ERA Toolkit: Applications of Wild Cards and Weak Signals to the Grand Challenges & Thematic Priorities of the European Research Area

iKnow*

ERA Toolkit

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iKNOW ERA Toolkit

Applications of Wild Cards and Weak Signals to the Grand Challenges & Thematic Priorities of the European Research Area

Funded by Directorate-General for Research and Innovation
Socio-economic Sciences and Humanities

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Foreword

iKnow is a European Commission funded project under the Socio-economic Sciences and Humanities (SSH) theme. The iKnow Consortium was built around two complementary teams: a research team led by the University of Manchester with the support of FFRC in Finland, TC AS in Czech Republic, Z_punkt in Germany, RTC North in UK, ICTAF in Israel; and a technology development team also led by the University of Manchester with the support of Cyber Fox in Czech Republic and Mindcom in Finland. This report is a clear example of the symbiosis between the R and TD Teams. iKnow was deliberately configured and project managed in this way in order to make the most of web-based technologies to support communications with a wide range of experts and stakeholders.

When we started iKnow in November 2008, the EC was positioning "Grand Challenges" at the core of the European research and innovation agenda. The report of the European Research Area Expert Group on "Challenging Europe's Research: Rationales for the European Research Area (ERA)" offered some guidance as to how should Europe respond to Grand Challenges. It provided three basic criteria for their selection: (1) relevance for European level action, (2) clear research dimension and (3) feasibility as an economic and social investment. iKnow has combined these guiding principles, with insights gleaned from a wide range of participatory activities, in order to embed Grand Challenges in the project's conceptual, methodological and technological agendas. This ERA Toolkit on "Applications of wild cards and weak signals to the grand challenges and thematic priorities of the European Research Area" aims to be a source of reference and inspiration, for all those involved with the European Research Area. The Grand Challenges agenda requires actions on a substantial scale in order to truly make a difference to the fortunes of its economies and the lives of its citizens. Hopefully, this Toolkit can also contribute to overcoming what the ERA Expert Group saw as a lack of drive, direction and imagination among Europe's political actors to achieve these ends. We have developed an interactive version of the ERA Toolkit (online at http://toolkit.iknowfutures.eu) which is interconnected with the foresight and horizon scanning tools and knowledge base of the iKnow project.

Researching "surprises" (i.e. Wild Cards) and "seeds of change" (i.e. Weak Signals) is an extremely challenging endeavour but a fascinating and rewarding one. During the project the general reception of the innovation, foresight and horizon scanning communities was extremely encouraging and this is reflected in the high levels of participation, which, at the time of writing is around 1,500 members (15 October 2011) and counting 75 countries. As a result of the enthusiasm we were overwhelmed with a huge amount of original contributions relevant to science, technology and innovation policy in Europe and around the world. The issues revealed in this report and contained within the iKnow community database were generated with the support of several face-to-face and web-based activities.

Overall, the study of Wild Cards and Weak Signals (WI-WE) helped us gain knowledge and understanding about emerging and future issues in a wide range of thematic areas. The areas include: Health; Agro-food and biotechnology; Information and Communication Technologies; Nanotechnology and materials; Energy; Environment; Transport; Social Sciences and Humanities; Space; and Security. Given the scope and limited resources of the project (particularly time) we needed to be selective; 120 WI-WE issues were rigorously analysed but this is just a small sample (10%) of the total number of issues generated by the project.

Nevertheless this number was sufficient to demonstrate effectively the many product and process benefits of iKnow. The product benefits of the research agenda are represented with over a thousand codified outputs that are useful for follow-up action. These include: 1000+ WI-WE issues and the various project reports with policy and research recommendations. In addition, the TD agenda generated seven technological outputs or systems, namely: iBank (to characterise and store WI-WE issues), iScan (to monitor and search WI-WE issues), iDelphi (to assess and prioritise WI-WE issues), iLibrary (to share innovation and FHS documents), iCommunity (to engage and network innovation and FHS people), iNews (to feature key contributions to iKnow's FHS systems) and iOracle (to map FHS practices, players and outcomes – in collaboration with the mapping activities of the European Foresight Platform). With regards to the process benefits, iKnow has provided a forum for the involvement and participation of 1,000+ stakeholders from Europe, 200+ from South America, 100+ from Asia, 100+ from North America, and 10+ from Oceania and Africa. The participatory and strategic dialogue space provided by the iKnow system has aided communication, networking and collaboration across organisational and geographical boundaries that would otherwise have been very difficult to bridge.

We hope that this report will encourage you to join the iKnow Community and we invite you to contribute to and make use of the resources available online at: **www.iknowfutures.eu.**

Rafael Popper
Director of iKnow

Introduction to iKnow

iKnow is one of six Blue Sky foresight research projects funded by the European Commission's Seventh Framework Programme for Research and Technology Development (FP7) under the Socio-economic Sciences and Humanities (SSH) theme. The project is aimed at interconnecting **Knowledge on issues and developments potentially shaking or shaping the future of science, technology and innovation (STI) in Europe and the world.**

There is a general consensus that the kinds of issues addressed by iKnow have often remained out of the "policy radar" and so far have received little attention in forward-looking activities: the identification and analysis of Wild Cards and Weak Signals (WI-WE) and their effects on European and national science, technology and innovation (STI) policy. Wild Cards are the kind of issues that can potentially shake our future; Weak Signals relate to issues that are currently shaping it.

- **Wild Cards** are high impact and low perceived probability events (e.g. unexpected systems failures or sudden transformations resulting from breakthrough or incremental innovations). Wild Cards are often presented as negative events, such as the 2001 terrorist attacks in the United States or the 2011 Fukushima nuclear disaster. However, they can also be positive such as the discovery of penicillin by Fleming and, more recently, the "failed treatment" for angina that led to unexpected side effects of the now worldwide-commercialised Viagra.
- **Weak Signals** are ambiguous events, often referred to as "seeds of change", providing advance intelligence or "hints" about potentially important futures, including Wild Cards, challenges and opportunities. Weak Signals lie in the eye of the beholder and are generally influenced by the mental frameworks and subjective interpretations of individuals with limited information about emerging trends, developments or issues in a particular time and context. Their "weakness" is directly proportional to levels of uncertainty about their interpretations, importance and implications in the short-medium-to-long-term. Thus, Weak Signals are unclear observables warning us about the possibility of future "game changing" events.

Overall, iKnow has two **interconnected objectives:**

- To develop and pilot conceptual and methodological frameworks to identify and analyse Wild Cards and Weak Signals (WI-WE); and
- To assess the implications and impact of selected WI-WE on, science, technology and innovation (STI) and key dimensions of the European Research Area (ERA).

To do so, iKnow has used Foresight and Horizon Scanning (FHS) approaches to support the research and technology development (RTD) agenda associated with each objective.

- **Foresight** is a systematic, participatory, prospective and policy-oriented process which, with the support of environmental and horizon scanning approaches, is aimed to actively engage key stakeholders into a wide range of activities "anticipating, recommending and transforming" (ART) "technological, economic, environmental, political, social and ethical" (TEEPSE) futures.
- **Horizon Scanning** (HS) is a structured and continuous activity aimed to "monitor, analyse and position" (MAP) "frontier issues" that are relevant for policy, research and strategic agendas. The types of issues mapped by HS include new/emerging: trends, policies, practices, stakeholders, services, products, technologies, behaviours, attitudes, "surprises" (Wild Cards) and "seeds of change" (Weak Signals).

This ERA Toolkit report provides a unique application of wild cards and weak signals approaches to the study of grand challenges and thematic research priorities of the European Union. Part I addresses 21 grand challenges in terms of their European relevance; their research foresight and Wild approach; and their potential research outcomes and benefits. A selection of Wild Cards and Weak signals are also outlined in relation to each Grand Challenge. Part II offers an overview of 11 thematic research areas, as well as emerging themes and issues associated to them. These emerging issues have been identified by means of a systematic scanning of research projects funded in the first half of FP7. A selection of Wild Cards and Weak Signals related to each theme is also provided. Finally, Part III focuses on applications of the WI-WE resources in STI policy and the ERA agenda.

Introduction to the ERA Toolkit

Summary

Why an ERA Toolkit?

This 'ERA-Toolkit' report aims to be a source of reference and inspiration, for all those involved with the European Research Area.

We explore some of the applications of the iKnow methods and tools to the themes of the ERA.

We find from experience that such themes call for a 'Wild approach' to exploration and deliberation in foresight and horizon scanning. In particular, this is supported by the 'WI-WE' (Wild Card / Weak Signal) resources – a whole platform of innovation tools (iBank, iScan, iLibrary, iCommunity, iDelphi, iNews and iOracle), as created by the iKnow project.

The themes of the ERA range far and wide, across technological, economic, environmental, political, social and ethical (TEEPSE) issues. Here these are set out in the form of 21 'Grand Challenges'and 11 'Thematic Priorities'.

Each of these Grand Challenges and Thematic Priorities is a broad and deep agenda. Often they aim to address so-called 'wicked' problems: issues which lack fixed boundaries or definitions; without clear scientific methods or evidence; and lacking any consensus on policy responses. Each of these extends from multi-disciplinary scientific approaches, towards other parts of society; policy and governance; finance and business; media and culture; and community and civil society.

And for each of these Grand Challenges and Thematic Priorities, it is clear that conventional research methods are generally not enough. To explore a world which is increasingly complex, interconnected, multi-level and vulnerable, new approaches are needed, which can respond both to systemic risks and to creative opportunities. To explore such risks and opportunities is the essence of the Wild approach, as supported with the WI-WE resources.

This report provides a first outline of how this is taking shape on the ground.

It is designed to be used in parallel to the iKnow platform on http://www.iknowfutures.eu, and in particular to the Practical Guide to applications of Wild Cards and Weak Signals.

Aims and objectives of the report

We have produced this report mainly for research policy-makers, research project leaders and researchers in the ERA, who are grappling with these wider challenges, and who will benefit from working with the Wild approach and the WI-WE resources. The main aims of the report include:

- General guidance for the application of the Wild approach and the WI-WE resources, in the ERA context.
- Outline of key research agendas in each of the ERA Grand Challenges and Thematic Priorities, with directions for the Wild approach and WI-WE resources.
- Demonstration of examples of the WI-WE resources, with extracts from the iKnow project platform. For each Grand Challenge and Thematic Priority addressed in this report, there is a set of 5 Wild Cards and 5 Weak Signals. Full details for each, together with the results of iDelphi surveys, can be looked up on the **www.iknowfutures.eu**

Outline and audience of the report

- Following this Introduction, the ERA Toolkit is set out in three main parts:
- Part I: Grand Challenges and the applications of the Wild approach.
- Part II: Thematic Priorities and the applications of the Wild approach.
- Part III: Background and implications for ERA research.

We see several types of audience and user groups in the ERA context:

1. Research policy makers, programme coordinators and managers.
2. Research project proposers, investigators and researchers.
3. Research users and knowledge intermediaries.
4. Research disseminators and educators.
5. Research funding organisations.

Background

Research in a 21st century Europe

The ERA research themes are increasingly multi-level, trans-disciplinary, user or policy-oriented, pro-active and socially engaged. This reflects a Europe and a global context, which is increasingly complex and inter-dependent, volatile and vulnerable, driven by systemic risks and grasping for creative opportunities.

To respond to this, in the wider spirit of the knowledge society, requires not only new research themes, but new paradigms for research. We can sketch these with some leading questions:

- **Why** the research is done? There is generally increased awareness of higher purposes and inter-connections to society and policy. Even the most esoteric laboratory work cannot ignore its implications.
- **Who** the research is by and for? We find that beyond traditional scientific or policy communities, there is business and finance, media and culture, communities and civil society, and other non-European cultures and belief systems.
- **Which** themes and topics? Generally, enlarging the scope of science and technology towards its social, ethical and environmental issues, with possibly a re-balancing towards social science and humanities.
- **How** such research is done? Generally, the new modes of research will extend beyond disciplinary boundaries, towards the exploration of complex adaptive and emergent system effects. These often inter-connect between society, technology, economy, environment, political and value systems.

In particular the 'how' question raises the issue of complex interconnections, which in our experience are beyond the remit of traditional fields and methods. So this is the entry point for the 'Wild' approach, supported by 'WI-WE' resources and information. Broadly, this Wild approach aims to explore the frontiers of what is probable or plausible, by asking 'what-if' questions. It seeks to systematically gather Weak Signals, relate them to potential Wild Cards, and to explore creative opportunities which interconnect between different parts of the system.

Much of this agenda, has been emerging for several decades of multi-level Framework Programmes and the parallel strands of the ERA. Only now is there a prototype information system which enables it to be formalized and structured, with the iKnow innovation network and knowledge management technology platform.

What is the European Research Area?

"The European Research Area is composed of all research and development activities, programmes and policies in Europe which involve a transnational perspective. Together, they enable researchers, research institutions and businesses to increasingly circulate, compete and co-operate across borders. The aim is to give them access to a Europe-wide open space for knowledge and technologies, in which transnational synergies and complementarities are fully exploited.[1]

"ERA consists of activities, programmes and policies which are designed and operated at all levels: regional, national and European. There are a number of fully integrated European-level structures and programmes: the EU RTD Framework Programmes, including the current Seventh Framework Programme (2007-2013), related European agencies and undertakings, as well as a number of intergovernmental infrastructures and research organisations. Some have existed for more than 50 years, such as the European Organisation for Nuclear Research (CERN) and the research activities of the European Atomic Energy Community (Euratom). Many were created in the 1970s and 1980s, such as the European Space Agency (ESA) and the first Framework Programmes. But there are also important new organisations which are changing the ERA 'landscape': notably, the European Research Council, the Joint Technology Initiatives and the European Institute for Innovation and Technology."

Note: This section about ERA is based on information available at http://ec.europa.eu/research/era/

What are the ERA Grand Challenges?

The following is an extract from the Final Report of one of the seven Expert Groups set up by DG Research of the European Commission, in the context of the follow-up to the Green Paper "The European Research Area: New Perspectives" adopted by the Commission on 04 April 2007.

> "This report presents a rationale for a European Research Area that has a clear purpose which is meaningful to Europe's citizens and political leaders and relevant to its key actors. While there is a pressing need to improve the effectiveness of the public research system, the ultimate justification of the resources and commitment needed to achieve this lies in increasing the value of the contribution that public and private sector research makes, and is seen to make, to Europe's economic, social and environmental goals.
>
> The central means to achieve this is to engage the research system in Europe's response to a series of Grand Challenges, which depend upon research but which also involve actions to ensure innovation and the development of markets and/or public service environments. Challenges may be rooted in economic, social or scientific goals but share a need to demonstrate their relevance at the European level, their feasibility in terms of Europe's capability to engage with them, and a clear research dimension such that they gain the commitment of the research community and pull through the necessary improvements in its efficiency and effectiveness".[2]

How did the iKNOW identify the Grand Challenges?

The list of 21 Grand Challenges presented in the iKnow ERA Toolkit is the result of extensive discussions by iKnow partners with science, technology and innovation policy expertise.[3]

The Grand Challenges were developed and described in terms of their (1) relevance for Europe, (2) relevance for research and (3) feasibility as an economic or social investment. These criteria were identified, as above, by the ERA Expert Group on Challenging Europe's Research: Rationales.

The description of the Grand Challenges (GC) against the three selected criteria is an open process and continuing process. The list was then socialised and shared with more than 40 experts participating in the iKnow workshops in the United Kingdom and Czech Republic. During this socialisation process, the iKnow team opened the discussions in search of additional inputs to the existing list, or new ideas for possible further Grand Challenges.

[1] *Text from http://ec.europa.eu/research/era*

[2] *Georghiou, L., Cassingena Harper, J., Cooke, P., Cozzens, S., Dearing, A., Henriques, L., Langer, J., Laredo, P., Sanz Menendez, L., Weber, M. and Popper, R. (2008), Challenging Europe's Research: Rationales for the European Research Area (ERA). Report of the ERA Expert Group, European Commission, DG Research, EUR 23326 EN. Available at http://ec.europa.eu/research/era/pdf/eg7-era-rationales-final-report_en.pdf*

[3] *The Manchester Institute of Innovation Research of the University of Manchester (UK), Finland Futures Research Centre, Z_punkt (Germany), RTC North (UK), Technology Centre of the Academy of Sciences (Czech Republic) and the Interdisciplinary Centre for Technology Analysis and Forecasting (Israel).*

Application of the Wild approach to the Grand Challenges

We should make clear, it is not feasible to produce a totally comprehensive and evenly spread list of all possible research themes, to cover all possible fields of science and policy. But the 21 Grand Challenges presented here are a reasonable approximation and spread, which is weighted toward what is of most significance and relevance to ERA and the future of Europe.[4] This tends to steer towards the social science and policy end of the spectrum.

Again, we see the 'Wild approach' and the WI-WE resources as more or less indispensable for exploring and deliberating on such challenges. How else can we explore the vital interconnections between different areas? Or how do we ask the 'what-if' questions, which should be low probability according to the theory, but seem to happen very frequently.

To take one small example: The shut-down of EU airspace in 2010 caused by the Icelandic volcano Eyjafjallajökull, raised many questions about such interconnections. Here we saw a unique combination: a modest geological event, an advanced technology system, multi-lateral policy and regulation, and complex passenger logistics and liabilities, all facing fundamental questions about risk and safety. There was much rapid learning, so the next volcanic eruption might be not such a surprise. But it can be anticipated that the next Wild Card event will be equally surprising, in a quite different way.

For each Grand Challenge in this toolkit, there is a common pattern. Each involves interconnections between different areas: political and ethical debates and dilemmas; trends, transitions and paradigm shifts; and a research agenda which needs a creative and pro-active response. So on each of the pages for each Grand Challenge we follow a common format based on the questions above:

- Is it relevant to address at a European level? i.e. What is the scope of the European agenda?
- Is there a clear research dimension contribution? In this case we focus on the particular contribution of the Foresight and Wild approach.
- Is it feasible as an economic or social investment? Approximately, what kind of benefits, and what form might these take? This is interesting, because to follow through the logic of the Wild approach, suggests a wider than normal range of stakeholders, users, or beneficiaries of such research.

Outline of the 'Wild approach' and the 'WI-WE resources'

This ERA toolkit is about the application of the iKnow methods and tools to the agendas and themes of the ERA.

On the surface this is about the 'Wild Cards' and the 'Weak Signals' which help to track them. However it's not so much about individual wild cards (hundred of these have been mapped in the iKnow project) – it is more about the underlying thinking and practice, and resources which are needed. There are many ways to frame this: but the iKnow project has developed a particular set of concepts and definitions. Here are the key words which are used throughout this report:

- The general ideas and concepts, and general approach to foresight and knowledge systems, we call the 'Wild approach'.
- The resources and tools, and the particular types of information needed to do this, in many different applications, we call the 'WI-WE' resources, tools, etc (shorthand for 'Wild Card and Weak Signal'). This includes the actual items which can be found on the iKnow platform: and also the methods and tools which are outlined in the Practical Guide.

[4] *The Grand Challenges presented in Part I are a further elaboration of Popper, R. and Sveinsdottir, T. (2010) European Grand Challenges: 21 challenges of the 21st century, iKNOW working paper, available online at www.iknowfutures.eu.*

PART I
Grand Challenges

Water security and vulnerability

Scope of the European agenda

Even in the most urbanised and industrialised parts of Europe, water is still the basis of all life – but water is often found in the wrong place at the wrong time. Large areas of southern Europe see severe water shortages, which can only increase with the onset of climate change, while in central and northern Europe there is ever more frequent flooding. Water is a complex technical and management issue, which also brings huge economic and political impacts, with many risks of conflict and insecurity.

There is increasing vulnerability to sabotage, terrorism or technical collapse in water systems. Meanwhile, water storage and distribution systems can also be damaged by water-related events such as floods and storms. There is also the global dimension, in the imports to Europe of industrialised food and materials which are responsible indirectly for huge 'water footprint', often in countries where there is a lack of water for local people. Overall, the question of water requires a more sophisticated governance system based on the inter-dependency of suppliers and users, upstream and downstream, uncertainties and risks, and a complex political economy of infrastructure and regulation.

Research foresight & Wild approach

In parallel with the governance agenda, the research agenda for water brings many challenges. There are many positive achievements: on the technical side, the use of remote sensing, GIS and hydrological modelling; and on the policy side, the emergence of ecosystems services (ESS) and related markets and fiscal policies. However it is fair to say that with the impacts of climate change, economic growth, urbanisation and land use change, alongside the larger scale of infrastructure and water transfers, the political and economic (and socio-cultural) problems are now in the centre of the stage.

The role of wild card and weak signal (WI-WE) thinking is very significant in this. Recent flood and water pollution disasters (e.g. Czech, UK and Hungary) have shown how the technical hazards of flood or drought can be magnified many times by social factors, including (for example) denial and delay, corruption and profiteering, incompetence and dysfunction, or social exclusion and fragmentation. These and similar factors are not often covered by any civil engineering or hydrological models – rather, they can only be explored with a more open and creative approach, which actively looks for wild card possibilities, and scans for the weak signals which can anticipate them.

Research outcomes & benefits

Clearly, water security is a basic life support essential, on which other economic or social or political agendas can be built. But the challenges to this are growing, and so the economic or social progress is put at risk. Conventional research into water resources management has made great progress; but meanwhile there are growing policy dilemmas, market barriers and social-cultural gaps. The wild card and weak signal approach can bring powerful insights on these questions, with great benefits both for the water industries, and their users in wider society.

Wild Cards

A Killer Water Filter
One in six people lacks access to clean water worldwide, making diarrhoea illness the leading cause of death globally. Novel materials promise better access to clean water around the world. Researchers have recently developed mobile water filters that can be manufactured for less than a penny.

Tropical UK
As a result of continuous global warming, the UK and other northern countries become a preferred tourist destination as average summer temperatures rise to 25 degrees, and the climate becomes as warm as in the Caribbean.

Privatization of water ends
The UN decides that clean water is a basic right of all people: and the privatization of water supplies ends now. All countries commit to the decision.

"Gold mine" Agriculture
A sudden change in global weather leads to severe crop failure around the world. Investors and nations start to compete in global food exchange. The price of basic food suddenly becomes over twenty times higher. Finally, basic production becomes profitable, but the other side of the coin is a global famine.

Vegetarian Monday
To combat climate change and water vulnerability, the EU forbids the consumption of meat in all member states on Mondays. Thus, shops cannot offer meat, nor can restaurants serve meat dishes. Some Europeans accuse the EU of abusing civil rights and liberties.

Weak Signals

Crowdsourcing for Crisis Management
The Ushahidi project brings crowdsourcing to bear on some of the most desperate situations people face around the world. Its downloadable software allows users to submit eyewitness reports during a conflict or disaster; the collected reports are displayed on a map.

Communities take over governance for certain public services
As privatisation and deregulation is seen to create social and environmental problems, there is a new wave of local communities taking ownership and management of basic services such as water and energy.

Small robots for environmental monitoring and research
The robots in this research, as part of an Ambient Intelligence platform, integrate sensors for monitoring and tasks execution, communications, and databases technologies (including knowledge discovery in databases (KDD) capabilities and the data sent back to human.

Growing frequency of floods in Europe and the world
The number of flooding events in Europe and the world has doubled since 2005. Such events highlight the inter-dependency of stakeholders in a water catchment area, and the different organizations involved. They also highlight the role of human error and moral hazard in warning, prevention, adaptation, insurance and post-event strategy.

Increasing Migration Due To Climate Change
Extreme weather such as hurricanes, storm floods or droughts are already causing migration. There are also "creeping" aftermaths of climate change, such as desertification, the loss of coastal areas by flooding etc, that will cause migration on a much larger scale.

Energy security and vulnerability

Scope of the European agenda

Energy is the lifeblood of a modern society, yet its supply appears more vulnerable and less secure than ever before. The interface of energy production with climate emissions requires a rapid transition away from fossil fuels; but in reality, nuclear energy has been discredited by the Japanese accident of 2011, and many renewable energies are expensive and/or have major environmental impacts of their own. New sources of fossil fuels such as the Arctic are discovered, but with ever-rising environmental damage, while the 'peak oil' moment comes ever closer.

The current financial and political problems of the EU mean that urgent decisions on the energy and climate security are delayed. In this situation, national borders are giving way to European co-dependence. As the power and gas networks spread wider, so do the transnational utility firms and the finance which drives them. There is a counter-case for highly localised 'micro-generation' and district energy networks (heating and cooling), but this too depends for success on access to the grid, and common frameworks for regulation and pricing.

Research foresight & Wild approach

There is a topical and fast moving research agenda on energy security, which covers the whole picture – technology and innovation, markets and finance, infrastructure and urbanisation, environment and climate, consumption and social behaviour. Current research programmes are beginning to shift from a conventional technology-engineering focus, towards a more holistic view, and in some cases a critical perspective on the political economy dominance of certain technologies and transnational firms.

The role of wild cards and weak signals in supporting this research is crucial. First, the growing complexity and inter-dependency of the system means that conventional analysis cannot forecast many of the most challenging 'surprises' which in reality come up frequently (e.g. the Russia / Ukraine gas supply problem of 2009). Then, that there are global linkages far beyond the normal 'research boundary', which need a more creative and wide-ranging wild card approach (e.g. the effect of Fukushima on German and Italian energy policy). Third, that urgent policy decisions with long term and geo-political effects need the best possible testing at every level, following a structured and participative foresight / scenario / wild card approach (e.g. Saharan solar energy). And fourth, that there are important cross-linkages between policy goals / research agendas / technology innovations. Again these require testing through the wild card approach (e.g. large scale geo-engineering).

Research outcomes & benefits

The benefits of getting this agenda right are huge and topical. Increasing energy security while helping to stabilise the global climate is a major policy challenge. Adding in other environmental impacts and social issues to the complexities of supply chains and infrastructure regulation, while minimising costs to public finances and business growth, is an even greater challenge. As events show clearly, the need is urgent to anticipate unpleasant surprises, and to promote various positive breakthroughs, and the wild card / weak signal approach is the best way to do this.

Links
http://ec.europa.eu/energy/security/index_en.htm
http://www.europarl.europa.eu/news/expert/infopress_page/051-46613-019-01-04-909-20090119IPR46612-19-01-2009-2009-false/default_en.htm
http://cordis.europa.eu/search/index.cfm?fuseaction=news.document&N_RCN=31439
http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/703&type=HTML

Wild Cards

Space-based solar panels
A new technology enables affordable and efficient large space-based solar panels, which by beaming microwaves provide most of the world's energy needs. The energy is clean and renewable, the source is infinite.

Energy storage breakthrough
One problem with renewable energy sources is vulnerability, variability and low concentration. This requires back-up sources and makes the whole system costly and inefficient. However, a revolutionary breakthrough in storage of from renewable energy sources would fully compensate their variability.

Sudden global energy crisis
If the 1970s type oil crisis happened again, it would still show persisting dependence of the advanced economies on oil and gas; it would yet show the potential of a nuclear energy, as it is relatively insensitive on development of fossil fuels prices at the world market.

Small-scale nuclear power
Countries, cities, villages and corporations turn to micro scale nuclear reactors in order to meet the energy demands which are otherwise not reached. The world is running out of oil and it all the time faces more and more strict CO_2 emission limits. The final trigger is the new temporal cease of Russian energy supply to EU markets.

A Wandering, Plant-Eating Robot
This robot gobbles up wood chips, leaves and other "biomass" and generates electricity. In the future, autonomous robots can roam the planet in search of raw biomass to consume for power. The EATR Robot can change the global energy supply system, especially in remote locations.

Weak Signals

Electronic Body Heat
Small wearable electronic devices such as watches or portable MP3 players can be already powered by body heat. Thermoelectric materials might also be implemented in energy-intensive application fields, which are characterised by high losses of energy due to unused heat emissions, e.g in cars or industrial machines.

Willing to pay for wind energy
Despite the fact that one can only get standard energy from a socket in the wall, many people are willing to pay more to get wind energy.

No rules on nuclear security
Nowadays, no strict global rules on nuclear security are implemented. With a anticipated spread of nuclear energy to third world countries, the threat of a consequent nuclear disaster is higher, as these countries' nuclear security standards may be lower and not fully implemented.

Instability in energy producers
Lack of stability and predictability merely increases in all major oil/gas energy producing countries such as Saudi-Arabia, Iran, Iraq, Libya and Nigeria.

Car-free city centres
Environmental impact from cars has led to European cities increasingly banning individual transport. Many European cities have already created designated zones for pedestrians and additionally introduced city tolls to enforce a reduction of inner city transport. A few small cities and islands are entirely car-free.

Health, illness and well-being

Scope of the European agenda

The health agenda across EU member states is under increasing pressure: rising costs, increasing lifespan, growing expectations, and at the same time, public sector deficits and shrinking budgets. Meanwhile behind the health service agenda is a wider awareness of positive health, rather than simply treatment of illness. This involves many other policy areas and open challenges: in workplaces, housing, cultural patterns, addictive behaviours, gender relations and so on. Above all there is a realization that many of these problems are in-built to the syndromes of affluence and the socio-political model of consumption; and particularly that institutions such as food companies and media channels are responsible, as much as individuals and communities.

As these patterns of health and well-being cross cut national boundaries, but at the same time show important differences, this raises the priority for the European level of research and innovation.

Research foresight & Wild approach

The European Centre for Disease Prevention and Control aims to 'search for, collect, collate, evaluate and disseminate relevant scientific and technical data'. Projects like FP7 funded FLUMODCONT are focusing on the spread of influenza, which aims to better inform EU-wide policy and responses. The project will build on patterns developed by the EU FP6 funded projects INFTRANS and POLYMOD. The EU funded centre EUTRICOD currently has 13 FP7 funded projects on infectious diseases, most of which are interdisciplinary.

The wild approach is crucial in moving such interconnected research forwards. There are recent 'surprise' events (e.g. SARS, BSE, various influenzas), and also wider structural trends (e.g. obesity, mental illness and depression, even the return of tuberculosis). In each case there are many complex interactions between individuals, communities, workplaces, global networks, and the health system itself. EU level research needs improved tools to be able to explore such wider connections. Meanwhile, at the bio-medical frontiers, there are growing ethical questions and potential wild cards which surround them (e.g. stem cell research, major transplants and neuro-biology).

Research outcomes & benefits

Health and well-being is the ultimate quality on which all else depends. But in an increasingly interconnected society, positive health aspirations are rising; and so are the vulnerability and the costs. New ways of assessing risk and hazard are needed: indirect and cumulative effects and the direct wild card 'surprises' – emergencies, disasters and the responses to them.

Links
http://ecdc.europa.eu/en/Pages/home.aspx
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=2&CAT=PROJ&QUERY=01267a866979:5e32:0716cc57&RCN=86763
http://ec.europa.eu/research/health/infectious-diseases/emerging-epidemics/projects/145_en.html

Wild Cards

Scientists up for murder as ethical issues for research are abolished
All ethical issues are removed from research and development, but there is an uprising of an opposition until there are calls for researchers to be accused of murder. As research trials on humans becomes prevalent, vulnerable sections of society (homeless, people with mental illness, 3rd world societies) are exploited and become guinea pigs for very risky research trials.

Public health and public benefit - HFA 3
Public health systems are being overtaken by individually targeted private health insurance, based on bio-geno-toxic tracing methods and intensive lifestyle management. Most EU public health systems are rapidly privatized in 2016-17, and this helps to pay for the government deficits caused by the banking crisis.

Animal Experiments End
Higher moral standards prevail and induce the end of animal experiments for pharmaceutical as well as for cosmetic products in the EU.

Trace pollutants cause 'ethnic air cleansing'
The hazard of trace pollutants in urban air are shown to affect certain ethnic minorities, e.g. Pakistani or certain EU groups, who are more susceptible to hereditary disorders such as B-thalassaemia. This leads to controversy on social norms on genetic disorders, and the disclosure of such information; ethnic tension and stress on kinship groups; and distrust of public policy and scientists.

Doc-in-a-box: Pervasive self treatment and diagnosis
Nano-enabled self diagnosis and self treatment becomes pervasive. This would allow the general public to diagnose, monitor and treat illness themselves having their own 'Doc in a Box'. Doctors may become redundant and the ageing population could increase. There would also be large scale unemployment of medical professionals.

Weak Signals

Deadly food products hit Europe
Health officials say the virus, believed to have originated from organic cucumbers in Germany has killed 10 people and infected hundreds. The epicentre of the outbreak has been in the country's north with more than 300 people contracting the disease in recent weeks - four times the normal annual figure of about 60.

Selection of sperm by donor social and cultural group
Despite opposition from many quarters (religious groups, some feminists and minority support and children's rights advocates) the trend takes off, with celebrity endorsement (and donation) and media promotion. Markets in sperm (and ova) are widely used, enabling – if not designer babies – high levels of choice about the background of gametes.

Mobile phone viruses will become a serious threat
In future, mobile phones will be able to monitor and control healthcare implants and intra body personal area networks. Mobile phones may be infected with viruses through short range communications (Bluetooth) or Multimedia Messaging Systems (MMS). Such viruses can also infect intra body personal area networks and implants.

Breast milk ice cream on sale
A London restaurant in Covent Garden serves a new ice cream, made with breast milk. The dessert, called Baby Gaga, is made with milk from a British mother who expresses on site. The milk is pasteurised before being churned with vanilla pods and lemon zest. An advert appealing for breast milk donations says: "If it's good enough for our children, it's good enough for the rest of us".

DNA Testing and Social Engineering on the rise
Technological advancements have seen that DNA can be accurately tested (for example to prove paternity). As technology becomes more integrated into society, will people start to pick partners and friends by their DNA? Will employers only employ workers with the 'right DNA? There is a risk that a social underclass may be created as 'DNA-snobs' fail to recognise none perfect DNA specimens.

Sustainability and climate change

Scope of the European agenda

The global climate and life-support system is now being disrupted and destabilised by human activity. This is not only a technical challenge (although the technology now exists in principle); but it is a political, economic, social, cultural and ethical challenge. The effects pay no respect to national borders, just as the political and economic causes of climate change emissions are mainly due to international and cross border systems. The EU has the most advanced multi-lateral climate change policy and market framework in the world, but this now is at risk from the public deficits and the disruption to investment which they bring.

Research foresight & Wild approach

The climate change agenda shows how the wild card approach can work on a multi-level 'wild situation'. The global climate itself is approaching a tipping point, just as other global systems (biodiversity, water cycle, nitrogen cycle, land use, etc.) are also approaching thresholds, transitions and 'surprises'. Such tipping points then cascade and induce further wild cards and 'surprises' at other levels, such bio-regions, nations, sectors, technologies, and ultimately communities and individuals. Recent developments in climate science and global systems analysis, combined with conflict from climate sceptics, suggest the possibility that the previous cause-effect paradigm of global warming, may be shifting to a much more uncertain and challenging situation of global climate chaos and disruption, where cause-effect relationships are less robust, and so are the political and economic policy responses to manage them.

The inter-dependencies in this are complex and challenging, and also subject to huge political and economic pressure. This suggests that a systematic research framework is needed to look at the 'long tails' of low probability events. Beyond that, it is particularly urgent to develop methods and tools to look at the 'amplification' and positive feedback effects, where human processes are combined with natural system tipping points: where moral hazard, denial and concealment, profiteering and speculation, corporate capture, etc, all become part of a multi-level 'wild situation'.

Research outcomes & benefits

The benefits to the EU of a pro-active and wide-ranging climate change research base are huge. They cover not only the direct benefits of contributing to the global agenda: they also promote economic competitiveness, innovation and markets; social and community benefits in security and resilience; and a wider culture of social / ecological responsibility and evidence based policy.

Links
http://cordis.europa.eu/fp7/environment/home_en.html
http://ec.europa.eu/environment/climat/home_en.htm

Wild Cards

'Spray' doesn't always contribute to CO_2 emissions
The rapid spread of spray-on solar cells leads to a worldwide rise in renewable energy production resulting in major reductions in CO2 emissions. This causes a massive escalation in debates around 'global warming' as scientists claim that the reduction in emissions has not affected global warming!

Individual and collective trading of pollution credits
Carbon footprint allowance (including tax) is allocated to individuals and business organisations. This policy results in the poor (and vulnerable) selling their allowance to businesses and those who are better off. Consequently, segregation based on carbon allowance quickly emerges in many areas, with regard to transport, housing location, and local renewable energy development.

Tropical UK
As a result of continuous global warming, the UK becomes one of the preferred tourist destinations as water temperatures raise to 25 degrees and the climate becomes as warm as in the Caribbean.

Worldwide vegetarianism
Strengthen by new political parties for protection of animals; vegetarianism becomes a mass worldwide movement with huge implications for the food industry and the global economy.

Boom of ocean economy
Development of new intelligent robotic devices and machines started new era in utilization of ocean environment and resources. Electric power from solar power plants on the ocean surface is utilised in underwater factories built straight next to row material resources on the seabed. New artificial islands are built in ocean with status of independent tax havens.

Weak Signals

Growing interest in geoengineering options
Growing number of research efforts aimed to increase the level of knowledge about the feasibility and implications of geoengineering options to, for example, limit climate change.

Venlo – A Whole Town Adopts the Principle of "Waste is Food"
Venlo (NL) and its 90.000 inhabitants adopted McDonough and Braungart´s concept of Cradle to Cradle (waste = food) as a vision for their city. This joins the industry with the politicians, the general public and the creative people in a giant common project. Entrepreneurs in Venlo saw it as a great tool for innovation that also makes sense economically, while saving our planet.

New fossil fuel resources
The world is struggling with energy security. There are many new serious attempts to utilise new fossil fuel resources. Price of oil is increasing. Countries and energy companies are constantly making new discoveries of new 'alternative' fossil fuel resources, most of which are highly CO_2 intensive and polluting.

New agricultural methods for coping with climate change
The SWUP-MED project is working with farmers communities to improve farming systems, by strengthening a diversified crop rotation and using marginal-quality water for supplemental irrigation. New climate-proof crops and cultivars with improved stress tolerance are being tested, selecting promising varieties of cereals, grain legumes and new crops.

Electronic Devices Powered by Body Heat
Small wearable electronic devices such as watches or portable MP3 players can be already powered by body heat. Thermoelectric materials might also be implemented in energy-intensive application fields, which are characterised by high losses of energy due to unused heat emissions, particularly in cars or industrial machines.

Ageing and demographic issues

Scope of the European agenda

Europe as a whole is ageing, and some of its more rural and remote regions are ageing rapidly. Such effects come from the benefits of reduced mortality through healthcare, medical technology, safer workplaces and public policy. Now, such effects seem to be a problem as much as an opportunity; and such challenges cut across many areas of public policy. There is the macro-economic question of pensions and fiscal redistribution; and a practical matter of who pays for the care of older citizens. There are difficult policy choices in the allocation of public or private healthcare and housing. There are urban-rural planning issues on the migration of the semi-retired and semi-leisured, or the segregation of older people with access both to care services and to wider communities.

Behind such immediate problems are cultural and psychological questions on the nature of families and kinship networks, the community capacity for mutual aid and care, and the social valuation of mature experience and wisdom. At the same time there are growing opportunities in older persons' education, leisure and online services, and in new forms of social groups and movements. Finally, there are new bio-medical and ethical challenges: the prolongation of life or the voluntary termination – all the way to cryogenics, genetic engineering, and the prospect (even as a 'what-if') of some form of immortality.

Research foresight & Wild approach

There are already many topical innovations in foresight type activity, often linked with social innovations such as 'U3A' (The University Of The Third Age). The elderly are increasingly a vocal and well-resourced social group with lobby organisations to match. In this highly interconnected agenda it would be a valuable contribution to push the boundaries through structured Wild thinking. This already happens in some ways, for instance to research the resilience of older people to urban heat waves and floods. But there are wider possibilities to be explored, as demonstrated by the WI-WE items such as brain-scanning, genetic screening, rural co-housing, or virtual avatars. These and others shine a light on opportunities and threats which in terms of a human lifespan, are just around the corner.

Such foresight would also look at social issues raised by other types of demographic trends, as seen in some countries and regions: gender balance ratios, the imbalance of certain ethnic groups, or the fragmentation of dual career households.

Research outcomes & benefits

The outcomes of such research are needed to inform public policy in all the questions raised above. But other benefits to other groups also seem likely: medical technology or ICT; investors in housing and care systems; education or leisure services; but most of all to the citizens and their families and communities.

Links

http://ec.europa.eu/information_society/activities/einclusion/policy/ageing/launch/index_en.htm
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=8&CAT=PROJ&QUERY=01267ad531ba:6c03:6a89403c&RCN=89398
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=3&CAT=PROJ&QUERY=01267a650a92:46fa:710c532e&RCN=90929

Wild Cards

End of Aging
Revolutionary findings in biotechnology impede mental and physical ageing. The impacts on human society are immense, individually and structurally, e.g. people are confronted and overstrained at first with the idea of possibly living forever; besides, the extension of life brings a transformation of social systems.

Body Parts on Demand
Due to several new techniques, it is possible to "manufacture" all different kinds of body parts on demand, e.g. heart patients needing a new organ, cancer patients needing new cells or burn victims needing new tissue can be helped. The new technique medical companies offering spare parts.

Artificial companions are more popular than biological partners
New robotic companions are helpful, nice, empathetic and obliging day and night, and it is possible to switch them off as necessary. In contrast, interpersonal relationships are getting worse, and number of new born babies is rapidly falling. It looks like robotic children will be the biggest crowd-pullers in near future.

Personalised Avatars
The Game of Life is being a part of normal human life. In the future bringing joysticks and scoreboards into our daily routine may be the key to making us better people. Ubiquitous revolution will bring personalized avatars to your work place and to your home. We can have assistants who do what we want them to do.

The Importance of Junk DNA
Genes make up only about 2% of the human genome. The rest was for many years ignored as "junk DNA". This space is an incredibly important part of the genetic code, home to a vast unexamined treasure trove of information that controls how genes behave. Biologists continue to be surprised by what was once dismissed as wasted space.

Weak Signals

Increasing Self-Medication
Due to rising costs, doctors are less often being consulted, but patients medicate themselves. The probability of undetected diseases and risks for overdoses rise.

Human Enhancements
Increasing research on enhancing human performance, e.g. modification of biochemical processes in the body, implants for monitoring body status and releasing drugs as well as nanotech-enhanced tissue, bones and brain.

Social TV
Social TV could improve the viewing experience and provide new business opportunities for carriers. The viewership for live television broadcasts has generally been declining for years. But something surprising is happening: events such as the winter Olympics and the Grammys are drawing more viewers and more buzz.

Increasing number of people reach 110 years
In Japan every year the average life expectancy goes up by 4 months. But the ageing process continues, and we can expect a whole new society of the 'fourth age'.

Humanoids learning socio-communicative skills
Human communicative skills rely on a complex mixture of social and spatio-temporal perception-action processes. Autonomous virtual agents that interact with people could benefit greatly from socio-communicative skills; endowing them with such skills, however, could mean decades of person-years in manual programming.

Food security and culture

Scope of the European agenda

In principle Europe is well fed, with capacity to be self-sufficient in food, and with the knowledge to do this in a sustainable way. In practice however there are problems all over. Large sections of the population are over-fed, with 'gluco-toxic' overload, and others are under-nourished due to lifestyle behaviour, cultural patterns, or addictions of various kinds. Both kinds of problems can be laid at the door of the multi-national agri-business and food production and marketing companies, although there are deeper and wider issues. Meanwhile on a global scale, the imports of foods are rising from new producers in developing countries, often leaving a trail of environmental damage, human rights abuses, in addition to expropriation of water and other resources. In the longer term, there are massive pressures coming up: the combination of climate change and desertification of southern Europe; the effect of 'peak oil' on a food supply chain which is totally dependent on fossil fuels for fertilizer and motive power; and the shifts in food trade due to the rising affluence in other parts of the world.

As to solutions, there are different approaches, which seem to diverge rather than converge. In one corner is the technology innovation approach, with bio-tech, precision farming and total quality management of supply chains. In another corner is a critical perspective on the agri-food business, with an alternative model of sustainable rural or urban development, with local production, holistic livelihoods, perma-culture approach to multi-functional land use.

Research foresight & Wild approach

Many foresights have looked at the agriculture and food question, and will continue to do so, with a topical combination of science, public policy, environment and land use, and global politics. However there is a risk firstly that the research process is full up with all the interconnections, without providing room for the more Wild frontiers of surprises, threats and opportunities. Secondly there is often a disconnection between the problems and the levers of change in policy or business. A Wild approach to research and deliberation, supported by targeted WI-WE information, has the potential for more 'out-of-the-box' thinking which can bring to the surface new opportunities, alongside potential risks, for policy or investment.

Research outcomes & benefits

As such this emerging model of a Wild approach to an increasingly 'wild situation', will bring benefits to Europe and all of its citizens. In following such a process there may be challenges to established interests in the agri-food supply and distribution chain, and indeed the lifestyles and diets of many people. But there is little alternative but to look forward.

Links
ftp://ftp.cordis.europa.eu/pub/food/docs/nutrition_obesity_examples.pdf
http://cordis.europa.eu/fetch?CALLER=NEWSLINK_EN_C&RCN=30921&ACTION=D
http://www.epha.org/IMG/pdf/Presentation_-_Obesity_Charter_En.pdf
http://www.europarl.europa.eu/news/expert/infopress_page/032-45946-012-01-03-904-20090112IPR45945-12-01-2009-2009-false/default_en.htm

Wild Cards

Artificial food production takes over
Artificial food production causes the death of the farming industry: Farming industry cannot compete, with giant industrial petro-chemical plants, affecting local food based businesses - butchers, bakers etc. Only large corporations can maintain food sales.

Traditional European Medicine
Research in 'monastery medicine' leads to an officially approved medical treatment called "Traditional European Medicine". This medical treatment is based on the centuries-old knowledge in monasteries on the effective prophylactic and reactive treatment with natural active substances from medical plants.

Mandatory Vegetarian Monday in EU Member States
To cut CO_2 emissions and to raise awareness of diet and health, the EU forbids the consumption of meat in all EU member states on Mondays. Thus, shops or restaurants do not offer meat. Whereas most people get used to it quickly, there is a small group that accuses the regulation of abusing civil rights and liberties.

Nano pills tastier than food
The food industry, farming and hospitality are all virtually abolished as new nano-pills provide all the required supplements of traditional food. There is a knock on effect to society as families no longer take time to enjoy a dinner together.

Agriculture becomes a "gold mine"
A sudden change in global weather leads to severe crop failure all around the world. Investors and nations start to compete in global food exchange. The price of basic food suddenly becomes over twenty times higher. Finally, basic production becomes profitable, but the other side of the coin is a global famine.

Weak Signals

Bees be no more, less food than before
Reducing numbers of bees and other pollinating insects reaches catastrophic levels with widespread crop failure due to lack of pollination of plants. Natural herbivores affected go into decline but other insects also deteriorate. Totally disrupting the natural food web with knock-on effects for birds and other animals that feed on insects as well as plants and onwards through the predators.

Hyrated Fullerenes (C60) coming to Ukrainian marketplace
Water soluble fullerenes are about to be launched on the Ukrainian marketplace as a natural food supplement called Fullerene Water Solution (FWS) Some of the over 20 medical benefits include antimicrobial, antiviral, highest antioxidant in the world, prevents cancer metastasis, radio-protective, prevents or cures a range of anti-inflammatory and autoimmune diseases.

Extinction of species providing common food
Increased reliance on fewer favoured varieties of plant and animal foods increases risk of devastating effect of diseases (e.g. through genetic selection, GM or just market pressure). Less varieties of apples/rice/wheat means less diversity and a larger proportion may be susceptible to diseases/pests that now extinct species may have had natural resistance too. Same is true for farm animals.

Food consumers are steered towards healthier dietary choices
Food consumers are steered towards healthier dietary choices by product labelling and by joint research activities.

Food markets became investment subject in previous credit crunch
Basic production of agriculture may become globally very profitable business if we face a few years of crop failures. Furthermore, if a credit crunch takes place at the same time, the prices of grain, raw materials and oil will probably go up in the markets in the same way as they did during the previous credit crunch. Tangible goods maintain their value.

Globalisation and localisation

Scope of the European agenda

At the top of the geo-political agenda is the changing shape of the global powers, and the prospect of the relative decline of Europe in relation to others. This in total is not necessarily negative, in the sense that European dominance was only resting on its colonial legacy, and that prosperity for other larger populations is welcome. But it brings profound implications for the European socio-economic model and sense of identity. Meanwhile there are many other dimensions to globalisation: finance and trade; energy and resources; culture and communications; science, technology and intellectual property; migrations and social movements. In each of these there are mounting pressures and potential catastrophes; but there are also new and creative opportunities.

Apparently at the other end of the scale, are the dynamics of the local and localisation – less discussed or studied, but perhaps the inevitable counter-vailing force to the global. In an age where global external forces seem to drive change everywhere, it takes a certain imagination to then look for contrasting patterns. But these may be found in many areas: housing and business locations; tourism and leisure; the aspiration for local foods and cultures. There is ongoing debate on the 'quality of life' factors of urban communities or rural landscapes, and the dynamics of growth or decline in apparently similar cities or regions. The impact of ICT is to displace the geographically local towards the 'network' local, which still has important physical effects.

Research foresight & Wild approach

To frame such a challenge as a research agenda, raises questions about the scope and nature of research. To study globalisation should we talk to global elites, to policy-makers, or the victims of side-effects? And to study localisation, working with 'local' communities could be a process without end. Thinking more widely, a creative foresight process is perhaps better able to respond to such unbounded and multi-layer kinds of problems, where subjects are all mixed up with objects, and theory mixed up with practice. Again the Wild approach and WI-WE type information could have a very positive role to play: not so much in forecasts or projections, as exploring the less tangible possibilities of complex interactions at multiple levels.

Research outcomes & benefits

This kind of research on such a 'hyper-complex' system has potential for results in quite unconventional forms. We could envisage an engagement of policy, business and civil society, in a coordinated research foresight programme which would explore the Wild approach at different levels, using social technology for active interconnecting shared intelligence, as suggested by the State of the Future programme.

Links
http://www.millennium-project.org/
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=14&CAT=PROJ&QUERY=01268e8395d4:5d29:7b6342c8&RCN=89077
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=13&CAT=PROJ&QUERY=01268e8c0171:f2da:282b2c87&RCN=89098

Wild Cards

$ hyperinflation
Due to growing pressure of the American citizens, the US government is forced to emit trillions of $, generating a hyperinflation comparable to the one that occurred in Germany after WW1. International trust in the $ collapses; a blooming creation of complementary currencies through Internet revitalizes local economies and autonomies, while international heteronomy declines sharply.

The mystery of 21-12-12
Various historic systems, both evolutionary (e.g. I-T'ing or systems of ancient Egypt or Indian system of Vedas, Bible – revelation of John the Baptist), and calendar (e.g. Mayan calendar, Platonian year) indicate that around the winter solstice of 2012, humankind is expected to face a crucial event, may it be in form of a spiritual transformation, world collapse, or just a new economic cycle.

Rise of Africa
In case of stopping civil wars and lethal epidemics, fair land distribution and increase of education Africa may become important player on the economic map of the world. There is enormous wealth of raw materials and natural resources, big labour force potential and big consumer potential. Therefore the Black Continent is in view finder of China and other emerging economies today.

Neo-tribal wars break in cities and in countryside
People increasingly affiliate with others having similar values, leading to polarized communities and decreased levels of tolerance. Eventually we end up to tribal-like situations. People in different parts of a city or blocks do not communicate or understand each other anymore. They have their own schools, restaurants, malls etc.

P2P networks as a predominant technology for data management
P2P (Peer-to-Peer) is a technology that fosters self-deployment and self-organisation, reduces operational costs, and optimises resource utilisation for the deployed applications and services. P2P network become so popular for the data sharing, storage and management worldwide that it is widely used without proper security rules in place.

Weak Signals

Seamless Transport Chains
First integrated multimodal supply chains and business-overarching application of intertwined databases enable seamless just-in-time deliveries without stopovers (e.g. in capital-intensive deposits) across the continent, leading to reduced costs, a higher quality and more satisfied customers.

Social Search - The Real Time People Web
The amount of information being available on the web in real time explodes, especially since Facebook status updates and tweets on twitter. It is now possible to see what lots of people are talking about in real-time on the web. This enables the so-called "Social Search". In contrast to web search, a social search engine makes it possible to find a people with information you need.

Product piracy and product imitation cases are increasing
The growing number of cases of product piracy and product imitation reveal an increased threat to business interests and the customers´ security due to deficient products and the utilization of materials with negative health effects. In particular, technological and innovative industries are highly affected by product imitations.

Some regional investments are not contributing to regional development
The ERAWATCH report on "RTD policy approaches in different types of European regions" identified that research investment in certain regions can have important contributions to national policy goals without making major contributions to regional economic development.

Reverse Innovation
Traditionally, innovations found their way from developed to emerging markets in the form of less-sophisticated products at lower prices. The numbers of examples that work the other way around are increasing. It is more and more the case that innovation "trickles up" from emerging to developed nations. GE Chairman Jeffrey calls this tendency "reverse innovation".

Social cohesion and diversity

Scope of the European agenda

As the mainstream economy and the financial system looks increasingly vulnerable, there is growing awareness of values in other sides of life – social cohesion, mutual aid, social enterprise, informal economy, cultural diversity, and community resilience, to bring up some of the names. But these are also under pressure or threat from many sides. The prospect of unemployment or alienation does not always produce cohesion and tolerance, but often has the opposite effect, as history shows too often.

This of course is a European agenda, as well as national, regional, urban, rural and local. The Structural Funds amongst many others have found that social measures and programs are more likely to lead towards 'sustainable development', than hard infrastructure. But there are over-arching questions. One is how best to connect the policy regime – often top-down, inflexible and bureaucratic – with the dynamics of social cohesion, often bottom-up, entrepreneurial, self-organising, but also open to misuse or abuse. Another is about the dynamics of social cohesion itself – what it is, how it works, and how to promote it. A third open question is about the role of the 'local community', in an age of global forces and virtual networks, not necessarily obsolete but certainly changed.

Research foresight & Wild approach

For such questions it appears that mainstream sociology, economics or other social sciences are not always effective, with many gaps between. It seems that many of the problems in front of us seem to interconnect between different parts of a very complex open system: as do many opportunities and potential solutions. This suggests again, a model of an extended research foresight process, following a more 'Wild' approach, which deliberately pushes at the frontiers of what is probable or plausible. It would explore topical examples, such as: social media in the Arab Spring; right wing murders in Norway; anti-capitalist occupations in many cities; riots in the UK and turmoil in Greece.

While such wild cards cannot be forecasted, a wider creative anticipation is certainly useful. This is not only about preparations and defences, but more understanding the nature of complex social systems, building resilience and mobilising creative opportunities. And since the 'social' or 'community' cannot be understood only as an 'object', it depends on a more pro-active, participative, action research mode of enquiry and deliberation.

Research outcomes & benefits

The outcome of such research should feed directly into the policy system. But in practice the policy system is often lacking the levers and the modus operandi which enables creative and effective action. So following through the implications of such research means to follow through the potential for creative opportunities, with stakeholders, on a broader front: finance and business; infrastructure and public services; media and culture; civil society and informal networks.

Links

http://www.eurofound.europa.eu/publications/htmlfiles/ef0591.htm
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=1&CAT=PROJ&QUERY=01268f919a1e:8c80:423e84a2&RCN=88907
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=7&CAT=PROJ&QUERY=01268fafceba:c3f7:5484f1e5&RCN=87583

Wild Cards

Brain Capacity Testing
Employees or e.g. international migrants are being "brain tested" by companies, if they have "good" (long life, good memory) brains. Bad brains are being discriminated against. Even school kids are being placed according to the results of their brain tests.

Abuse of individual DNA
Criminals sell fake DNA on internet. Politicians (or other famous/rich persons) are blackmailed by abusing their (fake) DNA "fingerprints". For example, police finds prime minister's DNA at many scenes of crime, or paternity lawsuits are issued against billionaires. Insurance company buy clients DNA to calculate premiums. Weapons race starts between DNA fakers and forensics.

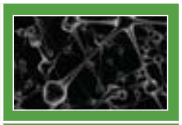
Spirituality becomes increasingly separated from organized and established religion
Massive disengagement of people from established religions, and movement to spiritual expressions outside religion. This trend will include spiritual attitudes to issues such as environment protection and climate change, animal rights, gay liberation, moral values, etc.

Major EU state elects neo fascist leader
The existence of political parties with far-right agendas is not a new feature in European politics. So what is really 'wild' or surprising in this event is the achievement of sufficient political dominance for a major EU state to elect a neo fascist or anti-Islam leader through, for example, national coalitions or major support of other far-right parties in Europe.

Facebook capitalism
Conventional market systems based on price and demand, are suddenly giving way to online networks for supply, demand and the all-important 'choice editing'. Half the FTSE firms lose half their value and are bought by new Web 2.0 start-ups.

Weak Signals

A New Model of Chaos
Researchers develop a mathematical model that could help us make sense of how conflicts get messy. Researchers in the Cornell University describe a model for predicting how a social group will break apart during a turbulent split.



Growing interests in gender politics and anti-discrimination regulations
Growing problems in gender politics and anti-discrimination rules concerning ethnic minorities: Separate regimes of law for different ethnic groups (i.e. permitting diversity for Jewish, Islamic and other communities where it comes to divorce, polygamy, education, etc.); Conflicts with ethnic/religious minorities as mainstream laws on domestic violence and treatment are forcibly applied.

Growing interest in post-conflict cultural identity
Several European sites of great historical and cultural interest become hotly contested in terms of their "ownership" and historical meaning – cultural tourists and pilgrims are increasingly seen as reviving past conflicts and extreme events occur (attacks defacement of monuments, destruction of symbols, etc.).

Social Innovation – The Urganda Rural Development and Training Programme
The URDTP is seen as a benchmark project for successful social innovation. What is distinctive about this educational program is that everyone learns the creative process –how to create a vision, contrast it with your current reality and take action to achieve your vision (in short, how to innovate!).

Ongoing radicalisation of fundamental islamist groups
Low political will and dedication to resolve conflicts in Middle East region has a consequence in ongoing radicalization of various Islamist groups in the region. With growing capabilities, these groups can acquire means of mass destruction, being it weapons or just materials (such as nuclear waste).

Technological security, hazard and risk

Scope of the European agenda

Technology is a great liberator, but also has a certain potential for entrapment into dependency, vulnerability and direct risk of harm. For instance, bio-medical technology raises new social and ethical issues: nano-technology or synthetic organisms bring 'unknown unknowns'; ICT brings transformation but also extreme vulnerability to breakdown or overload, sabotage or cyber-attack, or psychological dependency and organised crime.

This is an EU agenda, not only through global pressures, the involvement of trans-national corporations, and obvious trans-border effects. It is particularly European due to the large public funding going into research and technology development (RTD), mostly focused on the high-tech innovation end of the range. And while technology assessment and risk assessment is part of the mainstream process, using the latest and best foresight methods, it does appear that many of the more 'Wild' risks and security issues fall between gaps and are overlooked. A topical example is that of genetically modified organisms (GMOs) (also mentioned in the agri-food agenda). While such technology is almost impossible to test in the environment, there are strong commercial and scientific pressures, a political argument in progress, and a 'done deal' in the sense that most food imports already contain GMOs by default.

Research foresight & Wild approach

This is prime territory for the application of foresight, and many technology foresight platforms (TFPs) have grown from this agenda. But there is often a relatively narrow focus, in order to complete the program, or to keep stakeholders on board. This might be practical in the short term, but keeps the more topical possibilities off the agenda. This raises the possibility of a more Wild approach which deliberately pushes the boundaries of what is thought (by experts and/or stakeholders) to be plausible, probable or possible. Recent events seem to confirm that WI-WE type incidents are much more common than normally thought. There are events such as the 2009 food riots linked to land use for bio-fuels; the shutting down of EU airspace by a volcano in Iceland; or the vulnerability of Eastern European energy to political tension in the Ukraine. Each of these and more, show how systemic vulnerability can be magnified by unplanned and apparently improbable interactions between technological, environmental, political and social systems. It follows that research methods and evidence bases are needed which can focus on such interactions and push at the boundaries of what is thought to be probable or 'Wild'.

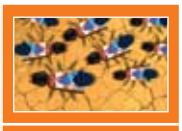
Research outcomes & benefits

The obvious outcome of such activity would be a safer, more reliable and more resilient Europe, where technology brings clear benefits rather than further problems. However that might be a little simple. It is more likely that the outcomes of a multi-level, multi-lateral process of deliberation, could bring tangible benefits by promoting understanding and cooperation between different parts of the innovation system: science and technology; finance and entrepreneurs; designers and engineers; regulators and promoters; consumers and civil society.

Links
http://www.europol.europa.eu/publications/Serious_Crime_Overviews/HTCThreatAssessment2007.pdf
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=1&CAT=PROJ&QUERY=0126893f042b:5f9a:04b34227&RCN=87538
http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=1&CAT=PROJ&QUERY=011dddfe9599:f5f3:22f11727&RCN=88625

Wild Cards

Cysects attack
Terrorists or criminal organisation uses remote-controlled swarms of "cyborg insects" (insects with implanted electronics) to infect people and/or animals or agricultural crops with biochemical agents. Perpetrators could be also a criminal agricultural company interested in disrupting the agriculture of competitors. Such "cysects" may also interfere with the natural biosphere and damage it.



Algae pathogen suddenly destroys new energy foundation
Step by step all human kind becomes dependent on algae biofuel production. Transportation relies almost entirely on algae biofuel, but heating and electricity production rely heavily on it as well. Use of oil goes down. Suddenly, a new type of airborne algae pathogen emerges and starts to spread around the world. The new energy foundation of the humankind gets suddenly destroyed.

Cities are lunch for plastic bag-bugs
Synthetic organisms are used in the industrial production of plastics, both to extend product life and to accelerate environmental bio-degradation. The latter varieties are difficult to control and in some tests are seen to attack many types of plastics. Omnivorous 'plastic bag-bugs' could rapidly consume all the plastics in the built environment and so the material basis of society.

The DNA Transistor
Many researchers now believe that that real advances in genomics will come not from simple X-causes Y correlations but from rich statistical understanding that emerges out of the sequences of millions of genomes. This set will reveal how our genetic code is likely to interact with the environment with the environment to make us who we are.

Molecular manufacturing turns into the next industrial revolution
The old vision of molecular nanotechnology (introduced by Drexler) materializes. "Universal nano-assemblers" or "nanofactories" build objects of practically any arbitrary size and complexity (including copies of themselves) from the molecules up, by using readily available feedstock molecules (e.g. from garbage) as raw materials. A new industrial revolution radically changes manufacturing.

Weak Signals

Life-form thriving on arsenic was discovered on Earth
NASA research discovered microorganisms on Earth (Mono Lake, California) that thrive and reproduce using the toxic chemical arsenic. This finding of an alternative biochemistry makeup could alter biology textbooks and expand the scope of the search for life beyond Earth. It changes knowledge about life on Earth, and increases the likelihood of extra-terrestrial life.

Scientists predict mobile phone viruses will become a serious threat
In future, mobile phones will be able to monitor and control healthcare implants and intra body personal area networks. Mobile phones may be infected with viruses through short-range communications (Bluetooth) or Multimedia Messaging Systems (MMS). Such viruses can also infect intra body personal area networks and implants.

Growing interest in wild cards and weak signals research
There is growing interest in understanding wild cards and weak signals, and other topics that are hard to forecast. The increasing recognition of importance of highly uncertain and low-probability events reflects trend for these to become more prevalent or disruptive of established policies and programmes (e.g. post-normal science, technology and innovation policy).

Growth of real-time monitoring and response to water problems
The WISER project is assessing the ecological status of European surface waters and evaluate recovery processes in rivers, lakes and coastal/transitional waters under global change constraints. These challenges could lead to the development of integrative systems that could measure levels of Biological Quality Elements (BQE) and deliver real-time strategies to tackle associated water problems.

Robot Swarm Intelligence
Enhanced research on robot swarm intelligence might soon allow robots to communicate and build a system. Cooperation is organized, self-dynamic, and self-contained by intelligent robots. Such capabilities are already demonstrated in certain military R&D.

Consumption and behavioural change

Scope of the European agenda

There is a recent awareness that the sustainability of the socio-economic model is not only about production, but consumption, all the way along the supply chains of products and services which can stretch around the world. Furthermore, it seems that consumption itself is a many-layered dynamic, involving technological, economic, environmental, political, social and ethical (TEEPSE) dimensions. This comes to a practical point, where governments at the European, national, regional or local level, look for ways to influence behaviour in consumption, use of public services, and other aspects of social life. In this task the conventional options of regulation, tax or subsidy, and awareness-raising, often do not seem to go far enough. So there is a very topical agenda for policy – how to promote or enable behaviour change?

This is a European agenda as much as any other, in the sense that the source of Directives, product regulations, trading systems such as the ETS, international trade policy, and other measures are all at the European level. It is also clear that the behaviour of citizens, communities and cultural groups, is increasingly networked and trans-national.

Research foresight & Wild approach

A foresight approach is not only useful, but indispensable to respond to such an agenda. It also involves a much wider range of stakeholders than normal research. It needs to focus not only on bi-lateral relationships and correlations; but on system wide dynamics, vulnerabilities and opportunities. For instance, a foresight programme to explore the innovation curve for low/zero carbon transport systems, would frame it as both a production issue and one of consumption and behaviour change. It would aim to involve engineers and scientists; entrepreneurs and financiers; labour and training agencies; consumers and inter-mediaries; infrastructure and urban planners; environmental and safety lobbies; media and cultural groups; economists, psychologists and anthropologists; and many others.

For such situations, it is essential to explore boundaries, anticipate systemic risks, and imagine creative responses. In that light the Wild approach is the obvious way to go, as supported with the WI-WE resources. This would be able to bring up potential wild card risks and failures; identify the weak signals to anticipate them; look for new creative synergies between different stakeholder groups; and test the robustness of road-maps and strategies.

Research outcomes & benefits

The outcome of such processes needs to be diffused and embedded. Too often, the foresight 'final report' is launched with much celebration, and then it 'goes on the shelf'. The approach sketched out here, sees more of a continuous process of creative learning and shared intelligence between all stakeholders involved. This would transform the systems rhetoric into real innovation systems anticipating, recommending and transforming futures.

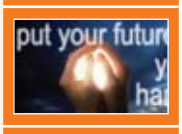
Links
http://www.eea.europa.eu/highlights/consumption-patterns-need-to-change-to-cope-with-growing-cities
http://europa.eu/pol/trans/index_en.htm
http://cordis.europa.eu/fetch?CALLER=PROJ_ICT&ACTION=D&DOC=2&CAT=PROJ&QUERY=011bdf00d646:2571:6c25b59c&RCN=86728

Wild Cards

Changing one's mind
A terrorist group uses a virus to change the behaviour or neutralise a certain population for a certain period. An artificial virus is developed that can be dispersed among people and infects individuals with specific properties. The idea to develop so called "anti ethnic" weapons using genetic engineering appeared in the past in relation with bioweapons.

Society manipulated with advances in interpretation of visual perception
Visual perception is proven to be different in males and females. This impacts on the design of future systems to facilitate medical decision-making, crime re-enactments and other scenarios as people react differently to visual stimuli. People are manipulated into taking courses of action they would not otherwise take (e.g. adhering to medical advice) diminishing human autonomy.

Do-It-Yourself (DIY) "wikiforesight" overtakes religion
Personal futures planning toolkits with "success stories" become widely available and used. Social movements emerge, with individuals and civil society groups making medium-to-long-term decisions aimed at shaping their future. These movements lead to a global debate about the actual role and usefulness of traditional established religion and self-help groups.



Automatic learning through neuro-data transfer
Automatic neuro-education is technologically possible but at a price - and therefore available only to wealthy people (or those singled out by powerful institutions for such enhancement). Techniques are developed for neurological implants with cognitive targeting for subliminal learning. Online learning and edu-tainment systems allow people to learn during work, leisure, or travel.

Nano dreams - more than a reality?
Brain-computer interfaces are created to manipulate dreams and parts of society become addicted to this quest for utopia and false states of euphoria are created. Dream manipulation becomes priority for parts of society - reality is neglected.

Weak Signals

A Holistic Approach: Demand and Supply-Driven Innovation Policy
So far, traditional innovation policy mostly focuses on the development of innovation, the supply side of innovation, so to speak. Recently, in Europe, a political discussion about a stronger emphasis on the demand side of innovation has started. The insight that both demand and supply side factors influence the way innovations emerge and diffuse on the markets becomes more common.

Putting the NO on InNOvation
In 2009 the American cereals manufacturer Post launched a new campaign on "Why we put the NO in Innovation." It emphasises the use of 100% natural ingredients and the fact that the product has not changed for centuries. A fictional CEO motivates his employees to be proud of the lack in progress and innovation their company and producst have shown over the years.

Emergence of no-gender societies
A Toronto couple are defending their decision to keep their infant's sex a secret in order to allow the child to develop his or her own gender identity.

Implantable electronics leaving no trace
Implantable electronic devices can be used to deliver dugs, monitor biomarkers and stimulate nerves. Once their action is completed they dissolve. Although this could be pioneering for medical research, it is also open to abuse as medical staff administering devices could easily exploit their power with little or no trace evidence. Equally, chips could be administered without a doctor's know-how.

Rising interest for health science and health policy
Due to a rising awareness for health issues in an ageing society, people become aware of the importance of health research as well.

Innovation, knowledge and technology

Scope of the European agenda

Across Europe, 'innovate or die' is the fundamental agenda – for countries or regions; technologies and infrastructures; services and communications – all as enshrined in the Lisbon agenda and countless other policy agendas. Of course new technologies and 'social technologies' are essential to improving quality of life in many areas, and the wheels of the production-consumption system are all predicated on growth through innovation. But to understand and promote innovation then becomes a major sector of innovation in itself: a curious bystander might ask naive questions about the nature of the socio-economic model which seems fixated on fashion, novelty, illusions of progress, as much as real contributions to well-being.

And then the challenges start to pile up. Firstly, when innovation does not seem to happen when and where needed, even with large amounts of public support. Secondly if that public support raises political and ethical problems with favouritism, protectionism, displacement and so on. Thirdly, if it turns out the benefits are spread unequally; and then, if the side effects and induced risks from innovation seem to be greater than the benefits. Lastly, many outcomes from technology innovation seem to offer possibilities for misuse or abuse by predatory or hostile interests. In reality all these effects are mixed up.

Research foresight & Wild approach

As the theme on which foresight was developed (along with military applications), technology innovation and 'knowledge innovation' is a good reference point and test card to return to. Again if anything can be summarised from several decades of technology foresight, FTA or other combinations, it is possibly that the foresight bandwagon attracts many riders; that finer understanding is needed of the dynamics of an innovation system; that many other activities run in parallel under different titles; that changes in global corporate structures and technology systems are essential to recognize; and that further development of creative methods and tools has potential to enhance the foresight contribution.

In this well-trodden field, the Wild approach and the WI-WE resources seem to have a vital contribution. As the active 'frontier-pushers' and the 'out-of-the-box' enablers, are able to highlight interconnections, opportunities and threats which otherwise remain in the shadows. As many futurists remind us, many of the most powerful innovations of recent decades were originally wild cards or science fiction. Now that technology is increasingly seen as embedded within wider social, political and environmental agendas, the need is growing to explore these frontiers more and with greater focus.

Research outcomes & benefits

The outcomes from such a process are many. We would anticipate a better handle on the dynamics of innovation in many areas of technology and business services; and this is likely to lead to more effective targeting of scarce public funding. On a wider front there is potential for a more informed and engaged process of social and policy deliberation, again so that risks can be reduced while benefits are increased.

Links
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=5&CAT=PROJ&QUERY=01268e24aa76:5b07:7433b3ac&RCN=86416
http://ec.europa.eu/information_society/eeurope/i2010/ict_and_lisbon/index_en.htm
http://ec.europa.eu/education/at-a-glance/about141_en.htm

Wild Cards

Drastic reduction in investment in research in Europe
Owing to a lack of interest in science, the goal of spending 3% of the GNP on research is dropped.

Cyber Crusade: Massive e-sabotage by "hacktivists"
Since the 90s, there have been struggles among nuclear researchers over the issue of a cold fusion, achieved by electrolysis. As the scientific and technological development advanced along the time, new nuclear processes were discovered. This resulted in confirmation of the cool fusion phenomenon.

3D media for copying reality
Advanced 3D technology is used for image data recording and presentation, which can perfectly imitate reality, Practically whatever from personal appointment to new clothing trial can be done in 3D virtual space instead of real pub or shop.

Nanotechnology - it's all a bit fishy...
Routine monitoring of marine pollution in the Red Sea finds high levels of nanopollutants in fish and this has been traced to a nanotechnology 'accident' in Saudi Arabia. Further tests show the particles in drinking water in Egypt causing political uprising and calls for invasion!

Geoengineering "solves" carbon problems but…
Geoengineering "solutions" to reduce the effects of continued greenhouse gas emissions can destabilise global and regional climates - and the political and legal framework. These aim to bypass the stalemate of international negotiations on targets and market mechanisms. Controversy emerges about side effects and the uneven costs and benefits across geographical areas and industries.

Weak Signals

Human enhancements
Increasing research on enhancing human performance: e.g. modification of biochemical processes in the body, implants for monitoring body status and releasing drugs as well as nanotech-enhanced tissue, bones and brain.

Reduced security = innovation
Google's former CIO Douglas Merrill describes Google's approach concerning internal innovation culture as offering employees as much freedom as possible, e.g. regarding operation system or location. Any other way would stifle their innovative capacity. This has an effect on security policies, as the company closes upcoming security-gaps in its own.

Dell's Idea Storm
The multinational technology corporation Dell is giving interested users the chance to post ideas on products, best practices and general topics. Other users can comment and further promote or demote them. In a specific section of the website users and interested visitors of the website are able to access general.

Rapid Innovation Testing
New technologies and digitalisation make innovation processes cheaper and more efficient. They enable easy testing and evaluation – offline and online. Enterprises increasingly use digital and conventional systems to test an ever-growing number of their ideas and thereby increase the probability of finding good solutions.

"Smart Specialisation" reduce risk of sub-critical systems
Many regions in Europe opt to compete in the same worldwide or EU tournament in the field of biotechnologies or information technologies. This sheep-like behaviour often leads to a collection of subcritical systems and results in an unhealthy uniformisation of the European knowledge base. "Smart specialisation" addresses this problem by reconciling polarisation and distribution.

Work-life balance and mental health

Scope of the European agenda

The work-life balance is both a personal issue, and a national or European issue. It calls up many specific questions about the conditions of employment and quality of life in cities. But on a wider scale it raises issues about the nature of the political economy model of neo-liberal capitalism, the culture of materialism, and the paradigm of consumption and production. The losers in this game are those with mental health problems, who for whatever reason do not seem to fit with the existing structures.

This is especially topical in 2011, as the Eurozone itself is at financial risk, governments appear to be funding the banks before their own people, and public demonstrations in many cities are calling for alternatives.

Research foresight & Wild approach

The foresight approach has much to offer this huge agenda. For such multi-level, interconnected, 'wicked' problems, it is essential to pursue research methods, and extended knowledge communities which can respond. The 'Wild' approach to all this would explore and stretch the boundaries of existing disciplines and existing policy spaces. It would use wild card methods to raise questions on 'what-if', which today seem quite out-of-the-box, but tomorrow frequently become reality. Examples include: leisure seekers, in golf or movie-going etc, are paid to experience advertising. Or, growing local food becomes a big business, as it seems to help the unemployed back into the job market. Or, people in jobs are continuously monitored for signs of mental dysfunction, and this operation itself encourages either conformity or deviance. Everywhere there are weak signals of such wild cards.

Overall, such 'Wild' foresight needs not only conventional research methods, but a new kind of approach, based on action-research, trans-disciplinary, creative and co-evolutionary knowledge for shared intelligence.

Research outcomes & benefits

Following this through, the research outcomes from such Wild thinking need to be more pro-active than the conventional academic model. They will be deeply embedded with European society – public governance, business and civil society. Where solutions can be found to work-life balance issues, these will be highly contingent on specific actors, policies and locations. It is part of this research programme to explore how the lessons can be universal.

Links
http://www.eurofound.europa.eu/ewco/reports/TN0510TR02/TN0510TR02.pdf
http://europa.eu/legislation_summaries/employment_and_social_policy/equality_between_men_and_women/c10917_en.htm
http://www.eurofound.europa.eu/ewco/2009/07/NO0907039I.htm
http://europa.eu/pol/socio/index_en.htm

Wild Cards

Societal "nervous breakdown"
The acceleration of life, sensory overload, pervasive ICT and fierce competition at the work place have led to a dramatic increase of mental illnesses and disorders, a rise in apocalyptic prophecies and conspiracy theories and wide-spread apathy. Attention deficit and hyperactivity disorders become the norm, combined with a general loss of confidence in existing.

Automatic guidance systems for vehicles
An automated guidance system for vehicles revolutionises traffic. People agree to less driving pleasure and freedom to introduce this new system that completely avoids fatalities and is much more efficient as it avoids traffic jams and enables the "driver" to do other tasks during a daily commute.

Invisibility spray available in high street stores
An invisibility spray is developed and the technology refined until it becomes available in most retail outlets and is affordable for the general public. Initially, this is seen as fun, however there are strong implications for security and the military as applications for warfare are exploited. Criminal behaviour also increases exponentially as the chances of being caught are dramatically reduced.

Memory enhancing drugs for rapid learning
Advances in neuro-biology enable the design of targeted endocrine catalysts, which enable rapid absorption and recall of massive amounts of information. Workplaces are the test beds for these, as workers are induced with new languages, technical skills and customer relationships.

Economic Breakthrough
Nowadays the whole world is immersed in the biggest economic conjuncture of history, due to the inability of world leaders who have driven to this point. Past mistakes will be paid for. Workers of the world – you have nothing to lose but your smart phones.

Weak Signals

Few policies to improve employment conditions and social benefits
One of the most striking observations is the low absolute number of reported initiatives intended at improving employment conditions and social security benefits (36/283). A total of eleven EU countries had not introduced any initiatives with the above objectives.

Ancestors' Second Life influences our First Lives
Virtual Agents on Internet or in IT devices are programmed with characteristics of family members, so they can be consulted, kept up to date, celebrated by those still living. Proves very successful innovation and many facilities are rapidly developed.

From 'open' towards 'top-secret' innovation
In Summer 2009, an employee of one of Apple's manufacturer committed suicide after losing a prototype of a next generation iPhone, There are rumours that he was maltreated and his house was searched illegally. Apple, commonly seen as one of the most innovative brands, treats its upcoming products like a state secret.

Different employment policies makes uneven research
The drive towards autonomy offers EU Member States (MS) few active policies to promote improved terms of employment and careers for researchers. Conditions of employment differ markedly too, with a broad split between MS where university researchers are civil servants with protected posts and those where researchers work within short-term contracts linked to specific grants.

Robots with human socio-communicative skills
Human communicative skills rely on a complex mixture of social and spatio-temporal perception-action processes. Autonomous virtual agents that interact with people could benefit greatly from socio-communicative skills; endowing them with such skills, could mean decades of person-years in manual programming.

Science, technology and ethics

Scope of the European agenda

The Lisbon agenda places science and technology at the centre of a knowledge based society, and huge funds are devoted to sponsoring innovation and RTD. At the same time it is clear that the benefits of S&T developments are often not universal across the population, and that many ethical or political issues are raised.

Broadly there are three areas of concern. The first is in areas of S&T which are by their nature pushing the ethical frontiers, and raising questions the fundamentals of human rights: especially in bio-technology and genetics, but also in many forms of ICT, nano-technology, etc. Another area is where S&T proceeds but raises new kinds of hazards and vulnerabilities: these might be direct pollution or industrial accidents, or indirect and system-wide through increased social dependence and lack of resilience.

A third area concerns those technologies which are innovating and extending conventional areas of production, such as energy, transport or communications; but, in the process, generating new ethical agendas and particularly, increased possibilities for misuse and abuse. The internet for instance is now becoming the main medium of choice for organised crime, state-sponsored cyber-attack, and invasion of privacy. Such issues are not going to be easily resolved via policy diktat; rather there will be an ongoing process of deliberation and social awareness.

Research foresight & Wild approach

This is a prime territory for a research foresight approach, which can think out-of-the-box, and explore interconnections between different areas of knowledge. It is also one which depends on a wider participative peer-review process, which can help experts and S&T entrepreneurs appreciate the wider context of their activities.

In such a challenge the structured and systematic use of wild cards and weak signals (WI-WE) is essential. These are tools for exploring the possibilities of hidden interconnections, the dynamics of complex human-technology interactions, and the ambiguous and incalculable effects of ethical, cultural and political changes. As such they do not aim to predict or forecast, rather to explore and illuminate future possibilities, and thereby to reflect light on present day choices and decisions. So for each of the main S&T programs of the ERA, there is a case for a continuous process of ethical evaluation, using a 'Wild approach' as part of an extended review community.

Research outcomes & benefits

Again the results will not be in predictions or forecasts: rather in a more robust and society-proofed program for S&T development, so that unfortunate or catastrophic side effects can be reduced, and social opportunities maximised.

Links
http://www.europarl.europa.eu/stoa/events/workshop/20090224/background_en.pdf
http://www.europarl.europa.eu/stoa/publications/studies/stoa2007-13_en.pdf
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=3&CAT=PROJ&QUERY=01268f9b2831:9bbb:00e3c6d7&RCN=92742

Wild Cards

Genetic blackmailing
Everyone might leave traces of DNA everywhere willingly or not. Present technology enables analysis of such DNA and its manipulation for negative purposes. Criminals can plant it to extort people or blame them for criminal acts.

Rapid diagnosis machines
"Labs-on-a-chip" have been introduced for time-saving and automatic diagnosis and detection of diseases. These new forms of diagnosis are comparable to ticket machines which are located in all areas of daily life such as supermarkets, gas stations or pharmacies.

Animal testing ends
Higher moral standards prevail and induce the end of animal experiments for pharmaceutical as well as for cosmetic products in the EU.

Scientists up for murder as ethical issues for research are abolished
All ethical issues are removed from research and development, but there is an uprising of an opposition until there are calls for researchers to be accused of murder. As research trials on humans becomes prevalent, vulnerable sections of society (homeless, people with mental illness, 3rd world societies) are exploited and become guinea pigs.

Body parts on demand
Due to several new techniques, it is possible to "manufacture" all different kinds of body parts on demand. Thereby, e.g. heart patients in need of a new organ, cancer patients in need of new cells or burn victims in need of new tissue can be helped.

Weak Signals

Nano-particles may contribute to air pollution
Recent research suggests that systemic access of ultrafine insoluble particles may induce adverse reactions in the cardiovascular system, and other organs.

Non-Western innovation boom
China's budget of research institutions and universities has grown with an annual rate of 20%. This development accompanied by the local presence of high-skilled scientists, a supporting regulatory environment and low costs of research give rise to the establishment of China as a powerful research location.

Reduction in human diversity
If genetic screening became widespread and allowed uncontrolled use in the selection of genes for specific traits then what would be the result? Genetic testing and screening has huge potential for medical applications, such as genetic diagnosis of vulnerabilities to inherent disease.

Cube-Sats for private space exploration & application
Cube-Sats, i.e. 1 liter and 1kg-satellites, are starting to be the subject of serious scientific and defence research. They could be to space science what the PC was to science in the 1980s and 1990s: a low-cost, disposable technology that supports rapid innovation; enables new players to conduct space research.

Robots with human socio-communicative skills
Human communicative skills rely on a complex mixture of social and spatio-temporal perception-action processes. Autonomous virtual agents that interact with people could benefit greatly from socio-communicative skills; endowing them with such skills, however, could mean decades of person-years in manual programming.

Crime, security and justice

Scope of the European agenda

Many parts of European society are fragmenting under the pressure of the downturn, the deficits and austerity measures, and the perception that the elites are running the governments. In this situation it is no surprise to see an upturn in crime of many kinds, and in response, a growth in the security industry and justice system. But there are many deeper issues. One is that crime is endless innovative, with recent moves into ICT and social technologies, people trafficking, white collar financial crime, etc. Another is that the role of justice and security is itself more in the spotlight, with fierce arguments on human rights, or rehabilitation of offenders. There is also an innovation agenda in the response, with GIS-enabled precision policing, targeted weapons and defences, in preparation for civil disorder as much as conventional crime.

This is of course a European agenda – not only as organised crime is increasingly cross-border or global; but also that the social policy regimes, and justice or police system responses, are increasingly shared in the Schengen zone and beyond. There is also the new/old challenge of trans-national security, in the light of recent cyber-attacks, blackmail via energy supplies, and the continuing tension in areas such as the Middle East.

Research foresight & Wild approach

In this challenging context, the scenario and foresight approach has been tested for some time. However there may be good reasons to look again at the kind of problems which are coming up, and the range of responses which are possible. A multi-level foresight research programme would look at: a) focusing 'inbound' for technology and crime causal paths; b) exploring 'outbound' to look at contextual factors - media, psychology, location, triggers and thresholds; and c) looking for systemic effects at various levels, where shared intelligence is the driver of change, whether on the criminal or the justice side.

In such a programme it then becomes essential to look further and wider, at the boundaries of what appears probable or plausible. The Wild approach helps to do this by providing a structured range of questions and responses, to be deliberated among a wider stakeholder community.

Research outcomes & benefits

The benefits of a fully mobilised research foresight, including applications of the Wild approach, are potentially very wide. In the first case they would help to build a more effective security and justice system, and more resilient communities. In the wider case they would aim towards a society which is less fragmented and more cohesive, so that many of the causes of crime would be solved at source.

Links
http://europa.eu/legislation_summaries/justice_freedom_security/index_en.htm
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=4&CAT=PROJ&QUERY=01268a30e434:1e7a:457d1ec7&RCN=91880

Wild Cards

Collapse of European Transport System
The increasing dependence of travellers and logistics - particularly freight traffic by road - on electronic route optimisation creates an overload in the system. A breakdown of the European transportation network ensues and impairs supply chains for industrial and commercial goods.

Abuse of individual DNA
Criminals sell fake DNA on internet. Politicians (or other famous/rich persons) are blackmailed by abusing their (fake) DNA "fingerprints". For example, police finds prime minister's DNA at many scenes of crime, or paternity lawsuits are issued against billionaires. In another scenario, insurance company is buying clients DNA (to calculate premiums). Weapons race starts between DNA fakers and forensics.

World without secrets
The development and introduction of great variety of sensors and surveillance systems with high level of interconnection and interoperability will create an environment in which everything is traceable and observable. Add to that the remote bio-sensing capability to achieve complete collection of data of any kind on humans by humans.

Disintegration of ordinary (nano-enabled)) products by remote signal
In the future industry most products are manufactured by "bottom-up" molecular nanotechnology, and many have built-in expiry date (when they automatically disintegrate for recycling). Terrorists or criminals find a way to disintegrate functioning products or critical equipment "into dust and ashes" by using remote signals.

Cyber Crusade: Massive e-sabotage by "hacktivists"
With the aim to achieve social/economic justice in Europe (instead of fraud or geopolitical rivalry), underemployed and politically driven "hacktivists" target EU agencies, governments and businesses, with cyberattacks and other electronic sabotage.

Weak Signals

Suicide bombing in Stockholm
A UK suicide bomber caused two explosions in Stockholm near Christmas shoppers. The bomber was killed in the attack. The bomber was exposed to extremist lectures and propaganda. The event is the latest in a series of events: it is now named the new "UK Christmas export". It could signal a wild card mass casualty terror event in Europe.

Domestic criminal law in international human rights cases
Widespread refusal of foreign leaders to travel to or within the EU, due to threats of prosecution for war crimes, etc.

Criminal gangs on the rise
Criminal Gangs expand their reach, evolving into criminal insurgencies capable of seriously challenging the legitimacy and solvency of nation-states worldwide. They become a serious threat to democracy, human rights, civil society, market economy and sovereign nation states.

Nice security if you can afford it
Many resilient communities go autarchic, in the face of sea level rise, extreme weather, unstable land and geological hazards. But, only the rich can afford high levels of security and hazard management. In response, other communities are pushed to cheaper higher-risk areas, where they develop new forms of countercultural action.

EU genetic data bank hacked
Hackers steal thousands of genetic records from an EU genetic data bank. The effect on personal lives is huge, and also leads to the collapse of several health insurance and bio-medical firms.

Governance, democracy and citizenship

Scope of the European agenda

The future of Europe itself is in the balance, according to some. But this is not only about supra-national institutions which appear very remote and unaccountable to the great majority of 400 million citizens. It is also about the configuration of identity and accountability at every level – national, regional, municipal, local community, and right to the household and personal level. Even more interesting is the apparent divergence of 'function' and 'territory', and the dislocation of 'governance' from many other forms of activity. Many now identify more with global networks and interest groups, than with any one administrative unit. But within those units, it seems increasingly that public sector government, as we know it, is one kind of actor competing with others, who are often much richer, smarter and faster. At the same time, there is increased recognition that the free market is quite dysfunctional in some ways, and that new forms of governance are needed to promote the public interest, however that is defined.

Research foresight & Wild approach

For this agenda, again it is important to find ways to think 'out-of-the-box', exploring the space opened up by following a 'Wild approach'. Many of the most interesting developments in governance in the last decade have been wild cards and systemic surprises, out of the expected range of 'normal' political or military conflict. For instance: social technology and its effect on the Arab Spring, and the 'Wikileaks' episode; the fluctuating agenda for climate change; the declaration of natural reserve rights by Ecuador; the USA election of Obama, followed by the Tea Party, followed by the downgrade of the US administration; and of course the iconic wild card of 9/11.

This suggests a research foresight and 'Wild approach', to explore a creative range of possibilities, both positive and negative. Weak signals can be scanned to assess the interactions between complex and intangible systems. Wild cards can be constructed, not as forecasts but as 'what if' scenarios which then open up areas of collective debate and deliberation.

Research outcomes & benefits

There are clear benefits to following this through, but not necessarily in conventional research formats. Some of the most interesting ERA initiatives have been where a wider range of groups parties can be constructively engaged in a wider debate on governance: the media and entertainment, finance and law, arts and culture, sport and leisure, and citizens and communities. This is not so much about producing blueprints for good governance, as much as cross-fertilizing seeds, in different locations and sections of society, which may flourish with creative and self-organising solutions.

Links
http://ec.europa.eu/public_opinion/archives/eb/eb68/eb68_first_en.pdf
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=2&CAT=PROJ&QUERY=012693d84f4f:b9e1:63825a72&RCN=87288

Wild Cards

Radical conflicts over water escalate into collapse of the civil society
Tensions that begin over water escalate into inter-regional and inter-state conflict, pitching citizens against government and even against one another. This causes a collapse of the civil society.

Empowered internet users take the political power from the old political parties
Empowered by the internet, individuals wield influence over critical issues formerly influenced exclusively by the government. Empowered internet users form new types of social movements that utilise the wisdom of crowds and flash social media. Finally they form strong political groups that demand direct power to vast number of societal issues.

Common European language created
A new Common European Language is established. I shall help to overcome language barriers within the EU and foster a common European identity. It shall not replace any language spoken in the EU member states.

Major EU state elects neo fascist leader
The existence of political parties with far-right agendas is not a new feature in European politics. So what is really 'wild' or surprising in this event is the achievement of sufficient political dominance for a major EU state to elect a neo fascist or anti-Islam leader through, for example, national coalitions or major support of other far-right parties in Europe.

EU rules Member States tax policy
Through new rulings, the EU may become a dominant force in Member States tax policy. EU budgetary requirements and individual nations' contribution rates are already integral to all EU members' design of tax policy. All member states must comply with EU decisions on social justice, competition and general regulatory standards.

Weak Signals

Idea contest "The energy efficient city 2020"
The idea contest is funded by the German Federal Ministry of Education and Research and part of the project "OFFIES 2020+: Open Innovation Processes for the Energy Efficient City 2020+". The purpose of the contest is to animate as many people as possible to generate and advance innovative concepts.

Crowdsourcing at the White House
President Obama was looking for new ways to open up the White House to the American people, in order to get different perspectives from all over the country and enable people to participate. For this purpose, the White House set up an interactive crowdsourcing platform called Open for questions.

Growing interest in post-conflict cultural identity
Several European sites of great historical and cultural interest become hotly contested in terms of their "ownership" and historical meaning – cultural tourists and pilgrims are increasingly seen as reviving past conflicts and extreme events occur (attacks defacement of monuments, destruction of symbols, etc.).

Wikileaks 'reveals' that the US spies on key UN officials
As reported by Wikileaks in BBC, a cable to US diplomats issued under US Secretary of State Hillary Clinton's name tells them to collect "biographic and biometric" information - including iris scans, DNA samples and fingerprints - of key officials at the UN.

Increasing dependence of EU on import of fossil fuels
The European energy strategy aims to secure the availability and stability of energy supply. However, increasing dependence of EU on import of fossil fuels makes this goal hardly achievable. Sudden political instability and potential conflicts in key export countries could seriously disrupt European energy supply systems and economies..

Coexistence and conflict

Scope of the European agenda

It is a truism that conflict is becoming more asymmetrical. The iconic 9/11 attacks, again, opened up a new kind of space: the trillion-dollar pursuit of a tiny band of fundamentalists by the world's largest military power, and the reinvention of a global gulag to back it up. More recently there have been cyber-attacks, diamond wars and counter-insurgencies, all overlaid on existing ethnic and religious tensions. Meanwhile the agenda for military conflict also becomes asymmetrical, when coupled with internal security and repression of the more conventional kind, as seen in Libya or Kashmir. More broadly we can track the impending pressures leading in the direction of possible conflict in many areas, particularly focused on natural resources: such as the Arctic oil reserves, Middle East water supplies, Russian gas pipelines, or African minerals.

Co-existence is the name of the agenda for international diplomacy, but this can become a trap as much as a liberation. In many cases such co-existence is now more concerned with internal co-existence and security regime between ethnic groups, cultural groups, class groups, or simply as in China the urban versus the rural population. Over-arching all this is the common factor in all countries, EU and otherwise – the uneasy co-existence of the elite, financial or political, with the population at large.

Research foresight & Wild approach

Futures studies and scenario methods originated, in part, from military studies, and the practical need to assess strategic decisions in the face of uncertainty. More recently, the diffusion of military into security agendas, and the spread of 'peace' studies into a more nuanced approach of 'co-existence', make all of this more challenging. The research foresight approach is basically indispensable in dealing with the typical 'security' agenda: concerning multiple layers of inter-locking tensions, between ethnic, political, economic and cultural interests, with conflict between global and local, and between elite and citizens.

Overall, the Wild approach is the essential component of such foresight: only by thinking out-of-the-box, with creative imagination on both risks and opportunities, can we hope to explore some of the more interesting possibilities. Furthermore it can put up different storylines from outside angles: some of the WI-WE here look at brain scanning; astrological convergence; and substitutes for religion. Recent history seems to suggest that such off-piste events may well be more plausible than the purely conventional.

Research outcomes & benefits

The goal of all this is of course, to turn conflict into co-existence: a further aspiration might be, if all is well, to follow through – into a utopian world of peace, harmony, justice and equity. The research will benefit from keeping each of these overlapping agendas in mind, and learning how to reflect the aspirations of all citizens and communities.

Links
http://www.delbih.ec.europa.eu/docs/StrategyPaper20092.pdf
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=1&CAT=PROJ&QUERY=01268fc23bbb:9d93:17fa2ce8&RCN=88613
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=14&CAT=PROJ&QUERY=0126935ec502:032b:1f98c641&RCN=87790

Wild Cards

Radical Transparency by Wikileaks
In recent times, Wikileaks has published a lot of confidental news meterial. Many governments and companies have found secrets published by Wikileaks. A well-coordinated and authoritative use of Wikileaks as an information source could make radical transparency more of a reality for policymaking.

1M Euros reparation cost per civilian death in conflicts
Revelations of massive numbers of civilian deaths in conflict zones (where Western countries are active) lead to the rapid growth of a well-organised social movement (e.g. in Facebook, Twitter or other web technologies) to campaign for reparation costs per civilian victim at 1Million Euros. As a result, state actors like the Iraqi government take legal actions against coalition forces.

Eco-radicalism becomes a new dogmatic fundamentalism
Eco-radicalism leads to eco-terrorism A growing number of environmentalists radicalize, staging protest, destroying infrastructure, and resorting to acts of violence. This can lead to dogmatic fundamentalism which attempts to oppress whole societies.

Israel and Palestine join EU
European leaders become heavily involved in the Middle East peace process. As an incentive they propose to open negotiations with Israel and the forthcoming independent Palestinian state about accession of both Israel and Palestine into the EU. This is indeed realised after the establishment of the Palestinian state.

New Electromagnetic Pulse Weapons
New technologies (not connected with nuclear devices) which can create large EMP, are developed for governmental laboratories. Such devices are used for safety studies of critical electronic systems of aircrafts and important C2 Systems. Illegitimate use of such devices can endanger civilian aviation and airports and could be a true wild card.

Weak Signals

Suicide bomb in Stockholm
Growing problems involving intersection of gender politics and anti-discrimination rules concerning ethnic minorities. For example, separate regimes of law for different ethnic groups, hugely extending current frameworks permitting some diversity for Jewish, Islamic and other communities where it comes to divorce, polygamy, education, etc.

A new model of chaos
Researchers develop a mathematical model that could help us make sense of how conflicts get messy. Researchers in the Cornell University describe a model for predicting how a social group will break apart during a turbulent split.

Arab leaders urge attack against Iran
As reported by BBC, Several Arab leaders and their representatives are quoted as urging the US to carry out an attack on Iran to bring an end to its suspected nuclear weapons programme.

Obama's controversial Nobel Peace Prize
The Nobel Committee wanted to contribute to enhancing that kind of international policy and attitude which Obama claimed to stand for. However, the 2009 Nobel Prize for Peace was heavily criticized for being premature and politically motivated. Though Obama himself said he did not consider himself worthy of the award, he nonetheless accepted it.

Growing fears that terrorists may acquire Pakistani nuclear material
US and UK diplomats feared Pakistan's nuclear material could fall into the hands of terrorists, the Guardian reports some of the leaked cables as revealing. Cables reported in the New York Times reveal the US has been attempting to remove highly enriched uranium from a research reactor in Pakistan since 2007.

Social pathologies and ethics

Scope of the European agenda

Recent trends have confirmed that society and the 'social order' is a very fragile thing. As for social pathologies, generations of academics have looked this or that way, with or against the policy-makers – deviance, social movements, social dysfunctions of many kinds, gangster and drug dealing regimes, or simple 'mindless criminals'. Broadly there appear to be three agendas of concern. The first looks at 'traditional' pathologies, such as crime and deviance; mental illness or dysfunction; and collective pathologies of ethnic tensions. A second area looks at new formations of these pathologies in new areas, for example: crime has moved to the internet; mental illness has moved to conditions such as obesity; and collective pathologies have exposed previously assumed conditions such as gender relations and domestic violence. Thirdly, there are apparently quite new conditions and trends to be explored. For instance the issues of on-line gaming and gambling have become major concerns in only 15 years; or the growth of disaffected and unemployable youth shows new kinds of post-industrial alienation.

Again this is a European social agenda, if not a European political mandate; as such trends generally leap over national borders, and are more likely to resonate with global cultural dynamics, as much as national policies. Again there is a political economy or 'post-political' dimension, which sees social pathologies as yet another phase in the evolution of global capital. There is also an evolutionary perspective which looks at such pathologies as the inevitable by-products of social development and transition.

Research foresight & Wild approach

The foresight approach is well equipped to explore some of the darker and wilder corners of the social and societal agenda. For example the UK Foresight project on obesity, and a following programme on mental health and well-being, illuminated the landscape, although perhaps falling short on the application of debate to policy. Moreover the Wild approach helps to illuminate the frontiers, with out-of-the-box thinking and interconnections between different areas of knowledge, which is essential to understanding some of the most significant dynamics. For instance, it seems there are active links between such themes as – ICT and fundamentalism; alienation and restructuring; depression and pharmaceuticals; diabetes and food multi-nationals; narcotics and deforestation. Overall there is a new realisation of uncertainty and ignorance – despite generations of sociological effort we seem to know less about the dynamics of our own society. So it may be that the Wild approach, supported by the WI-WE resources, is not an optional add-on but an essential tool for responding to future challenges.

Research outcomes & benefits

To be effective this kind of research is unlikely to sit only in the pages of academic journals. It is more likely to be the catalyst for a pro-active and creative dialogue between different sections of society, and different sources of knowledge. The benefits of addressing social pathologies will be both local, national, European and global. It may be they can start to focus on the biggest pathologies of all – the global system which enriches the elite and entrains the affluent, while devastating ecologies and resources on a global scale.

Links
http://ec.europa.eu/health/ph_determinants/life_style/drug/drug_en.htm
http://ec.europa.eu/external_relations/drugs/index_en.htm

Wild Cards

Spirituality separates from organized religion
Massive disengagement of people from established religions, and movement to spiritual expressions outside religion. This trend will include spiritual attitudes to issues such as environment protection and climate change, animal rights, gay liberation, moral values, etc.

Pollution, poverty & death – the blowback begins
Political reaction to evidence that the poor suffer much worse pollution levels: mass squats in affluent areas. One of these projects strings evidence about particulates implication in some widespread disease e.g. asthma.

Extreme measures
The EU youth are never more 'secure' than today, and never more insecure and risk-seeking. 'Extreme activity' communities include sports and leisure, drugs and sex, virtual worlds, and new strands of fundamentalism. There is almost a kind of death wish which spreads silently across affluent communities.

MacPublicService, Inc.
Internationalisation of public-and-private network goes extremely well. But this means everything is Americanised. 20% of EU public services (including jail) are provided by US companies.

Society nervous breakdown
The acceleration of life, sensory overload, pervasive ICT and fierce competition at the work place have led to a dramatic increase of mental illnesses and disorders, a rise in apocalyptic prophecies and conspiracy theories and wide-spread apathy.

Weak Signals

Growing privatisation of war
Major states are using corporate organisations in numerous military, security, and auxiliary roles – just as some countries' outsource even sensitive public sector activities (e.g. prisons) to private companies. Suspicions have been raised about the potential influence of such entities on security policy, alongside growing concerns with the human rights and ethical issues of such privatisation.

DustCart
The FP6 DustCart project is aimed at designing, developing and testing a system for improving the management of urban hygiene based on a network of autonomous and cooperating robots, embedded in an Ambient Intelligence infrastructure. It suggests a new method of garbage collection and of preserving cleanliness in public places.

Nepotism and corruption replace qualifications
Many professions are over educated. Elder people stay in their good positions as long as possible and they want to make favours to their relatives. Education starts to matter less and less. For example, the 'Athens 700€ generation', which refers to the generation of well educated under 35 years old people who earn max 700€ per month.

Radicalisation of Islam
Low political will and dedication to resolve conflicts in Middle East region has a consequence in ongoing radicalization of various Islamist groups in the region. With growing capabilities, these groups can acquire means of mass destruction, being it weapons or just materials (such as nuclear waste).

Growing interest in post-conflict cultural identity
Several European sites of great historical and cultural interest become hotly contested in terms of their "ownership" and historical meaning – cultural tourists and pilgrims are increasingly seen as reviving past conflicts and extreme events occur (attacks defacement of monuments, destruction of symbols, etc.).

Social exclusion, poverty and affluence

Scope of the European agenda

Across Europe there is wide debate on new kinds of poverty, exclusion and the 'underclass'. Social stratification for most of history seems embedded in the social order. But it may be now that traditional boundaries are taking new forms: for instance, alienated youth, disconnected diaspora, or an educated younger generation without jobs or access to the system. The 2011 riots in UK cities exposed new questions about the effects of global consumption culture on those without the means to buy into it. But it also raised the very tangible questions of the 'Spirit Level' , where all the evidence suggests that lower income inequality is correlated with higher health, prosperity and quality of life.

This Grand Challenge, in both traditional and new versions, is a well trodden path, but one which cuts across many policy and academic boundaries. It seems that national fiscal redistribution in the conventional sense, is both unaffordable in the age of austerity, and possibly ineffective, in an age of relative poverty driven by induced consumption desire. If poverty is not just a matter of income but the whole system of segregation and stratification of health, education, and cultural aspirations, then it is embedded in the social-economic model at the national and European level[1]. If there are other responses, such as third sector social enterprise, or social network interest groups, these can look promising, but do not always scale up in a way that fits either with public policy or corporate investment. In short, paradigm changes are inevitable but consensus seems impossible.

Research foresight & Wild approach

As a classic 'wicked problem', it seems that the challenge of exclusion and poverty has many definitions, but not so many clear solutions. It is noticeable that national foresight studies, even those directly focused on social policy, have often steered away from the poverty question, as too political and policy-sensitive. In principle this would be all the more reason to frame social policy research in a way which enabled more constructive debate. This calls for a program of research foresight at European, national and local levels.

Such a program would need to follow a 'Wild approach', in order to explore the darker corners of the problem, and then to generate wider and more creative solutions. This is shown by some examples of WI-WE type information: 'poverty tourism' is a growth business; heroin addiction shifts to virtual reality addiction; advanced genetic tracing enables segregation at birth; or, private universities take over higher education. Naturally one person's problem is another's solution, which is why there is no substitute for wide-ranging social deliberation, with the best available information, with a Wild approach to the frontiers of the possible.

Research outcomes & benefits

The outcomes of a such a program are likely to be both 'substantive' and 'procedural'. They are also likely to be 'heuristic' – not only statistical correlations beloved of social science, but a more pro-active, creative and entrepreneurial approach to solutions and opportunities. This might include new institutional designs, social technologies, trans-media cultural initiatives, holistic therapy and personal development, as well as revisiting the traditional structures of class and culture.

Links
http://ec.europa.eu/social/main.jsp?langId=en&catId=750
http://ec.europa.eu/social/main.jsp?langId=en&catId=637
http://www.eapn.eu/content/view/33/52/

[1] *Wilson R.G & Pickett K (2009), The Spirit Level: Why More Equal Societies Almost Always Do Better: London, Allen Lane.*

Wild Cards

Trading prosperity
New indicators for prosperity and well-being are increasingly popular, and EU trading markets set up. Alternative forms of money and exchange proliferate, which would seem to be good for prosperity, but huge fortunes are made by intermediaries and speculators.

Rapid diagnosis machines
"Labs-on-a-chip" have been introduced for time-saving and automatic diagnosis and detection of diseases. These new forms of diagnosis are comparable to ticket machines which are located in all areas of daily life such as supermarkets, gas stations or pharmacies:

All in the mind
New Web 3.0 virtual worlds take over the minds and lives of the youth – blurring the boundaries between entertainment, trading, networking, travel, education and work. The long-term effects are similar to hard drug habits but apparently much harder to kick.

Criminalisation of parents of homeless
As homeless people (especially children) are increasingly seen as a major social problem, parents are criminalised for not being able to take care or 'prepare' (educate) them.

Brain capacity testing
Employees or e.g. international migrants are being "brain tested" by companies, if they have "good" (long life, good memory) brains. Bad brains are being discriminated against. Even school kids are being placed according to the results of their brain tests.

Weak Signals

Public Transport re-emerges
Increasing public awareness towards sustainable mobility and a broad acceptance for public transportation services in Europe have helped to change the negative perception of it in emerging countries. It is perceived less as the means of transportation for the lower classes.

Informalisation through social entrepreneurship
The third sector has its third way. 20% of the workforces in EU is officially unemployed and entered the informal job market. 40% of the economy is going virtual.

Growing failures of social care in educating young people
New evidence mounts demonstrating the lack of educational engagement and achievement among young people from social care backgrounds. The perceived crisis of social care is intensified as "cycles of deprivation" accumulate and some young people successfully sue care institutions for failure to prepare them for adult life.

Growing interest in legacy of slave trade
Growing interest in legacy of slave trade helps to identify new targets for funding reimbursement - slave ports, companies, some communities in Africa itself. New claimants - e.g. people shipped around within British Empire.

Growing interest in new indicators of poverty and social exclusion
Growing interest in applying indicators to EU policy about poverty and social exclusion: this opens up new policy spaces with the possibility of better understanding and more effective responses to complex problems.

Economic prosperity and growth dynamics

Scope of the European agenda

At the top of the policy agenda is economic prosperity - if this is not too ironic, in the Europe of 2011, ravaged by austerity, unemployment and threat of financial default. At the same time there is increased questioning of the real meaning of 'prosperity': how far it widens the gap between elite and majority; how far it rests on a fading model of developed versus developing worlds; how far it damages the environmental life-support system; and most fundamentally, whether material affluence can equate to real prosperity and personal well-being. Even within the mainstream economic agenda, there is a growing awareness that economics seems to lack some essential understanding of the dynamics of the problem, which may be much more structural than simply a lack of credit. Emergency measures such as the Financial Stability Fund are widely seen to be for the benefit of the financial elite who continue to help themselves; and most conventional policy options such marginal tax rate changes, seem to be quite marginal to the issue.

Of course, this is not an easy moment to raise full-blooded alternatives to the system, with some countries looking at 25% unemployment rates. But it seems that the internal contradictions of the system as is, point towards to some very unpleasant possibilities in the near future. This of course is a pan-European agenda, particularly for the Eurozone; but it is also a national, regional and indeed a local agenda, if we look at the prospects for different communities in widely different locations.

Research foresight & Wild approach

Given its importance, this agenda might seem to deserve increased level of support from the ERA. But perhaps there is something of a paradigm effect. If the above economic challenges are all framed in terms of neo-classical theory, with inputs/outputs which macro-economic models can calculate, then it tends to remain within a small technocratic circle. However if we take a wider research foresight approach to explore some of the wider issues above, then our methods and tools will need some rethinking and development. And if we are looking for deeper understanding of both threats and opportunities, then the Wild approach is essential, for shining a light on the further frontiers. Some examples of WI-WE type information are very topical: carbon markets create a new credit crunch; marketing moves to neural implants; sudden growth of alternative local currencies; financial default of major cities opens the door to Chinese bail-out. As ever, the distinction between positive and negative outcomes for these, depends on who is asking, and whose strategy is working.

Research outcomes & benefits

The result of all this is likely to be more than refining another macro-economic model. In a situation which is hopelessly tangled, between short and long term, local and global, producers and consumers, a single fully rational theory or model seems unlikely. So again we need to look more in the direction of a creative process of shared exploration, social deliberation, anticipating and testing. Some of this is certainly towards the Wild end of the spectrum, and this might shed useful light on back on the mathematics of risk which helped to generate the current crisis.

Links
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=4&CAT=PROJ&QUERY=0126942dda1b:51ca:6155ecfa&RCN=91232
http://ec.europa.eu/social/main.jsp?langId=en&catId=736
http://ec.europa.eu/social/main.jsp?catId=89&langId=en&newsId=514&furtherNews=yes

Wild Cards

$ Hyperinflation
Due to growing pressure of the American citizens, the US government is forced to emit trillions of $, generating a hyperinflation comparable to the one that occurred in Germany after WW1. International trust in the $ collapses; a blooming creation of complementary currencies through Internet revitalizes local economies and autonomies, while international heteronomy declines sharply.

Green Vigilantes
Attacks (by individual) on energy waste become prevalent, including sabotage, naming-and-shaming and various forms of civil disobedience. This becomes a EU-wide movement and is targeting facilities where energy is unnecessarily wasted.

Checkout finance
Conventional banks continue to fail, including those now owned by governments: suddenly in 2015 most financial services are provided by large supermarkets (Tesco, Carrefours, Aldi, etc). This also finalizes the relocation of community activity away from town centres, towards supermarket sites (which also pushes up their corporate valuations).

Facebook capitalism
Conventional market systems based on price and demand, are suddenly giving way to online networks for supply, demand and the all-important 'choice editing'. Half the FTSE firms lose half their value and are bought by new Web 2.0 startups.

Freenomics
50% of the world's largest companies vanish in the next 5 years due to the emergence of Freenomics. New classes of free goods and services emerge, reshaping the underlying economics of entire industries. Grass-root, voluntary, open source, peer-to-peer services become Freenomics a new megatrend that fundamentally challenge the contemporary logic of the markets and finance.

Weak Signals

Euro's structural rigidity
In December 2010 Former British Prime Minister Gordon Brown said that the euro's problems were bigger than just its governments' debts. He warned that unless Europe solves the euro's structural rigidities and the enormous debts of its banks, in 2011 there could be a major crisis in the euro area.

Holistic innovation
The successful creation of innovations is considered to be one of the key factors for companies to generate sustainable competitive advantages and corporate growth. But the exclusive focus on creating smashing new product innovations barely accounts for achieving these economic targets.

Reduced Security for Innovation
Google's former CIO Douglas Merrill describes Google's approach concerning internal innovation culture as offering employees as much freedom as possible, e.g. regarding operation system or location. Any other way would stifle their innovative capacity.

Rapid Innovation Testing
New technologies and digitalisation make innovation processes cheaper and more efficient. They enable easy testing and evaluation – offline and online. Enterprises increasingly use digital and conventional systems to test an ever-growing number of their ideas and thereby increase the probability of finding good solutions.

Boom in crowdsourcing
The current global economic crisis has a pervasive impact on national economies and labour markets, resulting in increasing unemployment. Due to the fact that many unemployed workers do no longer have the chance to find a permanent position in their sector of expertise, Crowdsourcing marketplaces such as InnoCentive, TopCoder, uTest, and CrowdSpring are booming.

Urban and rural dynamics

Scope of the European agenda

As the rest of the world moves towards an urban future, the already urbanised Europe faces new challenges. There are new concepts and definitions of 'cities' and settlements: counter-urbanised 'edge cities' and peri-urban hinterlands: networked communities and virtual cities: and new forms of sun-belt tourism or campus parkway type cities, are all stretching the boundaries of what used be called 'urban'. In parallel, there is an emerging understanding of cities, not so much as territories but as flows or relationships, which can work on local, regional or trans-national scales. The European agenda for 'territorial cohesion' attempts to provide some rational policy structure for such flows, but it is an uphill task when most of the forces which drive urban and regional change, appear to be outside the scope of public policy. At the same the many kinds of dysfunctions, social pathologies and policy gaps, are generally left for the public sector to pick up the pieces.

The result is that we may see large numbers of 'dependency cities' alongside a favoured few 'elite cities'; such differences highlight the nature of the global game, in which cities and their components are small pieces. Meanwhile at the local level, many communities are comfortably suburban and affluent, next to many other communities who are insecure, displaced, alienated and fragmented.

Research foresight & Wild approach

In this situation it becomes urgent to explore systematically on a multi-level agenda, with the benefit of insights from a wider range of views than just the public policy corner. The application of foresight to urban issues and urban policy seems sensible at first sight – is that what cities are already doing with long term urban and regional planning? But there are many more layers than would appear in the carefully managed agenda for physical development: community development and social enterprise; cultural and ethnic issues; ecology and resource issues; the tension of global finance and local needs; the asymmetrical relationships within the governance community. The practice of urban foresight then needs to develop a modus operandi, so that it can explore these wider areas, at the same time being connected in a practical way to the levers of policy and/or finance.

In this task, again the Wild approach has an essential role to play. Individual cities and settlements might appear quite normal if not boring; but the system as a whole is volatile, unstable and vulnerable. Small changes such as the privatisation of utilities can have large effects on the poorest of society, even while others benefit from hi-tech innovation. With larger pressures coming up, such as peak oil, food shortages, climate impact hazards, mass unemployment and social unrest, cities are containers for both the problems and possibly the opportunities for moving forward. Few of these appear in urban policy documents or academic papers – so again, progress may be more a matter of creative thinking, entrepreneurial design and social market testing.

Research outcomes & benefits

Such an urban foresight agenda should ideally work at many levels with many different communities. There are examples where school kids have worked creatively with ethnic groups, engineers or financiers. This stretches the definition of foresight, into areas which work or have recently worked under different names: Round Tables, Local Agenda 21, Transition Towns, un-Conferences, Business Coalitions, etc. Again this becomes unavoidably political and possibly controversial; the task is then to mobilise change from these wider connections.

Links
http://www.eu-un.europa.eu/articles/fr/article_7816_fr.htm
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=5&CAT=PROJ&QUERY=012693b68b07:e1bc:5c9c3a22&RCN=93520
http://cordis.europa.eu//fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=5&CAT=PROJ&QUERY=012693b68b07:e1bc:5c9c3a22&RCN=93520

Wild Cards

This land is ours - or theirs?
Land use in and around cities has reached a tipping point – all underused or semi-vacant pieces of land are seized by local food growers, supported by local authorities who compete to be the most self-sufficient. In response many landowners put up fences, and there are struggles and even riots over the control and access to multi-functional land.

CCTV Cameras pulled down
After serious and systematic cases of privacy invasion and use of CCTV infrastructure by hackers and terrorists, the UN and other international bodies declare CCTV systems a major security threat.

Electronic currency disappears
Credit crunch causes a domino effect which leads to deep mistrust in global markets and end of money lending. People start to withdraw their savings, but it appears to be impossible due to short of real money in banks. Finally, electronic currency disappears.

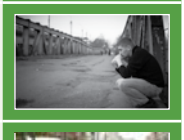
Pre-paid power
The crisis of trust in local politicians and elected democracy deepens: direct preference-based decision-making is developed as a commercial Facebook type service. This is backed by private equity transnational corporations (TNCs) who now own most social technology providers. The first 'pre-paid power' service is launched EU-wide in 2021.

Total security in the city
In Manchester the final solution to urban decline has now arrived – the all-gated community containing housing, leisure, work, shopping and education – all within a carefully graded pervasive-IT whole-household security system. Affluent professionals need no longer re-locate to the countryside.

Weak Signals

Interest in construction and nature of European identities
Evidence of rapid growth in diversity of identity across MS, with little if any sign of expected convergence (e.g. West and East, North and South). Assumptions that European identity will support social cohesion and political identity are challenged and realisation of need for new frameworks to support dissensus.

Recognition of role of work and community in regeneration
European peace corps, where youth unemployment and other problems attacked by large-scale mobilisation of young people in voluntary or semi-voluntary reconstruction and community action work in deprived regions.



Cars banned from city centres
Many European cities have already created designated zones for pedestrians and additionally introduced city tolls to enforce a reduction of inner city transport. In the future, a few small cities and islands are entirely car-free.

Silent spring in the living room
New evidence that many common furniture products (e.g. chipboard) release dangerous solvents into air, or accumulating in electronic equipment etc. So there is strong pressure to refurbish, re-engineer or ventilate in new forms of building design and management. Scientific uncertainty amplifies the public calls to demolish and rebuild whole towns and cities.

CoWorking Houses as Creative Hubs
More and more of the so-called knowledge workers from the creative class join so called CoWorking houses. CoWorking houses offer an easy, flexible and budget workspace. They combine workspace (productive and functional) with a creativity hub (social, energetic, creative). By this, people from a broad spectrum of disciplines meet and can collaborate with each other.

Education and skills dynamics

Scope of the European agenda

According to the Lisbon agenda, the knowledge economy is the way towards European prosperity and sustainability. But the road at the moment is not straight or smooth, and in reality Europe is falling behind its international competitors. The role of the education system is crucial; but there are many dilemmas and few simple answers.

What kind of knowledge is needed to compete in the global knowledge economy – do we need more technical skills, people skills, entrepreneurial skills, or transferable skills which might be more relevant in 30 years? And surrounded by pervasive information, should we pursue knowledge as a 'tacit' process of inter-personal relationships, rather than simple data which can be found on a smart phone? There are practical policy issues on the organization and management of schools, universities, professional training, or lifelong learning programs. These also point towards new opportunities, such as edu-tainment, niche tourism, and virtual learning systems. Over-arching this are wider debates, whether education is about economic growth, or about wider qualities, and how teaching and learning systems should respond to this.

Meanwhile, education is highly political, with a system which is embedded in social structures, and in particular the stratification of the elite, the majority and the excluded. This becomes a practical question as to how to pay, and who should pay for education, in a situation of public deficit and austerity. For example the emergence of private universities, or private funding systems for public universities, shows new opportunities and new dangers ahead. Similar examples highlight the cross-border and European dimensions, which is where the ERA aims to respond. 'Mobility of researchers', for one, is a positive pan-European agenda, which in practice raises questions on national differences in research support, with many gaps and barriers. To follow this through, the ERA agenda of the future may look beyond the research and higher education sectors, to schools, workplace training and the wider roles of knowledge.

Research foresight & Wild approach

It seems not only possible but probable that the education and skills training system of 2030 may be very different to now. So a future-oriented research foresight approach is essential, to exploring the prospective and outlooks, and forming multi-stakeholder strategies. At the same time we need to look beyond projections of current trends, towards new possibilities from inter-connections between different fields (e.g. social technology, education policy, applied philosophy, organization studies, behavioural economics). The Wild approach supported by the WI-WE resources will be essential, test the boundaries of the probable or plausible, and to explore more creative possibilities. For instance we can imagine a typical university course in 2030, as a combination of on-line targeted neuro-learning, with hands-on personal development on a rural eco-farm. The Wild approach will gather a wide range of such possibilities, and structure them to be relevant to policy choices in the present day.

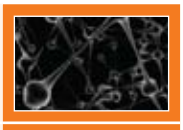
Research outcomes & benefits

As creative action is at the heart of the education system, a multi-level research foresight agenda will also need a creative action approach. The potential outcomes and benefits are many and multi-level, involving a wide range of stakeholders. To follow this through may need re-thinking conventional boundaries, between public and private sectors, teachers and students, providers and consumers, universities and industries, even to the 'text-books' and 'field-books'. So the result will be not so much a fixed strategy or blueprint, rather an ongoing debate and multi-level programme of creative foresight.

Links
http://www.timeshighereducation.co.uk/story.asp?storycode=408560
http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=4&CAT=PROJ&QUERY=0129221dd34c:abde:1722bb1f&RCN=93095
http://news.bbc.co.uk/1/hi/education/4092133.stm
http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=6&CAT=PROJ&QUERY=0129221dd34c:abde:1722bb1f&RCN=93999
http://www.se2009.eu/polopoly_fs/1.16246!menu/standard/file/A%20GREEN%20KNOWLEDGE%20SOCIETY_CREATIVE%20COMMONS_%20WEB1.pdf

Wild Cards

Automatic learning through neuro-data transfer
Technological enhancements of cognitive learning processes become available - but only for those able to afford them.



University of the third age
Elderly people are back to education, actively organise themselves and initiate a political party for the elderly which lead them back in power.

Basic education ends at the age of 18
Basic education (high school and first degree education) of today ends at the age of 18. High school education is achieved by the age of 15. Compulsory education system include first degree for everyone. The entire education system including universities change.

All in the mind
New Web 3.0 virtual worlds take over the minds and lives of the youth – blurring the boundaries between entertainment, trading, networking, travel, education and work. The long-term effects are similar to hard drug habits but apparently much harder to kick.

Visual literacy prevails
Reading and writing are no longer considered fundamental to children's education. New visual forms of communication combined with ubiquitous touch screens replace reading and writing.

Weak Signals

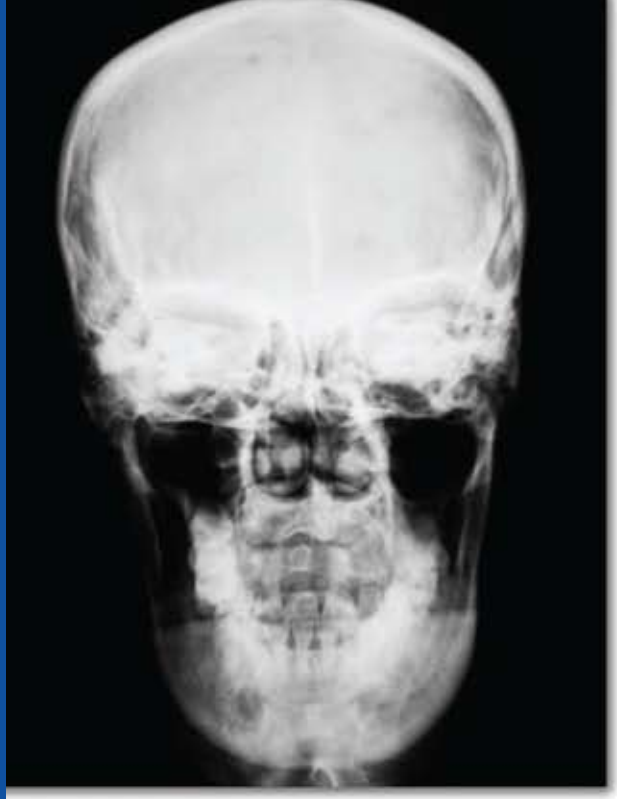
Emergence of no-gender societies
Emergence of new ways of promoting privacy, gender equality and identity freedom. New baby's sex kept secret by Canadian parents.

University offers Lady Gaga sociology course
The course is not focused on the person or the music but "the thing out there in society that has 10 million followers on Facebook and six million on Twitter". In other words, the "social phenomenon".

Libraries closing
UK Government spending cuts force libraries to close, this may result in people from deprived areas being unable to access books for reading pleasure. This will increase the current educational gap between rich and poorer areas.

Social Innovation – The Urganda Rural Development and Training Programme
What is distinctive about the URDTP educational programs is that everyone learns the creative process - how to create a vision, contrast it with your current reality and take action to achieve your vision (in short, how to innovate!).

Growing failures of social care in educating young people
Striking accumulation of new evidence on widespread failure of efforts to support the education young people in social care.









PART II
Thematic Priorities

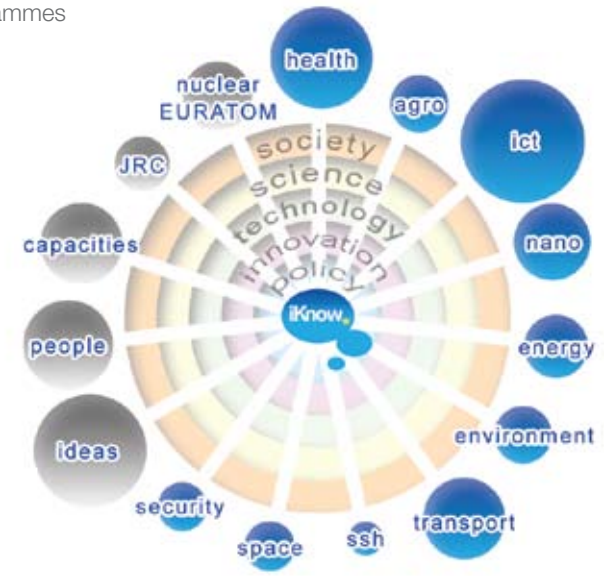
Introduction to the thematic priorities

Thematic Priorities

The European Union's Seventh Framework Programme (FP7) comprises eleven Thematic Programmes: these are listed below, (with their approximate budget in billions of Euros in parentheses):

1. Health (6.0)
2. Food, Agriculture, Biotech (1.9)
3. Information and Communication Technologies - ICT (9.1)
4. Nanotech, Materials, Processes (3.5)
5. Energy (2.3)
6. Environment (1.9)
7. Transport - incl. Air transport and Galileo (4.2)
8. Socio-economic Sciences and the Humanities (0.6)
9. Space (1.4)
10. Security (1.4)
11. Nuclear research - EURATOM (2.7)

The outer ring of this image shows the 15 specific programmes of the EC FP7 with the size representing the allocated funding, e.g. €9,110 million for ICT research and €610 million for social sciences and humanities (SSH) research.



This section provides some outline details and thoughts on these 11 thematic priorities, and discusses how they relate to the work on wild cards and weak signals carried out by the iKnow project.

The thematic details are abstracted from various EU documents, and the terms used to describe the various lines of work come from these authoritative sources.[5] Since iKnow deals with wild cards, it is probably worth pointing out that there might be alternative views as to the underlying rationales for, and the merits of, the different themes. There may well be wild cards that would emerge from consideration of such appraisals. For example, consider what wild cards might emerge from the ideas that we are looking at the "wrong" technologies, or at technological solutions where the real challenges are social ones, perhaps because our problem-framing has been captured by this or that lobby – and what weak signals would suggest that such is the case, or at least that growing numbers of stakeholders believe this to be the case.

But even without such deconstruction of the current themes, it is possible to envisage numerous wild cards that can be inspired by the work that is underway within them. We could ask, for example:

- What would happen if this research is unexpectedly successful, and important new applications of the knowledge are rapidly and successfully commercialised/made available on a large scale?
- What would happen if this research is unexpectedly unsuccessful, and obstacles to progress, or to European success, in this field are uncovered – what might these obstacles mean for development and applications of the knowledge in this field more generally?
- What unexpected things might happen that could take development and applications off on quite new paths, creating new paradigms or new sets of producer and user?
- Might there be unexpected interactions between work in this area and that underway in other areas?

These are only a small set of the questions that can be used to provoke wild card and weak signals (WI-WE) analysis. iKnow has been pioneering the systematic application of such lines of enquiry, focusing on the Science, Technology and Innovation scene, and on FP7 in particular. However, the approaches that we have developed should be applicable on a much wider scale, to just about any area of policy or strategic analysis.[6]

[5] *The main sources include the EC website and the following publication: "European Commission: Cordis. (2006) Understanding the Seventh Framework Programme (FP7). Retrieved October 21, 2011, from European Commission: Cordis."Web Site: http://cordis.europa.eu/fp7/home_en.html*

[6] *The results presented in Part II of the ERA Toolkit are to some extent based on the iKnow Consortium efforts to implement the "iKnow Methodology Manual for the systematic and structured scanning of FP7 projects" available at www.iknowfutures.eu*

Wild Cards

End of Aging
Revolutionary findings mainly in biotechnology not only understand, but also impede mental and physical ageing. The impacts on human society are immense, individually and structurally.

Animal Experiments End
Higher moral standards prevail and induce the end of animal experiments for pharmaceutical as well as for cosmetic products in the EU.

Rapid-Diagnosis-Machines
"Labs-on-a-chip" have been introduced for time-saving and automatic diagnosis and detection of diseases. These new forms of diagnosis are comparable to ticket machines which are located in all areas of daily life such as supermarkets or gas stations.

Brain Capacity Testing
Employees or e.g. international migrants are being "brain tested" by companies, if they have "good" (long life, good memory) brains. Bad brains are being discriminated against. Even school kids are being placed according to their test results.

Traditional European Medicine
Intense and highly funded research in the field of monastery medicine lead to the introduction of an officially approved medical treatment called "Traditional European Medicine" in all European member states.

Weak Signals

Mental Health from Retail Stores
Along with the general rising awareness for health and its commercialisation, mental health is becoming a commercial good as well; e. g. brainfood and brain training games were already introduced.

Increasing Self-Medication
Due to rising costs, doctors are less often being consulted, but patients medicate themselves. The probability of undetected diseases and risks for overdoses might rise significantly.

Neuro-Enhancement
New drugs are continuously introduced. The drug consumption of drugs to improve one´s performance or mood becomes more widespread (neuro-enhancement), particularly of medicine which is usually prescriped on people with cerebral diseases.

Human Enhancements
Research on enhancing human performance becomes more and more popular: e.g. modification of biochemical processes in the body, implants for monitoring body status and releasing drugs as well as nanotech-enhanced tissue, bones and brain.

Care Communities
Due to the ageing society and the need for nursing, new forms of living are being established: e.g. elderly people live together in "care-communities" and live in multi generation houses to be taken care of and to look after each other.

Health

Health is a major theme of FP7, with a total budget of € 6.1 billion. The objective of health research under FP7 is to improve the health of European citizens and boost the competitiveness of health-related industries and businesses, while addressing global health issues.

European-funded health research focuses on three pillars:

1. **Biotechnology, generic tools and medical technologies for human health**
   - High-throughput research
   - Detection, diagnosis and monitoring
   - Prediction of suitability, safety and efficacy of therapies
   - Innovative therapeutic approaches and interventions
2. **Translating research for human health**
   - Integration of biological data and processes
   - Research on the brain and related diseases, human development and ageing
   - Research on infectious diseases
   - Research on major diseases: cancer, cardiovascular disease, diabetes/obesity, rare diseases, |other chronic diseases
3. **Optimising the delivery of health care to European citizens**
   - Translation of clinical outcome into clinical practice, including better use of medicines
   - Quality, efficiency and solidarity of health care systems
   - Enhanced health promotion and disease prevention
4. **Other actions across the Theme include**
   - Support for health research
   - Responding to EU policy needs

Emerging themes and issues

Health is known to be one of the main determinants of quality of life, and huge efforts are invested into attempts to deal with major threats to health, and improve treatment of and recovery from ill-health. Technological breakthroughs have been common, and there are prospects for many more, some of considerable impact. At the same time, health systems are under strain and there are great needs for service innovation. New threats – or old threats in new forms – may reappear: epidemiologists are anxious about future flu pandemics, and AIDS and BSE demonstrate nature's capacity to surprise us with new infectious diseases. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Algae pathogen suddenly destroys new energy foundation of humankind
Suddenly, a new type of airborne algae pathogen starts to spread and destroy the new energy foundation of humankind.

Agriculture runs out of phosphor due to algae biofuel production
Production of large quantities of algae requires phosphor fertilizing. All available phosphor goes to algae production and agriculture especially in developing countries starts to severally suffer from scarcity of phosphor fertilizes.

Terrorists take algae production plants to their main targets
As oil sector is going down and algae is taking its place, new global geopolitical tensions arise. Ex-oil states drive terrorist attacks on algae.

Silent Seas
The world's fisheries continue to collapse although smart controls could help.

A Killer Water Filter
Novel materials promise better access to clean water around the world. By combining nanotechnology with cheap materials such as cotton and tea bags, researchers have recently developed mobile water filters that can be manufactured very economically.

Weak Signals

Emerge of new agricultural methods for coping with climate change
Currently new agricultural methods for coping with climate change are being piloted, included drought-resistant crops and new approaches to crop rotation and irrigation.

Bees be no more, less food than before
Reducing numbers of bees and other pollinating insects reaches catastrophic levels with widespread crop failure due to lack of pollination of plants. Natural herbivores affected and go into decline but other insects also in deterioration.

Food markets became investment subject in previous credit crunch
Furthermore, if a credit crunch takes place at the same time, the prices of grain, raw materials and oil will probably go up in the markets in the same way as they did during the previous credit crunch.

Food consumers are steered towards healthier dietary choices
Food consumers are steered towards healthier dietary choices by product labelling and by joint research activities.

Consumption drives market capitalism, not saving, conserving or sparing
Consumption drives market capitalism, not saving, conserving or sparing.

Food, Agriculture and Biotechnology

The European theme of Food, Agriculture and Fisheries, and Biotechnology, known as the Knowledge-Based Bio-Economy (KBBE) theme, has a total budget of € 1.9 billion. Theme 2 aims to promote European leading and innovative knowledge to increase productivity and competitiveness and improve our quality of life, while protecting our environment and social model.

European-funded KBBE research focuses on three pillars:

1. **Sustainable production and management of biological resources from land, forest and aquatic environments**
   - Enabling research
   - Increased sustainability of all production systems (agriculture, fisheries and aquaculture)
   - Optimised animal health production and welfare across agriculture, fisheries and aquaculture
   - Socio-economic research and support to policies
2. **Fork to farm: Food (including seafood), health and well-being**
   - Consumers
   - Nutrition
   - Food processing
   - Food quality and safety
   - Environmental impacts and total food chain
3. **Life sciences, biotechnology and biochemistry for sustainable non-food products and processes**
   - Novel sources of biomass and bioproducts
   - Marine and fresh-water biotechnology (blue biotechnology)
   - Industrial biotechnology: Novel high added-value bioproducts and bioprocesses

Emerging themes and issues

The idea of the bio-economy – that we are depend on biological processes and entities, and that out interactions with these systems can be increasingly informed by the new biosciences and biotechnologies (as well as related field such as ecology) is crucial here. There have been many concerns expressed about the management of arable and marine resources, for instance, with warnings that we could reach "tipping points" with regard to some habitats that could prove to underpin whole ecosystems. There are hopes that new technologies (including but not restricted to GMOs) could vastly improve our resilience and capacity to deal with, for example, climate change. And there are considerable uncertainties associated with the rapidly developing knowledge – and our continuing deepening of understanding about the complexities of the systems we are living within. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

3D mediDoc-in-a-box: Pervasive self treatment and diagnosisstworthily copying reality
Practically whatever from personal appointment to new clothing trial can be done in 3D virtual space instead of real pub or shop.

iBrain vs. Brain Point
Human thoughts could be transferred straight from the brain onto software similar to Microsoft Word. The software/application would also be able to analyze, process and structure the ideas into coherent text draft form.

Nano-lab inside your body
Chip is inserted in the body at birth which will monitor the body, prevent diseases and heal the body if necessary.

Secure and safe internet that is easy to use
A new Internet would be developed that would be safe from criminal activity and social pathologies, and it would be very much simplified in use.

Information crisis caused by personalized information delivery
Smart internet media enable targeted supply of information to individual users. This may be easily misused to isolate the user in a virtual world of incomplete or false information.

Weak Signals

Fast electronics for compact lab-on-chip applications
The goal of the ULTRA project is the development of THz systems for medical, biological and chemical analysis.

Next generation peer-to-peer content delivery platform
The project TP2P-Next develops an open source media delivery system with social and collaborative connotation using the emerging P2P paradigm. This development will have important consequences for content production and distribution.

Publish-subscribe Internet routing paradigm
A major flaw in the design of the Internet is its imbalance of powers in the favour of the sender of information.We need a new Internet architecture, where multicast, security and mobility are designet directly into the architecture.

Migration of internet services in pervasive ICT environment
There is a demand for internet services which enable user to change ICT platforms and still continue his tasks through an interface adapted to the new context of use.

Virtual laws and nations in cyberspace
The project VirtualLife aims to provide an immersive and secure virtual life environment, where a standard collection of laws (Virtual Constitution) finalized to the creation of a secure and trusted environment (Virtual Nation) will be studied.

Information and communication technologies

The ICT theme has a total budget of € 9.1 billion. ICTs are critical to improve the competitiveness of European industry
and to meet the demands of its society and economy. ICTs have a catalytic impact in three key areas:

- productivity and innovation, by facilitating creativity and management;
- modernisation of public services, such as health, education and transport; and
- advances in science and technology, by supporting cooperation and access to information.

Three main challenges of ICT taken up in FP7 are:

1. **Pervasive and trustworthy network and services infrastructure** that will gradually replace the current Internet, mobile, fixed and audiovisual networks. The 'Future Internet' is a major federating research theme within
this challenge.
2. **Engineering of context-aware and easy-to-use ICT systems** that self improve and selfadapt within their respective environments. The fields of cognitive systems, robotics and interaction remain priority research topics.
3. **The increasingly smaller, cheaper, more reliable and low consumption electronic components and systems** taking into account the alternative paths to next generation technologies and building the basis for innovation in all major products and service.

Emerging themes and issues

The new Information and Communication Technologies have been discussed and developed for several decades, but they remain "new" in two important ways. First, they are founded upon the generation and application of knowledge in fields that mostly existed on a small scale, if at all, before the last third of the twentieth century – microelectronics, optronics, telematics, advanced software, digital information processing and the like. Social and economic institutions of all kinds are slowly learning about, and coming to take account of, the wide range of opportunities the application of this knowledge can offer them, and the wide range of opportunities (and threats) posed by its application by other actors in their environments.

Second, we are continuing to witness a proliferation of new knowledge and its application, so that the ICT revolution has certainly not finished -0 indeed, we are arguably still in its early days. While there are some clear technological trajectories, there is much debate about the future of, for example, ambient intelligence, artificial intelligence, and social privacy and identity in information society. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Doc-in-a-box: Pervasive self treatment and diagnosis
Nano-enabled self diagnosis and self treatment becomes pervasive. This would allow the general public to diagnose, monitor and treat illness themselves having their own 'Doc in a Box'. Doctors may become redundant and the ageing population increases.

Invisibility spray available in high street stores
An invisibility spray is developed and the technology refined until it becomes available in most retail outlets and is affordable for the general public. Initially, this is seen as fun, however there are strong implications for security and the militia.

Nanotechnology - it's all a bit fishy...
Monitoring of the Red Sea finds high levels of nanopollutants in fish - traced to a nanotechnology 'accident' in Saudi Arabia. Further tests show the particles in drinking water in Egypt causing political uprising and calls for invasion!

New cure for MRSA found! Great news until serious side effects revealed!
Targeted nano antibacterial agents kill bacteria in laboratory rats and in rapid succession a new cure for MRSA is announced. Follow up studies find that nano anti-bacterial agents have asbestos like properties and there is public outcry.

Nano dreams - more than a reality?
Brain-computer interfaces are created to manipulate dreams and parts of society become addicted to this quest for utopia and false states of euphoria are created. Dream manipulation becomes priority for parts of society - reality is neglected.

Weak Signals

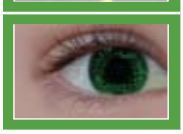
DNA Testing and Social Engineering on the rise
Technological advancements have seen that DNA can be accurately tested (for example to prove paternity). As this technology becomes more integrated into society, will people start to pick partners and friends by their DNA?

Herbs (enhanced by Nanotechnology) used to fight cancer
Natural herbs enhanced with Nanotechnology are being used to combat and fight cancer. If successfully developed, this natural remedy would revolutionise global cancer treatment and prolong life.

Bendy Copper Nanowires akin to foldable iPad
Chemists have perfected a simple way to manufacture inexpensive copper nanowires in great quantities that are so small they are transparent. Applications could clearly be in thin-film solar cells, TVs, computers and other flexible displays.

Synthetic Telepathy - thinking not so out loud...
Research is underway on synthetic telepathy to ultimately lead to a brain-brain communication system that would benefit soldiers on a battlefield aswell as stroke and paralysis sufferers.

Implantable electronics leaving no trace
Implantable electronic devices can be used to deliver drugs, monitor biomarkers and stimulate nerves. Once their action is completed they dissolve.



Nanosciences, materials, and production

The Nanosciences, Nanotechnologies, Materials and new Production Technologies (NMP) theme has a total budget of € 3.5 billion. A key objective of the NMP theme is to improve the competitiveness of European industry and generate the knowledge needed to transform it from a resource-intensive to a knowledge-intensive industry.

NMP research focuses on:

1. **Nanosciences and nanotechnologies** - studying phenomena and manipulation of matter at the nanoscale and developing nanotechnologies leading to the manufacturing of new products and services.
2. **Materials** - using the knowledge of nanotechnologies and biotechnologies for new products and processes.
3. **New production** - creating conditions for continuous innovation and for developing generic production 'assets' (technologies, organisation and production facilities as well as human resources), while meeting safety and environmental requirements.
4. **Integration of technologies for industrial applications** - focusing on new technologies, materials and applications to address the needs identified by the different European Technology Platforms.

Emerging themes and issues

Nanoscience and technology is highly controversial – less because of fears of "grey goo" or other out of control technologies, and more because it remains unclear just which of a host of different directions of development will prove to be the pacemaker – what is the nanotechnology equivalent of the microprocessor or gene sequencer going to be? But behind this controversy lies great confidence that huge progress will be made in our capacity to configure materials and artefacts in useful ways, potentially revolutionising such fields as energy production and storage, and health. Some possible applications are liable to be developed in dramatic and unpredictable ways. Controversy remains strong around the likely scope and impact of topics such as nano-manufacturing, which if commercially realisable, might trigger a new industrial paradigm. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Gas from Trash
The future of factories, which make gasoline, diesel and jet fuel, can be different. In the future they may be microscopic, and they might run on the garbage hydrocarbons that are all around us.

Breakthrough in cold fusion leads to renaissance in energy markets
Suddenly scientists discover the way to do cold fusion which leads to renaissance in energy markets.

Thanks to algae Australia becomes biggest energy producer in the world
Algae production begins around the world in all available sunny offshore areas, and in many inland bonds and lake areas by 2020's. Thanks to algae Australia becomes the biggest energy producer in the world.

"Cheap liquid fuel production from algae replaces oil by 2030"
By mid-2010's scientists in Europe discover new algae species from Mediterranean Sea which can be used very efficiently and very broadly in biofuel production. This allows to get cheap energy with a very reduced level of pollution.

National energy grid disappears
Due to new domestic heating and electricity production innovation, households become self-sufficient in energy. Finally, there is no need anymore for national energy grid.

Weak Signals

Algae production is a good way for carbon caption form atmosphere
Algae is, not only a carbon neutral form of biofuel energy production, but also a good way for carbon caption form atmosphere.

Many people are willing to pay more to get wind energy
Despite the fact that you can only get standard energy from a socket in your wall, many people are willing to pay more to get wind energy.

Use of electric cars enhance national energy safety
Use of electric cars enhance national energy safety because transportation becomes less dependent on only one form of energy - oil.

There are many new serious attempts to utilize new fossil fuel resources
There are many new serious attempts to utilize new fossil fuel resources. Countries and energy companies are constantly making new discoveries of new fossil fuel resources.

Obama´s goal: One Million e-cars on the US streets by 2015
In his State of the Union speech, Obama set a goal of putting one million "electric cars" on the road by 2015.

Energy

The Energy theme has a total budget of € 2.4 billion. Energy research aims to accelerate the development of cost-effective technologies for a more sustainable energy economy for Europe (and the rest of the world) and ensuring that European industry can compete successfully on the global stage. European-funded Energy research focuses on:

- **Hydrogen and fuel cells** - supporting EU fuel cell and hydrogen industries, for stationary, portable and transport applications.
- **Renewable electricity generation** - technologies to increase overall conversion efficiency, cost efficiency and reliability, driving down the cost of electricity production.
- **Renewable fuel production** - fuel production systems and conversion technologies.
- **Renewables for heating and cooling** - technologies for cheaper, more efficient active and passive heating and cooling from renewable energy sources.
- **CO_2 capture and storage technologies for zero emission power generation** - technologies reducing the environmental impact of fossil fuel use by capturing CO2.
- **Clean Coal Technologies** - substantially improve power plant efficiency, reliability and reducing costs through research, development and demonstration of cleaner coal and other solid fuel conversion technologies, producing also secondary energy carriers (including hydrogen) and liquid or gaseous fuels.
- **Smart energy networks** - increasing the efficiency, safety, reliability and quality of the European electricity and gas systems and networks in the context of a more integrated European energy market.
- **Energy efficiency and savings** - technologies to improve energy efficiency and to enable final and primary energy consumption savings, over their life-cycle, for buildings (including lighting), transport, services and industry.
- **Knowledge for energy policy making** - tools, methods and models to assess the economic and social issues related to energy technologies and to provide quantifiable targets and scenarios for medium and long term horizons.
- **Horizontal programme actions** - the topics described in this section have a horizontal character not linked specifically to any particular technology.

Emerging themes and issues

Energy security is a huge issue confronting Europe, and energy systems are implicated in climate change through their CO_2 emissions. They are complex and highly interdependent systems on which all sorts of social and economic activity rely, yet there is great controversy around the safety of key elements – most notably nuclear power stations and their ancillary operations. Many ways of improving their efficiency are under consideration, but often these confront obstacles related to the complexity and multiple stakeholders involved in the systems – yet systemic change may well be necessary. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Geoengineering "solves" carbon problems but…
Geoengineering "solutions" to deliberately reduce the effects of continued greenhouse gas emissions can destabilize global and regional climates - and also the political and legal framework.

Trace pollutants cause ethnic air cleansing in Europe
The hazard of trace pollutants in urban air lead to major health problems in certain ethnic minorities (e.g. Pakistani or certain EU groups) susceptible to hereditary disorders such as, for example, B-thalassaemia.

Risk assessment "saves" millions of lives but…
Risk assessment study leads to new risks as specific people, places or practices are avoided. As people migrate from areas described as "highly risky", new risks start to emerge around the systemic challenges associated to the relocation of millions.

Carbon crunch and the climate bubble
Global carbon markets and pricing mechanisms fulfil the wildest aspirations of the global community. But they quickly lead to runaway speculation and an inflationary carbon bubble, driven by expectations of easy money in carbon finance.

Cities are lunch for plastic bag-bugs
Synthetic organisms are developed for processing of plastics, but are difficult to control: there are fears that plastic eating 'bugs' could destroy the material basis of society.

Weak Signals

Growing frequency of floods in Europe and the world
Growing frequency of unusual storm weather has raised concerns about the need for early warning and information systems supporting disaster prevention and management.

Emergence of Mediterranean Sea acidification studies
Estimations of the Mediterranean Sea acidification show that, since the industrial era until the 2000s, all waters (even the deepest) have been acidified by values (ranging from _0.14 to _0.05 pH unit) higher than elsewhere in the open ocean.

Advances in portable and autonomous greenhouse units
Advances in portable and autonomous greenhouse units may be a benefit for subsistence farmers and remote / drought hit rural areas: but they may also help to accelerate the decline of such areas.

Emergence of secondary carbon financial vehicles
Rapid increase in number of secondary carbon financial trading which is derived from project based credits and permits. This shows signs of runaway speculation, and the shifting of carbon markets from an environmental to a financially-driven system.

Growing environmental legal class actions on no-win no-fee basis
Growth of environmental legal class actions on no-win no-fee basis indicates the precursors to global scale environmental law suits, with huge commercial opportunities equal to the risks involved.

Environment and climate change

The Environment theme has a total budget of € 1.9 billion. Environmental research has a twofold objective: (a) to promote the sustainable management of the environment and its resources through increasing knowledge about the interactions between the climate, biosphere, ecosystems and human activities; and (b) to develop new technologies, tools and services that address global environmental issues. Emphasis will be put on prediction tools and on technologies for monitoring, prevention, mitigation of and adaptation to environmental pressures and risks.

Environment research focuses on:

1. **Climate change, pollution and risks**
   - Pressures on the environment and climate
   - Environment and health
   - Natural hazards
2. **Sustainable Management of Resources**
   - Conservation and sustainable management of natural and man-made resources and biodiversity
   - Management of marine environments
3. **Environmental Technologies**
   - Environmental technologies for observation, simulation, prevention, mitigation, adaptation, remediation and restoration of the natural and man-made environment
   - Protection, conservation and enhancement of cultural heritage, including human habitat improved damage assessment on cultural heritage
   - Technology assessment, verification and testing
4. **Earth observation and assessment tools**
   - Earth and ocean observation systems and monitoring methods for the environment and sustainable development
   - Forecasting methods and assessment tools for sustainable development taking into account differing scales of observation

Emerging themes and issues

That we confront a whole series of environmental crises, and that these are interlinked in many ways that we are only just beginning to understand, is widely accepted. That we need research to monitor, map, and explore these problems is unarguable. How these crises develop – at what speed and intensity, with what repercussions – and how human intervention might mitigate or cope with the underlying problems and their immediate effects is much less clear. What sorts of interdisciplinary study are best suited to the challenges is also a matter of debate, not helped by the politicisation of many topics (and the interventions that powerful lobbies are making to undermine the science, as environmental researchers generally see it). We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Risks due to Virtual Simulation of Aircraft Navigation
Virtual human models in R&D do not represent real humans. Risks in labs are being underestimated and simulated movements or postures are used for the cockpit design and construction. Dramatic accidents ensue.

Automatic Guidance System for Vehicles
An automated guidance system for vehicles revolutionises traffic. People agree to less driving pleasure and freedom to introduce this new system that completely avoids fatalities is much more efficient and enables the "driver" to do other tasks.

Collapse of European Transport System
The increasing dependence of travellers and logistics - particularly freight traffic by road - on electronic route optimisation creates an overload in the system. A breakdown of the European transportation network ensues and impairs supply chains.

Minimum Flight Distance Introduced
Due to environmental reasons and the scarcity of resources, especially of crude oil, a minimum flight distance of 500 kilometres has been introduced in Europe.

Noiseless Aviation
New technologies such as smart high lift devices and flow control systems enable noiseless aviation. The air traffic rises, especially in urban areas, due to deregulation of airport restrictions such as the ban on night flights. Vast increase of CO2

Weak Signals

Less Bias Against Public Transport in Emerging Countries
Increasing public awareness towards sustainable mobility and a broad acceptance for public transportation services in Europe have helped to change the negative perception of public means of transport in emerging countries.

Realisation of Smart Safety
An intelligent road-on-vehicle is technically possible already and might lead to a safety- enhancing infrastructure: permanent road-to-car communication warns cars of red lights beforehand, gets traffic flowing and alerts drivers of stationary cars.

Seamless Transport Chains
First integrated multimodal supply chains and business-overarching application of intertwined databases enable seamless just-in-time deliveries without stop-overs across the continent, leading e.g. to reduced costs and a higher quality.

Research on Aircrafts Propelled by Alternative Fuels
Great efforts in research aim at developing the usage of alternative fuels in aeronautics. A wide spectrum of classical solutions as plant oils, synthetical fuel, or radical ones like organic materials may lead to positive impacts in various fields.

Cars Banned from City Centres
Environmental reasons and increasing chaos from a rising number of cars has led to European cities increasingly banning individual transport. Eventually, individual motorised transport could be replaced by a comprehensive public sys-tem altogether.

Transport and aeronautics

The Transport theme has a total budget of € 4.3 billion. The central objective of transport research under FP7 is to develop safer, 'greener' and 'smarter' pan-European transport systems that will benefit all citizens, respect the environment, and increase the competitiveness of European industries in the global market.

Emphasis is given to the following activities:

1. **Aeronautics and air transport**
   - reduction of emissions, work on engines and alternative fuels,
   - air traffic management, safety aspects of air transport,
   - environmentally efficient aviation
2. **Sustainable surface transport - rail, road and waterborne**
   - **development of clean and efficient engines and power trains,**
   - **reducing the impact of transport on climate change,**
   - **inter-modal regional and national transport,**
   - **clean and safe vehicles,**
   - **infrastructure construction and maintenance, integrative architectures**
3. **Support to the European global satellite navigation system**
   - Galileo and EGNOS
   - navigation and timing services,
   - efficient use of satellite navigation

Emerging themes and issues

Transport of goods and materials, and mobility of individuals, is something that most of us take for granted, and we anticipate that these will be accomplished safely and effectively. But in a world of rising energy costs, congestion of major traffic arteries, and rapid change in the industry landscape as new players enter the global scene, these expectations cannot be taken for granted. Even social exclusion becomes an issue, as an ageing population creates a higher proportion of people unable to legally drive vehicles themselves (even when they can afford them). The place that transport takes in the European future is unclear, though its importance is assured. Relations to healthy, environmental concerns; applications of new ICT and energy technologies; and industrial competitiveness – these are all issues that loom large in the context of this topic. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

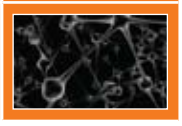
Soft "EuroLanding" or "Happy End" in EuroLand
The growth of debts, austerity packages and spending cuts in Europe lead to critical economic instability and the abrupt transformation of the Euro Zone. A few countries leave the Euro at huge political price while others enjoy the new "Euro Deal".

Do-It-Yourself (DIY) "wikiforesight" overtakes religion
Social technologies and "wikiforesight" enable people to discover and exploit future opportunities. Backed by leading celebrities and success stories, this spreads rapidly, powerfully challenging the role of religion in many people's lives.

Cyber Crusade: Massive e-sabotage by "hacktivists"
With the aim to achieve social/economic justice in Europe (instead of fraud or geopolitical rivalry), underemployed and politically driven "hacktivists" target EU agencies, governments and businesses, with cyberattacks and other electronic sabotage.

1M€reparation cost per civilian death in conflicts
Well-organised social movement (via Facebook) initially led by relatives of victims in armed conflicts but rapidly backed by governments & celebrities, leads to new regulations fixing at 1M€ the usual reparation cost per civilian death in conflicts.

Automatic learning through neuro-data transfer
Technological enhancements of cognitive learning processes become available - but only for those able to afford them.



Weak Signals

Concerns over socio-economic and humanities research "downgrade"
Commentators following the discussions about the next European Commission Framework Programme for Research and Technology Development (FP8) are concerned about proposals to downgrade socio-economic and humanities research role and funding.

Growing interest in wild cards and weak signals research
The interest in wild cards and weak signals research has increased the spectrum of issues considered as shapers of science, technology and innovation (STI), and, at the same time, increased the complexity of STI policy intelligence and formulation.

Ancestors' Second Life influences our First Lives
Virtual Agents on Internet or in IT devices are programmed with characteristics of family members, so they can be consulted, kept up to date, celebrated by those still living. Proves very successful innovation & many facilities are rapidly developed.

Growing failures of social care in educating young people
Striking accumulation of new evidence on widespread failure of efforts to support the education young people in social care.

Growing selection of sperm by donor social and cultural group
New developments in reproductive technology and its regulation, together with demand from some quarters of society, lead to substantial increase in sperm selection using criteria such as donor social class, IQ, lifestyle/personality and appearance.

Socio-economic sciences and humanities

The Socio-economic Sciences and Humanities (SSH) theme has a total budget of € 0.6 billion. SSH Research will help us study and provide answers to questions related to:

- growth, employment and competitiveness;
- social cohesion, social, cultural and educational challenges in an enlarged EU;
- sustainability, environmental challenges, demographic change, migration and integration, quality of life and global interdependence.

Emphasis is given to the following areas:

- Growth, employment and competitiveness in a knowledge society
- Combining economic, social and environmental objectives in a European perspective
- Major trends in society and their implications
- Europe in the world (covering a.o. migration, poverty, crime and conflict)
- The citizen in the European Union
- Socio-economic and scientific indicators
- Foresight activities, such as the future implications of global knowledge, migration and ageing
- Emerging themes and issues

Emerging themes and issues

Social sciences and humanities research is sometimes seen as an irritant, drawing attention to social problems or to ideas that are currently out of favour (though they may be mainstreamed in the future). This makes the theme a fertile one for generation of wild cards and weak signals, but its importance in enabling European society to reflect upon itself and where it is heading is critical. At the time of writing, concerns about the treatment of SSH in future Framework and Innovation Programmes have rarely reached a wide audience, but we might expect the absence of SSH research other than that directly informing other thematic areas to be a source of problems in years to come.

In the meantime, we can simply note that there are huge uncertainties as to the future development of social cohesion and social inclusion, of European demographics and mobility, of problems such as the “obesity epidemic” (not merely a health issue) and the relations of citizens with political institutions; and that the very economic crisis we are living through is a product of phenomena that are fit topics for SSH research (ICT applications in finance are a small part of the problem.). They are also topics where we would do well to anticipate surprises in the coming years. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

First contact with extra-terrestrial intelligence
First Contact: Contact with extra-terrestrial intelligence/civilisation is established.

Global warming is not anthropogenic
Scientists prove that the global warming is NOT anthropogenic, but related to changing solar activity or other newly discovered phenomena in space.

Revolutionary space propulsion technology
New space propulsion technology (not based on chemical rockets) enables a dramatic reduction of the cost per pound required to get a satellite into orbit or to propell a spacecraft to its target in space .

Space war
A military confrontation takes place in space, using space weapons such as anti-satellite lasers and missiles, space-planes, etc.

Space colonisation
Low-cost space travel and human enhancement technologies enable massive migration of humans from earth and establishing permanent space colonies on other planet or on large space stations.

Weak Signals

Ideas for radically new ways to reach Space
Creative ideas published over the years, for example the “Space Elevator”, point to potential alternatives to conventional space propulsion and may revolutionise space travel (e.g. by using much less energy).

Life-form thriving on arsenic was discovered on Earth
NASA-funded research discovered microorganisms on Earth able to thrive using the toxic chemical arsenic. This has changed the fundamental knowledge about what comprises all known life on Earth, and increases the likelihood of extra-terrestrial life.

Discovery of earth-like extra-solar planets
505 extra-sols planets were detected. Most are giant planets, but recently several relatively lightweight planets, only a few times more massive than Earth, have also been detected, thus increasing the likelihood of habitable planets.

Privatisation of space flights
Growing efforts to commercialise space travel. Boeing has teamed up with a private firm to sell passenger seats in its new space capsule designed to travel to the International Space Station as well as other future private space stations.

Optical lifting demonstrated for the first time
Scientists observed and experimentally verified a micrometer-scale object being lifted by a beam of laser light. Optical lifting may be useful for improving the design of solar sails for interstellar space travel.

Space

The Space theme has a total budget of € 1.4 billion. The aim of the Space research under FP7 is to support a European Space Programme focusing on applications such as "Global monitoring for environment and security" (GMES) with benefits for citizens and for the competitiveness of the European space industry. Emphasis is given to the following areas:

1. **Space-based applications serving European society**
   - Developing satellite observation systems and the GMES services for the management of the environment, security, agriculture, forestry and meteorology, civil protection and risk management.
2. **Exploration of space**
   - Provision of support for collaborative initiatives between ESA or national space agencies, as well as coordinating efforts for the development of space-borne telescopes.
3. **Strengthening Space foundations**
   - Support research for long term needs such as space transportation, bio-medicine, life and physical sciences in space.

Emerging themes and issues

Even if we will not be venturing far, or en masse, into the final frontier for many years to come, space is a highly important area for technology development – and it is well known that many existing infrastructures, including global communications, weather forecasting and navigation systems are dependent on satellites. Some of the wildest cards we could consider – discovery of extraterrestrial intelligence, serious threats of asteroid/comet impacts, large-scale solar flares, etc. – are connected with space science and technology (which may give us warnings and in some cases tools for addressing problems) . But even without such developments, there are many uncertainties on this frontier, not least those associated with geopolitics – who occupies space, who accesses resources, how do we govern threats of militarisation (or non-militarised conflict) and of off-planet activities that may affect the global environment? We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

Israel and Palestine join the EU
As an incentive for peace EU leaders propose accession of both Israel and the newndependent Palestinian state into the EU. The idea is supported by most Israelis and Palestinians. Both countries join the EU after short and effective negotiations.

CCTV Cameras pulled down
Concerns about privacy and security lead to global ban of CCTV systems.

Cysects attack
Attack by swarms of remotely-controlled cyborg insects against people or agriculture.

Changing ones mind
A terrorist group uses a virus to change the behaviour or neutralise a certain population for a certain period.

The Genetic Blackmailer
Individual DNA is misused for extorsion.

Weak Signals

Robot Swarm Intelligence
Enhanced research on robot swarm intelligence might soon allow robots to communicate and build a system. Cooperation is organized, self-dynamic, and self-contained by intelligent robots.

Scientists predict mobile phone viruses will become a serious threat
In future, mobile phones will be able to monitor and control healthcare implants and intra body personal area networks. Mobile phones may be infected with viruses through short range communications (Bluetooth) or Multimedia Messaging Systems (MMS).

Suicide bombing in Stockholm
The event is the latest in a series of events in which UK citizens were involved in terroristic attacks. It is now named " the new UKs Christmas export". It could signal a wild caRD " a MASS CASUALTY terror event in Europe.

No strict global rules on nuclear security
Nowadays, no strict global rules on nuclear security are being defined and implemented. This might cause a nuclear accident or disaster especially in the third world countries.

Growing privatisation of war
Growing use of corporate organisations in military, security, and auxiliary roles may lead to their potential influence in policies, including the regulation of activities in (post)conflict zones, wider security affairs and (para)military engagement.

Security

Security has a total budget of € 1.4 billion. Security research is an important building block for supporting European freedom, security and justice. It contributes to developing technologies and capabilities in support of other European Community policies in areas such as transport, civil protection, energy, environment and health.

Emphasis is given to:

- **Increasing the security of citizens** - technology solutions for civil protection, bio-security, protection against crime and terrorism.
- **Increasing the security of infrastructures and utilities** - examining and securing infrastructures in areas such as ICT, transport, energy and services in the financial and administrative domain.
- **Intelligent surveillance and border security** - technologies, equipment, tools and methods for protecting Europe's border controls such as land and coastal borders.
- **Restoring security and safety in case of crisis** - technologies and communication, coordination in support of civil, humanitarian and rescue tasks.
- **Improving security systems integration, interconnectivity and interoperability** - information gathering for civil security, protection of confidentiality and traceability of transactions.
- **Security and society** - socio-economic, political and cultural aspects of security, ethics and values, acceptance of security solutions, social environment and perceptions of security.
- **Security research** coordination and structuring - coordination between European and international security research efforts in the areas of civil, security and defence research.

Emerging themes and issues

Security is a challenging area, not least because even if we restrict ourselves to threats to security occasioned by direct human agency, these threats can include attacks on key infrastructures (and even on ecosystems or possibly environmental phenomena such as earthquakes). The threats might be expressed via traditional military institutions, or though terrorist initiatives of a highly organised or much more "spontaneous" kind. They may involve the use of conventional or new weapons (including weapons of mass destruction), or turn civil technologies to aggressive use. This may well mean that the government and private sector bodies that have been primarily engaged in dealing with defence issues and conventional emergency management may continue – ten years after 9/11 – to be unsuited for dealing with many of these challenges. Not least, there may be a shortage of relevant wild card thinking, despite the highly sophisticated war gaming and risk analysis capacities of such bodies. We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

Wild Cards

A breakthrough discovery in plasma physics
A shocking discovery has been made in ITER, which enables fast implementation of thermonuclear fusion into practical utilization in energy production.

Entering new energy era
Discoveries in physics of materials have been made - energy is now cheaper and its production more efficient

A considerable increase in efficiency of renewable resources
Gradual abandonment of nuclear energy for the sake of renewable energy sources, which are highly efficient in energy production

Clean coal technology discovered
Discovery of clean coal technology, which reduces negative aspects of burning coal for electrical power.

Severe accident of a nuclear power plant
Severe accident of a nuclear power plant with enormous radiological consequences on both human and natural environment

Weak Signals

Increasing shortage of qualified labor force
The increasing shortage of qualified labour force in certain industrial sectors.

Development of new materials
In the nuclear research, R&D also in other fields of science is necessary. It is especially the material science and its progress in development of new materials, first used in other industries (e.g. in airplanes) and then applied also to more efficient production of nuclear energy.

Nuclear power plants built in third world countries
Nuclear power becomes world-spread and nuclear power plants are being built in third world countries

Small-scale nuclear power plant operating
Small-scale nuclear power plant delivering energy only for two cities was put into operation

Lack of interest in nuclear energetics among young generation
Lack of interest in nuclear energetics among young generation

Part III
Applications to the ERA

Nuclear research

For a variety of reasons, while nuclear research here is related very much to energy concerns (nuclear power currently accounts for one third of the electricity generated in the EU) this theme is handled separately and through the framework of EURATOM. Thus the key issues of the Euratom programme are operational reactor safety and management of long-lived waste. All thematic domains to be addressed here are characterised by an overriding concern to ensure high levels of safety. The Joint Research Centre (JRC) supports these objectives of the European strategy for energy supply, particularly in helping to match the Kyoto objectives. The objective of the JRC research programmes is to develop and assemble knowledge in order to provide input to the debate on all important nuclear energy issues.

The overall research programme consists of two key activities:

- **Nuclear fusion** – a potential new energy source
- **Nuclear fission** and radiation protection

"Direct" Nuclear research conducted by the Joint Research Centre (JRC). The objectives of the research into fusion energy includes work on the joint implementation of ITER (as an international research infrastructure). Research into nuclear fission includes the management of radioactive waste, the continued safe operation of existing reactor systems, radiation protection, access to research infrastructures and the development of knowledge and competence in the nuclear field. The nuclear activities of the JRCs should provide customer- driven scientific and technical support of the EU policy with a focus on the management of nuclear waste and its environmental impact and on nuclear safety.

Emerging themes and issues

The nuclear field is as amenable to wild card and weak signals (WI-WE) analysis as any other. We will not provide a detailed account of the relevant iKnow work here, however, because the issues have been covered in the previous themes. We could if required pull out particular instances, and of course the approach could be applied to the particular projects here – what is fusion power was the subject of major breakthroughs, or in contrast what if it suffered catastrophic accidents or was undermined by disruptive innovation from other sources? What is it were to be to origin of scientific advances with high applicability to other areas? We outline some Wild Cards and Weak Signals related to this theme, generated by iKnow, in the next page.

How to use WI-WE resources in STI policy?

What kinds of STI policy and which questions?

In this section we look at the beginning and end of the cycle of knowledge. The context is a world which is increasingly interconnected, turbulent, and vulnerable to wild card surprises; and a STI agenda which needs to respond to this. The key question here is – how does the Wild approach and the WI-WE resource contribute to the generation and management of knowledge?

Revolving around this question is a wide range of activity, including:

- Science, technology and innovation policy: European, national, corporate.
- Research programming and management: European, national, corporate.
- Research methods within and between in many fields, at the level of programs and projects.
- Knowledge management systems: including scientific, corporate, public and civil society types of knowledge.
- Foresight processes and foresight related knowledge, in many types of organizations.

There are wide implications for STI policy of the Wild approach and WI-WE resources. Some conceptual issues are set out below; but first there are quite practical questions, such as:

- **What topics to research?** – Shifting towards the frontier of problematic knowledge – technically, socially, etc.
- **Who are the researchers?** – And the producers and users of such research: questioning explicit and tacit forms of engagement between different parts of the knowledge community.
- **How to programme research?** – And how to manage, validate, disseminate and evaluate research results: i.e. to explore unconventional paths for knowledge generation and transfer, with explicit and tacit forms of engagement between the knowledge community.
- **How to apply to policy and practice?** – In a world which is increasingly interconnected, turbulent, and vulnerable to wild card surprises; and a STI policy which needs to respond to this.

Paradigm shifts and the Wild approach

Meanwhile, the higher levels of science and research policy, are beginning to point in similar directions. There is a paradigm shift in the nature of scientific knowledge, and the science / technology / innovation systems which surround it. This can be framed as a 'co-evolutionary approach' to science / technology / innovation, and the policies which aim to support it. This broad concept can be mapped onto a 'knowledge space', again with some interesting dynamics to explore (Figure 1.1);

- If we are lucky enough to enjoy 'safe' knowledge and 'safe' outcomes, we can practice 'Normal science', using 'convergent' research modes. This is pictured in the lower left hand corner. This can work with clearly defined problems, peer-reviewed theory and methodology, robust models and datasets, and falsifiable hypotheses.
- But for many problems, particularly anything which raises policy issues or socio-political-ethical debates or dilemmas, the 'safe' criteria do not work very well. So we can see 'science for policy' as an unstable position, where often the expectations do not meet with the available resources.
- So there is an inevitable shift into the opposite corner, on the upper right. Here we have 'wild' knowledge and 'wild' outcomes, leading to 'divergent' research modes. Here there are fuzzy, multi-level, interconnected problems: high levels of uncertainty and conflict in values and stakeholders; multiple competing theories and methodologies; often a gaping lack of evidence; research processes which can only be mobilized through stakeholder debate… This is summed up with the concept of 'post-normal science'. However this corner is also unstable, struggling with wild problems and profound ignorance.
- The shift is then to the 'co-evolutionary science' corner. This aims at creative responses to wild outcomes, through application of wild knowledge into shared intelligence. In practical terms, this avoids drawing a boundary around 'science' or 'research'; rather it looks at the extended chains of knowledge and cognitive processes, across the whole of society, of which scientific knowledge is one component.

Such 'co-evolutionary' science requires creative responses to complex and interconnected 'agendas', where problems, opportunities, conflicts, responses, each start to overlap and inter-connect. This co-evolutionary approach sees extended co-production of knowledge across wider networks of stakeholder learning and policy innovation, on the lines of the 'DIPSI' model (discursive, inclusive, participative, sustainability, interactive). It looks at research processes and results as multi-level learning pathways. It sees research users and policy-makers as part of a larger system of networked learning and shared intelligence. It sees policy systems themselves, and policy-knowledge combined systems, as more focused on the agenda for systemic resilience, adaptive capacity, shared intelligence and learning capacity.

This position also tends to continue along the cycle, back to the starting point, when the shared intelligence becomes 'normal' and mainstream for all involved.

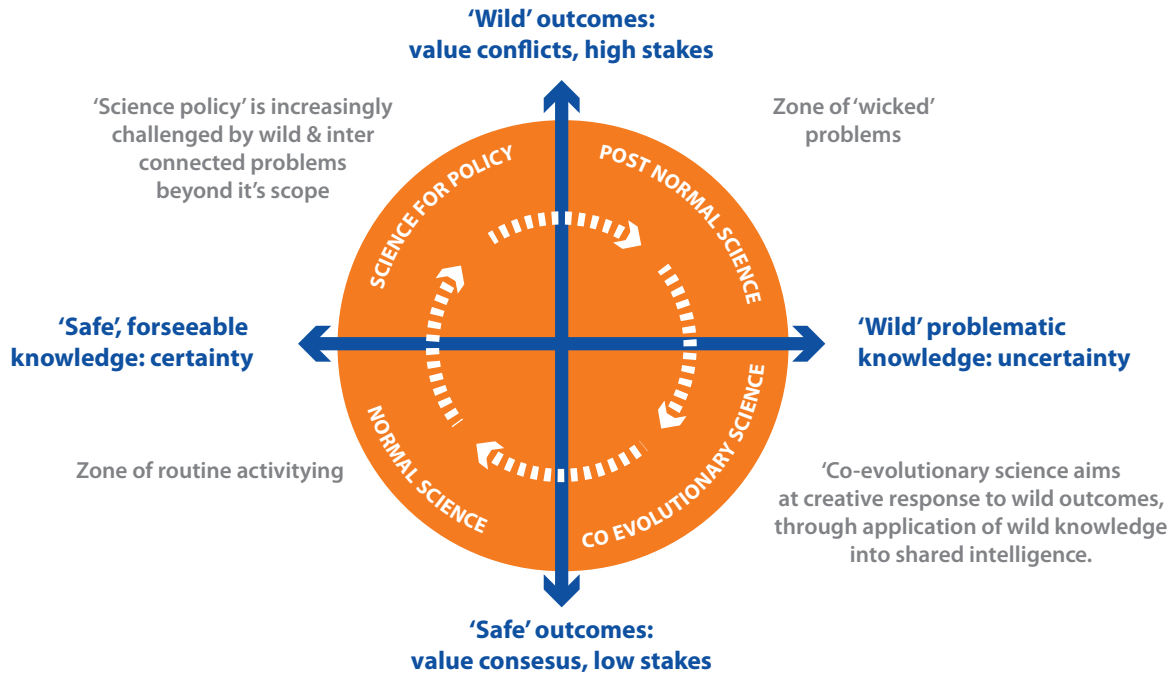


Figure 1.1 Shifting knowledge paradigms and the Wild Cycle

In this way the agenda and operation of science is not only about 'discovering facts' and 'proving theories'. It is more about designing human systems which can learn and innovate with the benefit of active learning (in which facts and theories are a useful part). This is very clear in the recent developments of ERA based research, for instance in the FP7 Thematic Work Programmes.

Overall, the Wild approach has much to offer this co-evolutionary model, based in wild knowledge and wild outcomes. Following that, the WI-WE methods and tools, are essential resources for exploring this challenging and creative 'knowledge space'.

How to apply WI-WE to research management?

Within a typical research program or thematic specification, there are some trends which involve the Wild approach:

- There is a general shift of 'typical' programs and projects towards a WI-WE focus (i.e. with wild, problematic, high impact issues of systemic change). These include the well-known risks of natural disasters, technology hazards etc; they also include social, economic, cultural, political, ethical issues, which each involve 'wicked' problems.
- The implication is that systematic WI-WE methods and tools should be built as a regular feature into mainstream research program specifications and methodologies.
- This would set out guidelines as sketched in this chapter, for systematic exploration of the frontiers between 'wild' and 'safe' areas of knowledge. It also prioritizes the interconnection of different types of knowledge from different areas.
- This also involves application of the research results, in feedback to the WI-WE end of the policy spectrum. This should raise the questions of risk assessment and strategic planning above – i.e. what problematic events, changes, hazards are plausible or significant, and what weak signals would be relevant and useful ?

Which topics are informed by WI-WE resources?

The selection of research topics and project design is also informed by the WI-WE resources. The ERA (European Research Area) is increasingly formed around cross-cutting themes, wicked systemic problems, and new modes of trans-disciplinary action research working. So the topics and methodologies are likely to take on:

- More conventional WI-WE events: natural dis rs, techno hazards, which are likely to be amplified by socio-cultura tical f s. So th a res agenda is focused on this amplification process through its soci ural-political facto
- Less unconventional WI-WE events: new and surprising combinations of various factors, e.g. technological, economic, environmental, political, social and ethical factors, which are generally more problematic and paradigm changing.
- Systematic use of WI-WE at the pre-programming stage of scoping and scanning.
- Use of WI-WE for interconnecting knowledge between 'Grand Challenges' and other levels.
- Use of WI-WE to mobilize debate between stakeholders with different views on issues in the domain of problematic knowledge.
- Reference from and contribution to the iKnow system, as the context for research agenda setting, design and programming.

How to apply WI-WE to the STI policy process?

STI applications need a structure which is as clear as possible, to navigate through knowledge development processes, which are often complex and fuzzy. Again, we use here the general foresight structure (here titled 'divergence, emergence, convergence'), as tailored to a typical general process of STI policy-making. There are different applications of the WI-WE resources at each stage, which may come from the iKnow platform or other sources (Figure 1.2).

'Agendas': horizons & boundaries: policy scope & resources

- General wild cards to test policy scope & system boundaries
- Wide scan to inform horizons, scope, strengths & weaknesses

'Divergence': Explore possible futures & capacities

- Specific wild cards, to explore possible futures & capacities
- Thematic scan to support scenarios & stakeholder analysis

'Emergence': Develop pathways & approaches to STI policy

- Pathways tested with social / technical / conceptual 'wild' thinking
- Scan for vulnerability, resilience, opportunities & threats

'Convergence': Road-maps, strategies, policies, assessments

- Strategy 'wind-tunnel' testing by further wild card application
- Scan for road-map & strategy testing, assessment evidence

'Actions': Program management monitoring, evaluation

- Periodic testing of management, monitoring & evaluation
- Continuing monitoring & evaluation cycle

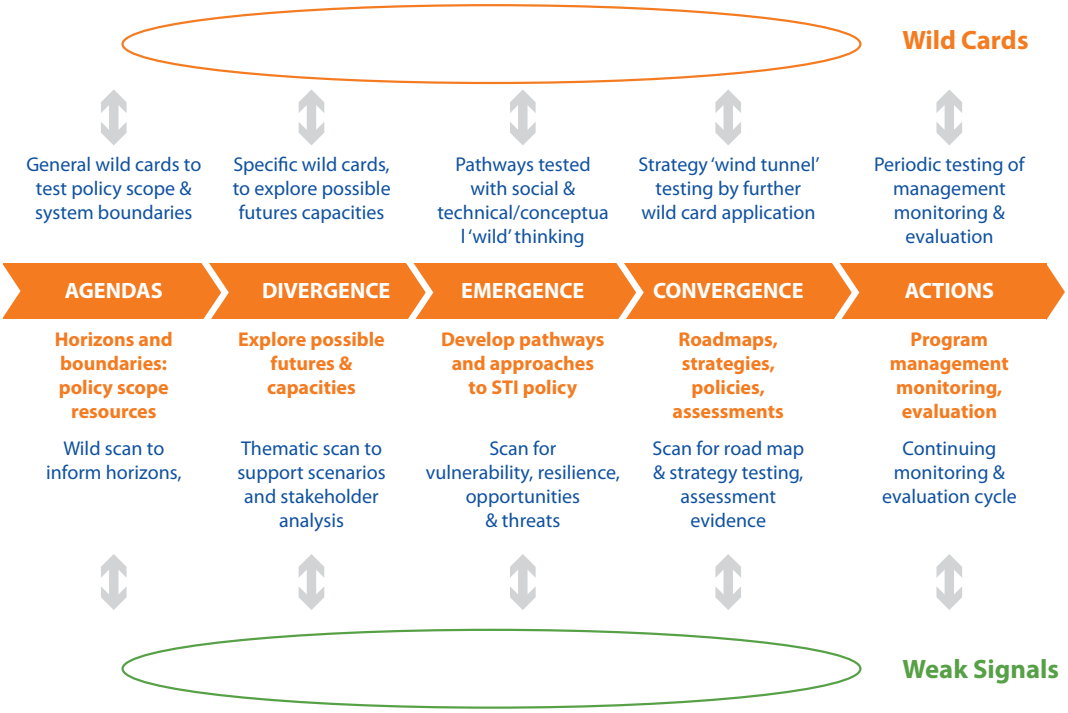


Figure 1.2: WI-WE applications in science, technology and innovation (STI)

Application to the ERA agenda

How to develop & manage research programmes

Within a ERA research programme area:

- General shift towards 'divergent' and 'co-evolutionary' modes of research.
- Systematic use of WI-WE at the pre-programming stage of scoping and scanning.
- Use of WI-WE for interconnecting knowledge between 'Grand Challenges' and other levels.
- Reference from and contribution to iKnow's iBank and iLibrary platforms as the context for general research scoping, design and programming.
- Use of WI-WE to mobilize stakeholders with different views on problematic knowledge.

For example – consider a research programme centred on the theme of post 2008 financial stability.

- Obvious Wild Card 'situation' (i.e. family of interconnected Wild Cards) – global credit crisis, Eurozone crisis, public deficit crisis, etc; with most Weak Signals systematically ignored and filtered out, systemic risk driven by moral hazard incentives, etc.
- Need to involve stakeholders in active mode, systematically exploring possible WI-WE, testing the frontiers of the 'problematic' knowledge zone, etc.
- Research programme results should be improved and enlarged from the conventional economic and financial focus (which arguably was part of the problem).
- Research project design goes beyond the convergent mode, to the divergent and co-evolutionary modes.

How to develop & manage research projects

Within a typical ERA project :

- General shift of 'typical' projects towards a WI-WE focus (i.e. problematic high impact issues of systemic change, etc). Although not necessarily conventional risks of natural disasters, technology hazards, etc.
- Systematic WI-WE exploration to be built into 'typical' research methodology.
- Exploring the frontiers of 'safe' knowledge and 'problematic' knowledge.
- Interconnection of different knowledge from different areas.
- Reference from and contribution to iKnow's iBank and iLibrary as the context for specific research.
- Application of the research results back to the WI-WE end of the spectrum – i.e. asking what problematic events, changes and hazards are plausible and significant. And what Weak Signals would be useful?

In the ERA context, the Grand Challenges each raise an agenda with a combination of –

- More conventional Wild Card events and hazards – natural/technological disasters which are likely to be amplified by socio-cultural-political factors. So there is a research agenda which is focused on this amplification process through its socio-cultural-political factors.
- More unconventional Wild Card events and hazards – new and surprising combinations of various factors e.g. technological, economic, environmental, political, social and ethical factors, which are generally more problematic and paradigm changing.

iKnow interconnecting knowledge

The iKnow system can be accessed at the following address:

www.iknowfutures.eu

Please register and explore our 7 iKnow Technologies:

www.iknowfutures.eu

The Innovation, Foresight and Horizon Scanning System