)
 Radhusgt. 17 – 3etg, (P.O. Box) Postboks 46, Sentrum, 0101 Oslo, Norway.
 Tel: 47 22 40 50 40, Fax: 47 22 40 50 55
 Email: pfu@presse.no, web: <http://www.presse.no/np.asp#Pressens%20Faglige%20Utvalg>
- **SLOVAKIA – Press Council of the Slovak Republic**
 Mr Zuzana Krutka (Chair).
 Tlacova rada Slovenskej republiky, Zupne namestie 7, 815 68 Bratislava, Slovakia.
 Tel: 00 421 2 5443 5071, Fax: 00 421 2 5443 4534.
 Email: predseda@ssn.sk; krutka.zuzana@ssn.sk, web: www.trsr.sk
- **SLOVENIA – Novinarsko Castno Razsodisce (Journalists' Ethics Council)**
 Mr Vili Einspieler (Chair); Ms Spela Stare (Secretary general)
 Drustvo novinarjev Slovenije, Wolfova 8, 1000 Ljubljana, Slovenia.
 Tel: 386 1 426 03 63, Fax: 386 1 426 03 64,
 Email: razsodisce@razsodisce.org, web: <http://www.razsodisce.org>
- **SPAIN (CATALUNYA) – Consell de la informacio de Catalunya (News Council of Catalunya)**
 Mr Josep Pernaut (Chair); Josep Maria Cadena (Secretary general)
 10 Rambla de Catalunya – 4rt 4a, Barcelona 08007, Catalunya, Spain.
 Tel: 34 93 317 19 20 (ext. 246/228), Fax: 34 93 317 8386.
 Email: cic@periodistes.org, web: <http://www.periodistes.org/cic/cat/Consell.htm>
- **SWEDEN – Pressens Opinionsnämnd (Press Council)**
 Mr Justice Johan Hirschfeldt (Chair); Olle Stenholm (Press ombudsman)
 P.O. Box 12708, Kungsholmstorg 5, 11294 Stockholm.
 Tel: 46 8 692 4600, Fax: 46 8 692 05
 Email: ced@po-pon.org, olle.stenholm@po.se, web: www.po.se

- ▶ **SWITZERLAND – Conseil Suisse de la Presse / Schweizer Presserat (Press Council)**
Peter Studer (Chair); Martin Künzi (Secretary)
(P.o. Box) Postfach 201, 3800 Interlaken, Switzerland.
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- ▶ **UKRAINE – Journalistic Ethics Commission**
Mr Volodymyr Mostovy
CJE, apt 8, Kruhlouniversytetska Str. 11/19, Kyiv [Kiev], 01024 Ukraine.
Tel: 380 44 25 33 807, Fax: 380 44 25 32 404
Email: cje@charter4.com.ua, editor@mirror.kiev.ua, web: <http://www.cje.org.ua>

- ▶ **UK – Press Complaints Commission**
Sir Christopher Meyer (Chair); Tim Toulmin (Director)
Halton House, 20/23 Holborn, London EC1N 2JD.
Tel: 44 207 831 0022, Fax: 44 207 831 0025
Email: pcc@pcc.org.uk, web: www.pcc.org.uk