

DG Research

**Monitoring Policy and
Research Activities on
Science in Society in
Europe (MASIS)**

National Report, Finland

October 2011

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Written by

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Table of Contents

0	Introduction	3
	National context	9
1.1	The place of science in society - current debates	9
1.2	Policy goals and priorities	11
1.3	National challenges, opportunities and trajectories	17
	Priority setting, governance and use of science in policy-making	19
2.1	Public engagement in priority setting	19
2.2	Public - private interaction	21
2.3	Use of science in policy making	22
2.4	Key actors	23
	Research related to Science in Society	26
3.1	Research on Science in Society	27
3.2	Main stream research embedding Science in Society issues	28
3.3	Funding for research on Science in Society	29
3.4	Importance of Science in Society issues as evaluative elements for national research programmes and academic institutions	30
	Activities related to Science in Society	31
4.1	National science communication trends	31
4.2	Science journalism and training activities	33
4.3	Young people and science education in schools	34
4.4	Communication activities	36
	The Fukushima accident	44
5.1	Media coverage and public debate	44
5.2	Levels and modes of public involvement	46
5.3	Political responses and scientific advice	47

0 Introduction

The EU recognises the importance of ensuring that European research and research in Member States is firmly rooted in the needs of society, particularly in light of the constantly changing Europe. Efforts to reinforce the societal dimension of research are channelled through the 'Science in society' (SIS) programme. The SIS programme supports activities focusing on the governance of the research system, research ethics, public engagement in science, women in science and the promotion of scientific education and science communication.

The Monitoring Policy and Research Activities on Science in Society in Europe (MASIS) initiative is a major undertaking under the SIS programme. Its aim is to map, steer and monitor the SIS landscape in the European Research Area (ERA) (http://ec.europa.eu/research/era/index_en.htm), in order for EU citizens and society to benefit the most from SIS efforts. MASIS also covers the eleven Associated Countries.

The national MASIS reports are cornerstones in this endeavour, as they contain the knowledge gathered by a network of national correspondents on SIS. The reports will be updated every six months. The reporting format was developed on the basis of advice from the network of national correspondents, as well as discussions with authors of the initial MASIS report (see this [LINK](http://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf), [ftp://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf](http://ftp.cordis.europa.eu/pub/fp7/sis/docs/sis_masis_report_en.pdf)). In addition, the Commission and a network of national validators offered comments and advice.

In total, 38 national reports covering 38 (EU and associated) countries have been produced. This is the report on Finland. It consists of four main sections:

1. National context
2. Priority setting, governance and use of science in policy-making
3. Research related to SIS
4. Activities related to SIS
5. The Fukushima accident.

The intention of this report is to provide a good general overview of the SIS situation in Finland, including public engagement in science, different models and use of scientific advice and expertise for policy-making, activities related to assessment and ethical issues of science and technology, SIS research activities and scientific culture as well as trends, policies, actors and activities. The last

chapter on the Fukushima accident was added later to the original report and contains information on the national coverage and the role of scientific advice in connection with the accident.

Please note, in accordance with the terms of reference for the MASIS project, that the issue of ‘women in science’ is **not included** in the mapping as this has been extensively mapped and reported in other European projects. Please note also that the present report follows the initial MASIS report in using the term ‘science’ in its broadest sense, as in the German ‘Wissenschaft’, covering also the social, economic and human sciences. A few subsections are concerned only with the natural sciences, and in these cases it is explicitly indicated.

Statistical data sheet, Finland

	2000	2005	2006	2007	2008	2009	2010	EU27 average/total, 2008
Research and development								
Gross domestic expenditure on R&D (GERD), in % of GDP ¹	3,35	3,48	3,45	3,47	3,72	-	-	1,89
GERD by source of funds, % of total GERD ¹ :								
- Business enterprise sector	70,2	66,9	66,6	68,2	70,3	-	-	55,0
- Government sector	26,2	25,7	25,1	24,1	21,8	-	-	33,5
- Higher education sector	0,2	0,2	0,3	0,3	0,2	-	-	0,9
- Private non-profit sector	0,7	1,0	1,0	1,0	1,0	-	-	1,6
- Abroad	2,7	6,3	7,1	6,5	6,6	-	-	8,9
GPD (million current PPP \$)							1814	
	132786	160972	170211	186808	190266	177068	36	15285005
Total researchers (FTE) per thousand labour force	13,4	15,0	15,1	14,5	15,0	-	-	6,3
Total researchers (FTE) per thousand total employment	15,2	16,6	16,6	15,7	16,2	-	-	6,6
Gross Domestic Expenditure on R&D -- GERD (million current PPP \$)	4445,2	5601,2	5920,1	6495,5	7098,2	7094,5	-	276734,4
Public R&D expenditures (% of GDP)	0,95	0,99	0,97	0,94	0,91*	0,88*	-	0,66*
Business R&D expenditures (% of GDP)	2,37	2,46	2,46	2,51	2,56*	2,61*	-	1,16*
Number of R&D personnel ¹ , % 1000	22,9	24,0	23,9	22,6	22,4	-	-	
Number of R&D personnel by sector of performance ¹ , % of total R&D personnel:								
- Business enterprise sector	52.604	57.471	58.257	56.243	56.698	-	-	2.455.192
- Government sector	56%	56%	57%	57%	58%	-	-	52%
- Higher education sector	14%	13%	13%	13%	13%	-	-	14%
- Private non-profit sector	29%	30%	30%	29%	28%	-	-	33%
	1%	1%	1%	1%	1%	-	-	1%
Innovation indicators								

	2000	2005	2006	2007	2008	2009	2010	EU27 average/total, 2008
- S&E and SSH graduates per 1000 population aged 20-29	-	36,6	38,3	40,1*	42,0*	-	-	41,5*
- S&E and SSH doctorate graduates per 1000 population aged 25-34	1,90	2,23	2,17	2,12*	2,07*	-	-	1,26*
- Public-private co-publications per million population	-	88,1	78,0	-	-	-	-	-
- SMEs introducing product or process innovations (% of SMEs)	-	40,8**	44,7	48,9*	53,5*	-	-	32,0*
- Employment in medium-high & high-tech manufacturing (% of workforce)	7,23	6,76	6,81	7,03	7,26*	7,49*	-	6,78*
- Employment in knowledge-intensive services (% of workforce)	14,98	15,86	16,40	16,49	16,58*	16,67*	-	14,80*
Patents								
Patent applications to the EPO, total ²	1413	1291	1442	1391	-	-	-	
Patent grants at the USPTO, total ²	1530	2032	2383	2444	-	-	-	
Triadic patent families, total ²	372	329	330	321	-	-	-	
Patent applications filed under the PCT, total ²								
Human resources in science and technology								
Total, % of labour force ¹	19	20	21	22	23	-	-	16
- Scientists and engineers, % of labour force ¹	-	6,8	6,8	-	-	-	-	-
Networks and projects								
National share of FP6 SiS budget	-	3%	2%	2%	-	-	-	-
No. of FP6 SiS projects managed in Finland	-	8	7	2	-	-	-	-
National share of FP7 SiS budget	-	-	-	0%	1%	14%	-	-
No. of FP7 SiS projects managed in Finland	-	-	-	0	2	10	-	-

	2000	2005	2006	2007	2008	2009	2010	EU27 average/total, 2008
Tertiary/higher education								
Students at ISCED levels 5-6 enrolled in the following fields: science, mathematics, computing, engineering, manufacturing, construction - as % of all students ¹	36,2	38,0	37,4	36,6	-	-		24,9 ⁴
Academic staff (ISCED 5-6), total in full time unit ¹								
Public Understanding of Science (only 2005 og 2010 data) se pdf dokumenterne								
% of population very interested in new scientific discoveries and technological developments	-	26	-	-	-	-	32	
% of population very well informed about new scientific discoveries and technological developments		6	-	-	-	-	10	
% of population regularly or occasionally attend public meetings or debates about science and technology	-	10	-	-	-	-	8	
% of population regularly or occasionally sign petitions or join street demonstrations on matters of nuclear power, biotechnology or the environment	-	9	-	-	-	-	14	
% of population 'agree' and % of population 'disagree' that thanks to science and technology, there will be more opportunities for future generations	-	78/10	-	-	-	-	82/9	
% of population 'agree' and % of population 'disagree' that science makes our ways of life change too fast	-	46/36	-	-	-	-	56/27	
% of population 'agree' and % of population 'disagree' that we depend too much on science and not enough on faith	-	41/34	-	-	-	-	40/36	

	2000	2005	2006	2007	2008	2009	2010	EU27 average/total, 2008
% of population 'agree' and % of population 'disagree' that because of their knowledge, scientists have a power that makes them dangerous	-	49/34	-	-	-	-	-	56/28
% of population 'agree' and % of population 'disagree' that in my daily life, it is not important to know about science	-	35/52	-	-	-	-	-	33/56

Notes: 1) Data from EUROSTAT, 2) Data from the OECD, 3) Data from EuroBarometer 73.1 (2010) and EB 63.1 (2005) 4) Data from 2007

*: extrapolation of data

** : imputed data

National context

This section sets the scene and describes political developments, public debates and policy initiatives of major relevance to the place of science in society in Finland.

1.1 The place of science in society - current debates

The Finnish landscape of public debates on the place of science in society can be sketched through the following five themes:

- institutional reform of the research and innovation system;
- climate and energy policy and debate;
- user and demand oriented innovations;
- open science and Escience;
- political pressures on evidence based decision making.

The first theme, renewal of the research and innovation system relates to how the turmoil about socially and scientifically relevant research is being managed through several institutional reforms. The next three themes are substantial debates taking place in different arenas: climate and energy as an overarching theme provoking debate both among experts and the public at large; issues of user and demand oriented innovations provoking debate among business companies, researchers and policy makers; and open access and Escience as challenges for the research community and research policy makers, but also reaching larger audiences through increasing applications of research that are publicly available on the internet. The fifth theme relates to on-going debates and conflicts about political nature of scientific advice in relation to specific issues of controversy. Each of the themes are next described.

Institutional reform of the research and innovation system has involved major changes over the last 5 years, such as the New Governmental Innovation Strategy, New Universities Act, establishment of SHOKs (Strategic Centres for Science, Technology and Innovation), the renewal of funding and structures of Finnish sectoral research, the creation of Aalto university (from the merger of three Finnish universities: The Helsinki School of Economics, Helsinki University of Technology and The University of Art and Design Helsinki), the need to reduce the number of universities and polytechnics, and more generally, changes in infrastructural policies, funding of research careers and internationalization of research.

Changes in the funding and governance structures of research are at the core of those reforms. In the background there is the former Finnish government's programme for improving productivity in all governmental sectors and this programme has continued under the present government. Funding of research activities has also been an issue of constant public debate, and at the universities, for example, concerns have been expressed about the autonomy of research and about dominance of economic issues over social and cultural aspects. This discussion has been continued around the finding of the recent international evaluation of Finnish research by the Academy of Finland, which reported about a slight decrease of the quality of productivity of scientific research in Finland in the 2000s.

Climate and energy policy and debate have been related to Government's new climate and energy strategy (2008), and the Foresight Report on Long-term Climate and Energy Policy that the government adopted in 2009. Extensive consultations of experts and stakeholders (resulting in a series of background reports) accompanied the preparation of the Government's climate policies, and a series of seminars targeted at wider audiences including regional actors was organized. In this sense Government's climate policy is an example of evidence based policy and more active consultation of wider societal actors.

The debate about climate policy issues was especially intense before the COP15 summit and as the UN 2009 conference was approaching, various stakeholders mobilized evidence to influence national policy makers, including engineers, who created their own climate programme, civic organizations who banded together, and one industrial organization had a common project with a trade organization to promote energy industry.

Among most recent debates are the Government decision on two new nuclear power plant units (in addition the one that is under construction). The nuclear issue divided political party lines in the parliament, and some public demonstrations occurred in Helsinki before the decision was done in May 2010.

User and demand oriented innovations have been advanced by Finland's national innovation strategy (2008) and the Ministry of Employment and the Economy policy framework laying down the key elements of a demand and user-driven innovation policy (2009). Basically the issue is about finding new means to strengthen knowledge based economy, and the discourse is more restricted to professional circles, still increasingly impacting the way that research is being organized in Finland.

An interesting aspect of this policy shift is its emphasis in supporting public-private partnerships. Parallel with supportive policy initiatives, recent years in Finland have witnessed an emergence of consultancies and think tanks (e.g., Advansis, Gaia, Net Effect, Demos Helsinki) that have achieved an increasingly important role in the preparation of governmental and organizational strategies and evaluating and foresighting societal developments. The think tanks have been in an important role in stimulating debate and providing new perspectives on the matters of science and technology.

Open science and Escience are debates among science policy planners related to possibilities of enhancing the accessibility and availability of research data. Several reports and initiatives are related to this topic, and making e-services that leverage research data easily and widely accessible is believed to increase the effectiveness of research and innovation, make new findings possible and enable the use of data in unforeseen ways and in new contexts.

Political pressures on evidence based decision making. Public discussions on the political pressures on evidence based decision making have risen in autumn 2010. There are some scientists publicly saying that their advice has been neglected due to political pressure, and for example the Parliamentary Ombudsman is currently investigating whether the freedom of speech by some energy researchers at the VTT Technical Research Centre of Finland has been illegally restricted by their employer. Other debates focusing on the role of scientific evidence behind political decisions include the discussion on Pandemrix vaccine and the observed rise in cases of narcolepsy among children and adolescents; suspects of connections of researchers in public research institutes with industrial companies; controversy about the impact of saturated fats on public health. The way in which these discussions will continue and include new research areas, may be reflected on the overall trust in science and expert advice in the future.

1.2 Policy goals and priorities

Several important policy initiatives and reforms have taken place during the last 5 years in Finland. Among most important initiatives are the following developments:

- The Evaluation of the National Innovation System
- The National Reform Programme 2008-2010 (NRP)
- The New Governmental Innovation Strategy
- Demand and User Driven Innovation Policy Framework
- New Universities Act
- Establishment of SHOKs (Strategic Centres for Science, Technology and Innovation)
- The renewal of funding and structures of Finnish sectoral research
- The creation of Aalto university (from the merger of three Finnish universities: The Helsinki School of Economics, Helsinki University of Technology and The University of Art and Design Helsinki)

- Publicly funded research data project
- SADe-project, eServices and eDemocracy project
- Government foresight report on climate and energy policy

The Evaluation of the National Innovation System

Content and objectives: The Finnish National Innovation System was evaluated by international experts, and the results of the evaluation were published in October 2009. The starting point of the evaluation was the Government's Communication on Finland's National Innovation Strategy to the Parliament, which included the policy guidelines with respect to the development and renewal of Finnish innovation policy. The aim of the evaluation was to provide insights into how the National Innovation System, its structure and organizations can respond to the changes in the global environment and to the challenges these changes pose.

The international evaluation experts have identified modes of operation, processes and tools, that the Finnish innovation policy can be designed and implemented with. The evaluation states that even if the current state of the Finnish innovation system is good, it is not enough; while some of the panel's proposals are laborious to implement, a survey conducted to support the evaluation reveals that the actors of the Finnish innovation system are optimistic about its future and they are ready for, and even demand, major changes.

The evaluation reveals that the Finnish system is less international than conventionally thought and that the Finnish innovation system lacks explicit cross-ministerial decision making and execution. The evaluation calls for a reform of the current complex research and innovation system, and stronger coordination of dispersed research and innovation activities. A need for a change towards more experimentation, risk-taking, and acceptance of failure is considered an important direction of change. The evaluation panel also focus attention on sectoral research (conducted in public research organizations, PROs) and recommends moving their academically-orientated research to universities and organizing the remaining tasks into 4–5 units in accordance with larger societal needs (as opposed to the current structure based on ministries' administrative boundaries). The panel also proposes to make the system transparent and not to make regional policy a starting point for national direct support of private innovative activity.

Impact assessment: The international evaluation is among the key initiatives providing insights on how to develop the Finnish research and innovation system in the near future. Evaluation is associated with foresighting and will impact future RDI measures.

Main documents: <http://www.tem.fi/index.phtml?l=en&s=3161> ;
<http://www.aka.fi/en-gb/A/Science-in-society/Evaluation-of-research/>

The National Reform Programme 2008-2010 (NRP)

Content and objectives: The programme suggests that public R&D funding will be increased annually by 5 per cent between 2008 and 2011 with the target of increasing the GDP share of research to 4 per cent. The impact of public R&D funding is also planned to be improved. In addition the following more specific objectives have been outlined: 1) more companies involved in R&D work; 2) government research institutes receiving more external funding for research; 3) to strengthen the role of VTT Finland in the implementation of innovation policy; 4) knowledge-based innovation policy will be promoted and structural reforms in R&D will be made to further foster it; 5) innovation policy strategies and measures of those executing them will be harmonized; 6) to encourage new forms and areas of demand-based and user-oriented innovation activities; 7) strengthening of the link between internationalization and innovations; 8) overall development of the operating environment of growth companies within the scope of a broad-based innovation policy; 9) bring together regionally dispersed R&D&I activities into networks of innovation communities and create strong regional innovation clusters.

Impact assessment: The programme provides the general orientation to research based development in Finland: increasing r&d funding; strong demand and user orientation; co-operation between public and private actors across regions.

Main documents: <http://cordis.europa.eu/erawatch/>

<http://cordis.europa.eu/erawatch/index.cfm?fuseaction=policy.document&uuid=B6CC5F9B-013A-2D44-BC52993A8DB21D27>

National Innovation Strategy

Content and objectives: The strategy seeks to broaden the base of the national innovation policy by seeking economic growth and well-being through productivity in public services and quality of working life, as well as through private sector competitiveness. Innovation policy influences the competence-based competitiveness and renewal of the business sector, national economy and regions. Subsequent to the National Innovation Strategy there as Government's Communication to the Parliament, in which a call for a broad-based and

systemic approach as well as demand- and user-orientation in innovation policy were emphasized. These two strategic delineations highlight the increasing role of information and knowledge in the society as well as stresses the urgency in addressing the challenges induced by globalization.

Impact assessment: The National Innovation Strategy provides guidelines for a broadly understood innovation policy including non-technological considerations. Remarkable in the strategy process is that it was prepared openly, being based on some 800 views contributed by experts, stakeholders and citizens through workshops and the Internet.

Main documents: <http://www.tem.fi/?l=en&s=2411>

Demand and user-driven innovation

Content and objectives: As part of the implementation of Finland's national innovation strategy, the Ministry of Employment and the Economy has outlined a policy framework laying down the key elements of a demand and user-driven innovation policy. Based on this policy framework, the Ministry will develop an action plan for such a policy in 2010. User-driven innovation makes use of information on customers, user communities and customer companies. It engages users as active participants in innovation activity. The key aspect of user-driven innovation is information on user needs, whether these needs are already identified, still hidden or potentially emerging. The aim of user-driven innovation policy is to raise market actors' awareness of new innovation tools. It also seeks to create a social infrastructure supporting user-driven innovation while removing obstacles to and boosting incentives for innovation activity.

Impact assessment: This document introduces a new focus on demand and user driven innovation activities. Especially the latter involves a strong focus on new forms of participation as a tool of product development, information gathering and even policy formulation.

Main documents: <http://www.tem.fi/index.phtml?l=en&s=2382>

The new Universities Act

Content and objectives: The new Universities Act will further extend the autonomy of universities by giving them an independent legal personality, either as public corporations or as foundations under private law. At the same time, the universities' management and decision-making system will be reformed. Its purpose is for universities to be better able to: 1) react to changes in the operational environment; 2) diversify their funding base; 3) compete for international research funding; 4) cooperate with foreign universities and research institutes; 5) allocate resources to top-level research and their strategic focus areas; 6) ensure the quality and effectiveness of their research and teaching; 7) strengthen their role within the system of innovation.

Impact assessment: The new universities act strengthens the role of external actors in university management, and underlines universities role in their third task related to the innovation system.

Main documents:

<http://www.minedu.fi/OPM/Koulutus/koulutuspolitiikka/Hankkeet/>

http://www.minedu.fi/OPM/Koulutus/koulutuspolitiikka/Hankkeet/Yliopistolaitoksen_uudistaminen/index.html?lang=en

Strategic Centres for Science, Technology and Innovation (SHOK)

Content and objectives: SHOKs are new public-private partnerships for speeding up innovation processes. Their main goal is to thoroughly renew industry clusters and to create radical innovations. Centres develop and apply new methods for cooperation, co-creation and interaction. International cooperation also plays a key role in the operation of the Strategic Centres. In Strategic Centres, companies and research units work in close cooperation, carrying out research that has been jointly defined in the strategic research agenda of each Centre. The research aims to meet the needs of Finnish industry and society within a five-to-ten-year period.

Impact assessment: SHOKs are a prominent example of new innovation policy instruments supporting close co-operation between business and research institutes.

Main documents:

http://www.tekes.fi/en/community/StrategicCentresforScience_0Technology0and0Innovation/360/StrategicCentresforScience_0Technology0and0Innovation/1296

<http://www.aka.fi/en-gb/A/Science-in-society/Strategic-Centres-for-Science-Technology-and-Innovation/>

The renewal of funding and structures of Finnish sectoral research

Content and objectives: The Advisory Board for Sectoral Research was established in 2007 to coordinate the overall steering of state sectoral research. Its action is geared to support and strengthen performance management of sectoral research in each field of administration. The aim is to improve ministries' commissioning know-how, enhance the targeting of sectoral research and step up the utilisation of research over administrative boundaries. The mandate of the Advisory Board for Sectoral Research is to: 1) steer and develop sectoral research and its utilisation within government, step up inter-ministerial and cross-sectoral cooperation on sectoral research and take initiative in matters relating to them; 2) coordinate sectoral research programmes involving several ministries; 3) put forward proposals for the implementation of sectoral research programmes and monitor their implementation as determined by the ministries and other funding organisations and report on the implementation to the government; 4) put forward proposals for structural development of sectoral research, and; 5) carry out other tasks assigned by the government or the Ministry of Education.

Impact assessment: The sectoral research reform aims at developing a more systematic structure for sectoral research providing knowledge base for evidence based policies by the government and ministries.

Main documents: <http://www.minedu.fi/OPM/Tiede/setu/index.html?lang=en>

The creation of Aalto university

Content and objectives: The Aalto University was created from the merger of three Finnish universities: The Helsinki School of Economics, Helsinki University of Technology and The University of Art and Design Helsinki. The three schools of the Aalto University are all leading and renowned institutions in their respective fields and in their own right. The combination of three universities opens up new possibilities for strong multi-disciplinary education and research. The new university's goal is to be one of the leading institutions in the world in terms of research and education in its own specialized disciplines.

Impact assessment: The foundation of Aalto university is among the biggest one-shot investments to applied research; the new funding basis strengthens business actors role in university research.

Main documents: <http://www.aalto.fi/en/about/>

Public availability of research data project

Content and objectives: Publicly produced and financed research data is an important national resource, which is currently only partly accessible. Making research data and the e-services that leverage such data easily and widely accessible would increase the effectiveness of research and innovation, make new findings possible and enable the use of data in unforeseen ways and in new contexts. The objective requires tangible technical, cultural, attitudinal and structural changes. Current challenges are related to scattered data storage and organization, legislation, practices, terms of data use, payments and services that support the use of the data.

Impact assessment: The report suggests amending current legislation to better support the role of research and innovation in the information society and ensure that data is available legally.

Main documents: http://www.csc.fi/english/csc/news/news/tuta_raportti_en

SADE-project, eServices and eDemocracy project

Content and objectives: The projects aim is to promote eServices in public administration. A targeted core proposal for 2015 in eServices and eAdministration is that Finland has a networked public administration where administrative services are available on multiple channels and are effortlessly accessible so that they lend support to citizens in every life situation and to businesses throughout their life cycle.

Impact assessment: SADE-project will be an important tool in accelerating the usage of eServices in various context of public administration. Potentially it can contribute to innovative means and pilot case studies advancing eDemocracy in Finland.

Main documents: http://www.vm.fi/vm/fi/05_hankkeet/023_sade/index.jsp

http://www.vm.fi/vm/en/04_publications_and_documents/01_publications/04_public_management/20100107SADeSe/name.jsp

Government foresight report on climate and energy policy

Content and objectives: The Government adopted in October 2009 the Foresight Report on Long-term Climate and Energy Policy. Setting a target to reduce Finland's greenhouse gas emissions by at least 80 per cent from the 1990 level by 2050 as part of an international effort, the report marks out the road to a low-carbon Finland in 2050.

Impact assessment: The long-term climate and energy policy strategy represents an openly prepared strategy process including extensive stakeholder consultations; the process was also supported by several reports from different research field indicating broad understanding of evidence based policy making.

Main documents:

<http://www.valtioneuvosto.fi/toiminta/tulevaisuusselonteko/en.jsp>

1.3 National challenges, opportunities and trajectories

Continuing consensus about science and innovations as a strategy for national success and prosperity is a strong historical trajectory in Finland. It means that public investments in research and education have traditionally been seen as the key drivers for success of the Finnish economy and society, and the current economic down turn has nothing but reiterated this viewpoint. The fact that there prevails a rather harmonious view about the best of science and best of Finnish society and its citizens, is reflected in several ways that the place of science in society is constructed through public policies and debates.

The consensus thinking is highly reflected in the wide-ranging composition of the Research and Innovation Council, government's highest science policy organ. Included in the council are prime minister and seven other ministers, representatives of business companies, public research funding agencies, public and private research organizations, representatives of trade unions, and policy makers.

In terms of the Finnish public, recent and past science barometers indicate that the level of public knowledge about scientific facts is high, and Finns have high trust in the institutions of science and technology. According to the Science Barometer 2010 that is the third study in a series launched in 2001, the majority (57%) of respondents say they are interested in science, research and technology. Although the percentage is high, it is nevertheless lower than in the previous study (decline from 63% to 57%).

Recent OECE Pisa reports have given excellent results for Finnish students, thus indicating about the high level of education at Finnish schools. The finding of an international survey, published in Science, that 30% of Finns do not be-

lieve in the evolution theory (while 65% do so), has caused some uneasiness, but not more severe reconsiderations about the status of educational system.

Debates about technoscientific issues such as nanotechnology or GMOs have been modest (the latter, however, with some peaking in the beginning of 2000). More regularly, conflicts related to the scientific issues have mainly been managed within the research system.

The role of public education and knowledge in Finnish culture and economy have historically been central, and they continue to be so in the present situation. A characteristic of the Finnish SiS culture is a strong focus on innovations, and Finland is the home of the Millennium Technology Prize (<http://www.millenniumprize.fi/>), which is world's biggest technology prize, awarded by Technology Academy Finland, an independent fund established by Finnish industry and the Finnish state in partnership. The aims of the prize are to promote technological research and innovation that have a positive impact on the quality of life, alleviate fears towards technological change and encourage discussion between technology specialists and societal decision makers. While critical public debate about the appropriate place of science in society has been somewhat limited, researchers from different fields are regularly in a pivotal role in contributing to on-going debates, for example, about climate change, the state of the Baltic sea, nuclear energy and waste management, economic crises, renewal of the pensions system, and the historical events during the Finnish civil war in 1918 and the Second World War. No radical changes in the nature of science in society communication have taken place during the last 5 years.

Priority setting, governance and use of science in policy-making

This section focuses on the different actors involved in shaping the relationship between science and society and the processes for governing science at national level. This includes government initiatives, institutions and organizations as well as public involvement and policy-making processes at all levels related to science and technology.

Different themes will be elaborated in the Finnish context, including ethics in science and technology, equality, diversity and inclusiveness in scientific institutions, and ethnic or social minority groups in scientific contexts and careers. Moreover, this section will highlight actors in science communication and technology assessment. Public involvement in science and technology decision-making as well as the use of science in policy-making at the national level will be covered in this section.

2.1 Public engagement in priority setting

2.1.1 Formalised procedures for citizen involvement

The Finnish science and technology policy culture can be characterized as exclusive-corporatist (Pelkonen, 2008)* in the sense that central stakeholder and interest groups, in addition to scientific advisors and state officials, are regularly consulted in the regulatory processes, while citizens as interested individuals or as members of civil society organizations do not have such a formalized role.

Priority setting, for example in the preparation of new research programmes, for the Academy of Finland and Tekes – the Finnish Funding Agency for Technology and Innovations, often takes place through committees and working groups. The Academy of Finland also occasionally organizes “exploratory workshops”, in which researchers and stakeholders in the field are invited to discuss future research needs. The scope of stakeholders contributing to priority setting changes case-by-case, and it can cover students in the preparation of policies for higher education or some occupational groups (e.g. teachers or pro-

* Pelkonen, A. (2008). The Finnish Competition State and Entrepreneurial Policies in the Helsinki Region. University of Helsinki, Department of Sociology, Research Reports No. 254.

professionals in the field of medicine) if the issue is relevant to them. Increasing usage of spokes-persons in making clarifications and pre-studies for regulatory preparation is a current tendency in Finland, which may have a narrowing impact on the breadth of stakeholder consultation. The strength of using spokes-persons is that they can involve an “independent” and “neutral” perspective on the issues under preparation. The downside is that key actors and stakeholders do not necessarily feel ownership with the reforms proposed by outside experts.

In assessment activities, broadly understood, there are certain established and more recent procedures that formalize consultation mechanisms. The Finnish Law of Environmental Impact Assessment (1994) purposes to strengthen public availability of regulatory information and public participation in environmental decision-making. In practice, the law has been implemented for example in environmental impact assessment of nuclear waste disposal sites, in which context consultation of local inhabitants have been organized. The requirement of broad-scale stakeholder consultation was also recently established in the “Rule of Regulatory Preparation” by the Ministry of Justice (2010), a rule that is applicable in a wider context of regulatory processes.

While stakeholder consultation is a regular practice in Finland, more sporadic is consultation of citizens through citizen panels or other participatory processes.

2.1.2 Citizen- or CSO-initiated activities with political impact

Characteristic to the Finnish culture of public decision making is that regulatory information is publicly available on the Internet or it can be directly requested from the relevant authority by any citizen. The corporatist tradition of policy making provides possibilities for specific (to the case) organizations to contribute to the preparation of decisions (through comments to proposals and participation in working groups). Together these two channels of impact ensure a continuous but limited way of impacting public decisions on s&t issues.

Perhaps due to the consensus seeking style of Finnish decision making, striking examples of citizen or CSO-initiated activities with a strong impact on political decisions are difficult to find. However, the recently emerged think tank organizations, such as Demos Helsinki (www.demos.fi), have contributed to the political agenda setting by raising new issues for public debates, e.g. politics of happiness or the end of consumerism. The recently occurred public controversies about political pressures on evidence based decision making (see section 1.1) have caused some legal actions, as for instance the Parliamentary Ombudsman investigating whether the freedom of speech by some energy researchers at the VTT Technical Research Centre of Finland has been illegally restricted by their employer, as claimed publicly by the researchers themselves. The way in which these discussions will continue and how public agencies react on them will be indicative of a cultural transition that may be occurring.

2.1.3 Importance of upstream engagement

Upstream engagement of ordinary citizens has not been strong in Finland. However, the Finnish s&t policy system allows room for bottom-up initiatives from the research community, and the Finnish system encourages close interaction between academic, governmental and business actors.

The recent increase of the number and role of think tank organizations in contributing to s&t issues has broadened the scope of viewpoints in related policy making.

Doctoral schools, in particular The Finnish Post-Graduate School in Science, Technology and Innovation Studies (TITEKO) and The Finnish National Graduate School in Environmental Social Science (YHTYMÄ) have in recent years produced a considerable number of experts with an understanding about science in society issues, and now many of them are working with issues of scientific decision making.

The National Consumer Research Centre (NCRC), with a staff about 40 persons, has been active in conducting and studying participatory approaches that have been applied with several issues of policy making and product development. CIVISTI project, in which a new participatory tool for upstream engagement of citizens (contributing to EU framework programme planning) is being developed in a project coordinated by the Danish Teknologirådet, is an example of NCRC's recent activities. World Wide Views on Global warming involving 100 citizens in 38 countries across the globe is another recent example of citizens participation project conducted at the NCRC.

2.2 Public - private interaction

Cooperation between the research and business sectors is strong in Finland. Since the end of 1970s the Finnish research system has been reformed through several initiatives strengthening the orientation of the system toward producing innovations and supporting co-operation between business firms and research organisations.

Research programmes of Academy of Finland and Tekes (the Finnish Funding Agency for Technology and Innovations) are among the central mechanisms supporting research co-operation between academic and business partners.

The Law of inventions in higher educational institutes, enforced in 2006, is an example of more recent measures stimulating innovation activities within publicly funded research institutes, by allowing rights for patents to individual researchers. Innovation centres with innovation advisers have been established to support patenting and commercialization of inventions.

The New Universities Act (2009) is another recent example that aims at strengthening the role of universities in the innovation system. The act includes reforms in the universities' management and decision-making systems, for example by requiring representation of societal stakeholders in its administration.

The establishment of Aalto university, in 2010, as the biggest national interdisciplinary university in the field of applied sciences, was a big investment for innovation oriented research. External funding by business organisations is an important part of its financial basis.

Some other initiatives supporting business-research collaboration are business parks that have been established in the proximity of universities and public research institutes; measures supporting research mobility of researchers; and increasing alumnus activity networking ex university students (now professionals in different sectors of the society) with current university students and professionals.

2.3 Use of science in policy making

2.3.1 Formal procedures and advisory bodies involved

There are several mechanisms and procedures for science and evidence based policy making in Finland:

- Committees and working groups including scientists and other experts are regularly being used in governmental and ministerial decision processes.
- Sectoral research institutes (e.g. the National Institute of Health and Welfare, and Finnish Environment Institute SYKE) are organised under various ministries, with responsibilities of providing policy relevant knowledge about topical issues under regulatory processing.
- Foresight activities have been extensive in Finland, in recent decades, and high numbers of foresight and scenario reports have been produced to the government, ministries, as well as other regional and local customers. Among the challenges of foresight, however, is that the activities have not been coordinated thus creating challenges for effective deployment of their results.
- In the parliamentary context, there is the Society of Researchers and Parliamentarians, Tutkas, with a long tradition in supporting dialogue between members of the parliament and researchers. The Parliamentary Committee for the Futures and The Research and Innovation Council are also among the committees most oriented at scientific and technological issues and their critical evaluation.

Almost in all policy areas it is easy to find examples of processes applying scientific knowledge in different steps of the policy cycle.

2.3.2 Trends at national level

Availability of scientific knowledge is easier through internet, and benchmarking to international studies and evaluations has increased. While previously

OECD based evaluations had a particular role in international benchmarking, now other relevant studies are more abundantly available.

In the national policy arena the emergence of think tanks has been a special phenomenon. Previously there was a “vacuum” of think tank type organisations, but now several of them have been established. This can partly be explained by the pressures of the public sector to cut its costs by outsourcing activities. The new think tanks also provide new labour markets for highly educated knowledge workers.

Difficult to measure, but possible to see is the increasing usage of different types of forums, workshops, and panels that are formed to discuss and process some specific regulatory issues. Often the work of such forums is supported by internet based tools sharing and documenting the results and process descriptions.

2.4 Key actors

2.4.1 Ethics in science and technology

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
National Advisory Board on Ethics (http://www.tenk.fi/eng/function.htm)	Ethics councils / committees	Public	The board is nominated by the Ministry of Education and Culture. The board makes proposals and issues statements to governmental authorities on legislative and other matters concerning research ethics.
The National Advisory Board on Health Care Ethics (http://www.etene.fi/en)	Ethics councils / committees	Public	The board discusses general principles in ethical issues in the field of social welfare and health care and concerning the status of patients and clients as well as to publish recommendations on them.
Board for Gene Technology (http://www.geenitekniikanautakunta.fi/en)	Ethics councils / committees	Public	The board is the competent authority in Finland regarding the use of genetically modified organisms in accordance with the Gene Technology Act.
Advisory Board on Biotechnology (http://www.btnk.fi/en/btnk.html)	Ethics councils / committees	Public	The board is a consultative body of experts in issues related to bio- and gene technology appointed by the Government.
University of Turku, Department of Philosophy (http://www.soc.utu.fi/laitokset/filosofia/en/index.html)	Universities and other higher education institutions	Public	Research in ethics of science and technology.
University of Helsinki, Department of Social and Moral Philosophy (http://www.helsinki.fi/socia)	Universities and other higher education institutions	Public	Research in ethics of science and technology.

landmoralphilosophy/			
The Finnish Association of Graduate Engineers TEK is a professional and labour market organisation (http://www.tek.fi/index.php?id=11)	Trade union	Mixed	Support reflection in the field of engineering ethics and ethics of technology.
Technology for Life (http://tep.kaapeli.fi/english/)	Other civil society organisations	Mixed	Support reflection in the field of engineering ethics and ethics of technology.

2.4.2 Equality, diversity and inclusiveness in scientific institutions and in educational systems

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
The Academy of Finland, http://www.aka.fi/en-gb/A/Science-in-society/The-research-career/Equality/	Universities and other higher education institutions	Public	Issues statements about equality in scientific research activities and institutions.
Universities, e.g. University of Helsinki (http://www.helsinki.fi/tasavarvo/english/index.html)	Universities and other higher education institutions	Public	Universities have their own equal opportunity programmes.
Ministry of Education (http://www.minedu.fi/OPM/Tarkennettu_haku/Tarkennettu_haku?lang=en)	Government and ministries	Public	Ministries have their own equality programmes.

2.4.3 Science communication

Name of actor and web-link if possible	Type of actor	Sector	Domestic or foreign	Brief supplementary description
Universities, e.g. University of Helsinki, Department of Communication, http://www.valt.helsinki.fi/comm/fi/english/	Universities and other higher education institutions	Public	Domestic	Media studies on science communication.
The Committee for public information, http://www.tjnk.fi/en/	Other advisory bodies	Public	Domestic	Follows progress in research, arts and technology, and awards grants, makes a shortlist of candidates for the State Award for Public Information.
Federation of Finnish Learned societies, http://www.tsv.fi/engl/	Other advisory bodies	Public	Domestic	Issues statements, launches initiatives and makes recommendations relating to academic research.
Finland's national public	Media	Mixed	Domestic	Has several programmes devoted to

service broadcasting company YLE, http://avoinyyle.fi/www/en/index.php				communication of science and technology.
NGOs like Demos Helsinki, http://www.demos.fi/demos_hki	Professional SiS practitioners (communicators, consultancies)	Mixed	Domestic	A think tank actively contributing to on-going debates about technological and social innovations in society.
Key individuals such as Leena Palotie (deceased), Esko Valtaoja, Linus Torvalds, Kari Enquist, Helena Ranta, Pekka Himanen and Ilkka Hanski	Key individuals	Private	Domestic	Prominent scientists popularizing their research in the media

2.4.4 Technology assessment

Name of actor and web-link if possible	Type of actor	Sector	Brief supplementary description
Sitra, the Finnish Innovation Fund http://www.sitra.fi/en/	Independent fund	Public	Supports discussion on on-going scientific and technological challenges facing Finland.
Parliamentary Committee for the future, http://web.eduskunta.fi/Resourcource.phx/parliament/committees/future.htm	Government and ministries	Public	Responsible for technology assessment for the Parliament.
Aalto University, Systems Analysis laboratory, http://www.sal.hut.fi/	Universities and other higher education institutions	Public	Provide university courses related to technology assessment; involved in TA activities
National Consumer Research Centre, www.ncrc.fi	Governmental research organisation	Public	Practices participatory and constructive technology assessment
Tekes – the Finnish Funding Agency for Technology and Innovation, www.tekes.fi	Public research and innovation funding agency	Public	Has an evaluation unit exercising technology assessment activities in a broad sense.
Think tanks, for example Demos Helsinki, http://www.demos.fi/english	Professional SiS practitioners (communicators, consultancies)	Private	

Research related to Science in Society

This section is concerned with research activities related to science in society. The purpose is to describe the efforts in Finland, including the SIS research being undertaken and how SIS issues are embedded in mainstream research. The section will also elaborate on how SIS research is being funded and what the scale of funding is.

A distinction is made between *SIS research* on the one hand and *SIS issues embedded in mainstream research* on the other. SIS research are the studies particularly targeting public understanding of science, governance of science, science policy, science education, science communication, ethics in science and technology, the reciprocal relations of science and culture, young people and science and similar issues. However, SIS issues may also be present in other research activities, in which the main objectives of research are *not* SIS related issues, but in which SIS practices or perspectives are embedded. This could include studies within the natural sciences which apply innovative or extensive use of public involvement in the research process, new ways of communicating research results, ambitious efforts to bring ethical and societal issues into research, innovative ways of involving a variety of stakeholders (politicians, NGOs, industry, social scientists etc.). Such efforts are referred to as SIS issues embedded in mainstream research.

The section provides examples of Finnish research projects and funding programmes related to SIS, cross-cutting and emerging themes of SIS. Moreover, the role of SIS in evaluative practices of research programmes and institutions are elaborated.

It should be noted that this section is concerned with mapping research activities which are **not fully EU funded**. The subsections are concerned with national as well as international research efforts, but not activities funded solely under the European framework programs. Such research activities are already well-documented elsewhere.

3.1 Research on Science in Society

3.1.1 Research projects

Name of project (incl. web-link or contact information)	Local, national, or cross-country	Institutions participating	Budget and funding source	Field of study
PROACT research programme 2001-2005; http://proact.ktm.fi/index.phtml?lang=3	National	Tekes and Ministry of Trade and Industry funding; several universities and research institutes	EUR 10 million	Governance of science
Helsinki Institute of Science and Technology, http://www.valt.helsinki.fi/blogs/hist/henkilosto.htm	National	Ministry of Education and Culture; several universities	+ 200 000 EUR per year	Governance of science Social studies of science
Tasti Unit for Science, Technology and Innovation Studies	National	Ministry of Education and Culture; University of Tampere	+ 250 000 EUR per year	Governance of science Innovation studies
Audio Visual Science Audiences (AVSA)	EU-wide	University of Helsinki + internat. partners	500 000 EUR	Science communication
Citizen Visions on Science, Technology and Innovation; www.civisti.org	EU-wide	National Consumer research + internat. partners	900 000 EUR (total)	Public understanding of science Governance of science
The Finnish Post-Graduate School in Science, Technology and Innovation Studies , http://www.valt.helsinki.fi/blogs/titeko/	National	Academy of Finland funding; several universities	86 000 EUR (2010-2013)	Governance of science Science studies, innovation studies
Science Barometer, http://www.aka.fi/en-gb/A/Academy-of-Finland/The-Academy/Academy-news/The-third-Science-Barometer-of-all-time/	National	Finnish Society for Scientific Information	?	Public understanding of science

3.1.2 Trends in research

The Finnish research on SiS issues is distributed between various universities and research institutes. Thinking about the availability of research funding, innovation related studies are certainly in a privileged position. Therefore themes such as deployment of research results in decision making; creative and innovative environments; science issues are important at the moment.

However, there are also some other themes that are topical. Governance of science and technology is an issues approached from several thematic points of views, including issues of participatory/deliberative governance of science and

technology; regulation of risks and uncertainties; more generally, studies in the area of science and technology studies, supported e.g. by the Post graduate school focusing on these issues.

Ethics of science and science communication are themes that have been maintained on the research agenda by a couple of established universities or university departments (mainly, University of Helsinki and University of Turku).

In terms of scientific and technological substances, there have been, in recent years some studies focused on biotechnology issues, while nanotechnology is an example of an emerging research theme (e.g. projects at the Committee of the Futures within the Parliament; University of Helsinki; Demos Helsinki).

3.2 Main stream research embedding Science in Society issues

3.2.1 Trends and good examples

There are multiple ways in which SiS issues are embedded in Finnish research activities. Most importantly, the research programmes by Tekes and the Academy of Finland are one of the key instruments for research funding of research that is considered scientifically and socially relevant. Some of the research programmes, such as FICCA, the research programme on climate change (since 2010) and ESGEMO, the research programme on Environmental, Societal and

Health Effects of Genetically Modified Organisms (2003–2007) focus directly on SiS issues. Further, in many of the research programmes by Tekes and Academy of Finland, there is typically a small ELSA (Ethical, Legal and Social Aspects) component delivering funding. However, ethics is most often the dominant frame of ELSA studies, and more attention in Finland would be needed to indicate that the whole palette of SiS themes could be included under the ELSA component.

SiS issues are being educated at Finnish doctoral (or post graduate) schools that systematically teach extra academic or “transferable” skills to new research students. The education of transferable skills is based on an understanding of “research life cycle”, in which different skills are required in its different steps, including e.g. understanding of business and IPR issues; science communication; ethical aspects of technology development; funding issues; working life skills; writing to different audiences etc.

The third task of universities in taking part in societal debates and contributing to the Finnish economy and innovation system is a matter of increasing focus, since researchers are encouraged to take part in topical debates, and in some research institutions the evaluation of performance by the research personnel includes categories for non-academic activities.

3.3 Funding for research on Science in Society

Name of program and link to 'call'	Primary funding agency	Total budget in € per year	total amount in € applied for per year	Average no. of applicants per year	Average no. of successful applicants per year
Helsinki Institute of Science and Technology Studies (HIST)	Other public sector funding agencies	200 000			
Network for Higher Education and Innovation Research (http://blogs.helsinki.fi/heineblog-en/)	Other public sector funding agencies	400 000			
Academy of Finland, financing for The Finnish Post-Graduate School in Science, Technology and Innovation Studies (http://www.valt.helsinki.fi/blogs/titeko/)	National research council	160 000			
Ministry of Education and Culture, supports societies and research organizations conducting social scientific research that supports policy making.	Other governmental funding agency (incl. Ministries)	500 000			

Research funding on SiS issues is highly distributed. Examples of research schemes under universities are networks such as Helsinki Institute of Science and Technology Studies (HIST) and Network for Higher Education and Innovation research. Academy of Finland finances SiS research through the Finnish Post-Graduate School in Science, Technology and Innovation Studies. A less well-known source of funding is the Ministry of Education and Culture funding of 500 000 per annum to research supporting societies and research organizations conducting social scientific research that supports policy making. Other funding is available through TaSTI Unit for Science, Technology and Innovation Studies at the University of Tampere (<http://www.uta.fi/laitokset/yti/English/tasti/index.html>), and also through the Tekes – the Finnish Funding Agency for Technology and Innovation that has funds research related to technoscientific issues, however, dominantly with a focus on innovation and business potential issues. (The Academy of Finland had a research programme on research policy between 1996-1999, but more recently it has not targeted any programmes related to SiS-issues.) Sitra, the Finnish Innovation Fund is also interested in funding some science and technology related themes that it emphasizes in its activities (such as energy and climate research and development which are topical at the moment).

3.4 Importance of Science in Society issues as evaluative elements for national research programmes and academic institutions

The focus on dissemination of research results is an item of evaluation in all research programmes. In practice, the evaluations can estimate how much publications are devoted to different types of audiences, and how researchers have been networked with other national and international actors.

In addition to evaluation of publications, dissemination of research and networking, however, evaluation of other SiS issues has been more sporadic. For example, in the evaluation reports researchers can be asked to report and reflect on their different ways of communicating with different types of audiences and stakeholder groups.

Evaluation of scientific performance has strengthened during recent years, and the trend is that even the “third task” activities of research institutions become under systematic evaluation, even though currently there is not yet an established set of indicators that would be used in such evaluations. The number of patents clearly is in some cases a relevant indicator of SiS impact of research. Management of research data, its further usage and open access of research data and results will be among emerging research evaluation themes.

Activities related to Science in Society

This section relates to SIS as a field encompassing a variety of different activities particularly concerned with public communication of science and technology in Finland. The issues addressed are formats for science communication and the actors involved in science communication as well as trends at the national level.

4.1 National science communication trends

Media coverage of scientific and technological issues is rather extensive in television, radio and in Helsingin Sanomat, which is the biggest national daily newspaper. There are several professional actors and associations that focus on different aspects of communicating issues of science, technology and innovation. Overall, Finns are ranking high in terms of public knowledge about scientific issues, which can be an indicator that communication has been successful in popularizing science.

What is lacking in Finland are actors within the scientific community, such as Royal Society in the UK, who takes stands in topical matters and provokes critical discussion among Finnish academia and media. In terms of communicating about scientific matters, the emphasis has been in focusing on the innovation potentials and increasing attraction to science, while the focus on the analysis of risks and raising critical questions has been less active (this is well reflected in the parliamentary technology assessment, which in many European countries focused on societal risk analysis, whereas in Finland the focus is more on innovation potential detection).

Communication about scientific issues is widespread also in the sense that Finns are highly educated, and a high number of doctors are produced each year (about 1500 per year, which is a high number compared to the population of 5 million); therefore it is natural that the highly educated citizens do not stop using a “scientific approach” in their professional communications, but more likely, use it also in their daily communications. It is also probable that the readership of science magazines, science focused tv and radio programmes, and internet forums is increased that way.

Citizens’ access to information is excellent. Finnish public administration and many other actors such as universities, NGOs, business organizations and other types of organizations have been active in disseminating information about their activities and research results. There also prevails an informal culture of

administration in Finland, which means that it is easy to ask information directly from relevant authorities.

The historically long and strong tradition of enlightenment and reliance on authorities has to some extent blocked more directly participatory approaches to science society communications, but the emerging new think tanks as well as some research units have been active in changing the landscape in this respect.

More and more discussion is spread, uncontrolled, on the Internet, causing new ways and feedback loops in the communication from the researchers and policy makers to stakeholder groups and more general audiences. For example, the case of Swine flu indicated that an Internet site established by an NGO reached more visitors than the main information site established by the relevant national health authority. The uncontrolled quality of information on the internet causes new challenges for the authorities to manage, in new ways, discussions about the fate of science in society.

4.1.1 Good practises

The Science Forum is a biennial science festival. It's an event of great diversity under a chosen main theme. It gathers leading scholars from various fields to introduce their branch of scholarship and the latest research results to a wide audience. The Forum has expanded into a five-day festival packed with some 300 appearances by researchers from different parts of the country. The Science Forum includes various activities, such as lectures, exhibitions, debates, discussions, planetarium shows, Youth Day, Science Night, books, and prizes. All fields of research from the humanities and natural sciences to art and technology are represented. The event is free of charge, and organized by the Federation of Finnish Learned Societies, the Finnish Academies of Sciences and Letters and the Finnish Cultural Foundation¹. The event has an established role as an exhibition of the national research community in the fields of natural and social sciences as well as humanities. The event provides multiple interactive methods and it has attracted much audience. It has plans to expand nationwide in the near future, and then some of the contents could reproduced in other university cities.

YLE Teema is a themed Cultural Channel (by the Finnish national broadcasting company YLE), devoted to documentaries, movies and music. The channels provides a very broad cultural perspective from punk rock to opera, from 1960s spaghetti westerns to classic old movies, from pop to classical art; and it is for science fans of every age group and encourages viewers to learn. It offers friends of history a whole range of Finnish and international history documentaries. An interesting dimension of the Teema channel is that it opens Finnish TV archives to the requests of the audience. Teema's most profound and distinctive characteristic is its emphasis on themes, and it packages its programming into in-depth thematic seasons (for further information see, <http://teema.yle.fi/kanavaesittely/English>).

¹ <http://www.tieteenpaivat.fi/engl/index.html>

Heureka – the Finnish Science Centre, offers changing exhibitions, a planetarium, and various public events (like lectures) about science and technology. The fundamental social goal of the Centre is to increase the appeal of natural sciences and technology among children and young people, thereby enriching the knowledge base of our society. The Learning Centre produces, develops and tests demonstrations, experiments and exercises related to different fields of science. In 2008, the Learning Centre served the needs of approximately 63,000 students and 4,000 teachers. Heureka serves also larger audiences (750 000 annual visitors) as it aims to advance public understanding of science and to develop new methods for science learning.
<http://www.heureka.fi/portal/englanti/>

4.2 Science journalism and training activities

Journalist associations with a focus on science communication include:

- Finnish Association of Science Editors and Journalists, which is a national organization of professionals involved in science communications. The purpose of the organization is to promote science communication activities, as well as the exchange of science information not only within the scientific community, but also in society as a whole (<http://www.fasej.fi/>).
- The Finnish Society for Innovation Journalism acts as a link between people interested in innovations, the way they are covered in the media, and how better stories could be written about them (<http://finjo.fi/blog/in-english/>).
- Association of Environmental journalists, acts as a link between environmental journalists and reporters in TV, radio and magazines (<http://www.ymparistotoimittajat.fi/yhdistys.html>).
- Association of Medical Editors connects journalists and editors who follow medical science, health care and health politics. (<http://www.laaketieteentoimittajat.fi/index.php?lang=fi&&o=0>)

Science journalism educations takes place through e.g., following channels:

- Masters degree programme on science communication at the University of Oulu
- Minor study programme on science communication at the University of Helsinki, Department of Communication

Major newspapers, especially Helsingin Sanomat have internal training of journalistic skills

Training activities related to science in society skills include:

- Doctoral schools, established in 1995 in Finland, providing more systemic educations of extra academic skills or “transferable skills” to new research students is an important channel within universities.
- Programmes of science communication at the universities of Oulu and Helsinki. In the latter, for example, there is co-operation with science centre Heureka, YLE, the National Broadcasting Company, and Helsingin Sanomat, the biggest national newspaper, which provides an opportunity for students to practice science journalistic writing and arrangement of science exhibitions.

Research programmes funded by the Academy of Finland and Tekes – the Finnish Funding Agency for Technology and Innovations, provide more sporadic education about science communication of e.g. matters related to gene technology.

4.3 Young people and science education in schools

4.3.1 Skills and interest

LUMA project by The Finnish National Board of Education (FNBE) under the Ministry of Education has been on-going since 1996. LUMA is a national level programme supporting vocational and comprehensive education of mathematics and natural sciences. The project provides additional materials, web-based educational services and connections between schools, university personnel, policy makers and industrial organisations. Attracting girls in the issues of mathematics and natural sciences is among the special targets of the project.

Currently the national LUMA Centre (LU stands for ‘luonnontietee’, natural science in Finnish, and MA for mathematics) is coordinated by the Faculty of Science of the University of Helsinki to bring schools, universities and industries together. The aim of the LUMA Centre is to promote the learning, studying and teaching of natural science, mathematics, computer science and technology on all levels, (<http://www.helsinki.fi/luma/english/index.shtml>).

VIKSU Launched in 1998, Viksu the Academy of Finland Annual Science Competition for Senior Secondary Students, is the biggest event of its kind in the country. The aim of the competition is to inspire greater enthusiasm among students in science and in research careers and at the same time to create a stronger basis for a sustained interest in doing science².

The Viksu concept is following (see the web link). Entries in the form of essays around 20 pages in length are invited from individuals or a maximum of two partners. The essays may be from any discipline and cover any subject. Each entry is reviewed by two experts, including for instance researchers involved in Academy-funded research projects. On this basis some 20-30 entries are short-

² <http://www2.aka.fi/index.asp?id=DA7E39BAA1664A1DA75AC4B70EF733F3>

listed for a panel review which decides the winners. The panel of experts consists of professors from different disciplines.

Prizes are awarded to the ten best entries: the prize money totals around EUR 16,000. In addition, the best-performing schools in the competition get to share prize money worth EUR 8,000. Several Finnish universities grant automatic entry for winning students, provided that their essay is directly related to the field of study for which they have applied and that the student has completed the matriculation examination.

The Academy's Annual Science Competition for Senior Secondary Students has now been arranged 12 times. Each year some 120-160 entries are received. Girls have been more active in submitting entries than boys, but the top prizes have been evenly distributed. Entries are received from all disciplines. Last years the best entries have included essays from the fields of biology, physics, history, literature, computer science and philosophy.

Tutki-Kokeile-Kehitä (Research-Experiment-Develop) is an Finnish annual science and technology competition for young people from 6 to 20 years old. Entering projects are on fields of biology, environment, chemistry, geography, life sciences, mathematics, medicine, physics or technology. A project can be an invention, a study, a computer program or a result of a design process. The criteria used to assess the projects are: originality of the idea, practicality of the solution and creativity in the approach to the problem; quality of written report; the age of contestants. Among all entries, the best 15 projects will be selected for an exhibition. The contestants responsible for these selected projects will be invited to Science Centre Heureka to present their work to the members of the jury and the jury members will have an opportunity to interview the contestants. Ideas of a technical nature can in some cases be protected by various means such as patents, copyright and registration of designs or trademarks. If a project seems to have any features worth protecting, the organizers will help the contestants to start the protecting process. The total sum of monetary prizes is 10 000 euro. (<http://www.tek.fi/index.php?id=1157>)

4.3.2 Societal issues and critical reflection

Supporting critical debate and reflection *per se* about science society issues is not among Finnish strengths. However, there are interesting new approaches such as ILMARI, a climate change and energy information project that aims to enlighten primary, secondary and high school students and teachers about climate change and their role as human beings; young people shall be involved in conversations and receive support in their projects. During five years, there have been over 800 school visits all over Finland. 30 000 students have heard about their issues and there has been training for two hundred volunteer climate envoys. According to the evaluation report in spring 2005, school visits have been successful in strengthening young people's awareness. 38% of secondary school students and 18% of middle school students have become more aware about the climate situation. Half of the students considered themselves to be informed enough to work against the climate change. Since then, experiences

from this project have been used in other school visiting projects due to the successful concept of Ilmari and how NGOs work together (see, <http://www.energychange.info/casestudies/159-case-study-5-ilmari>).

The Ilmari project has been financed by the Ministry of Trade and Industry under the Finnish Climate Change Communications Programme 2002-2007. Ilmari project has won several energy and climate change communication prizes. Currently the school envoy activity developed within the Ilmari project continues as an established part of the activity of the organizations that were involved in the Ilmari project. According to an evaluation of the Ilmari project, one of its main success factors was “peer group communication”, in other words, school pupils have found it easy to listen to the messages from young NGO members who worked as the climate envoys.

The Finnish science centre Heureka <http://www.heureka.fi/portal/> has also been active in organising exhibitions and other activities (e.g. science buses, science circus) focused at school pupils and students and discussing about topical societal issues such as climate change.

4.4 Communication activities

Means	Much less	Less	Same	More	Much more
Science TV programmes				X	
Radio			X		
Newspapers			X		
Magazines			X		
Large scale festivals				X	
Web-based communication					X
Museums, exhibitions			X		
Citizen- or CSO initiatives				X	

4.4.1 TV programmes

Programme title (and web-link if possible)	Frequency	Duration (in minutes)	Target audience	Themes covered
Prisma studio (Prisma studio) http://ohjelmat.yle.fi/prisma/etusivu	Weekly	30	General public	Magazine-style programm with the latest discoveries of natural sciences and related innovations.
Prisma document (Prisma dokumentti) http://ohjelmat.yle.fi/prisma/etusivu	Weekly	45–50	General public	Presents international natural science and technology documents.
Curlicue sciences (Krökta rummet / Tieteen koukerot)	Weekly	-	General public	Swedish speaking magazine-style programm with the latest discoveries of natural sciences and related innovations. Concentrates

				on Finnish and Nordic research.
Cutting edge (Veitsen terällä)	Weekly	30	General public	Magazine-style programme about the latest developments on medical science.
Various history documents http://teema.yle.fi/ohjelmat/historia	Weekly	Varies	General public	Public tv-channel YLE Teema presents continuously various documents that are based on historical research, both Finnish and international.
Teacher.tv (Opettaja.tv) http://opettajatv.yle.fi/	Daily	-	Teachers, pupils	Various programmes and other web-based material for teachers.
MythBusters http://www.mtv3.fi/myytinmurtajat/	Weekly	60	General public	Reality-tv-style programme from Discovery channel, where popular myth are tested scientifically
Dr. Kiminkinen (Tohtori Kiminkinen) http://tv1.yle.fi/ohjelmat/asia/tohtori-kiminkinen	Weekly	25	General public	The doctor of a rural Health Care Center meets patients and discusses about health issues with them
Acute (Akuutti) http://ohjelmat.yle.fi/akuutti/etusivu	Weekly	40	General public	Information about health and diseases, doctor answering questions of audience.

4.4.2 Radio programmes

Programme title (and web-link if possible)	Frequency	Duration (in minutes)	Target audience	Themes covered
Absolute truth (Absoluuttinen totuus) http://ylex.yle.fi/radio/ohjelmat/ylex-tanaan/absoluuttinen-totuus	Weekly	5–10	General public	Scientific foundations behind everyday phenomena. Mainly based on physics.
Stars of the month (Kuukauden tähtitaivas) http://www.yleradio1.fi/tiede/kuukaudentahtitaivas/	Monthly	15–20	General public	Stars (astronomy).
Radiator (Radiattori) http://www.yleradio1.fi/tiede/radiattori/	Weekly	30	General public	Natural sciences, physics, chemistry, astronomy, bio-sciences and technology.
Receptor (Reseptori) http://www.yleradio1.fi/tiede/reseptori-terveydeksi/	Weekly	25	General public	Medical science and health knowledge.
Handbook of technology (Tekniikan käsikirja) http://www.yleradio1.fi/tiede/teknikankasikirja/	Weekly	15	General public	Peaks into the world of technology.
Nature evening (Luontoilta) http://lotta.yle.fi/ijulkaisu.nsf/sivut/luontoilta	Monthly	120	General public	Phone-in programme, where experts answer the questions of audience about nature.
Biology-related programs with	Weekly	25	General	Reportage, discussion, interviews

varying titles http://www.yleradio1.fi/tiede/biologia/			public	related to biology.
Language minute (Kieliminuutti) http://www.yleradio1.fi/tiede/kieliminuutti/	Weekly	1	General public	Radio-columns about the aspects of Finnish language.
History-related programs with varying titles http://www.yleradio1.fi/tiede/historiasarjoja/	Weekly	40	General public	Reportage, discussion, interviews related to history.
Epoque (Epookka) http://www.yleradio1.fi/kulttuuri/epookki/	Monthly	55	General public	Discussion about cultural history with scholars.
World history (Maaailman historia) http://www.yleradio1.fi/tiede/maailmanhistoria/	Weekly	5	General public	Radio-columns about key people and events in history.

4.4.3 Popular science articles in newspapers and magazines

Newspaper science sections:

Title of newspaper (and web-link if possible)	Frequency of science section	No. of print runs	Target audience	Themes covered
Helsingin Sanomat http://www.hs.fi/	Weekly	410 000	General public	Varies
Aamulehti http://www.aamulehti.fi/	Weekly	140 000	General public	Varies
Keskisuomalainen http://www.ksm1.fi/	Monthly	73 000	General public	Varies

Popular science magazines:

Title (and web-link if possible)	Frequency	No. of print runs	Target audience	Themes covered
Tiede http://www.tiede.fi/	Monthly	60 000	General public	Natural sciences
Tieteen Kuvalehti http://tieku.fi/	Monthly	47 000	General public	Natural sciences and technology
Tähdet ja avaruus http://www.avaruus.fi/aikakausslehti/uusin-lehti.html	Less than monthly	17 000	General public	Astronomy and space technology
Historia http://www.historialehti.fi/hst/	Monthly	15 000	General public	World history
Yliopisto http://www.helsinki.fi/ajankohtaista/yliopistolehti/	Monthly	20 000	General public	Popularized research from the University of Helsinki
Several universities' and polytechnics' publications targeted at local	Varies	Varies	General public	Varies

readers				
Tieteessä tapahtuu http://www.tieteessatapahtuu.fi/english/index.html	Less than monthly	6 200	General public / Science policy makers	Articles on current research questions, new publications and book reviews

4.4.4 Festivals, science weeks, etc.

Activity title (and web-link if possible)	Activity type	Organiser	Frequency	Number of participants (approx)	Venue (city/region/national)	Short description
Science Days (Tieteen päivät)	Science-days	Tieteellisten seurain valtuuskunta (Federation of Finnish Learned Societies), Tiedeakatemiajaosto (Delegation of the Finnish Academies of Science and Letters) and Suomen Kulttuurirahasto (The Finnish Cultural Foundation).	Bien-nial	15 000	Greater Helsinki region	Multi-discipline event, where research give popularized and general lectures about science and research.
Open University (Avoin yliopisto)	Open univer-sity	Universities.	Con-tinu-ously	70 000	All around the coun-try.	Almost all the 20 Finnish universities have their own open university teaching.
Technology Days (Tekniikan päivät)	Science-days	Technology acad-emy	Bien-nial	??	Espoo	Technology and natural sciences for general public
Science fair in Turku (Turun tiedemessut)	Science fair	The Academy of Finland	Bien-nial	23 000	Turku	Presents cultural studies and social sciences
SciFest	Science festival	Joensuun Tiedeseura ry (Sci-ence Society of Joensuu) and Itä-Suomen yliopisto (University of East-ern Finland)	Once a year	6 000 – 8 000	Joensuu	Targeted for students, school children, teachers, parents from all around the world.

4.4.5 National portals, blogs

Activity title (and web-link)	Activity type	Number of users (if known)	Themes covered	Short description
Research.fi	Portal	-	Science and technology	Finnish science and technology information service contains key statistics and other data on Finnish science and technology, as well as links for more in-depth information: statistical and other publications, documents and databases.
HighTech Finland (www.htf.fi)	Web-page	-	Technology	Presents the latest achievements and developments in Finnish technology.
GM-foorumi (gmfoorumi.fi)	Web-based discussion forum	-	GM-technology	Open, democratic and unbiased forum for discussion about GM-technology.
Xpert Search (www.etsixpertti.fi)	Web-service	-	Finnish research	Xpert Search is a free tool for the Finnish and international media, helping journalists to find the right researcher in Finland for expert commentary, for background information or to find a new angle on the subject at hand. The service is maintained by the Academy of Finland together with all Finnish universities and research institutes.
Tietysti.fi (http://www.tietysti.fi/T/)	Web-page	-	Popular research for larger audiences	Stories about research, its impacts, successes and failures and highest achievements.
A propos (http://www.aka.fi/Apropos/)	Web-journal	-	Research	Web-journal of the Academy of Finland
Ilmastotieto http://ilmastotieto.wordpress.com/	Blog	-	Climate science	Discussion about climate, based on scientific research.
Bioteknologia info http://www.bioteknologia.info/	Web-page	-	Biotechnology	Information and news about biotechnology

4.4.6 Science museums and centres

Activity title (and web-link if possible)	Activity type	Number of visitors/year	Themes covered	Venue (city)	Short description
Heureka http://www.heureka.fi/portaal/englanti/	Science centre	750 000	Science and technology	Vantaa	Interactive exhibitions about many fields of science, planetarium, public events
Museum of technology (Tekniikan museo) http://www.tekniikanmuseo.fi/	Museum	16 000	Technology	Helsinki	Varying exhibitions about the history of technology
Discovery Museum of Tampere http://www.tiedemuseo.com/	Science centre	-	Natural sciences	Tampere	Informational experience centre for kids of all age and their parents. Experimenting new things and learning through playing.
Museum of Natural Sciences (Luonnontieteellinen museo) http://www.fmnh.helsinki.fi/	Museum	470 000	The collections include botanical, zoological, geological and paleontological specimens from all over the world.	Helsinki	An independent research institution functioning under the University of Helsinki
The Maritime Museum of Finland (Suomen merimuseo) http://www.nba.fi/en/mmf	Museum	70 000	Objects, photographs, archival material and literature pertaining to seafaring and boating	Kotka	National maritime museum operating under the National Board of Antiquities whose role is to preserve and interpret the history of Finnish seafaring.
Zoological museum of the University of Oulu (Oulun yliopiston eläinmuseo) http://cc.oulu.fi/~zoolmus/	Museum	36 000	Focuses on northern nature and species.	Oulu	The main tasks are education and research.
Geological museum of the University of Oulu (Oulun yliopiston geologisen museon) http://cc.oulu.fi/~geomuwww/index.html	Museum	7 600	Geological and mineral collections are mainly from Fennoscandia	Oulu	Collecting, conserving and maintaining geological samples for university and general educational purposes and for research
Botanic Museum of the University of Oulu (Oulun yliopiston kasvimuseo) http://cc.oulu.fi/~herboulu/	Museum	300	Botanic specimen.	Oulu	The number of specimens is about 0.5 million. One of the main missions is to maintain and augment the collections in its priority areas.
Terranova: Kvarken Nature Centre (Merenkurkun luontokeskus)	Science centre	18 000	Special natural features of the unique Kvarken	Vaasa	Tells the story of the last ice age and the following land rise in the Kvarken. Also

http://terranoa.vaasa.fi/?id=1&lang=1			area.		provides information about tourism and special interest activities in this unique landscape.
Tampere Mineral Museum (Tampereen kivimuseo) http://www.tampere.fi/kivimuseo/inenglish.php	Museum	17 000	Rocks and minerals	Tampere	The 7000 objects of the exhibition have been collected from 70 countries.
Kuopio Natural History Museum (Kuopion luonnontieteellinen museo) http://www.kuopionluonnontieteellinen-museo.fi/en_index.html	Museum	30 000	Natural science museum	Kuopio	The Kuopio Natural History Museum oversees the activities of the natural science museum and serves as the natural history museum of Kuopio University.

4.4.7 Citizen- or Civil society organisations initiatives

Activity title (and web-link if possible)	Activity type	Frequency	Number of participants	Short description
Tiedekahvila http://www.tietysti.fi/fi/T/Tiedetapahtumat/Tiedekahvilat/	Science cafe	-		Science cafes all around Finland, where researchers tell about their work and results (by the Academy of Finland).
Tietobreikit http://www.tietysti.fi/fi/T/Tiedetapahtumat/Tietobreikit/	Science cafe	-		Science cafe for young people (by the Academy of Finland).
Demos Helsinki www.demos.fi/english	Think tank	-		An independent think tank, whose aim is to develop democracy to suit the needs and capabilities of the people of the 21st century, based on extensive, high-quality research.
e2 http://www.e2.fi/en/ajatuspaja-e2/	Think tank	-		Focuses on democracy, sustainable development, equality and society's capacity for change.
Suomen Toivo –ajatuspaja www.toivoajatuspaja.fi/	Think tank	-		Promotes responsible market economy through research, education and publication.
Vasemmistofoorumi www.vasemmistofoorumi.fi	Think tank	-		The Left Forum is building a collaborative network sharing a leftist set of values and extending from political parties to universities, research institutions and expert organizations.
Kalevi Sorsa -säätiö http://www.sorsafoundation.fi/tpl_site_01.asp?lang=3&sua=1&q=y&s=14	Think tank	-		An independent and open social democratic think tank. The Foundation's aim is to encourage public debate that promotes equality and democracy as well as pro-

				duce its own research and publications.
Vihreä Sivistysliitto http://www.visili.fi/english .htm	Think tank	-		Promotes a sustainable lifestyle.

The Fukushima accident

5.1 Media coverage and public debate

The media³ has been very active in following the Fukushima disaster and completing a picture of the situation and risks emerging in different areas: Radiation in food and water, after-shocks, progression of the hazard classification, impacts on everyday life in Fukushima and Tokyo, spent fuel, risk taking by the workers in the Fukushima site, increasing evacuation zone around Fukushima, safety of other nuclear plants in Japan, risk over airplanes crashing nuclear power plants, typhoons in Japan etc. The main focus in the media has been on technical aspects of the accident: Number of victims, levels of radiation, impacts on humans, progression of the rescue operation etc. Comparisons to the Tshernobyl accident have been typical.

Characteristic to the Finnish media debate is that the Radiation and Nuclear Safety Authority (STUK) has been in a highly central role in understanding, explaining and interpreting the situation. STUK has commented on the risk issues from the Finnish point of view, and maintained a most positive view of the level of safety of nuclear energy. STUK has regularly compared the safety of Japanese nuclear facilities to our national facilities and concluded that in Finnish nuclear facilities there are better safety systems (e.g. cooling systems, provision of electricity in case of an emergency), and unlike Japan, Finland has since a long time resolved the problem of nuclear waste disposal. Fukushima accident has also raised the issue of the safety levels in the Russian Sosnovy Bor nuclear power plants (both aging and the one under construction). Regarding the latter, STUK estimated that the safety standard is of good quality, but the thickness of the safety cover of the plant is not good enough to protect the plant against an airplane crash. Other experts from the National Technical Research Center and universities have largely echoed the positive evaluation of our national safety standards.

Some weeks from the disaster began discussions about more political issues. In this respect the most important background was the parliamentary elections in April 2011. It was speculated whether the green party or other parties would take Fukushima as a political theme of discussion – including fears of populis-

³ In order to study the media debate in Finland a study of 252 articles (between March 12 and September 29) in Helsingin Sanomat, a major nationwide newspaper with a readership of around one million Finnish speaking citizens, was conducted.

tic policies among the pro nuclear camp. The green party actually adopted a strong anti-nuclear policy, but they lost the elections (with a possible explanation that other parties have also adopted green values, and the green party has adopted several other policies that didn't prove very popular). The green party has also demanded that the government wouldn't grant new permission to construct more nuclear reactors in Finland. It also demanded an amendment to the current restricted financial compensations by nuclear power companies. The social democratic party of Finland also revised its nuclear policies more negative toward building more reactors in the near future. Nuclear energy didn't finally become a big theme in the elections.

In the pro-nuclear camp, Finnish companies committed to build additional nuclear power plants have confirmed to continue construction despite the Fukushima accident. Only one company, in the field of food supplies, claimed that it would reconsider its position. Ministry of Employment and the Economy also argued that the German way (of renouncing from nuclear energy) could not be possible in Finland, due to the high demand and rising costs of energy.

More generally, it has been reflected that Europe is becoming divided in how countries perceive nuclear energy: the German speaking Europe is against, while France, Sweden, the UK and Finland are pro. There have also been speculations about the future of nuclear power in the world, and the danger that the demand of fossil fuels will increase.

In addition to the technical and political themes, an interesting aspect of the Finnish media attention is that there have been several articles, in which the everyday experiences and feelings of the local inhabitants in the catastrophe area have been reported through on-site interviews: stories about despair, uncertainties, rumors, survival and gradual reconstruction. In one article, the everyday life and feelings of Finnish citizens in Japan during and after the disaster were reported, based on Facebook and SMS messages.

Some of the media coverage linked the Fukushima crisis to climate change. This was done mostly in opinion pieces (e.g. letters to the editor and editorials). The majority of those opinions were pro nuclear power, and expressed by editors or engineers. It was argued, that nuclear power is necessary in mitigating climate change, because it produces much less greenhouse gas emissions than most other forms of energy (fossil fuels), and because new renewable energy sources are still only marginal. They admitted that nuclear power has its risks, but they are still smaller and more controllable than the risks of climate change. Therefore, it was argued, we should not renounce nuclear power, but improve its safety.

The only opinions expressed against nuclear power came from the Finnish Greenpeace and the foreign minister of Germany. In the previous opinion, it was argued that nuclear power should not be put up as an only solution – and alternative – to climate change, because greenhouse gas emissions can be reduced also by energy saving and renewable energy sources. It was argued, that even if nuclear power in the world was doubled, it would reduce only 3–4 % of the global greenhouse gas emissions. The foreign minister of Germany (Guido

Westerwelle) presented in his text the reasons and consequences of Germany's decision to shut down all nuclear power plants. He stated the plans to increase the use of renewable energy sources, to replace the nuclear technology gradually. In the 2 actual news articles linking Fukushima and climate change, statements from the IEA and a director of Fortum (an energy company that is a stakeholder in Finnish nuclear power plants) were cited. They both emphasized the importance of nuclear power in mitigating the climate change.

In terms of governance issues, STUK has been concerned on how to receive accurate and up-to-date information of the situation in Japan. It mentioned internet based sources and journals as the most feasible source of information and criticized Japanese information sources as slow and being of poor quality. A concern of the culture of policy making in Japan, being based on a hierarchic culture of policy making and on the fear of losing one's face, and favoring hiding of information has been criticized in several articles. National safety authorities are arguing that the safety cultures are better in Europe and worse in Japan and the USA. On the other hand, also STUK has suffered from problems in their own public communication, while their internet pages collapsed due to an unexpectedly high number of visitors. They were also criticized, in an opinion piece, of giving a misleading picture of the levels and risks of radiation in Fukushima.

An interesting format of science communication is a 24 Q&A about nuclear disaster, in which questions were collected from readers, and the newspaper organized a panel of ten high level experts to respond. One special event was when a fake figure, circulated in Finnish newspapers, about the prospected direction of nuclear emission, proved to be based on incorrect information; STUK finally revealed the fake and the figure was withdrawn from publicity.

5.2 Levels and modes of public involvement

In addition to the governmental authorities experts, other active participants in the debated include environmental NGOs (calling for better safety evaluation and monitoring, closing down nuclear energy and criticizing the Finnish policy of building nuclear energy delaying investments in renewable energy), citizens (mostly engineers or retired nuclear safety and environmental experts – one of them calling for attention to the problem of “pack ice” in forthcoming nuclear power plants in Northern Finland), Finnish municipal managers (especially from Northern Finland, where new nuclear reactors are being planned; they have commented on the situation by confirming their willingness to continue planning and building nuclear power plants in their municipalities by arguing that in Finland there won't be such earth quakes that could endanger the safety of the plants).

Other actors are a “panel of intellectuals” (composed by the newspaper Helsingin Sanomat, HS) that voted about the desirability of nuclear power in Finland: 72% were against building more reactors. An opinion poll was conducted by HS indicating that 48% of Finnish citizens are for and 48% against building more nuclear power plants in Finland. 85% of the population believes that the

level of safety in Finnish nuclear power plants is high. There was also an anti-nuclear demonstration involving 300 citizens in the Northern city of Kemi.

A Finnish author specialized in eco-thrillers, Risto Isomäki, has paid attention to the possibility that interests towards “fourth generation nuclear power plants” will increase, with the consequence that such reactors will use such type of nuclear fuel that is more easily convertible to nuclear weapons. Isomäki became famous, since in his last book he predicted a Fukushima kind nuclear disaster.

While most of the actors have expressed their worries over the Japanese situation, a representative of the Red Cross Finland reminded that Japan is a rich country and have good opportunities to handle the situation. A well-known ex member of parliament called for more nuclear power since it is necessary for combating climate change, and less dangerous than risks involved with climate change and fossil fuels.

5.3 Political responses and scientific advice

There have not really been concrete political responses to the Fukushima accident. Shortly after the problems in Fukushima started, the Ministry of Employment and the Economy (MEE) gave directions for STUK, the Radiation and Nuclear Safety Authority Finland, to carry out a study on how Finnish Nuclear Power Plants have prepared against loss of electric power supply and extreme natural phenomena in order to ensure nuclear safety. On May 16th STUK gave a briefing to MEE about the Finnish Nuclear Power Plants and their readiness to encounter extreme nature phenomena. The briefing stated that new threats or deficiencies that would require immediate safety improvements have not occurred. Nevertheless, the Power Plants should continue to improve their readiness to encounter extreme nature phenomena, the briefing argued.

STUK is also compiling a national stress test for nuclear power plants, in response to the European Councils decision (March 25th 2011) to evaluate the safety of all nuclear power plants within EU. The National Progress Report (based largely on the above-mentioned MEE briefing) was published September 15th, and the Final Report will be published before the end of 2011. In its very latest report, STUK found several flaws in the current safety systems in Finnish nuclear power plants.