European Commission

iKNOW Policy Alerts

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

MiolIR, Manchester Institute of Innovation Research, The University of Manchester
Rafael Popper, Ian Miles, Joe Ravetza, Thomas Teichler, Ivan Montenegro Perini, Deborah Cox and Jeff Butler

FFRC, Finland Futures Research Centre
Jari Kalvo-Oja, Maurizio Sajeva and Leena Saarinen

Z_punkt
Karlheinz Steinmueller and Sivert von Saldern

RTC North
Gordon Ollivere and Anthony Walker

TC AS, Czech Technology Centre of the Academy of Sciences
Martin Fatun, Karel Klusácek and Ondrej Valenta

ICTAF, Interdisciplinary Centre for Technology Analysis and Forecasting
Yair Sharan and Aharon Hauptman

Mindcom
Juha Lång and Damien Decanter

Cyber Fox
Jan Klusácek, Josef Vacatko and Miloslav Dorňák

IKNOW PROJECT CONTACT
Dr Rafael Popper - rafael.popper@manchester.ac.uk

EUROPEAN COMMISSION
Directorate-General for Research and Innovation Directorate B – European Research Area Unit B.5
Social Sciences and Humanities

Contact: Perla Srour-Gandon & Domenico Rossetti di Valdalbero
European Commission B-1049 Brussels
Tel. (32-2) 29-62811 & (32-2) 29-52944 Fax (32-2) 29-79608
E-mail: perla.srour-gandon@ec.europa.eu and domenico.rossetti-di-valdalbero@ec.europa.eu
Designed by Charlotte Smith - charliegirldesign@googlemail.com

LEGAL NOTICE
Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information. The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission. © iKnow Project, 2011. Reproduction is authorised provided the source is acknowledged.
Contents

Foreword 9

1. Introduction to iKnow and the Policy Alerts 11
2. Methodology and Logic behind the iKnow Policy Alerts 13
3. Policy Alerts
   Blue Sky Policy Alert 01 - Killer Virus 17
   Blue Sky Policy Alert 02 - Body parts on Demand 21
   Blue Sky Policy Alert 03 - Nervous breakdown of society 25
   Blue Sky Policy Alert 04 - Scientists up for murder as ethical issues are abolished 28
   Blue Sky Policy Alert 05 - Traditional European Medicine 31
   Blue Sky Policy Alert 06 - Wheat crisis hits humans and animals 35
   Blue Sky Policy Alert 07 - Total rejection of the “Internet of Things” 38
   Blue Sky Policy Alert 08 - Universal electronic systems breakdown 41
   Blue Sky Policy Alert 09 - Invisibility spray 44
   Blue Sky Policy Alert 10 - Pervasive self-diagnosis and self-treatment 47
   Blue Sky Policy Alert 11 - Reduction in human diversity? 50
   Blue Sky Policy Alert 12 - Don’t put in the trash: tank your car and warm up your home 55
   Blue Sky Policy Alert 13 - Outburst Of The Black Economy 58
   Blue Sky Policy Alert 14 - Floods in europe cause mass migration 61
   Blue Sky Policy Alert 15 - Minimum Flight Distance Introduced 64
   Blue Sky Policy Alert 16 - Inner Cities are Closed for Private Cars 67
   Blue Sky Policy Alert 17 - Towards the utopia 70
   Blue Sky Policy Alert 18 - Empowerment of women: 73
   Blue Sky Policy Alert 19 - New pro-war president elected in the us 76
   Blue Sky Policy Alert 20 - Critical Information Infrastructure Collapsed: Back to the 80s! 79
   Blue Sky Policy Alert 21 - The rise of a new world 82
   Blue Sky Policy Alert 22 - The Poor Old 85
   Blue Sky Policy Alert 23 - Total control by Big Brother technologies 88
   Blue Sky Policy Alert 24 - Robots & iCare for the Aged 91
   Blue Sky Policy Alert 25 - iBrain vs. Brain Point 94
   Blue Sky Policy Alert 26 - 3D media trustworthily copying reality 97
   Blue Sky Policy Alert 27 - Free Time Society in Europe 100
   Blue Sky Policy Alert 28 - European Commission scrap research support projects 103
   Blue Sky Policy Alert 29 - Cyber crusade: Massive e-sabotage by ‘hacktivists’ 106
   Blue Sky Policy Alert 30 - Israel & Palestine are admitted to the EU 109
Blue Sky Policy Alert 31 - Nano-lab inside your body 112
Blue Sky Policy Alert 32 - The lottery: the way to the perfect world 115
Blue Sky Policy Alert 33 - The great tide: a new planet 118
Blue Sky Policy Alert 34 - Major EU state elects neo-fascist leader 121
Blue Sky Policy Alert 35 - China’s investment and services “great wall” 124
Blue Sky Policy Alert 36 - abrupt disintegration of the euro zone 127
Blue Sky Policy Alert 37 - Transhumanism becomes a significant force 130
Blue Sky Policy Alert 37 - Rise of Africa 134
Blue Sky Policy Alert 38 - First contact with Extraterrestrial Intelligence 137
Blue Sky Policy Alert 40 - Revolutionary Space Propulsion 145
Blue Sky Policy Alert 41 - Female-centric projects a turn-off for women 148
Blue Sky Policy Alert 42 - Universities close as research doesn’t meet industry needs 151
Blue Sky Policy Alert 43 - Severe accident Of a nuclear power plant 154
Blue Sky Policy Alert 44 - Entering new energy era 157

Appendix: Dynamics of the iKnow Workshops in Pictures 160

LEGEND OF FP7 AND ERA ICONS

FP7 THEMES

Health
Agro-Food and Biotech
Information and Communications Technologies (ICT)
Nanotech
Energy
Environment
Transport
Social Sciences and Humanities (SSH)
Space
Security

EUROPEAN RESEARCH AREA GOALS

Research Mobility
Research Infrastructures
Research Institutions
Knowledge Transfer
Public Research
Science and Technology cooperation
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.

This report (‘Policy Alerts’) represents the first collective effort to translate Wild Cards and Weak Signals (WI-WE) research into well-structured policy briefs. It highlights the key elements of the iKnow WI-WE approach and offers practical recommendations for further research on a wide range of issues.

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
1 Introduction to iKnow and the Policy Alerts

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 Policy Alerts report provides a unique compendium of the use of Wild Cards and Weak Signals to inform research policy. Section 2 provides an overview of the methodology and logic behind the Policy Alerts and Section 3 provides a collection of four-page policy briefs produced by the iKnow Consortium during the life of the iKnow project.
Methodology and Logic behind the iKnow Policy Alerts

During the iKnow project we organised over half-a-dozen thematic workshops in 5 countries (Czech Republic, Finland, Germany, Israel and the United Kingdom). Each workshop involved an average of 20 thematic experts. Each workshop involved focused on two or three thematic areas of the European Commission Framework Programme Seventh for Research and Technology Development (FP7), namely: Health; Agro-food and biotechnology; Information and Communication Technologies; Nanotechnology and materials; Energy; Environment; Transport; Social Sciences and Humanities; Space; and Security.

The iKnow workshops “Wild Cards in Turbulent Times” explored the potential of Wild Cards and Weak Signals (Wi-We) analysis for the research, policy and business communities.

The workshops had five main objectives:

1. To introduce the wild card approach and research agenda
2. To analyse and evaluate wild cards from the iKnow database (iBank)
3. To generate new wild cards which are relevant to key research areas
4. To “tame” the wild cards with the help of weak signals analysis
5. To explore implications for science, technology and innovation policy

Our cross-boundary approach

Our cross-boundary approach brought research, business and policy actors together to form a unique group of people to discuss “issues” potentially shaking the future of science, technology and innovation (STI). iKnow workshop participants were carefully selected in order to achieve a good mix of expertise from the above-mentioned thematic areas of FP7. The workshop focused on three “overlapping” themes.

The dynamics of the workshops had some slight variations in each country but the overall methodology was applied as a guiding framework including two major tasks.

The first task was called WI-We Analysis and involved a number of discussions, structured brainstorming and prioritisation activities. These were, informed by pre-workshop documentation: on key drivers shaping selected thematic areas and a selection of wild cards and weak signals prepared by the iKnow Consortium. The discussions focused on six major elements of a wild card situation: (1) the so called “wild-tameline” and the surprises (wild features) associated to a low probability high impact event, (e.g. knock-on effects of 9/11 attacks in the USA); (2) the potential impacts of the wild card on eight dimensions: Infrastructures, People’s Lives, Legislation and Regulation, Economy and Business, Defence and Security, Government and Politics, Environment and Ecosystems, Science and Technology; (3) the various interpretations of the “wild features”, i.e. whether the wild cards will lead to a continuation, discontinuation, re-emergence or emergence of issues in the future; (4) the actions that may need to be taken by (5) three types of actors at global, European and national levels. These actors include scanners (i.e. people or institutions monitoring WI-We features), shapers (i.e. people/institutions inhibiting or enabling WI-We features) and stakeholders (i.e. people or institutions positively or negatively affected by the WI-We features). Workshop participants were then asked to identify (6) weak signals or “observables” increasing the probability of occurrence of the wild cards and their “wild features”.

The second task was called WI-We Actions and involved three rounds of brainstorming sessions. These sessions used the results of the first task to generate actions that policy, business and research actors needed to undertake before and after the occurrence of selected Wild Cards.

The figure below illustrated the logic of the tasks used in the iKnow workshops. The workshop results were later processed by the iKnow consortium, taking into account the template used by the European Commission to launch calls for research project proposals. This involved a synthesis of the workshop results using a template (a four-page policy brief) based on the key findings of tasks 1 and 2 and a box for “recommended research”. The box includes: (a) thematic area, (b) research topic, (c) objective, (d) expected impact and (e) importance for Europe.
Section 3 of this report provides 44 iKnow Policy Alerts collectively produced by the iKnow Consortium with the contributions of more than 100 experts participating in the various iKnow workshops.

The following figures show the sorts of issues discussed in the various iKnow workshops. They represent flip-charts and post-its used in brainstorming and expert discussions about selected WI-WE issues.

---

### WI-WE Analysis

**E.g. UK Parliamentary system undermined by MP expenses**  
(boat cleaning on the taxpayer)

<table>
<thead>
<tr>
<th>Global</th>
<th>European</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>G1</td>
<td>G1</td>
</tr>
<tr>
<td>G2</td>
<td>G2</td>
<td>G2</td>
</tr>
<tr>
<td>G3</td>
<td>G3</td>
<td>G3</td>
</tr>
</tbody>
</table>

**Wild-tameline**

<table>
<thead>
<tr>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
</tr>
</thead>
<tbody>
<tr>
<td>we1</td>
<td>we2</td>
<td>we3</td>
<td>we4</td>
</tr>
</tbody>
</table>

**Impacts**

<table>
<thead>
<tr>
<th>i1</th>
<th>i2</th>
<th>i3</th>
<th>i4</th>
</tr>
</thead>
</table>

**Interpretations**

<table>
<thead>
<tr>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
</tr>
</thead>
</table>

**Actions**

<table>
<thead>
<tr>
<th>Ac1</th>
<th>Ac2</th>
</tr>
</thead>
</table>

### WI-WE Actions

**E.g. World financial crisis**  
“why did no-one see it coming?”  
(Queen Elizabeth, Oct 2009)

**SSH**

<table>
<thead>
<tr>
<th>Early actions</th>
<th>Early reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-wild card</td>
<td>pre-wild card</td>
</tr>
</tbody>
</table>

**Policy**

<table>
<thead>
<tr>
<th>G1</th>
<th>G2</th>
<th>G3</th>
</tr>
</thead>
</table>

**Business**

<table>
<thead>
<tr>
<th>G1</th>
<th>G2</th>
<th>G3</th>
</tr>
</thead>
</table>

**Research**

<table>
<thead>
<tr>
<th>G1</th>
<th>G2</th>
</tr>
</thead>
</table>

---

**Example of issues discussed in the WI-WE Analysis task**

- **F1**: Freedom of information campaigners won a High Court case to get MP’s claims released after years of battling Commons authorities.
- **F2**: Leaked information (CD): expenses claims were published by the Daily Telegraph.
- **F3**: MP’s ‘fraudulent’ claims (e.g. an adult film, mortgages on homes that relatives live in, paying too much to relatives from public funds, etc.)
- **F4**: Media Frenzy: MP’s expenses making headlines for nearly two years.
- **I1**: Complete and meaningful reform needed: 387 recommendations in BBC’s Have Your Say on MP expenses.
- **I2**: 50% of MP’s are corrupt - 316 recommendations in BBC’s Have Your Say on MP expenses.
- **I3**: Sir Thomas Legg’s Interpretation: 2 vague rules* and a culture of deference surrounds MP’s expenses.
- **im1**: Public distrust in MP’s has mounted.
- **im2**: New rules for MP expenses.
- **A1**: Freedom of information campaigners.
- **A2**: High Court.
- **A3**: Daily Telegraph / Media.
- **A4**: MP’s.
- **Ac1**: Sir Thomas Legg’s audit of MP’s expenses.
- **Ac2**: The Director of Public Prosecutions announces that 3 MP’s and 1 peer will face criminal charges over their expense claims.
iKnow Policy Alerts
Killer Virus

RECOMMENDED RESEARCH

THEMATIC AREA
Health

RESEARCH TOPIC
Prevention of pandemics: Awareness raising and surveillance systems.

Improved surveillance systems for the early detection of infectious viruses and campaigns to raise awareness, inform and educate populations about viruses and how they spread will become much more important. A project by Google indicates a future direction for designing early warning systems. The concept is that infected persons can enquire via the internet about the symptoms they are suffering; if they use specified key words then Google can analyse the pattern of keyword usage and identify regions where there is a high concentration or intensity of symptoms or a large dispersed number of people making similar enquiries.

A major research effort could also focus on how to raise awareness of the appearance of an unknown or highly lethal virus, without creating panic. Other projects might examine how seriously potential pandemics are regarded by a population and the effects of (a number of) precautionary announcements. Recent viruses (bird flu and swine flu) fortunately did not turn out to be as dangerous as was initially proclaimed. But repeated false alarms could cause ‘announcement fatigue’; this would hinder any necessary action and enhance the onset of pandemic.

OBJECTIVE

The objective of the research described above is to increase the probability of virus detection at the earliest possible stage. It is also to prevent behavioural patterns from accelerating the rapid spread of a virus.

EXPECTED IMPACT

Research on the topics listed above would a) reduce the risk of delays in detecting lethal viruses b) facilitate behavioural interventions to control the effects of a virus, c) help to control and contain the infection within a region or population and before it reaches pandemic scale.

IMPORTANCE FOR EUROPE

Europe is one of the world’s largest traffic junctions and is therefore especially vulnerable to the appearance of a lethal virus. Europeans are highly mobile both for business reasons and tourism. New viruses often originate in tropical regions, which Europeans are increasingly likely to visit.
Surprises (wild features)

Fortunately, for more than 90 years the world has been spared a devastating pandemic. The last real pandemic dates back to the year 1918 and is generally known as the “Spanish Influenza” pandemic. It lasted more than two years, a about a fifth of the world population was infected and at least 25 million victims were claimed.

Nowadays a “normal” flu-like infection appears every winter in Europe; the first signs and symptoms do not differ from those experienced during the “Spanish Influenza”. Medicine has advanced but surprisingly, the measures used to control pandemic have not changed significantly and were recommended during the recent appearance of bird flu and swine flu. People were told to avoid contact with large crowds, to keep strict hygiene, to wash their hands regularly, and to avoid drinking from glasses and bottles used by others. It would not be surprising if a new virus with initial flu-like symptoms appeared in the future. And spread just as fast or even faster than the “Spanish Influenza”. Medical research is probably capable of developing appropriate treatments if effective early warning systems and emergency response systems can be established.

Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”:** A broad number of scanners are related to this Wild Card. The most important ones are scientists, epidemiologists and virologists working at all kinds of institutions such as universities, hospitals or tropical institutes and global health institutions such as the World Health Organisation (WHO) and international early warning networks like the European Influenza Surveillance System (EISS).

- **Shapers** (i.e. enablers/inhibitors) such as medical research institutions developing effective vaccines, ministries of foreign affairs (by posting warnings against travels to regions, which are particularly affected by the virus), international surveillance networks, hospitals, national governments (by making necessary and appropriate prevention measures) and business enterprises.

- **Stakeholders** positively or negatively affected such as infected people, business enterprises, public institutions, travel providers, airlines, societies as a whole and health care systems and infrastructures.
Potential impacts

The appearance of a highly infectious and lethal killer virus has vast and primarily negative impacts on all areas of life. First of all, the threat to people's health is enormous. This would probably lead to a high uncertainty in societies and fear of leaving one's home. Besides suffering from the unpleasant effects of the virus itself (such as dizziness, fever and nausea), infected people might have to live under quarantine and thus get isolated from daily life and society. Even whole regions which are significantly affected by the virus might be put under quarantine and cut off from their environment. This might lead to a high probability of social riots and a decrease of public security in affected areas. Loss of faith in public institutions and national governments might be the consequence. The latter is further fostered, if effective vaccines against the virus are rare and better medicine and services could only be affordable by the rich. Besides these negative impacts on society and public security, the global economy might be highly negatively affected. Depending on the number of infected people, entire factories and production plants might stand still, leading to massive financial losses and possibly resulting in supply shortages of vital products. But the appearance of a killer virus might be also related to "positive" impacts, although this does not seem to be obvious at first sight. For example, the virus could be a trigger for more intensified international cooperation regarding research on virology, particularly on prevention measures, new effective vaccines and improved surveillance systems. Hereby, prospective appearances and global spreads of highly infectious viruses could be prevented. Coming generations would definitely benefit from these increased research activities.

Potential actions

**Policy actions**

**Early actions:** The task of policy might primarily consist of two supplementary actions. On the one hand, policy could take on preventive measures in order to minimise the likelihood of a deadly virus appearance and to avoid its possible global spread. On the other hand, policy could develop an emergency plan in case a deadly virus appears and its spread cannot be stopped. Both possible actions could contain the development of a European pandemic plan, which is divided into measures on European, national, and regional levels. This plan could consist of improved surveillance networks (European level), the timely procurement of a sufficient amount of masks and effective vaccines and increased regulation on hygiene in hospitals and public places, where large numbers of people permanently are in contact (particularly in large congestion points such as airports, railway stations and subways) (both national level). Actions at regional levels could include the implementation of specific quarantine locations. Other preventive measures such as media campaigns could focus on awareness raising in the population and instructions on how to behave correctly in order to preventively minimise the risk of infection.

**Business actions**

**Early actions:** Possible business actions are quite similar to policy actions mentioned above. First of all, business enterprises have to implement policy regulations regarding to hygienic standards and risk management. Secondly, business has to produce necessary masks, medicine and fast diagnosis devices. This also includes opportunities for new business models regarding to hygiene, pharmaceutics and insurances. Further, business enterprises could communicate aspects of hygiene in advertising and TV commercials.

**Research actions**

**Early actions:** As highly infectious viruses regularly have potentially global significance, international networking and cooperation of research institutions should be fostered. Improved trans-national research could detect deadly viruses much earlier and significantly accelerate the development of effective vaccines. Transnational databases including latest research results might support these processes. Specific research projects could further concentrate on a) diffusion patterns b) awareness raising c) simulation of public panic and d) impacts of a virus crisis on the economy.
Weak signals

Currently, two essential signals might indicate not only the appearance of a lethal and highly infectious virus but also its devastating global spread. At first, there is a rising number of highly infectious viruses, which could spread world-wide in a couple of weeks or even days. Most recent prominent cases were the avian flu and the swine flu. Fortunately, these viruses were not as devastating as feared and effective vaccines were developed in time. The second essential signal or indicator particularly concerns the latter point of vaccines. Regarding to the avian and the swine flu, there was evidence that a growing number of infected persons were resistant against particular antiviral vaccines. I cannot be ruled out completely that prospective mutations of such viruses are fully resistant and lead to a large number of casualties.

References

SPIEGEL ONLINE: WHO erklärt Schweinegrippe zur globalen Seuche. 11 June 2009. URL: http://www.spiegel.de/wissenschaft/meron/0,1518,629872,00.html (as of: 08 February 2011).
Due to several new techniques, it is possible to “manufacture” all different kinds of body parts on demand. Thereby, e.g. heart patients needing a new organ, cancer patients needing new cells or burn victims needing new tissue can be helped. But it can also be non-medical reasons that drive people to make use of the new possibilities such as athletes, for example, longing for better lungs and new cruciate ligaments or actors for prettier noses and ears. The new technique attracts new players such as medical companies offering the production of the spare parts.

**Objectives**

The objective of the research actions mentioned above aim at ensuring the availability of high-quality artificial body parts for everyone and to reduce the risk of inferior transplantation, that are detrimental to health or might even lead to death.

**Expected Impact**

Research on the topic listed above would a) ensure the provision of high-qualitative body parts; b) increase the affordability of artificial body parts; c) raise the acceptance in society towards artificial body parts.

**Importance for Europe**

High requirements to materials and production processes might significantly reduce the hazardous risks of transplanting artificial body parts. Due to extensive certifications and the associated reliability of artificial body parts, the European Union could immensely benefit as industrial location, as it may become the global market leader for artificial body parts. Most importantly, the promise of these technologies lies in an improved health and quality of life for European Citizens.
Surprises (wild features)
The triumph over death and eternal life is basically one of the oldest dreams of mankind. The occurrence of this wild card would certainly be another step towards fulfilling this dream. Nowadays, a major part of the population becomes seriously ill and in the worst case dies because of organ failures or in the case of burnings because of extensive damage to skin tissue. Failure or even the destruction of essential organs can be caused by a large range of incidents, e.g. traffic accidents, contamination or infectious disease. In such grave cases, the last resort to save one's life is generally an organ donation and transplantation. But organ transplants is certainly a difficult and complex matter. First of all, an appropriate organ has to be available on the “market” and the time between the removal and the implantation has to be as short as possible. Extended storage and long transportation may damage or destroy the organ and its vital functions. Besides these problems, further complications can emerge after the transportation itself. As the implanted organ is extraneous, the body often reacts with a rejection of the organ, which can lead to additional life-threatening complications. Within this wild card scenario, such complications would completely disappear, as new techniques of manufacturing all different kinds of organs, tissue, body parts as arms, ears and fingers or even teeth enable the production and implantation of suitable body products on demand without and negative side effects on health and well-being.

Key actors
Key actors related to this wild card, include:

- **Scanners or “early warners”:** Several scanners could be related to such a wild card. The most important ones are scientists in ethics/practical philosophy, churches and religious denominations, the media (e.g. reporting in revolutionary breakthroughs in stem cell research and tissue engineering) and of course medical research institutions, doctors and universities.

- **Shapers (i.e. enablers/inhibitors)** such as medical research institutions, new players, which might offer a broad variety of different services and “body products” (e.g. companies offering and storing new body parts or specialising in organ quality management), medical institutions, insurance companies and possibly touristic providers of “transplantation trips”.

- **Stakeholders** positively or negatively impacted such as all kinds of people demanding for body parts for medical need (such as people with burns, organ failures, visual defects or hearing loss) or for body shaping (for aesthetic or athletic reasons), body part providers, hospitals, insurances, pharmaceutical institutions, pharmacies and extreme sport providers.

---

### Manifestation
**Gradual development**

### Potential impacts in Europe

<table>
<thead>
<tr>
<th>Infrastructures</th>
<th>***</th>
</tr>
</thead>
<tbody>
<tr>
<td>People’s Lives</td>
<td>****</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
<td>****</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
<td>***</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
<td>★</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
<td>****</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
<td>***</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>****</td>
</tr>
</tbody>
</table>

**Low ★ Medium ★★ High ★★★ Very high ★★★★**
Potential impacts

The possibility of producing artificial body parts on demand implies a broad number of different negative and positive impacts. One essential negative impact of this wild card might be the affordability of artificially generated body parts. Particularly when the maturity stage of innovative manufacturing techniques is reached for the first time and the first generation of “body products” is available in the market, such products might only be affordable for the rich, which might lead to a discrimination of the poor and a further increase of social gaps. A second aspect concerns the availability of artificial body parts. In case these are permanently available, this might seriously foster a higher risk affinity of societies. People could cause more accidents due to driving less attentively, do more extreme sports and lead an “unhealthy” lifestyle (people could excessively drink and smoke without having fear of becoming seriously ill, as damaged organs could be replaced easily at any time). Another important aspect concerns the productions capabilities of artificial body parts and tissue. An effective production of high quality organs requires a broad medical infrastructure and knowledge, which cannot be found in all European countries. This might possibly result in three consequences: High benefits for producing and exporting countries; financial disadvantages of countries which do not have respective infrastructures; boom of specific travel agencies offering specific services such as journeys to countries which offer new production and transplantation technologies (complete package including outward journey, stay at a hospital/institution, operation, after-treatment and return journey). Besides the negative aspect mentioned above, the wild card certainly includes a number of positive aspects, which seem to overweight the negative ones. These are primarily an improved quality of life through an effective treatment of several diseases, increased life expectancy and higher productivity due to less illness. Uncertain impacts are considered to be transplantations of organs to improve one’s abilities (“organ doping”) and the possibility of rising costs for health.

Potential actions

The possibility of producing artificial body parts on demand

Policy actions

Early actions: Assuming the wild card is regarded as rather desirable, the task of policy could primarily consist in creating appropriate framework conditions for research on stem cell production technologies and other kinds of innovative technologies enabling an effective production of artificial body parts. This includes deregulation and harmonisation of stem cell research, incentives for “key researchers” (by offering them excellent research conditions), funding of education in health and medicine and fostering the acceptance in population. Further policy has to ensure the availability of body parts for everybody (e.g. by reorganisation of health systems), enact regulations for quality management, ensure the security of (individual) genetic data and to take measures against body part black markets. The latter might ensue in case artificial organs are only available at a high price and insurance does not cover the costs.

Business actions

Early actions: This wild card could certainly result in the emergence of a new growth market “Artificial body parts”. There is great economic potential for enterprises, which define their role and business models at an early stage. New business models could include the production of artificial organs or services in diagnostics, certification and quality management.

Research actions

Early actions: Assuming again the wild card is regarded as rather positive, research could basically should on conducting stem cell research in international cooperation in order to share knowledge, gain new insights into different technologies and to increase the possibility of getting revolutionary breakthroughs regarding an effective and cost-efficient production of artificial body parts. Additionally, research should focus on the development of quality management concepts and the exploration of specific qualitative indicators for perfectly working organs of high quality. However, all these research and policy actions would need to be preceded or accompanied by research and discourse on the ethical implications of such a development.
Weak signals

There are several signals that either individually or in combination with others indicate the possibility of a prospective occurrence of this wild card scenario. A striking example is the movie “Repo Man” from the year 2010. In this movie, an institute offers artificial organs which can be bought on credit. Further more fact-based signals include: The rising number of research institutions dealing with research on stem cell therapy and reproduction. This in combination with the vast number of the latest successes in this field certainly proves that it might just be a matter of time until the commercial production of body parts can be realised on a large-scale level. Further signals are the increased funding, the increased interest of the media on the topic, the growing number of suitable carrier structures for some body parts and tissues, tissue plotting and tissue engineering in case of burnings.

References

Nervous Breakdown of Society

RECOMMENDED RESEARCH

THEMATIC AREA
Health Care, Social Sciences and Humanities (SSH) and Security.

RESEARCH TOPIC
Early anticipation of and measures against neuropsychiatric epidemics.

In order to prevent, detect and contain nervous breakdowns of societies, research should be enabled to develop early warning systems as well as front-of-the-pipe measures and end-of-the-pipe measures against neuropsychiatric epidemics.

OBJECTIVE
Studying self-reinforcing societal processes from the macro perspective and the transmission of mental viruses from the micro perspective might help to anticipate the progression of a neuropsychiatric epidemic before it breaks out for the first time. Also, different types of neuropsychiatric epidemics with specific symptoms, courses of disease and infection routes might be identified. Defining indicators, thresholds and monitoring methods might then help to detect neuropsychiatric epidemic hotspots, early on, from where the mental virus might spread into other regions. Mitigation and adaptation measures (including pharmaceuticals, medical devices and services) for the individual diagnosis and treatment of people affected might thus be targeted more efficiently.

EXPECTED IMPACT
The full prevention of neuropsychiatric epidemics through these measures will be unlikely. However, containing their impact and breaking the vicious circle of mutual reinforcements will become more probable.

IMPORTANT FOR EUROPE
After Japan the region most likely to be hit by a neuropsychiatric epidemic is Europe. The impact of such a nervous breakdown of societies will probably be worst in Europe. The aging of societies, which is most forged ahead in Europe, is, both, potential cause and first effect of a nervous exhaustion of societies. Also the fact that Europe falls behind in global economic competitiveness, as indicated by very low GDP growth rates, is a potential driver of a neuropsychiatric disorder in societies. Additionally, the shared culture, the close cooperation and the homogeneous media within Europe makes a quick spread of a neuropsychiatric epidemic in a 500 million people area more likely than in any other region of comparable size. Therefore, research in neuropsychiatric epidemics is of vital interest to Europe.

Acceleration of life, sensory overload by the media, pervasive ICT and fierce competition at the workplace have led to a dramatic increase in mental illnesses and disorders, a rise in apocalyptic prophecies and conspiracy theories and widespread apathy. Attention deficit disorder and hyperactivity become the norm, combined with a general loss of confidence in existing organisations – state, churches, family. Society as a whole is facing a kind of nervous breakdown with subsequent burn-out syndrome.

FP7 Themes
- Health Care
- Social Sciences
- Humanities
- ICT
- Security
- Innovation
- Environment
- Climate Change

ERA Goals
- Sustainable Society
- Security
- Growth
- Health
- Knowledge
- Growth
- Environment
- Innovation
- Security
An increase in lifestyle diseases and mental illnesses in developed economies is nothing new. However, the very extreme spread and impact form the surprising elements of this wild card. In 2008, neuropsychiatric disorders already accounted for 26% of the health burden in high-income countries according to WHO data (health burden measured in DALYs or disability-adjusted life years, a measure combining morbidity and mortality; high income countries according to the World Bank country classification). That means a health burden of 31 million DALYs of a population of 965 million people. According to WHO projections the health burden regarding neuropsychiatric disorders will remain relatively stable at 33 million DALYs and its burden share will rise to 28% by 2030 in the baseline scenario. A rise to 60 or even 90 million DALYs, with unipolar depressive disorders, bipolar depressive disorders, schizophrenia, epilepsy, alcohol use disorders, drug use disorders, post-traumatic stress disorders, obsessive-compulsive disorders, panic disorders, insomnia and migraine accounting for the highest growth rates, would be mirrored in the wild card of a true nervous breakdown of society. Also the spread of mental illness forms a surprising element, as the process might be similar to traditional viruses. Depressive people “infect” family member and friends. The psychic virus spreads from country to country, transported by media and prophets of doom.

Surprises (wild features)

An increase in lifestyle diseases and mental illnesses in developed economies is nothing new. However, the very extreme spread and impact form the surprising elements of this wild card. In 2008, neuropsychiatric disorders already accounted for 26% of the health burden in high-income countries according to WHO data (health burden measured in DALYs or disability-adjusted life years, a measure combining morbidity and mortality; high income countries according to the World Bank country classification). That means a health burden of 31 million DALYs of a population of 965 million people. According to WHO projections the health burden regarding neuropsychiatric disorders will remain relatively stable at 33 million DALYs and its burden share will rise to 28% by 2030 in the baseline scenario. A rise to 60 or even 90 million DALYs, with unipolar depressive disorders, bipolar depressive disorders, schizophrenia, epilepsy, alcohol use disorders, drug use disorders, post-traumatic stress disorders, obsessive-compulsive disorders, panic disorders, insomnia and migraine accounting for the highest growth rates, would be mirrored in the wild card of a true nervous breakdown of society. Also the spread of mental illness forms a surprising element, as the process might be similar to traditional viruses. Depressive people “infect” family member and friends. The psychic virus spreads from country to country, transported by media and prophets of doom.
This may lead to a rising split in European societies materialising in mentally impaired children and people being excluded or marginalised. In case of a resulting economic collapse, more violence and riots will have to be expected. In general, the belief in state and government is likely to decline. Also, the population will decrease not so much because of the rising number of suicides but because people are no more willing to have children. On the one side, they do not want to expose their potential children to a world experienced as insecure. On the other side, people do not dare to take the responsibility for someone else. Organising one’s own daily life becomes an ever more difficult task for a growing number of people. This includes housing and eating - homelessness and malnutrition, both, will probably spread. Apart from that, several stabilising mechanisms are imaginable including a rise of esotericism, a revival of smaller communities re-substituting the global market economy with local barter or even subsistence economies.

Potential actions

Policy actions

Early actions: To anticipate a nervous breakdown of society early on, the implementation of a regular psychometrical census is recommended. To prevent or to contain the development, stress competence training in the educational system could be implemented on all levels (including primary, secondary, tertiary and adult education). Also, physical activity (sports) and sedative media programs might be encouraged.

Early reactions: To avoid or to contain massive secondary effects after a nervous breakdown of society, the implementation of re-socialisation programs might be encouraged. Furthermore, riot detection and dispersal squads should be established as well as specific protected spaces in the public. Also, preventive imprisoning might become a political issue.

Business actions

Early actions: Corporations must implement new processes and internal services in order to protect their employees from psychological strains and mental disorders. This includes the implementation of mental health plans and special trainings, the definition of stress or aggression safety values as well as intervention teams (“de-stressors”).

Early reactions: After a nervous breakdown of society, new markets for specialised companies will emerge. These include de-stressing services for business and individuals. New kinds of wellness resorts (“deceleration camps”) will emerge and jobs with therapeutic character will rise. Specialised pharmaceuticals will be developed as well as new devices (eventually “madness level detection devices” will be invented).

Research actions

Early actions: Before a nervous breakdown of society takes place, research must develop an early warning system including indicators, thresholds, monitoring and early intervention methods. At the same time, new pharmacological mitigation measures will have to be invented.

Early reactions: After a nervous breakdown of society, research might have to assess the implications for security and judiciary systems. New means of riot control and remote brain scanning might become matters of research.

Weak signals

There are several signals warning us about the probability of occurrence of such a wild card. First and foremost, the incidence of mental illnesses and suicide primarily among young people forms a good indicator of a nervous breakdown of society under way. Today’s spread of ADS and ADHS among children are an alarming sign already. Also crime statistics may serve as an indicator and the increase of hate crimes in several European countries is a weak signal already. Additionally, the EU working surveys show a rising number of people working to tight deadlines which is a hint for the level of stress suffered already by a large number of people in their working life. Furthermore, the increasing number of non-voters and the spread of local currencies in Europe show that many people have already withdrawn from the political system or the global market economy, respectively.

References

URL: http://www.taz.de/1/zukunft/wissen/artikel/1/krauschreibungen-nahmen-zi/ (as of: 08 February 2011).


WORLD HEALTH ORGANISATION: Disability-adjusted life years (DALYS). Global Health Observatory Database 2011.
URL: http://apps.who.int/ghodataviz/viz-72063 (as of: 08 February 2011).
Scientists up for murder as ethical issues are abolished

RECOMMENDED RESEARCH

THEMATIC AREA
Health, Social science and humanities, Science and society and cross cutting themes

RESEARCH TOPIC
Promoting ethical conduct in science.
Training in research ethics to help researchers grapple with ethical dilemmas by introducing researchers to important concepts, tools, principles, and methods that can be useful in resolving these dilemmas. The research environment is an important factor in potential ethical misconduct, and a course in research ethics is likely to help people get a better understanding of these stresses, sensitise people to ethical concerns, and improve ethical judgment and decision making.

OBJECTIVE
The key objective of this is training and education in research ethics to help reduce the rate of misconduct in science.

EXPECTED IMPACT
Most scientists are highly ethical, and only researchers who are morally corrupt, economically desperate, or psychologically disturbed tend to commit misconduct. Any training course designed to educate researchers in ethical codes of conduct and the importance of ethics will have limited effect on those who are willing to commit misconduct. However, deviations from ethical conduct occur in research as a result of ignorance or a failure to reflect critically on problematic traditions, and a course in research ethics may help reduce the rate of serious deviations by improving the researcher’s understanding of ethics and by sensitising the researcher to the issues.

IMPORTANCE FOR EUROPE
Ethical issues in research are of growing importance in Europe, and there are guidelines in place, but these are often misconstrued by researchers, who believe they are conducting research in a moral way. By ensuring researchers have a strong understanding of ethical issues, Europe can drive forward innovative activities without ethics being seen as a barrier, but more as a guide as to what is morally correct.

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 become prevalent, vulnerable sections of society (homeless, people with mental illness, 3rd world societies) are exploited and become guinea pigs for very risky research trials.

FP7 Themes

ERA Goals

Author(s): Anthony WALKER (RTC North)
Wild Features

When people think of ethical issues, they often think of rules that distinguish right from wrong, or a code of professional conduct that distinguishes between acceptable and unacceptable behaviour. This is particularly important in cutting edge research and development, and there are often disagreements in the way certain ethical issues are interpreted.

For years, some scientists have argued that ethical issues have hampered progress, for example in stem cell research and where animal testing is involved. The wild features involved with this wild card relate to the fact that there will be ‘no’ ethical restrictions placed on research if this wild card were to manifest. This is obviously quite a dramatic change to the current situation where scientists can no longer claim that science is neutral but must consider the ethical and social aspects of their work. Indeed, there is more ethical legislation coming into practice in current times, so a paradigm shift to have zero ethical restrictions for research can certainly be considered wild!

Further wild factors relating to this wild card include the use of human guinea pigs to conduct risky trials. Although human trials are an integral part of some research, without ethics or moreover ‘morals’, there is a risk that vulnerable parts of society may be exploited and abused in the name of science!

Possible interpretations

One way to interpret this wild card is if ethical barriers to research are removed it could be seen as a great opportunity for researchers to drive forward with their studies governing their own behaviour. As boundaries are pushed in the ‘name of science’ and previously unaccepted behaviour becomes acceptable, the research and breakthroughs may be established at a rapid pace. This may start with the best will in the world to make scientific progress to treat incurable diseases for example, but as the quest continues, research trials may become more risky and with less integrity. Perhaps, looking beyond this, further wild features would be that scientists conduct research on vulnerable sections of society, and there is no policy, governance, legislation or ‘ethics’ that prevents this. Tests on pregnant women could create genetics deformities and there is a risk of a culture that promotes “here is €1000 if I can trial a drug on you”.

However, there is always a risk that communities and society become less tolerant to this behaviour as they see it as human exploitation until there is a significant backlash against scientists who are convicted of murder!
Key actors
Several actors could be related to this wild card including: mainstream political parties, governmental departments, research institutes, trade associations, ethics committees and general research organisations (academic and private). Insurance companies and personnel involved in the legal system may also find this interesting post wild card. Perhaps the people most related to this though are individual researchers who are conducting their work in areas that currently require ethical reviews.

Weak signals
There are already groups on the rise opposing research that require ethical reviews and a number of controversies relating to stem cell research. There are new ethical issues about computers, IT, business and in the media. For example, computer ethics deals with how computing professionals make decisions regarding social conduct, and with advances in social media (such as twitter, facebook and myspace) there are new social-media ethical dilemmas. Ethical issues are prevalent throughout society.

There are controversial journal articles, papers and books written that suggest society has no right to interfere with scientific progress, but rather science has the right to interfere with natural processes (for example, “Controversial Science: from content to contention” by Thomas Brante, Steve Fuller and William Lynch). If this perspective were to be adopted by society, then it could clearly lead to ethical issues being ignored in the future in the ‘name of science’.

Even when clear ethical standards and principles exist, there will always be times when the need to do accurate research runs up against the right of potential participants, and no set of standards can possibly anticipate every ethical circumstance. It may be that scientists follow their instincts of what is right when boundaries are ‘fuzzy’.

Potential actions
If ethical issues in Europe were to be abolished there would be a need for some sort of governance as to what is deemed ‘right’ or ‘wrong’. Otherwise, there is scope for anything to be achieved in the name of science and the possible backlash from parts of society who oppose the works of ‘mad scientists’. With this in mind, there are a number of issue pre-wild card (early actions) and post-wild card (early reactions) that need consideration.

Policy actions
Early actions: The most obvious actions to be taken by policy makers is to make a decision as to what ethical issues, standards and guidelines should govern research activities. Risk analysis balancing scientific progress against what is ethically correct.

Early reactions: Responsibility to ensure that society is protected against research activities that are ‘off the radar’.

Business actions
Early actions: Consultations to define new ethical guidelines

Early reactions: Opportunities for organisations in the legal profession. Opportunities for private research organisations to conduct trials and experiments without risk of ethical opposition.

Research actions
Early actions: Responsibility to conduct research abiding by current ethical conduct. Lobbying opportunities to define new standards of ethical control.

Early reactions: Voluntary ethics codes can be applied although no official governance.
Traditional European Medicine

**THEMATIC AREA**
Health and Biology

**RESEARCH TOPIC**
Cross-national research on medical plants and applications of naturopathy

In order to introduce an officially applied field “traditional European medicine”, national and cross-national research on these topics will need to be intensified. Nowadays, only a few research organisations in Europe are dealing with traditional European medicine and international cooperation and exchange of significant findings is rather low. So it would be necessary to conduct research on alternative forms of natural medicine in all European states, particularly due to local differences in applied plants and herbs. The latter is partly due to different climate conditions in respective countries. Research should be especially stimulated in Slavic countries, where there is a continuous tradition of medical knowledge in monasteries. Besides, knowledge from different countries should have to be increasingly shared.

**OBJECTIVE**
The objective of the actions mentioned above is to exploit knowledge regarding to naturopathy from different regions in Europe and appropriate application fields. This profound knowledge might build the basis for an eventual introduction of an official therapy based on traditional European medicine.

**EXPECTED IMPACT**
Research on the topic listed above would a) ensure comprehensive research on different forms of alternative natural medicine; b) enable cross-national exchange of gained knowledge; c) raise the acceptance towards natural medicine in societies d) help to implement a kind of official traditional European medicine as a supplementary to conventional medicine, maybe not only in Europe but in other world regions as well.

**IMPORTANCE FOR EUROPE**
The ageing societies, the developments of high-tech medicine but also the adverse reaction of pharmaceuticals are an enormous financial burden on European health care systems. Thus, research on monastery medicine could not only lead to a healthy society but also help to reduce the enormous cost pressures on European health care systems.

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. 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. This “new” treatment is fully accepted by society and broadly recognised as an effective supplementary to conventional medicine.

**FP7 Themes**

**ERA Goals**

*Author(s): Ines LIETZKE (Z._punkt), Sivert VON SALDERN (Z._punkt)*

*Contributor(s): Dr. Johannes G. Mayer (University of Wuerzburg, Germany)*

**Wild Card**

Blue Sky Policy Alert 05 - Traditional European Medicine

Wild Card Policy Alert 04 - Scientists Up For Murder As Ethical Issues Are Abolished
Between the 8th and 13th century, it was the monasteries which shaped the medical treatment in Europe. This is partly due to the 73 chapters of monastic rules composed by Benedict of Nursia from the year 527. Chapter 37 contained the following rule: “Care for the sick comes before all else”. This basic principle lead to the introduction of doctors and pharmacies in almost every monastery on the European continent. One can say that monasteries were the medieval hospital operators. Thus, in the course of time the nuns and monks gained profound knowledge on medical plants and their application fields and created manifold herb gardens. The theoretical base of this monastery medicine was mainly humoral pathology - the theory of four fluids. However, the European era of monastery medicine finally ended in the beginning of the 19th century due to secularisation, except in Slavic states and Italy, where the usage of European medical plants leads back to a continuous 2000-year lasting history. Today, the majority of the old knowledge on medical plants has to be meticulously explored and recorded from old books and documents, which is quite a time and money-consuming task. It would be a real breakthrough if all of the ancient knowledge was completely restored, compiled and finally used to built the fundamental base of an officially approved “Traditional European Medicine” in all European countries. This TEM would constitute an effective supplementary to conventional medicine, implying a broad variety of positive effects on well being and well-tolerated treatment of diseases without undesirable side effects.

Key actors
• Scanners or “early warners”: A broad number of scanners could be related to such a wild card. The most important ones are certainly research institutions exploring the effects of different herbs and plants and publishing articles on their findings, several media as TV and radio stations reporting on the history and new application fields of medical plants, patients who are successfully treated with medical plants and last but not least doctors applying different techniques of naturopathy.
• Shapers (i.e. enablers/inhibitors): The most important shapers of this wild card are definitely research institutions dealing with different forms of natural medicine, botanists and chemists who discover certain effects and active substances both randomly or on purpose, doctors and pharmacists who adopt different practices of natural medicine (e.g. by attending seminars in medical knowledge in monasteries), small pharmaceutical companies dealing with naturopathy, large pharmaceutical companies conducting research on natural medicine and finally European policy makers.
• Stakeholders positively or negatively impacted such as patients, doctors, hospitals, pharmacies, pharmaceutical companies, insurance companies, companies from the food industry, policy makers and last but not least societies as a whole.
Potential impacts
A breakthrough in medical knowledge in monasteries, respectively the Europe-wide implementation of an official medical area called „Traditional European Medicine“ might lead to a broad number of impacts on different fields such as society, business and politics. Firstly, the emergence of this wild card could lead to an increased awareness towards one’s own health and a growing self-prophylaxis, particularly with regards to common widespread diseases, cardiovascular diseases or different types of cancer. This is partly due to the significant value of healthy nutrition in medical knowledge in monasteries. Essential questions with regards to nutrition consist of „what do I eat, when do I eat and how do I eat“. Following these essentials in daily life, health of European societies might enormously increase. This could actually have positive impacts on ailing health systems and unrentable health insurances, as the considerable share of today’s costs for covering treatments of widespread diseases could be saved. Further, it might actually happen, that a large number of medicine without any undesirable side effects is developed. Generally speaking, this would lead to increased well-being of societies. Nevertheless, this wild card might also have certain negative impacts, particularly on producers of mammals, classic pharmacies which only focus on selling synthetically produced pharmaceuticals, Internet pharmacies and last but not least pharma companies which refused to invest in research on medical plants. Another important aspects concerns the necessary reorientation of conventional doctors and pharmacies. In case this wild card emerged, the number of pharmacies producing their own pharmaceutical compounds and offering a broad range of consultation services might increase.

Potential actions
If ethical issues in Europe were to be abolished there would be a need for some sort of governance as to what is deemed ‘right’ or ‘wrong’. Otherwise, there is scope for anything to be achieved in the name of science and the possible backlash from parts of society who oppose the works of ‘mad scientists’. With this in mind, there are a number of issue pre-wild card (early actions) and post-wild card (early reactions) that need consideration.

Policy actions
Early actions: Assuming the wild card is regarded as rather desirable, the task of policy could primarily consist in creating appropriate framework conditions for research on medical knowledge in monasteries and other kinds of natural treatments. This primarily includes financial support of cross-national cooperation, incentives for “key researchers” (by offering them excellent research conditions), funding of education in traditional health and medicine and fostering the general acceptance of natural medicine in population. Further political actions might have to focus on changing current approval procedures for pharmaceuticals and methods of alternative treatment.

Business actions
Early actions: This wild card could certainly result in the emergence of a new growth market “Traditional European Medicine”. There is great economic potential for both small and large enterprises, which define their role and business models at an early stage. New business models could for example include the purchase of medical plants sets for self-mixture at home, delivery services for convenience food based in traditional monastery recipes, nutritional consulting or wellness temples offering a broad variety of natural treatments. Further, there might be significant challenges for health insurances and specific contracts focussing on traditional European medicine.

Research actions
Early actions: Assuming again the wild card is regarded as rather positive, research could basically focus on building international cooperation networks dealing with the exploration of traditional medicine applied in entire Europe. The object of this research is to completely discover ancient recipes of healthy food, effective mixtures of medical plants and active substances and its application fields.
Weak signals

There are several signals that either individually or in combination with others indicate the possibility of a prospective occurrence of this wild card scenario. First of all there are various signals related to the work of the research group “medical knowledge in monasteries” at the University of Wuerzburg. GlaxoSmithKline, the worlds second largest pharmaceutical company is supporting their work. Further, there has been an enormous increase of external requests at the research group lately. Lust but not least, the existence of the research group itself and the fact that this groups is financially supported are important weak signals. Another important signal might be a research group in Austria, which focuses on the exploration of some kind of traditional European medicine. They have already registered this research area at the UNESCO as an intellectual heritage and they try to establish this area as an official medicine. Besides, this group is already conducting training seminars.

References

Wheat crisis hits humans and animals

RECOMMENDED RESEARCH

THEMATIC AREA
Agriculture, environment, social sciences and humanities, and security.

RESEARCH TOPIC
From farmer to consumer: Diversifying crop production and consumption.

Overreliance on a few core crops (e.g. wheat) makes food production and consumption vulnerable to any type of disruption. Were a new wheat disease to develop it could have severe implications for food markets worldwide, which could have unforeseen consequences such as starvation, civil unrest and high food prices. There is a need to prepare for diversifying food production and consumption in order to avoid such consequences. Farmers need to be assisted in order to better diversify their crops and consumers should be made aware of a greater variety of food products.

OBJECTIVE
Research could focus on examining both food production and consumption patterns and current methods that are being used to influence both sides. Research could focus on ways to reach consumers and influence them to diversify their food consumption in order to move away from overreliance on a few core products (e.g. wheat). Research which focuses on food production could examine current food production trends in order to inform successful ways of diversifying crops. Research could also focus on food regulation, legislation and policy in order to identify what can be done to ease the transition to diversifying crops.

EXPECTED IMPACT
Research should aim to a) examine current food production and consumption patterns; b) inform practices that aim to diversify crop production and consumption; c) inform any policy response, regulatory and legislative initiatives that could encourage crop diversification.

IMPORTANCE FOR EUROPE
Food security is an important grand challenge for Europe and threat to core crops could potentially have serious implications. It is vital that research underpins any policy preparation from the EU. Joint regulation is also necessary and the EU needs to take initiatives to formulate a response in the event of threats to food security. EU policy could then provide blueprints for any policy response from the governments of member states.

This wild card (also called “wheat comes a cropper”) concerns the emergence of a new pest or disease which specifically targets wheat and wipes out the entire world wheat crop. This leads to a severe worldwide shortage of a staple food for humans and animals. Through genetic mutation a new pest or disease emerges that targets and destroys all wheat crops; it spreads quickly across the globe. The impact is severe as the worldwide food supply for humans and animals is put in serious shortage. It happens at a time when humans and animals have become overly dependent on one particular source of food. Large farms with mono-culture crops have come to dominate massive farming areas; these areas produce lots of food but with alarming risks to humanity and the environment. The global vulnerability associated with this wild card is created by markets that constantly drive down prices without strategic consideration; only the cheapest sources survive in this system. Standardisation in the food and farming industry exacerbates the vulnerability of the whole system.
**Surprises (‘wild’ scenario features)**

What make this a wild card? In general, over-reliance by a group of human or animals on just a few types of food (or indeed other support systems) makes the group vulnerable. If the group itself is also very large then potentially critical situations arise. This might also be linked to global biodiversity issues, especially interdependency between and across species (and “food-chains”). Any disruption to a one plant or species on which a critical dependency exists will have a massive impact. When business concepts emphasise bigger farms for efficiency and performance (or when an equivalent trend in non-human biological terms occurs) then the concept has consequences which are not initially recognised in the prevailing business paradigm. In this case we do not just get larger suppliers we also get fewer suppliers and less variety/variance. Another dangerous feature about the wild card is that genetic engineering can cause the inadvertent introduction of new ‘advanced’ pests and diseases. These can escape attention until it is too late. Because of the mono-culture there is too little inherent protection or resistance to prevent the disease spreading. The impact will be devastating. To make matters even worse, there is a smaller gene pool from which to breed new crops (unless the wild card is heeded). The extent to which humans rely on animals as a food source means that the food chains of each animal must be examined to identify vulnerabilities.

In so far as we are also concerned about animals for other reasons and not just as a food source for ourselves (e.g. for transportation and for power to drive machinery, for entertainment and sport, and for moral and religious reasons) we should also consider any vulnerabilities which we might introduce in their food chains as a consequence of human selfishness or unsustainable behaviour.

**Possible interpretations**

There are a number of possible conditions under which this event becomes wild. Firstly, that we now are living in a time-and-space in which we cannot completely eliminate risk. In other words, inherently, we live in a ‘risk society’ (as once coined by Ulrich Beck). In such society what constitutes risk is not only natural risk (like natural disasters: floods, earthquakes, tsunami, etc.) but also what Giddens terms ‘manufactured’ risks (i.e. human-made or human-induced catastrophe like computer virus attacks, nuclear reactor leakages, etc.). Secondly, in this light, we now actually rely on just a few food sources to feed the size of population. Moreover these sources are human-made/genetically modified/enhanced mono-culture crops. Any disruption to their production will have an impact on the survival of a large group of human beings. We do not have adequate monitoring programmes for disease development.
Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as researchers who monitors the spreading of crop diseases; scientists who should work in a different paradigm to start thinking of diversifying food resources rather than attempting to create mono-culture, high-yield crops for the sake of food industrial efficiency and productivity.

- **Shapers (i.e. enablers/inhibitors):** governments who should provide not only a regulatory framework for crop production but also encouragement and incentives to farmers and food processing industry for more diversification.

- **Stakeholders** positively or negatively impacted: farmers will be impacted since they are the central actor in the food supply-chain and play a critical part in providing food for humans and animals; consumers and the general public will suffer from the lack of food supply and from the massive social unrest if this wild card manifests. In this situation, the police are to deal with the societal impact, especially when food supplies run out and public restlessness (and probably riot) take place.

Potential impacts

What could possibly be the impacts of this wild card? It is envisaged that the impact would be massively affecting the society, for example: (1) massive civil unrest because of massive disruption of markets for food/ feedstuffs; (2) high food prices due to this wild card, which will create trade barriers to protect individual countries’ interest; (3) starvation, especially in the west thus forcing western countries to rely on others for food; and (4) massive needs to move to other staple crops – whose prices rise. These impacts will force people to rethink about genetically-modified (GM) crops, from GM as the cause of this massive disaster, to GM as possible solution for survival. It is also worth-noting that, at many fronts, it is the developing countries that have to bear the brunt.

Potential actions

What actions need to be taken before and after the wild card? This very much lies on the very idea of having a more reliable system which does not have to rely too much on mono-culture food crops. One possible potential action is building public awareness to grow their own foods. At a more massive level, policy should encourage farms to diversify crops they produce. Another possible policy direction is for the governments to back up the plan to build up and fund, or to continue, the establishment of gene banks which will store the varieties of genes. In different action, an action could be to have policy which needs to reserve bio-fuels trend which contributes to the tendency of massive mono-culture crops.

In a more detailed account these actions can be specified below.

<table>
<thead>
<tr>
<th>Policy actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Policy to (1) encourage/incentify general public to grow their own food and farmers to diversify crops; (2) reverse biofuels trend; (3) create access to diverse markets; (4) have contingency (countermeasures) plan to loss of feedstock.</td>
</tr>
<tr>
<td><strong>Early reactions:</strong> Once manifested, policy is needed to (1) devise quarantine procedures for early action plan; and (2) to ensure early identification of disease outbreak.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> For business, it is important to attend to research on related issues, as well as to take responsibility in monitoring for possible disease mutations.</td>
</tr>
<tr>
<td><strong>Early actions:</strong> Once manifested, business need to think of a new system to redistribute food, and to have production/research resources ready to act.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Some research agenda before the wild card manifests are: building up gene banks; development of wide range of crops as some of them may be resistant to the disease; increasing R&amp;D on GMO on wild wheat; research on genetically enhanced crops resistant to disease; better understanding of institutional barriers to use of foresight knowledge; monitoring disease developmentmigration; monitoring risks of all monoculture; sharing information on risks, strategies, etc.; and Map potential effects and viability of shifts to new food resources.</td>
</tr>
<tr>
<td><strong>Early reactions:</strong> Once the wild card happens, research should focus on the dietary change impact and anticipate for public attitude shift.</td>
</tr>
</tbody>
</table>

Weak signals

Some signals are identified, if these emerge individually or in combination with others, we have to be ready for the wild card to manifest. These signals might be: (1) localised outbreak in an area which is not monitored; (2) Climate change which causes an existing disease to mutate; (3) bioterrorism attack or unintentional lab release that contaminates the farms; (4) the increasing amount of large areas of mono-culture that allows rapid spread of disease/pest; and (5) the more intensive hi-tech farming methods that reduce crop resistance.
Total rejection of the “Internet of Things”

**RECOMMENDED RESEARCH**

**THEMATIC AREA**
Mainly ICT, but also Security, SIS, SSH

**RESEARCH TOPIC**
R&D of Privacy Enhancing Technologies (PETs) tailored to IoT; Incorporation of “Security and Privacy by Design” principles in the early stages of new IoT applications; Social acceptance of new technologies

**OBJECTIVE**
Safeguards against abuse of IoT applications (e.g., privacy intrusion); Better understanding of the social acceptance (fears, hopes) of IoT and the balance between benefits and threats

**EXPECTED IMPACT**
Assuring social and economic benefits of IoT and the future Internet. Safe, secure and dependable IoT-based services.

**IMPORTANCE FOR EUROPE**
Contribution to the viability and success of the European ICT industry, to the advancement of future Internet-based technologies, and to the confidence and trust of European citizens in online services.

In fact, it has major impact on the everyday life of members in a knowledge based society.

Despite extensive research and large business investments, practical applications and wide use of the Internet of Things (IoT) and Ambient Intelligence (AmI) fail because of severe distrust and total rejection by users. Major social backlash prevents uptake of AmI and IoT tools and services, both dissuading market development and heavily regulating suppliers.

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Gradual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★★ by 2030 ★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Negative</td>
</tr>
<tr>
<td>Implications</td>
<td>Transformation of a system</td>
</tr>
<tr>
<td>Inspired by</td>
<td>(1) FP6 Projects SWAMI, HYDRA (2) A foresight study done at ICTAF</td>
</tr>
<tr>
<td>Related to</td>
<td>FP7 projects: CASAGRAS</td>
</tr>
<tr>
<td>Key words</td>
<td>ICT, Ambient Intelligence, Internet of Things, Ubiquitous Computing, Cyber Attacks, Cybersecurity, Privacy, Security, Hacking, Privacy Enhancing Technologies, RFID</td>
</tr>
</tbody>
</table>

**Potential Impacts in Europe**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>★</th>
</tr>
</thead>
<tbody>
<tr>
<td>People’s Lives</td>
<td>★★★★</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
<td>★★★</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
<td>★★★★</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
<td>★★★</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
<td>★★★</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
<td>★</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>★★★</td>
</tr>
</tbody>
</table>

Author(s): Aharon Hauptman, Yoel Raban (ICTAF)
Wild features
First applications of IoT used in real life prove that the “dark side scenarios” of AmI and IoT are real. Massive malicious attacks, identity thefts and sophisticated hacking cause real damage. Using the AmI/IoT systems “in disguise” (by “virtual identities” that conceal the real person behind them) is common; nobody is able to know anymore who is who, whom to trust, and who and what is real or not. The vulnerabilities are too severe, and all the technological safeguards fail.

The result is total rejection by the society and total collapse of such systems. Moreover, other concepts of the “future internet” are critically endangered too.

Possible interpretations
The wild card refers to a situation where these technological developments of IoT systems fail in the sense that the real (or perceived) risks of abuse outweigh the real (or perceived) benefits.

Because of total distrust of the IoT/AmI and other future internet services, it turns out that people prefer old-fashioned (and much safer) interaction means with other people, with services and with machines.

Key actors
Several actors could be related to such a wild card, including: ICT researchers and developers, investors in IoT/AmI applications, SME’s and other firms involved in IoT/AmI technologies and services, ICT regulators and relevant standardisation bodies, and consumer organisations. Other kind of relevant “actors” would be computer hackers and cybercriminals.

Weak signals
Many IoT projects are underway, and real widespread applications are likely to materialise in the next 5 years. On the other hand, many “successful” cyber attacks in the recent past prove the seriousness of potential vulnerabilities, and show that the public awareness of the risks is far from being sufficient. Advanced privacy enhancing technologies (PETs) are in their embryonic stage, and their success is unclear.

According to forecasts, by the year 2020 the Internet may connect 500 million machines, 3 billion people, and 1 trillion objects (“things”). Through multitudes of sensors and actuators, the virtual and the physical worlds will become connected, if the visions of “Ambient Intelligence” (AmI) and the “Internet of Things” (IoT) become reality.

The vision of massively interconnected systems of computers and sensors embedded everywhere, combined with intelligent collection and processing of private information, should naturally raise concerns. The EC FP6 project SWAMI (Safeguards in a World of Ambient Intelligence) focused on potential “dark scenarios” associated with AmI applications, and possible safeguards to prevent them. These scenarios deal with critical issues that need to be addressed for successful deployment of AmI. The vulnerabilities and risks include issues of privacy, security, trust, identity (and identity theft), loss of control, dependency, exclusion and digital divide, victimization, surveillance, spamming and malicious attacks. For example, with regard to RFID tags embedded in products, one of the dark scenarios describes how criminals might use RFID readers to select potential victims by obtaining information about purchased expensive items.

The report TAUCIS, written of behalf of the Federal Ministry of Education and Research (Germany), states that the risks of Ubiquitous Computing (which is essentially the same idea as AmI/IoT) are first of all related to information privacy. Severe privacy issues can arise in response to information coming from a very wide range of sources.

According to the recent EC INSFO/EPoSS report it is expected that “the Internet of Things will become a reality over the next 20 years”. However, the report points out that a central issue of the Internet of Things is related to trust, privacy and security, and the increasing fears of dark scenarios. “The real advantages of the IoT have to be shown convincingly, all citizens’ concerns must be addressed and taken into account when developing innovative solutions and proposals”.

Potential impacts
Total distrust and rejection by users will lead to total collapse of IoT/AmI systems. Other concepts of the “future internet” will be critically endangered too. People may prefer old-fashioned (and much safer) interaction means.

Business models of networked-based activities (based on the AmI/IoT concept) will prove totally inadequate. Firms that invested in IoT applications will lose their investments and collapse, with huge economic implications. Consumer markets will be critically affected as well, because of the failure of the whole new generation of interconnected “IoT-enabled” gadgets and devices.
Even new healthcare systems may fail, because of their
dependence on ubiquitous interconnected sensors and
actuators embedded in homes, clothes, etc.

Security and defence will be impacted as well,
because many security and military systems (e.g.
wireless sensor networks) have been devised based
on similar engineering approaches as the civilian IoT
applications. Also expected advances in agriculture,
transportation, communications and other areas will be
severely hindered because of their dependence on IoT
technologies.

Moreover, the abandonment of the IoT/Aml due to mass
public distrust would have far-reaching implications
for the integration of public opinion into technology
innovation from its very first stages so as to avoid a
repeat of this postulated huge loss of investments.
Innovators would have to ensure that their products
were acceptable to the public, and that safeguards were
in place to prevent the huge and sudden loss of faith in
them.

Potential actions

Policy actions

Early actions: Policy makers should regulate,
examine appropriateness and agree on common
rules and standards across EU with regard to
widespread IoT/Aml applications and services, with
special attention to privacy protection, security,
business liability, etc. Appropriate regulations and
standards for R&D and new products development
(NPD), taking into account the potential threats.

Business actions

Early actions: Development of effective safeguards
for IoT and appropriate privacy-enhancing
technologies.

Research actions

Early actions: Deeper understanding of social
acceptance and concerns with regards to new
technologies in general, and IoT/Aml in particular.
Special research attention should be directed to
the issue of trust: trust in governments (as one of the IoT-
based service providers, including e-Government),
trust in info service providers, and trust in technology
at large.

Better analysis of potential threats and risks posed
by specific IoT applications. Exploration and more
effective development of evolving concepts related to
the development of new technologies and products.

For example, concepts such as SLCA (Social Life
Cycle Analysis) and SAT (Sustainability Assessment
of Technologies), where the idea is to embed social
considerations (such as security, privacy, acceptance
etc) from the initial stages of design and development
and throughout the lifetime of products/systems.
Research and development of effective privacy-
enhancing technologies (PETs) tailored to IoT/Aml
systems.

Sources and References

ITU INTERNET REPORTS 2005:
The Internet of Things
Ambient Intelligence Forum 2009: www.confabb.com/
conferences/82321-ambient-intelligence-forum-2009
SWAMI Project: http://swami.jrc.es
D. Wright et al, “Safeguards in a World of Ambient
Intelligence”, Springer, 2008
Internet of Things in 2020: Roadmap for the Future,
(EC DG INFSO and EPoSS report, Sept 2008),
Y.Raban et al, “Future Secure Identification and
Authentication of Persons and Items”, ICTAF Report E/165,
January 2009
Science and Technology Foresight Survey: Delphi Analysis.
Science and Technology Foresight Center, National Institute
of Science and Technology Policy (NISTEP), Japan,
May 2005 (NISTEP report No. 97)
“Disruptive Civil Technologies, Six Technologies with
Potential Impacts on US Interests out to 2025”,
APPENDIX F: “The Internet of Things”, SRI Consulting
Business Intelligence. Conference Report, April 2008,
www.dni.gov/nic/confreports_disruptive_tech.html
EC FP6 project HYDRA: www.hydramiddleware.eu
Universal electronic systems breakdown

RECOMMENDED RESEARCH

THEMATIC AREA
ICT, environment, energy, social sciences and humanities, and security

RESEARCH TOPIC
Societal response to potential blackout of electronic systems.

Contemporary society relies on a communication network, which is based on one electronic standard system. Further standardisation such as TCP/IP and 3G which on one hand ease communication processes on the other hand leads to potential security vulnerability. Increasing reliance on computer systems/networks and increase of computer based crime furthermore increases the vulnerability of societal infrastructures, should a natural disaster or acts of terrorism disable communication and energy systems.

OBJECTIVE
Research could focus on examining the nature of societal reliance on standardised systems. Research could focus on developing backup systems that could be used in the event of a current system breakdown. Research could identify areas of vulnerability (e.g. security measures at major power plants, likelihood of terrorist attacks) Research could furthermore use foresight methodologies to examine how society could be prepared for alternative ways of living, should a system breakdown occur.

EXPECTED IMPACT
Research should aim to a) inform the development of an alternative energy and communication system; b) devise strategies for crisis response across Europe; c) inform relevant policy, legislation and regulation across EU; d) inform business enterprise and innovation in this field; e) revise existing policies promoting standardisation; f) explore alternative ways of achieving systems compatibility and interconnectedness.

IMPORTANCE FOR EUROPE
Threat to energy safety is an important grand challenge for Europe and grand scale disruption to the energy system could have unforeseen consequences for all levels of society. Finding ways of securing energy flow throughout Europe is vital and innovation in this field is important. Joint regulation is also necessary and EU needs to take initiative to formulate a response in the event of threats to food security. EU policy could then provide blueprint for any policy response from the governments of member states.

This wild card (also called “when lights go off”) relates to the vulnerability of “advanced” societies, especially those in which information and communication networks are based on a few electronic standards. This has been happening very recently with the emergence of standard protocols (i.e. TCP/IP, 3G, etc.) which on the one hand eases communication processes but on the other hand creates vulnerability. One unexpected event (e.g. a terrorist attack or a sun wave storm) could lead to a global electronic systems breakdown and the advanced technological societies would be hit hard by this as everything we do now is controlled in some way by technology.
That our societies have become networked, thanks to the advancement of electronic and computing devices, has been discussed and theorised since 1960s. The fact that our societies are more and more reliant on a few electronic standard systems and protocols is also known. Standardisation has indeed offered ease and convergence but at the same time poses risks. The question here is how to achieve systems compatibility without standardisation? A universal electronic systems breakdown, however, would not come out of the blue as markets force systems to use cheap, yet vulnerable, components which are most vulnerable to attacks or breakdowns. A systems blackout would disrupt most aspects of our life, as modern societies could be described as one giant interconnected e-system. Networked societies have allowed us to be connected with each other via technological advancement but they have also brought major risks. In the potential event of major electronic data loss (e.g. personal, financial or scientific, to name a few), there would be massive civil unrest. In a particular context such as in cold climate, the impact could be devastating and serious as this wild card will affect the life-support systems like gas, heating, water, and electricity.

Possible interpretations

There are many conditions making this wild card ferocious. But here we will explore three possible interpretations. Firstly, that we rely too much on single systems which are interconnected. The world has now become a giant network. Instead of having many independent (or interdependent) systems, we are relying on and building one massive system which we hope can hold everything. This is highly risky. Secondly, that we do not have alternative/back up source of energy. We may need to provide an independent (mobile) energy generator to anticipate the failure of the main generator either due to attack or natural disaster like sun wave storm. Lastly, that we do not really have a map of the areas of vulnerability. We do not really know what aspects of our societal life are really vulnerable and what can be handled with reasonable planning when things go wrong.
Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as scientists who monitor the sun’s activities; researchers who are developing universal electronic protocol standards.

- **Shapers** (i.e. enablers/inhibitors): governments, regulators, global actors (e.g. TNCs) and energy companies.

- **Stakeholders** positively or negatively impacted: society in general as the wild card will actually impact on all of those whose life depends more and more on the sophistication of technology; energy companies who not only will suffer from losing control to the energy supply but will also face pressures from consumers and regulators; police and the army who has to anticipate riots and violent actions as the wild card directly crashes the existing social order.

Potential impacts

This wildcard will bring about total chaos, as all aspects of our societal life are dependent on the one standardised, electronic network. As result there will be chaos, as nothing works. This chaos will inevitably lead to major civil unrest/crime. With the electronic systems which manage supply-chain of consumer goods, supply for foods is affected – it is running empty very quickly, worsening the impact.

Potential actions

The actions to address this wild card can probably be directed to these two orientations: firstly, to build backup systems to anticipate if the main system is down; and secondly, to build a more resilient society. To achieve this, a number of early actions (pre-wild card) and early reactions (when the wild card occurs) are devised below.

Business actions

**Early actions**: Business has to be made aware of this wild card and business should be open and supportive to incentives for alternative systems, instead of blindly campaigning for standardisations.

**Early reactions**: To anticipate the chaos by collaborating with government and non-government groups to ensure that basic needs are provided for. Then, business needs to change its business model, to aim for alternative systems.

Research actions

**Early actions**: Research needs to aim for testing the resilience of back-up systems; to identify most critical vulnerability; to build knowledge bank of low-tech alternatives; to research decentralised systems and incentives; and to study social attitudes to risk and technology dependency – how to overcome resilience and bottom-up organisation for recovery.

**Early reactions**: To research the resettling of society in the aftermath of massive chaos.

Weak signals

What can indicate that the wildcard is happening? Some signals are identified here. Among others, they are: increasing frequency of interference effect; greater reliance on standard systems; no backup systems – or even if there are, these also depend on the same network. Other indicators are if more communities engage in electrical criminal activity while at the same time we experience a greater reliance on harmonised systems and that machines become more “intelligent” than humans and we, humans, lose control. This can be easily spotted as we come to rely more on computers in everyday life. Another signal, which links to the natural cause to this wild card is that historical data shows that a sun wave storm happened sometime in the past (17th century?) and that certainly will happen again, only we do not know when.
Invisibility spray available in “Boots”

RECOMMENDED RESEARCH

THEMATIC AREA
Nanotechnology, ICT, transport, security and social sciences and humanities.

RESEARCH TOPIC
Rapid Developments in Stealth Technology.

Stealth technology, which is currently limited to the military sector, is advancing fast. New players and rapid developments in nanotechnology indicate that developmental leaps may be on the horizon. This may lead to stealth technologies becoming more readily available for other sectors and even for public consumption. Potential applications of this technology are numerous and military interest is growing. This would have extensive impact on security measures, traffic control, crime prevention and military operations.

OBJECTIVE
Research should focus on understanding the ways in which stealth technology could impact on wider society, and propose ways of responding to new threats that could potentially arise from stealth technology becoming more readily available. Research could also focus on public perception of stealth technology and examine stakeholder attitude in order to better predict social acceptance of stealth technologies. Research could focus on how systems of traffic control and security would need to adapt should stealth technology become readily available.

EXPECTED IMPACT
The research will a) inform counter strategies within the sectors of security, traffic and crime control, devise strategies for appropriate policy responses across EU; b) inform common legislation and regulation across EU; c) inform business enterprise and innovation in this field;

IMPORTANCE FOR EUROPE
Advances in stealth technology could potentially have serious implications for Europe and it is vital that research underpins any policy response from the EU. Common regulation is also necessary and EU needs to take initiative to formulate a response should stealth technology enter the public domain. EU policy could then provide blueprint for any policy response from the member states.

This wild card relates to a situation whereby an invisibility spray is developed and the technology refined until it becomes available in most retail outlets and is affordable to 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.

FP7 Themes

ERA Goals
**Surprises ('wild' scenario features)**

This wild card was inspired by ongoing research projects and ideas in FP7 regarding breakthroughs in the development of metamaterials and engineered 3-D materials that can reverse the natural direction of visible and near-infrared light rendering target objects ‘invisible’. It is clear that the ‘wild’ nature of this event is the further development of the technology to allow it to be used on human beings and be readily available. Although this may seem like a harmless technology, there are radical implications, for instance, there would be a need for an ‘invisibility detector’ and security systems would have to be radically changed (to counter potential applications in espionage). This could open up a new market and provide a large boost to any private invisibility detection services. The potential to transfer this technology to other applications is huge. War would be revolutionised by the capability to attack using invisible soldiers. Criminal activity could rise since people and vehicles would be invisible to witnesses and cctv systems. In addition there would be a need for a new kind of traffic management system. In parallel with related potential applications can be envisaged a need for radical innovations in social networks, both physical and virtual, and a need for new communication techniques. What would this mean for the fashion industry? Could this lead to the collapse of the fashion economy or in contrast to a new era of clothing excitement and ambiguity? Would applications of the spray make clothes themselves invisible? Further questions regarding the long term safety of users are unanswered, and new legislation required.

---

**Possible interpretations**

There are numerous conditions that make this Wild Card important – ranging from technological applications to implications on society. For instance, the social quest for the ‘body beautiful’ would be removed, and greater confidence established for people traditionally seen as ‘different’, with more emphasis based on senses other than sight. Heightened awareness of smell and sound becomes apparent, and people could possibly become addicted to the phenomenon of being invisible causing a shift in attitude towards fellow humans. Clearly one of the interpretations and applications for this would be for use in warfare. Whoever (or whichever country) developed this technology first would have a distinct advantage, and terrorist and criminal activity would rise until people were so afraid to leave their own home for fear of being attacked/mugged. Certainly, there would be a need for legislation and regulation regarding the use of such technology.
Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as anti-stealth technology and systems developers as well as public/private defence and security R&D organisations
- **Shapers** (i.e. enablers/inhibitors): military and security organisations are obvious enablers as the potential for an invisible nanosoldier becomes a reality. Similarly, criminal and terrorist groups would be very keen to exploit the fact they could be invisible.
- **Stakeholders** positively or negatively impacted include the industry involved in manufacturing the spray. This Wild Card, should it occur, would also require legislation and policy requirements to ensure human rights are not affected.

Potential impacts

This Wild Card has the potential to bring about a number of significant impacts. It is uncertain as to whether these would be positive or negative, and there a number of things that are impossible to predict. However, there would be huge implications for controlling traffic systems and thousands of cameras/CCTV security systems would be rendered obsolete in a very short period of time, as there is a new need to detect ‘invisibles’. There is the potential for new types of crime to emerge and the effects on society have the potential to be significant. New means of communication would be required whilst being invisible and there could be a fundamental damage to social networks.

Potential actions

There is already initial research underway regarding the development new kind of materials by bottom-up approach. Novel ideas are further being developed in attempts to make things invisible. For that reason, a number of early actions (pre-wild card) and early reactions (if the wild card occurs) should be considered:

**Policy actions**

**Early actions:** Legislation definitions, Regulations; Technology risks, risk analysis; Cooperation in funding between governments and military – otherwise maybe the weapons end only in the hands of armies; Claims to ban it for public use and military

**Early reactions:** Regulations, health and safety - long lasting effects

**Research actions**

**Early actions:** Possible social implications, Paradigm shift in public attitude; FP7 project Ensemble - self organised materials for/with extreme electromagnetic properties; Countermeasures; Adapting current research (technology); Glasses to see the invisibles; Surveys of stakeholders, public, R&D attitude; Stakeholders and analysis; (post it crosses boundaries between before and after); Technology mapping, Risk analysis (post it crosses boundaries between before and after).

**Business actions**

**Early actions:** Cooperation, technology and applications transfer; Money for self assembly research

**Early reactions:** Control on business in this area – otherwise high risks

Weak signals

There is already research ongoing on meta-materials and composite materials with extraordinary properties enabling them to bend light around objects. There is certainly the potential to advance this technology and as such there are a number of signals or observables warning us about the probability of occurrence of such a wild card. Interestingly, invisibility is a phenomenon that has been talked about for many years through various media. In the 19th Century H.G. Wells wrote about the invisible man, and popular rock band Queen had a hit with the invisible man in the 1980’s. More recently, the global success of the Harry Potter franchise has brought the vision of an invisibility cloak to a worldwide audience. Further signals include: (1) First experimental evidence in microwave have already been demonstrated based on transforming optics; (2) Panasonic announces spray-on wallpaper electronically controlled which changes physical appearance of walls; (3) Stealth technology is at the pre-invisibility stage; and (4) Military authorities are increasingly interested in this technology.

There are also a number of growing trends that could be an indication of the future possibility of this wild card including: Research on new security systems; Military advancements in stealth; and breakthroughs in ‘invisibility cloak’ research.
Pervasive self-diagnosis and self-treatment

RECOMMENDED RESEARCH

THEMATIC AREA
Nanotechnology; Health; ICT, and Social Sciences and Humanities.

RESEARCH TOPIC
Self-diagnosis and self-treatment in Western Medicine.

Abundance of medical information on the Internet has given rise to the practices of self diagnosis and self treatment. Equipment whereby patients can monitor their blood pressure and heart rate is also readily available. The trend of an ageing population will also mean that public health systems will be met with increasing challenges. As waiting times get longer, patients may resort to diagnosing and treating themselves. Rapid developments in nanotechnology and ICT could indicate that sophisticated diagnosis and treatment systems could be developed in the near future.

OBJECTIVE
Research should focus on examining how access to new diagnostic/treatment technologies would affect society (e.g. ageing population, pressure on public health services) Research could focus on examining the feasibility of building up health databases which could accurately provide diagnosis on the basis of medical tests (e.g. blood, urine etc). Research could also focus on implications for business (e.g. business planning and market forecasting) and health systems. Research should also focus on potential legislative and regulatory issues and how to best form a policy response.

EXPECTED IMPACT
The research will a) increase awareness of current self diagnosis/self treatment practices; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and technical innovation in this field.

IMPORTANCE FOR EUROPE
Self diagnosis/self treatment in health needs to be regulated and legislation needs to aim for ensuring safe practice. It is vital that a policy response aimed at the control and regulation of this industry is informed by research into foreseeable impacts (e.g. healthier population). It is furthermore important that the EU forms a coherent legislative response that could guide member states in forming their legislation.

This wild card assumes that 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. Although this occurrence is considered ‘wild’, it is very interesting as there are a number of ongoing research projects based around this technology, which if exploited could trigger this wild card. This would have a huge impact on people’s lives, drastically changing the way that we diagnose and treat illness and disease.

FP7 Themes

ERA Goals

Author(s): Anthony WALKER (RTC North), Rafael POPPER, Joe RAVETZ and Thordis SVEINSDOTTIR (University of Manchester)
Contributors: Anna KONONIUK (Bialystok University of Technology), Denis LOVERIDGE (University of Manchester), Andrey MAGRUK (Bialystok University of Technology), Dorota PAWLAK (Polish Institute of Electronic Materials Technology), Sally RANDLES (University of Manchester), Ozcan SARITAS (University of Manchester), PHI SHAPIRA (Georgia Tech), Alexander SOKOLOV (Higher School of Economics).
Artist: Joe Ravetz
Surprises (‘wild’ scenario features)

Treating illness is clearly of huge importance globally, and this wild card would not only dramatically alter the way in which ailments are treated, but also change the way in which we monitor and diagnose illness. Imagine the scenario whereby everybody has a small microchip which gives a morning report on the state of heath of an individual, for example, specific actions are proposed over breakfast such as ‘take the pill’. It is feasible that high throughput scanners could be achieved by 2030 thus providing cheap personal genome at €10 overnight and giving automatic interpretations/diagnosis. The potential is high for the knock-on effect of early diagnosis and treatment available to all increasing the ageing population – significant increases of having ‘too many healthy people’ would be highly likely. Further societal effects would include the expansion of health communities as the centralised medicine system is redundant and dissolves.

Possible interpretations

It is considered that there is certainly a need for technical progress in this field, and one way of interpreting this wild card is to consider it as an aid to enhancing the quality of life (which is clearly high on the global agenda). Equally, this technology would be available cheaply and as such has the potential to be accessible by the global population. However, as much as this could be considered as a great benefit, it is apparent that with these developments, there would be a rise in the ageing population.

There would also be ‘opportunities’ in other sectors as there would be a need for proper databases to be developed to ensure the accuracy of such technology.

Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”**: such as public and private organisations involved with patient safety and medical malpractice, health incurrence and legal services providers as well as health and safety agencies.
- **Shapers** (i.e. enablers/inhibitors): regulators and the global society, especially the ageing population who are more reliant on diagnose and monitoring of treatments.
- **Stakeholders** positively or negatively impacted include several actors of the health care system. Clearly, the effects of such a wild card would be of significance and concern to doctors, pharmaceutical employees and other health care workers who could be rendered redundant (or at least the reliance on them for diagnosis would be drastically reduced). In parallel to this, health care systems would be altered, for instance, far less people would require hospital attention, and perhaps there will be fewer people inclined to become involved in health care (and if the technology ‘collapsed’, there could be a global lack of qualified pharmaceutical and health workers).

(Alternatively medical work could be dramatically transformed and economically vibrant)
**Potential impacts**

This wild card could bring about a number of different impacts, and it is uncertain as to whether this would be primarily beneficial or unwanted. With the development of this advanced technology and the realisation that it is available to the global population, what would happen if this was rejected by society? For instance, what if people still preferred the personal relationship and comfort that can be afforded by visiting the doctor? With the technology rejected, will there still be enough qualified health care specialists? This would have a dramatic global impact. Similarly, if the ‘doc-in-a-box’ patents were controlled by Russian-Chinese conglomerates, there could be a US boycott of the world intellectual property system. A further impact could be that big Pharmaceutical organisations can no longer be sustainable and they disappear. Of course, there is the possibility of people living longer and having a greater quality of life, but again this will lead to a rise in the ageing population. Careful considerations would need to be maintained with regard to disposing of the units – millions of doc-in-a-box may end up in landfill. There is the impact on social well being to consider as social isolation could lead to large bouts of depression. Regarding actual technological impacts, complicated diagnostic systems could become unpredictable for outlying cases and may lead to the death of some prescription users; this means that regulation is needed.

**Potential actions**

There are a number of actions that should be considered with regard to this wild card, for example, there may be a need for Nano Education from primary school or the Development of databases for self diagnosis and problems to diagnose leading to something like www.doctorgoogle.com. For As such, a number of early actions (pre-wild card) and early reactions (if the wild card occurs) should be considered:

**Policy actions**

**Early actions:** Stakeholder and public debate; New infrastructure; Educational system; New legislation – specific legislation; International dimension (negotiation).

**Early reactions:** Monitoring systems and regulations at policy level.

**Business actions**

**Early actions:** Public- private partnerships; Business planning – forecasting of market entry; Technological improvements; Development of databases of medical conditions on blood, urine and other tests; Development of programs for analysis of the tests available online www.doctorgoogle.com; Disruptive technology for pharmaceutical; Positioning new business for new product.

**Research actions**

**Early actions:** Development of algorithmic descriptions of diseases; Developing self-diagnosis technology roadmaps; Identification key technologies; Research on standardised analysis of medical data (blood results, urine results) by deduction from many possibilities to the one which someone is ill; Public perception – acceptance of technology.

**Early reactions:** State-of-art analysis, technology analysis (this post-it was placed on the before/after border); Risk analysis (this post-it was placed on the before/after border).

**Weak signals**

As discussed, this wild card is very relevant and interesting due to their being a number of research projects ongoing with the potential to influence, impact and advance current technology. As such there are several signals or observables that either individually or in combination with others may be warning us about the probability of occurrence of such a wild card. Such signals include: (1) Existing self diagnosis via the internet – everybody can already to some extent diagnose themselves due to the overwhelming amount of information available in the internet; (2) Numerous patents are being taken out (or applied for) on multiple aspects of core technology – Some patents have been contested with likely long delays on commercialisation; (3) Herbs (enhanced by nano) are being used with the potential to fight cancer; (4) Much research is ongoing into ‘intelligent’ materials to release antibiotics into wounds; (5) Nanotubes are being used to ‘heal’ cancer directly in the cell without damaging other cells or tissues; (6) Everybody wants to be happy and live longer - Social disturbances on the rise, changes in family structures (people grow/get mature later); (7) Funding programmes that are directed towards health; and (8) Targeted nano-antibacterial agents developed to kill bacteria.

There are also a number of growing trends that could be an indication leading up to this wild card including: the generation gap increasing with the potential for having 5-10 generations all living at the same time; the increase in the ageing population; and the changing and evolving definition of what it is to be ill.
Reduction in human diversity?

**RECOMMENDED RESEARCH**

**THEMATIC AREA**  
Nanotechnology, Health, Security, Social Sciences and Humanities.

**RELEVANCE OF THE ERA STRATEGIES**  
This Weak Signal is relevant to a number of the six ERA strategies:
- Facilitating and promoting knowledge sharing and transfer:
- Fostering and facilitating coherent international cooperation in science and technology:

It is important to raise the awareness of scientific research and progress in this field to discourage misinformation being disseminated to the public. This might also help to share and diffuse specific knowledge concerning the risks involved (and/or opportunities that may emerge as a result of scientific breakthroughs).

As with much current research and development, it is highly important to ensure that new and emerging opportunities are encouraged and that potential risks are eliminated.

**RELEVANCE OF A RESEARCH-FRIENDLY ECOSYSTEM**  
This Weak Signal may be relevant to ‘Creating a closer link between researchers and policy makers’ as it is important to ensure that scientific progress is not held up by policy. Equally, it is important to make sure that scientific progress does not ‘overtake’ policy and advance without due care.

**RELEVANCE TO FUTURE RTD & STI POLICIES**  
Potential implications and risks associated with the Weak Signal represent highly important issues of future R&D priorities and this could dramatically impact on STI policies. It is important that future R&D is focused on maximising the benefits of this technology and encouraging new trends to emerge that will be advantageous to global healthcare and well being. In conjunction with this, it is crucial that any potential risks are eradicated. Equally of importance is that society is aware of the potential applications of this technology to avoid misinformed and misguided opinions being formed. This could lead to new regulations being established to ensure this doesn’t occur. This Weak Signal should have its main impact in the policies relating to Health, Security and Society.

**IMPORTANCE FOR EUROPE**  
This Weak Signal is likely to be of interest to a number of sectors particularly health, security and science and society. The possible issues indicated are important globally, as the benefits and risks have the potential to have dramatic impact – the future developments may bring significant benefits to healthcare, but also has the possibility of having longer term problems associated with it. It is interesting that a technology being developed to primarily prevent and cure disease could have the potential to have the opposite effect and actually has the potential to lead to the increased susceptibility of disease pandemics.

Therefore, it is important for Europe to ensure that the research and development of this subject follows the ‘right’ path through development of guidelines and regulations that misinformation is not presented to the public. This in itself is a challenge!

---

If genetic screening became widespread and allowed uncontrolled use in the selection of genes for specific traits then what would be the result? This weak signal was inspired from a current European funded FP7 collaborative research project – NANODNASEQUENCING: Nano-tools for ultra fast DNA sequencing. The objective of this project is to ‘develop a cheap and high speed DNA sequencing technology.’ Although it would seem that genetic testing and screening has huge potential for medical applications, such as genetic diagnosis of vulnerabilities to inherent disease, the technology applications will largely govern whether this technology ultimately is positive or negative. For example this weak signal could be indicating a possible new or emerging trend, such as reducing human diversity which could result in increasing susceptibility to disease pandemics, which would be important for the world and could have significant impacts between now and 2025.

---

Author(s): Anthony WALKER (RTC North)
Typology
It is difficult for the general public to monitor weak signals which emerge from ongoing research projects due to scientific filters (limiting the access to knowledge and technology). This particular weak signal could lead to undesired impacts if the technology developed is utilised in a negative or aggressive manner. However, it does have the potential to lead to more positive technological breakthroughs and as such it is perceived as mixed.

Importance and potential implications
This weak signal is important globally because it could lead to a reduction in human diversity which would affect the whole world. It is also important for Europe and on a national scale (particularly national governments) as this may increase the susceptibility to disease and as such significantly impacting on the healthcare industry. Equally, technological applications may lead to the advent of cures for existing diseases, hence this technology and weak signal is extremely important economically (to appropriate businesses) and to society globally.

Current situation
Genetic testing allows the genetic diagnosis of vulnerabilities to inherit diseases, and can also be used to determine a child’s paternity (genetic father) or a person’s ancestry. Normally, every person carries two copies of every gene, one inherited from their mother, one inherited from their father. In addition to studying chromosomes to the level of individual genes, genetic testing in a broader sense includes biochemical tests for the possible presence of genetic diseases, or mutant forms of genes associated with increased risk of developing genetic disorders.

In recent times, knowledge of DNA sequences has become key for:
• basic biological research,
• other research branches utilising DNA sequencing,
• numerous applied fields such as diagnostic, biotechnology or forensic biology.

The advent of DNA sequencing has significantly accelerated biological research and discovery. The rapid speed of sequencing attained with modern DNA sequencing technology has been instrumental in the sequencing of the human genome, particularly in the Human Genome Project. Related projects, often by scientific collaboration across continents, have generated the complete DNA sequences of many animal, plant, and microbial genomes.
Current testing for inherited disorders includes a broad spectrum of diseases and is rapidly expanding into complex yet common diseases that are now recognised as having a genetic component. Genetic tests are routinely performed to confirm a suspected diagnosis, to predict the possibility of future disease or illness, to detect the presence of a carrier state in individuals who may be unaffected but whose children may be at risk, and to predict improved therapeutic responses. As we begin to experience the benefits of a completed Human Genome with the identification of more and more genes, genetic testing is becoming an increasingly common medical practice.

While genetic testing can provide a definitive diagnosis for many inherited diseases, the complexities of applying these same principles to multifactorial diseases is a new frontier for the clinical laboratory. Given the rapid advances in new technologies, as well as a better understanding of genotype-phenotype correlations, it is inevitable that such testing will become a routine part of healthcare for all.

The issue of genetic screening and advanced DNA sequencing will be globally important as the technology develops with a keen eye cast of future applications.

Drivers

This Weak Signal is present by the following drivers:

- **Scientific drivers:** The latest technological progress in genetic screening can lead to identifying rogue genes, which would allow medical treatments to be developed to decrease the risk of genetic disorders. Pharmaceutical research on this subject could lead to significant breakthroughs of developing high speed DNA sequencing technology which could be used for rapid diagnosis of specific genes. Although, this would originally be developed for treatments for patients, there is a risk that this may lead to longer term problems for natural evolution if the population becomes less diverse.

- **Economic drivers:** New technologies and services that emerge from research and development can present new opportunities for many types of organisations. Potential applications via transfer of technologies can lead to developing further benefits such as in the agricultural industry (for example developing crops resistant to droughts). Looking to the future, what would happen, to policies and premiums and the risks to which they relate if insurance companies were able to rapidly genetically test a person for a rogue or mutant gene?

- **Political drivers:** National governments are keen to have greater information on the general public (for example, in UK – discussions on ID card scheme carrying personal data including genetic profile).

- **Social drivers:** Genetic screening and DNA sequencing is the subject of much debate in social circles. Whilst curing diseases is paramount to this technology, there is scope for certain societal circles to utilise the technology in the selection of ‘elite partners’ with no genetic mutations potentially leading to a dramatic split in society. Further drivers could lead to in-vitro selection of the sex of unborn children and infertility treatments of which the future consequences are unknown.

Filters

There are a number of filters that may prevent us from adequately monitoring this weak signal:

- **Scientific filters:** Much information relating to this technology is not yet publicly accessible, so the general public are not fully aware of the possible uses. Be that as it may, there is much interest in this technology, and as such, there is much uninformed debate as to whether the advent of high speed genetic testing will lead to positive or negative applications. Scientific filters also interconnect with other filters (such as social and institutional), as media coverage of this technology and potential applications can dramatically influence public opinion.

- **Institutional filters:** Similarly with scientific and technological filters, media attention for genetic screening and possible negative (or positive) side effects can influence perception of the technology.

- **Affective filters:** Will the scientific progress be hindered by policy?

Potential issues

Genetic screening is one of the fastest moving fields in medical science - and arguably one of the most contentious.

Based on previous research and the Human Genome Project, there are a lot of ethical, legal and social issues surrounding the availability of genetic information. Particular concerns arising from genetics research generally include:

- **Fairness in the use of genetic information by insurers, employers, courts, schools, adoption agencies and the military.**

- **Privacy and confidentiality of genetic information.**

- **Psychological impact and stigmatisation due to genetic differences.**

- **Reproductive issues including adequate informed consent for complex and potentially controversial procedures, use of genetic information in reproductive decision making, and reproductive rights.**
Clinical issues including the education of doctors and other health service providers, patients, and the general public in genetic capabilities, scientific limitations, and social risks; and implementation of standards and quality-control measures in testing procedures.

Uncertainties associated with gene tests for susceptibilities and complex conditions linked to multiple genes and gene-environment interactions.

Conceptual and philosophical implications regarding human responsibility, free-will versus genetic determinism, and concepts of health and disease.

Health and environmental issues concerning genetically modified foods (GM) and microbes.

Commercialisation of products including property rights (patents, copyrights, and trade secrets) and accessibility of data and materials.

Of course, key to the scientific progress of this technology is how it will be perceived by society. If the majority of the public are ‘against’ genetic screening it will create potentially strong barriers hindering progression.

Potential risks
Considering testing genes...the physical risks attached to this are minimal as it usually just incurs taking a blood sample. However, there are a number of other risks associated with this such as psychological effects and privacy issues.

Regarding the potential risks of this weak signal in the future, there are a number of potential problems that this may lead to:

- **Immediate (before 2015):** Society may reject genetic screening technologies due to the emotional, psychological and financial issues associated with the ‘results’.
- **Short term (2015-2025):** Genetic discretion could cause splits in society - Genetic discrimination occurs when people are treated differently by their employer or insurance company because they have a gene mutation that causes or increases the risk of an inherited disorder. People who undergo genetic testing may be at risk for genetic discrimination. Fear of discrimination is a common concern among people considering genetic testing. Several laws help protect people against genetic discrimination; however, genetic testing is a fast-growing field and these laws don’t cover every situation.
- **Medium term (2025-2050):** A reduction in human diversity could occur due to genetic screening. This could inhibit natural evolution and the world may become more susceptible to disease pandemics.
- **Long term (post 2050):** Society could be driven by liberal eugenics – a genetic database using biometrics to identify and classify individuals where leading to widespread discrimination and breakdown of society.

Potential opportunities
Genetic testing has potential benefits whether the results are positive or negative for a gene mutation.

- **Immediate (before 2015):** People are able to make informed decisions regarding healthcare directing prevention, monitoring and treatment. Routine testing for healthcare could become commonplace and impact significantly on healthcare.
- **Short term (2015-2025):** Pharmacogenetics examining the relationship between genetic variation and an individual’s response to medicine could drive the future expansion of genetic testing services. Although it remains uncertain how the interests of all relevant stakeholders can be met, this approach has the possibility of marking a departure from the ‘one size fits all’ approach to prescribing and moving towards a pre-prescription genetic test guide for drug selection and dosage levels.
- **Medium term (2025-2050):** Diseases (such as cancer) may be able to be characterised at genetic level offering significant benefits for diagnosis and management.
- **Long term (2050):** Emerging applications could eradicate all disease following advances in genetic screening techniques. Although and opportunity, this could also lead to negative consequences (susceptibility to ‘new’ diseases).
Potential stakeholder actions

• Immediate actions (before 2015): Europe is challenged with informing society of the short, medium and long term affects of ongoing research in genetic screening. As such, further support for research and development in this area could enhance public awareness and general ‘acceptance’ of this technology.

• Short term actions (2015-2025): The release of Europe (or global) wide legal regulation relating to the ‘moral code’ of genetic screening and DNA sequencing.

Relevance to research areas

This Weak Signal, and the potential issues surrounding it, has relevance to a number of high level European thematic research areas. FP7 research areas that are relevant include:

• Health: This is arguably the most relevant area and genetic testing is of high importance for research on health and medicine. It indicates the fast moving advances in the technology and it is crucial to shape future beneficial applications and inhibit potential abuse. Research on the social effects of genetic testing needs to be strengthened and public awareness of the benefits needs to be enhanced. It is also worth considering that if this technology becomes widespread it may lead to a reduction in human diversity which could have disastrous consequences (such as increased susceptibility to new disease).

• Security: With the possibility of a reduction in human diversity and the increased chance of disease pandemics, this Weak Signal could have relevance to the security sector if it used in acts of terrorism (e.g. purposely spreading biologic disease). Also, potential applications of artificially creating genetic mutations could lead to the development of ‘enhanced human attributes’ which would raise security concerns globally.

• Regions of Knowledge: If genetic discrimination became widespread, then this could result in the collapse of certain societies across Europe.

There are also potential implications relevant to other FP7 themes as this technology has scope to cross cut and interconnect with other themes.

Relevance to Grand Challenges

The Weak Signal of greater application of genetic screening may be particularly relevant to a number of Grand Challenges:

• Diseases/health and well being (inc. Animal and human diseases): Healthcare and well being may be increased due to the prevention and eradication of disease due to monitoring at genetic level. This also has the potential to have a more ‘negative’ effect on well being if this causes and increased chance of new, evolving diseases causing widespread panic and possible pandemic situations.

• Ethics/abuse of future S&T developments (e.g. radical human enhancement, cloning etc.): The power of public perception of technology and scientific breakthroughs cannot be underestimated. Propaganda and misinformation regarding abuse of this technology (e.g. by terrorists or the military) can radically change public opinion on what could initially be a technology developed to prevent and cure disease.

References

NANODNASEQUENCING - http://www.nanodnasequencing.org
The Human Genome Project - http://www.genomics.energy.gov
RTC Northwest Ltd, UK - Interviews
Coverage and Reimbursement of Genetic Tests and Services, Secretary’s Advisory Committee on Genetics, Health and Society, 2006
http://aappolicy.aappublications.org/cgi/content/full/pediatrics;107/6/1451 Postnote 227, Parliamentary Office of Science and Technology, July 2004
Don’t put in the trash: tank your car and warm up your home

RECOMMENDED RESEARCH

THEMATIC AREA
Physical infrastructure, Economy, Policy and governance, Environment & ecosystems, Science, technology and innovation (STI).

RESEARCH TOPIC
New energy system: what does free energy mean? A benefit for citizens and a loss for industry?

OBJECTIVE
Understanding how markets are unable to measure very great benefits coming from the free satisfaction of human needs. A scientific breakthrough, which causes great losses for industries and capital markets. How to employ all resources in another way, in order to ensure returns to industries and workers cut off from markets?

EXPECTED IMPACT
Free, clean and safe energy spread all over the world. A great benefit, not measured by the produced wealth in terms of capital.

IMPORTANCE FOR EUROPE
The importance would be global.

Technological developments will allow different types of trash to be used to produce energy mainly by gasification in a range of larger or smaller plants. These developments will make it possible to use trash directly in car engines or community heat and power plants. The wild card is derived from analysis of innovation policies that have focused especially on new technologies and research around applications for using trash as a ‘new raw material’. The wild card also assumes that some technological breakthroughs have been reached so that energy production can happen at the local level, so that very often there is no need to provide energy, electricity and heat from external power plants. This wild card integrates the scenario that the power infrastructure grid as we know it could disappear.

FP7 Themes

ERA Goals

Author(s): Maurizio SAJEVA (Finland Futures Research Centre)
Contributors: Jari KAIVO-OJA and Yriö MYLLYLÄ (Finland Futures Research Centre)
Photo from the SSFI “Back to the Future”
Surprises (‘wild’ scenario features)
Biomass gasification already exists. The assumption in this wildcard is that the size of process plant and process times can be dramatically reduced and the efficiency can be increased.

Possible interpretations
A possible interpretation is the possibility to produce energy at local level anywhere and for whatever purpose, without having any impact on the environment, and only using organic waste or even other kinds of waste.

This wild card could generate radical changes. ‘Free’ energy would be a bonus around the world but probably with significant organisational innovation in energy systems infrastructures and associated economic losses.

This wild card would mean a benefit for all society but a negative impact on the markets, due to the collapse of energy systems. There would be less need for huge infrastructures and plants. A great benefit which is not measured by market mechanisms.

Key actors
Key actors would be mainly researchers and scientists, as well as all users. A new industry will emerge, namely, the producers of different kinds of power plants. Key actors are also old energy industries and the whole connected sector, which have to operate the reconversion of their own operative activities.

Weak signals
A weak signal could be identified in the growing research activity undertaken in the field of energy from biomass. In Finland, many studies are being carried out and the research is already applied in power plants, which have made some farms or regional life contexts energy-independent. This wild card would be the product of intensified research in this particular field, probably the result of some scientific breakthrough. Weak signals are also the continuous search for new hybrid car engines or using different kinds of gas: in any case alternatives to traditional gasoline.

Potential impacts
The potential impacts could refer to the collapse of entire infrastructural systems and their transformation into new power plants producers. A possible impact could be the intensive use of arable land, which would be taken over by agriculture. This kind of energy could then be associated with solar, wind and other kinds of energy, to avoid the use of arable land just for biomass production.
### Potential actions

#### Policy actions

**Early actions:** Strengthening the research in this field but relying on a mix of different energy types, in order not to become too dependent on just biomass. Converting energy infrastructures and offering operators and workers in the sector opportunities for conversion, additional education in the new fields.

**Early reactions:** Supporting the conversion of infrastructural systems and research related to the different kinds of energy sources.

#### Business actions

**Early actions:** Increasing the energy-related research in different directions, being ready to change systems and business operations in response to scientific breakthroughs.

**Early reactions:** Converting productions and business to meet the new technological achievements.

#### Research actions

**Early actions:** Increasing applied research in different fields. Investing in new technologies.

**Early reactions:** Continuing investing in long-term research activities.
Outburst of the black economy

RECOMMENDED RESEARCH

THEMATIC AREA
Environment, social sciences and humanities, energy, ICT and security.

RESEARCH TOPIC
Future measures aimed to curb CO₂ emissions (e.g., CO₂ taxation and CO₂ credit scheme). International response to the grand challenge of climate change has aimed to find ways of curbing CO₂ emissions by way of taxation and credit schemes. Knowledge is however needed regarding the future impact and success of these initiatives. There are current concerns that criminal elements might see an opportunity in CO₂ credit exchange and that businesses and governments might seek to evade CO₂ taxation.

OBJECTIVE
The research should focus, by using methods of foresight, on whether CO₂ credit trading and CO₂ taxation could potentially lead to the development of criminal activity such as the formation of a CO₂ ‘black economy’ or CO₂ tax evasion havens. Research could examine current trends in CO₂ curbing measures and consider whether alternative energy technology could be more successful in minimizing CO₂ emissions. Research could also look towards whether an incentive scheme for businesses and individuals could prove a better solution than CO₂ credit schemes and taxation.

EXPECTED IMPACT
The research shall a) aim to predict the future of CO₂ curbing measures; b) suggest whether alternative solutions (e.g. incentive) could be more successful; c) predict the likelihood of a formation of ‘carbon black economy’ or CO₂ tax evasion; d) suggest policy, regulative and legislative responses.

IMPORTANCE FOR EUROPE
Knowledge of future impact of measures that aim to curb CO₂ emissions is vital for the successful continuation of environmental policy in Europe. It is vital that research underpins any policy response from the EU. Unified regulation is also necessary and EU needs to take initiative to formulate a response should CO₂ curbing measures such as CO₂ credit scheme or CO₂ taxing become a platform for criminal activity. EU policy could then provide blueprint for any policy response from the member states.

National economies start relying on ‘black’ (i.e. unofficial) economies of ICT (cyber crime), finance and carbon credit trading. Dependence on the aforementioned systems has left us vulnerable to the development of a black cyber-economy including identity theft, software piracy, hacking/scams and counterfeiting. In particular carbon-tax evasion may grow insignificance. A major stimulus towards the establishment of a black market system is the world’s increasing demand for energy and decreasing supply; there could be a crisis in energy markets.

FP7 Themes

ERA Goals

Author(s): Thordis SVEINSDOTTIR, Joe RAVETZ and Rafael POPPER (University of Manchester), Rob ASHWORTH (Regional Technology Centre North)
Contributors: David ALEXANDER (University of Florence), Joe BALLANTYNE (The Futures Company), Alastair BROWN (UK Climate Impacts Programme), Steve CONNOR (Creative Concern), Tony DUGGLE (SAM Consulting), Pierre ROSEIL (Swiss Federal Institute of Technology at Lausanne), Anna SACIO (Institute for Sustainable Technologies)
Artist: Joe Ravetz
BLUe SKy POLicy aLeRt 13 - OUTburst oF tHe bLAcK eConomy

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Gradual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★★ by 2030 ★★★★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Uncertain</td>
</tr>
<tr>
<td>Inspired by</td>
<td>Brainstorming session and group discussions in the iKNOW Workshop in Manchester (February 2010)</td>
</tr>
<tr>
<td>Key words</td>
<td>Black economy, identity theft, corruption, carbon credit trading, piracy, CO₂</td>
</tr>
</tbody>
</table>

Low ★ Medium ★★ High ★★★ Very high ★★★★

**Surprises (‘wild’ scenario features)**
What would be wild about this card would be the rapid decline of the above mentioned national and legalised systems. Also, this would mean that criminal activity goes global and solidifies into working systems as substantial as the current legalised systems. The global CO₂ market collapses and governments, businesses and individuals start trading CO₂ credits on the black market rather than using the official legalised system. This wild card would also indicate a sudden decline in legality and belief in the legalised systems of the nation states.

The rise in black market economy would benefit countries with weak legalised infrastructures and high levels of organised crime. These countries would consequently become bigger players in international politics. The eruption of a black carbon economy would destroy the next round of global climate talks which would result in the breakdown of communications on CO₂ policy. Climate and environment protection would become controlled by organised crime syndicates and these would start protecting the rainforests.

**Possible interpretations**
A possible interpretation of this wild card would be that black economy systems are more profitable and effective than traditional systems. Another way of interpreting this wild card would be that nation states are failing to effectively serve peoples’ needs. An extremely positive or generous interpretation would be that there is a power shift in society away from centralised government towards community based and other forms of governance; to some extent this kind of shift (reducing the role of government in society) is already being encouraged in some countries.

**Key actors**
Key actors related to this wild card, include:
- **Scanners or “early warners”** such as police units that work on organised crime and cross-national police agencies such as Interpol and Europol.
- **Shapers** (i.e. enablers/inhibitors): organised crime syndicates, corrupt businesses, and environmental agencies and regulators.
- **Stakeholders** positively or negatively impacted include governments, trade groups and international financial markets.

**Potential impacts**
One impact might be that provision for social welfare and preparedness for disaster are minimised or neglected since there might be no taxes collected to pay for them. However, organised crime does generate income so it is a question of priorities and justification within the new economy. Short term activity and income with long term vulnerability are likely. Public governments go bust and black market syndicates take over systems of trade and business. Shift of power as tax havens and criminal organisations become more prominent as bases of power. Official climate change talks and initiatives would be halted and could result in break down of current CO₂ legislation.
### Potential actions

#### Policy actions

**Early actions:** Incentives to help legal businesses and technology; Further steps to be taken in order to tackle organised crime; More flexibility for the police and legislative institutions in order to effectively fight criminal conduct; Climate policy needs to be designed to prevent criminal powers taking control of carbon trading.

**Early reactions:** Governments need to respond quickly to this wild card and come together on an international level to ensure their power; Policy that aims to tackle crime needs to be strengthened.

#### Business actions

**Early actions:** Focus on Innovation and alternative business models, technology and environmental solutions in order to strengthen legal ways of doing business.

**Early reactions:** Continued focus on innovation and alternative business models, technology and environmental solutions in order to strengthen legal ways of doing business.

#### Research actions

**Early actions:** Case studies of criminal activity and corruption; Research on black economy; Research into Alternative energy (e.g. renewable) to avoid energy crisis; Develop a new branch of institutional / behavioural economics / freakonomics.

**Early reactions:** Focus on how to bring things back to legality; case studies of criminal activity and corruption; research on black economy; research into alternative energy (e.g. renewables) to avoid energy crisis; research into alternatives forms of economy (including alternative currency models).

### Weak signals

Weak signals to indicate this wild card might occur would include suspicion and evidence of systemic corruption within governments and the financial sector. Increase in organised crime such as cyber crime, drugs, weapons trade along with human trafficking. Also there have been instances where governments and nation states have become almost bankrupt due to lack of financial regulation and legislation (examples: Iceland and Greece) leading to civil unrest, political crises and lack of confidence in government, politicians and the global financial system.

A weak signal could be considered the immense size of economies built on illegal activities such as the drugs trade, human trafficking, illegal migration and terrorism. It is estimated that the black and grey economy in the UK can be worth anything from £53bn to £137bn a year according to Professor Talbot at the University of Nottingham, who gave his estimation in 2004. Governments seem to be ill equipped to tackle this economic activity and lack coordination and foresight in this area.

A weak signal for the rise of cyber crime is the increasing number of identity thefts in the wake of massive data collection by governments. Such data is stored on networked computers and has frequently been transferred between institutions on discs, which can be easily lost or stolen. There are numerous examples of this happening in the UK. People also willingly post their personal data online where it is easily accessible to criminals. Increase in piracy, online scamming and sophistication of computer viruses and Trojans could also be considered a weak signal for this wild card.
Floods in Europe cause mass migration

RECOMMENDED RESEARCH

THEMATIC AREA
Environment, social sciences and humanities, health and security.

RESEARCH TOPIC
Managing multi-agency communication and response in case of disasters.

Climate change and changes in weather patterns have brought on increase in flooding across Europe. Increase in frequency of flooding as well as flooding in unprecedented locations has proved to be a great challenge for the organisation of response. Uninterrupted and clear communication between early warning systems and response bodies has proved to be an obstacle to successful management of preparatory methods and the aftermath of severe flooding.

OBJECTIVE
The research could focus on communication technology with the aim of improving multi-agency communication during instances of flooding by using new developments in ICT. Research should focus on how best to improve early warning systems and their communication with regulatory and response institutions (e.g. government, rescue, police, fire services and ambulance teams) as well as the general public. Research could also focus on ways of managing the aftermath of severe flooding and take into account organisational confusion, controlling of civil unrest and mass migration to higher lying areas.

EXPECTED IMPACT
The research should lead to a) design of a communication that is capable to handle multiagency communication; b) utilise new ICT technologies to ensure uninterrupted communication c) assist in development of a flooding response system; d) pilot bottom-up approaches (i.e. exploring possible ways of engaging civil society) in disaster management.

IMPORTANCE FOR EUROPE
Flooding is fast becoming one of the grand environmental challenges in Europe. Fast response and uninterrupted communication between early warning systems and response bodies is vital so that loss of human life and damages to infrastructures can be minimized. It is important that EU forms a coherent disaster response that could guide member states in forming their practices. It is important that research underpins innovation and the development of new communication technologies so that it may be designed to the highest standard.

Expected impact includes:
- Design of a communication system capable of handling multi-agency communication.
- Utilisation of new ICT technologies to ensure uninterrupted communication.
- Assistance in the development of a flooding response system.
- Pilot testing of bottom-up approaches in disaster management.

Importance for Europe:
- Flooding is becoming a major environmental challenge.
- Proper response is crucial to minimize loss of life and damage to infrastructure.
- EU needs a coherent disaster response strategy.
- Research should support innovation and new communication technologies.

Serious protracted flooding of low-lying areas leads to mass migration to higher lying areas and forces a rethink in low country policies. This could be due to e.g. sea level rise, exceptional tide, storm surge, summer drought and consequent fluvial flooding. Migration would flow in unsuspected directions, e.g. Africa which would lead to overcrowding in higher lying areas. This would lead to ghetto formation and possibly civil unrest. Social inequality would increase as higher lying areas would be inhabited by the rich whilst lower lying and high risk areas would be inhabited by the poor.
**BLUE SKY POLICY ALERT 14 - FLOODS IN EUROPE CAUSE MASS MIGRATION**

**Surprises (‘wild’ scenario features)**

The wild factor here is not necessarily the flooding itself, which could be inevitable with ongoing rapid climate change. The lack of preparedness and policy measures to cope with the flooding and the likelihood of this happening within the next 20 years would make this a wild card. The issue of migration also adds wildness to this card and the scale and unprecedented way of the migration from lower lying areas. We are at the moment too focused on local disaster plans and not holistic cross-national plans to respond to disasters such as flooding. Migration from EU countries to Africa would make this wild card very wild, as migration stream in this direction is unprecedented in recent history and many African countries are not well prepared to receive a high volume of displaced people. Higher lying and thus sought after areas would quickly become over crowded, and civil unrest is likely to follow. This would also put a strain on natural resources in the most inhabited areas and consequently energy and food safety would be threatened.

**Possible interpretations**

There is a possibility of positive interpretations such as the reconstruction of damaged infrastructure or a limited disaster may force a change in the way disasters are dealt with and increase preparedness for future events. This wild card would certainly test the Business Continuity Plans that are in place as in the case of discrepancies that became apparent when the World Trade Centre was destroyed. A negative interpretation would point to the fact that no one seemed prepared for this scale of a flooding disaster. Warnings were not listened so emergency responses were not well planned or coordinated.

**Key actors**

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as risk analysts, engineers and modellers that would attempt to predict level and timing of flooding and create disaster recovery plans and countermeasures.
- **Shapers** (i.e. enablers/inhibitors); governments, policy makers, national and international response bodies, military, police, and rescue teams.
- **Stakeholders** positively or negatively impacted include insurance companies playing an important role post wild card.

---

**Manifestation**

- Sudden development

**Importance**

- Low ★
- Medium ★★
- High ★★★
- Very high ★★★★

**Likelihood**

- ★★★ by 2030 ★★★★ by 2050

**Impact on EU**

- Very negative

**Inspired by**

- Brainstorming session and group discussions in the iKNOW Workshop in Manchester (February 2010)

**Key words**

- flooding, mass-migration, disaster response, environment

---

**Potential impacts in Europe**

<table>
<thead>
<tr>
<th>Area</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructures</td>
<td>★★★★</td>
</tr>
<tr>
<td>People’s Lives</td>
<td>★★★★</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
<td>★★★</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
<td>★★★★</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
<td>★★★</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
<td>★★★</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
<td>★★★</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>★★★★</td>
</tr>
</tbody>
</table>

---

**Low ★ Medium ★★ High ★★★ Very high ★★★★**
Potential impacts

There would be immediate impact on local people and infrastructure and then more widespread consequences for example if London, an international financial centre, was flooded it could lead to a collapse of markets and subsequent economic disaster. Impact on the insurance sector would be vast and could even lead to a breakdown of the system.

Flooding and migration could also lead to a rise of a new superpower or at least change the power balance across Europe. Mass migration from lower-lying areas would possibly lead to a ghetto formation in high risk areas whereas the poor would not be able to afford to live in safer areas. This would also put a strain on natural areas and resources and increase urban populations.

The poor would live in high risk areas while the wealthy could choose to live in safer areas. This would increase inequality and social division.

Potential actions

In order to be prepared for this, focused disaster investment would be required, in addition to allocation of resources on standby to cope with the effects and for evacuation.

Policy actions

Early actions: Policy makers would need to use existing evidence to prepare.

Early reactions: Preservation of continuity in relocation; Provision of essential services Preservation of critical infrastructure; Relocation planning, taking into account the hazard areas.

Business actions

Early actions: All encompassing disaster planning and creation of contingency plans for businesses.

Early reactions: Recovery of productivity and market position.

Research actions

Early actions: Look at indirect/secondary implications of the disaster and from there develop ways to prevent it; Find ways to artificially increase land space; Develop ways to evacuate the towns efficiently and quickly; Exploring possible role of civil society in disaster communication and response management; Economic market analysis would need to be carried out.

Early reactions: Continuing economic market analysis; Identification of low hazard areas; Research would need to focus on social and welfare issues.

Weak signals

Weak signals that indicate the unpreparedness include the absence of measures to respond to such a situation. Organizations seem and concern of organizations and people in general. We are seeing an increase in flooding in low lying areas in Europe, recently we have seen flooding on the west coast of France the west coast of France (a nation with similar climate and level of development to the UK) has just seen storm winds and sea surges, with the loss of 45 lives and a national emergency. It is also a weak signal that many low lying places seem to be very ill prepared for flooding. An example of this would be St Ives and Zennor, who were flooded in April 2009. These places had flood protection implemented but according to the council, lacked drainage solutions to quickly get rid of surface water. The public also seemed unaware of what measures they could take in protecting their homes and businesses.

Flooding response in the UK in 2007 demonstrated further how unprepared many places are for severe flooding and how vulnerable infrastructures are, such as railway and road system. Many roads were closed and train services suspended. Officials were later criticised for a high level of unpreparedness and slow response. Also armed forces were overstretched in rescue operations around the country.
Minimum Flight Distance Introduced

RECOMMENDED RESEARCH

THEMATIC AREA
Transport

RESEARCH TOPIC
Research on sustainable transport.

The ongoing discussion on the immense impacts on climate change caused by transport (by rail, road and sea, but particularly by air) reveal the growing need for sustainable transport infrastructures and alternative eco-friendly combustion to reduce or even to completely avoid negative impacts on the environment. As there will always be a need of travelling over short and long distances, a number of complementary research actions have to be taken into account. According to this wild card, two major actions could include: a) Research on alternative fuels for airplanes (as aviation solely depends on fossil fuels); this research has to be fostered in order to achieve a considerable share of eco-friendly bio-fuels in aviation in the long run b) Increased research on high-speed infrastructures (by rail or magnetic fields) that might appropriately substitute short-distance flights. The latter is necessary to enable passengers to travel comfortably in case short distance flights are prohibited.

Latest developments in research on alternative fuels in aviation certainly indicate a possible paradigm change in the aviation industry, as a growing number of airlines and aviation groups such as the EADS are exploring the usage of biofuels, in particular made from algae.

OBJECTIVE
The objective of research is to foster the greening of air transport and to construct an intelligent system of transport infrastructures for high-speed trains between major European conjunction points.

EXPECTED IMPACT
Research on sustainable transport might contribute to less environmental pollution caused by aviation and might set the course for sustainable transport infrastructures that enable comfortable travelling for coming generations.

IMPORTANCE FOR EUROPE
Such research is crucial for Europe due to the potential contribution to mitigating climate change.

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. Thus, travelling to destinations which are less than 500 kilometres away has to be realised by alternative means of transport, such as trains, buses, cars or boats. This wild card has a number of vast impacts on different areas, e.g. it might significantly affect peoples’ travel patterns and could certainly lead to a revival of road and rail usage.
**BLUE SKY POLICY ALERT 15 - MINIMUM FLIGHT DISTANCE INTRODUCED**

**Manifestation**
- Gradual development

**Importance**
- **Medium**

**Likelihood**
- **High** by 2030
- **Very high** by 2050

**Impact on EU**
- Rather Positive

**Inspired by**
- Discussions on the generation of new wild cards in the transport working group on the iKnow expert workshop in Cologne, Germany.

**Related to**
- FP7: European research on transport, particularly on SST: The greening of air transport

**Key words**
- Aviation, Flight Distance, Green Transport, Short-Distance Flights, Travel

---

**Surprises (‘wild’ scenario features)**

Air travel is a convenient fast way to travel on long distance and short distance journeys. Since the 1970’s, European passenger volume in air travel has continuously increased and after the private car, the aircraft is the second favourite means of transportation in Europe. For the future, a further increase of air travel is expected. This development is regarded as a major environmental issue because of global warming and pollutants. Air travel is the most energy-intensive way to travel; travelling the same distance by train consumes less than half the energy needed for flying. Converted to a single person-kilometre and in comparison to long-distance flights, environmental pollution of air travel is higher in short distance flights, since distance-independent ground activities (e.g. starting the engines) consume more energy than steady flying over long distances. Thus, in this wild card scenario the European Union has enacted a law that prohibits flights shorter than 500 kilometres. In the short term, there will likely be clear winners and losers including: increased road and rail usage, an overall decrease of travellers; isolation of some cities due to their inaccessible location.

**Key actors**

Key actors related to this wild card, include:

- **Scanners or “early warners”**: several scanners could be related to such a wild card. The most important are environmental protection organisations such as Greenpeace and WWF, which have been demanding the prohibition of short distance flights for a long time now.

- **Shapers (i.e. enablers/inhibitors):** such as policy makers, railway companies, public transport providers and research institutions and last but not least environmentally conscious travellers and society.

- **Stakeholders** positively or negatively impacted such as plane manufacturers, airports, travellers, people living next to airports, airlines and business enterprises.

**Potential impacts**

The prohibition of short distance flights has both negative and positive influences on several areas and groups. First of all, this wild card could lead to immense structural changes in the aviation industry and a change in cost structures for airlines and aircraft manufacturers, especially for smaller regional planes. The rising costs for providers would be passed to customers (higher ticket prices).

Travel could become less comfortable and convenient, with consequences for meetings, conferences, and leisure. Video and telephone conference systems would be more popular.

Property prices for residential and business premises could change dramatically in some cities.

Winners would be railway and bus companies and there could be improvements in public transport networks and terrestrial mobility services as a whole.

Another beneficiary group would be people who live next to airports. Noise pollution would decrease significantly at the many smaller airports which focus on short distance flights.
However, the traditional airport hub and spoke system could be revolutionised with long distance flights being arranged to a greater variety of airports.

But on top of the above impacts, the most prominent would be the reduction of environmental pollution.

**Potential actions**

**Policy actions**

**Early actions:** Assuming that the European Union is planning the prohibition of short distance flights in Europe, policy could take on two types of actions; first of all policy makers/national governments in European countries would have to prepare and to accustomed travellers for less travelling by plane and to give incentives to use trains and intercity buses in advance. This could be done by putting taxes on kerosene, by putting a value added tax on international flight tickets and the abolishment of subsidies of airlines and the aviation industry. Intrinsic motivation of travellers could be achieved by an international agreement on environmental protection and clarifying negative environmental impacts of aviation in large-scale campaigns on TV, the radio and in newspapers. Second, policy makers would have to improve and extend existing transport infrastructures in order to enable travelling by alternative means of transport in comparable time and comfort. Therefore, possible actions could include no speed limits on highways, the implementation of “Transrapid”-infrastructures and fast lanes on highways and the subsidisation of Car-to-X Infrastructures. Additionally, there would have to be new security concepts to be developed for trains, as trains might increasingly become targets of terrorist attacks.

However, all of this assumes that the wild card is regarded as desirable – in order to determine that, an in-depth analysis of the potential impacts of prohibiting short-distance-flights would need to be conducted in advance. Such an analysis would be a necessary basis and framework for research and policy actions.

**Business actions**

**Early actions:** Business enterprises should prepare their employees for the increased use of video and telephone conferences and expand their enterprise “virtual mobility”. Car manufacturers could develop new eco-friendly propulsion concepts and public transport providers could construct entirely new transport systems and mobility services. The same should be done by airlines, which have to completely redefine their routes, markets and business models.

**Research actions**

**Early actions:** Research should primarily focus on the development of multi-modal transport concepts, integrated and alternative transport infrastructures and on alternative combustion and fuels in order to reduce emissions. However, particularly research on defining what is supposed to be the minimum flight distance could be important. Such an analysis would have to take into account, e.g. the geographical location of countries and their risk of being isolated in case the wild card occurs.

**Weak signals**

There are mainly two major weak signals, which indicate the prospective occurrence of this wild card scenario. These are the scarcity of fossil resources, basically crude oil which is used to produce kerosene, and the strong environmental pollution which is caused by aviation and which is proven to be particularly extreme on short distance flights. These two factors strongly foster the prevailing discussion on climate change and sustainable development in European governments and societies, which indicate a shift in consumption patterns towards sustainability and responsible consumption. Another weak signal is the current construction of new and the upgrade of already existing high speed lines between major traffic conjunctions, e.g. between Cologne and Frankfurt, Cologne and Paris (via Brussels) or between Stuttgart and Paris.

### References

Inner Cities are Closed for Private Cars

RECOMMENDED RESEARCH

THEMATIC AREA
Transport, heritage, tourism

RESEARCH TOPIC
Research on human-oriented urban development and alternative transport.
Research on philanthropic urban development is increasingly gaining importance in this wild card scenario. Profits from private car-free city centres can only be generated if the city is consequently designed for the prevailing mobility requirements of residents. This has to be closely linked with research on alternative, particularly eco-friendly means of transportation and the effective design of intermodal mobility solutions and infrastructures.

OBJECTIVE
Research on human-oriented urban development should focus on the pedestrian-friendly design of city structures, in particular regarding the revival of dense clusters of housing spaces, workplaces, shopping facilities, recreation sites and public institutions such as schools and hospitals. Traditionally, settlement development in urban areas has been characterised by the spatial split of essential life and work functions. This development was primarily driven by the technical capabilities of the internal combustion engine, which has enabled fast travelling over steadily growing distances. Nevertheless, necessary transports in cities, which are affected by the closure of their inner cities, have to be conducted via the implementation of an intelligently managed public transport system.

These offer a broad range of different vehicle types with different drive systems such as busses, trains, bicycles, scooters and cars. These measures have to be further accompanied by incentives, regulation and campaigns, that foster a car independent lifestyle. These types of issues have to be examined further by European research.

EXPECTED IMPACT
Research on the topic listed above would a) enable a high mobility in city centres without depending on a private car; b) increase the general quality of life in bigger cities; c) give decisive impulses for the solution of traffic problems in megacities in countries outside the EU.

IMPORTANCE FOR EUROPE
The turning away from possessing a private car in inner cities might give important stimulus for a general shift in European mobility behaviour; towards a broad acceptance of alternative transport concepts and public transport.

Growing environmental problems such as noise and air pollution and increasing traffic chaos from a rising number of cars has led the European Union to enact a new law; European cities with more than 100,000 inhabitants have to completely close their inner cities for individual private cars. Only small mobility devices such as bicycles or scooters and all types of means of public transport, including electric vehicles from public car-sharing pools, are permitted in city centres. Private cars have to be parked in the periphery, e.g. in special car parks. The closure of city centres for private cars is obligatory and cannot be overridden by national policy.
At first sight, this wild card does not seem to be an extreme event with any vast impacts at all. For quite a long time now, the majority of European cities have pedestrian areas, which mainly extend across the centres or specific parts of old-towns. The vast majority of these parts are usually characterised as shopping streets or commercial areas with a large number of different retail stores, malls, restaurants and recreation centres.

On the other hand, an increasing share of European cities has already introduced or is currently introducing access restrictions or city tolls for cars with high emission levels, particularly of fine dust and nitric oxides. Contributions of traffic to particle pollution are high in street canyons, which can usually be found in busy city centres. Restrictions and tolls are primarily implemented for health and ecological reasons. An increasing number of studies classify fine dust and nitric oxides to be extremely dangerous to health, especially being carcinogenic.

However, the aspects mentioned above are not regulated by European law but by provincial governments and city senates. Furthermore, existing regulations do not affect closures of city centres for all private cars, but only for certain vehicles such as “old polluters”. In this wild card, not even a single private car, even non-polluting ones, such as electric cars or fuel cell cars, are allowed to drive into the centres of cities with more than 100,000 residents.

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as environmental protection organisations like Greenpeace, traffic planners, particularly from regions with high traffic congestion, and residents, who are directly affected by negative impacts on quality of life by traffic jams, smog and noise pollution in city centres.
- **Shapers** (i.e. enablers/inhibitors): such as city and traffic planners, policy makers such as the European and national governments and providers of mobility services, particularly of public transport solutions.
- **Stakeholders** positively or negatively impacted such as public transport providers, car manufacturers, residents in city centres and in the outskirts, retail and the real estate industry, among others.

Potential impacts

The closure of inner cities for private cars involves a vast number of both negative and positive impacts. Such a regulation certainly includes strong impacts on the life situation of residents of inner cities, as they are not permitted to enter the centre with their private cars anymore. They have to leave their cars in specific car parks in the peripheries and have to take the train, bus or any alternative means of transportation to approach their homes. This may lead to a high probability of protests or even riots by residents of inner cities.
Due to the increased restrictions to individual mobility and the rising dependence on public transport, living in city centres might become less attractive to a large number of people. People might move out of inner cities, which may lead to a change of real estate asset price structures in the centres as well as in the outskirts. Problems, particularly growing space problems might occur in the peripheries due to the growing number of parked cars. On the other hand, the wild card implies important positive impacts, which outweigh the negative ones mentioned above. First of all, it leads to a drastic reduction of environmental problems in inner cities, in particular a perceptible decrease of noise and air pollution. Thus, this wild card could lead to a growing quality of life for residents. Already today, almost any errands in inner cities can be accomplished by walking, by bicycle or by taking the bus. Besides, the number of road accidents and by that the mortality rate on roads might be minimised significantly. And in case affordable, effortless and quick mobility solutions are guaranteed by specific mobility and public transport providers, this might even lead to a revival of inner city centres as habitats and many people might be attracted and move back. Nevertheless, certain actions have to be taken in order to benefit from this wild card. Such actions are described in the section below.

### Potential actions

#### Policy actions

**Early actions**: In order to slowly accustom the affected stakeholders, particularly the residents of inner cities the transformation of inner cities into car free zones has to be executed little by little, e.g. by firstly implementing high tolls for inner city car usage, adapting the city planning process towards “pedestrian friendly towns” respectively cities of “short routes” and finally closing specific areas after one another.

**Business actions**

**Early actions**: The main actions that have to be taken by business actors concern the improvement of mobility opportunities and the availability of sufficient provision facilities. Retail stores and shopping malls have to move back to the centres and public transport providers or entirely new mobility services providers have to improve the public transport systems and offer all kinds of intermodal mobility solutions, e.g. a broad range of bike or vehicle sharing concepts, new logistics services and last but not least effective parking solutions for private cars, that have to be stationed outside the centres.

### Research actions

#### Early actions:

According to the high restrictions to individual mobility through the prohibition of private cars in city centres, research has to focus primarily on alternative city concepts (enabling an easy accessibility of different facilities such as schools, hospitals, shopping centres, supermarkets or postal offices) and on new means of transportation, such as for example eco-friendly micro vehicles that enable mobility without any restrictions. The latter is closely linked to research on “enabling mobility for old aged people”. As European societies are getting older, transport infrastructures and vehicles have to be increasingly adapted to old-age peoples’ needs.

#### Weak signals

Currently several weak signals exist that might indicate the prospective occurrence of this wild card. Road traffic accounts for a large part of air pollution in European cities. Followed by authorised plants, road traffic is the second largest source of nitrogen oxide in Berlin. Several European cities such as London or Berlin have already taken different measures in order to regulate and minimise road traffic in certain parts of the inner cities. For example, in February 2003, London introduced a city toll (London Congestion Charge) for an area of 38 km² in the city centre, which was further extended to the Western city districts in February 2010 (Western Extension). In 2008, Berlin introduced an access restriction for vehicles with high fine dust emissions, other cities have followed Only cars possession an “environment sticker” which indicates the cars’ low emission level may access the so called “low emission zone”. Recent data proves, that such measures on regulating road traffic (combined with the increased efficiency of internal combustion engines) involve a decrease of pollutant concentrations in city centres. In Berlin, the overall particular matter has continuously decreased by more than 80% since 1990. Sporadic events such as the car-free Sundays (e.g. in Hannover) further reveal the demand for increased calm and relaxation in inner cities.

### References


Towards the Utopia?

**RECOMMENDED RESEARCH**

**THEMATIC AREA**
Social Sciences and Humanities (SSH), Security, Physical infrastructure, Virtual infrastructure, Social welfare, Economy, Policy and governance, Environment & ecosystems, Science, technology and innovation (STI)

**RESEARCH TOPIC**
Effects of democracy and development achievement on the geopolitical equilibrium of a multi-polar world.

**OBJECTIVE**
Studying democratic mechanisms and their possible weaknesses in respect to peace-keeping at global level. Researching possible prevention policies and legislation to reinforce democratic decision-making processes. Reinforcing participation in decision-making by extended communities of stakeholders and citizens. Research the role of media and information-sharing in respect to these matters.

**EXPECTED IMPACT**
Possible legislative, political and institutional reforms or changes, which can boost democracy and participation in decision-making, also preventing the production of failures in democratic systems.

**IMPORTANCE FOR EUROPE**
Improvement in the success of European democratic systems and the role of the EU as a supranational institution, for the purpose of achieving a more democratic world and strong cooperation between nations.

This wild card assumes the development of a general system at global level, for issues regarding the whole planet. When technology has reduced distances and generated activities with a global impact, a permanent system of global governance is established. This system, by means of information technologies, also allows the realisation of a more direct democracy and world citizens’ participation in decision-making. This could, for instance, take place through public general consultations, by very efficient voting systems, through the internet network. Decision-makers are then called to operate according to a main principle of accountability.

In this way, also decisions regarding the future of technological choices, for instance, related to energy solutions, become characterised by widespread information about technical, security and socio-economic implications and uncertainties. Decision-making becomes participatory at global level so that the society experiences a great increase in the level of democracy and social inclusion.

Thanks to such participation the whole planet achieves greater prosperity and higher technological development. The myth of Atlantis comes true, a prosperous and technological advanced society is able to face global matters collectively, to properly manage sustainability and climate change, to avoid or drastically reduce conflicts, and to explore together outer space.

**FP7 Themes**

**ERA Goals**
**BLUE SKY POLICY ALERT 17 - TOWARDS THE UTOPIA**

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Gradual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★ by 2030 ★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Positive</td>
</tr>
<tr>
<td>EU preparedness</td>
<td>★</td>
</tr>
<tr>
<td>Inspired by</td>
<td>Previous research on governance of complexity.</td>
</tr>
<tr>
<td>Key words</td>
<td>Democracy, Global Governance, Development, Politics, Human rights, Security,</td>
</tr>
</tbody>
</table>

**Potential impacts in Europe**

<table>
<thead>
<tr>
<th>Category</th>
<th>Potential Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructures</td>
<td>★★★</td>
</tr>
<tr>
<td>People’s Lives</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
<td>★★★</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
<td>★★★★</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
<td>★★★★</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
<td>★★★★</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>★★★★</td>
</tr>
</tbody>
</table>

Low ★ Medium ★★ High ★★★ Very high ★★★★★

**Surprises (‘wild’ scenario features)**

The main wild feature is constituted by the realisation of a peaceful and advanced world, free from hunger, crime and conflicts, in which the participation of all citizens has defined a winning model. Another wild feature would be the exceptional unity, mutual aid and good understanding between the different world cultures and contexts. There is awareness and shared understanding of habits, mindsets and experiences, for the common purpose of building a better world, enhancing ethical principles, peace and cooperation between nations.

**Possible interpretations**

This wild card assumes the strong tendency of the global society to get closer and closer to that utopic, advanced and right society, which has sometimes been described in mythology. This reflects the actual possibility to realise a fairer world living in peace and harmony, as the famous song by John Lennon tries to imagine. Is this kind of trend really possible? Is it really possible to achieve that win-win solution combining individuals’ personal needs and desires with the well-being of society? A world utopia might be impossible but at least we can make good progress towards it?

**Key actors**

Key actors in this wild card can be considered mainly International Organisations and Associations, such as the UN, NATO, the OECD, the EU, and other continental Unions of Nations (e.g. USA), but also national governments, political parties, social movements, and in general all civil society and public media, as well as multinational and national corporations.

**Weak signals**

Weak signals related to this wild card can be identified in the growing participation of citizens in political life, which has lately had a greater impact thanks to the pervasiveness of information technologies, social networks and enhanced communication between people even at very great distances. A weak signal is also represented by the progressive breaking down of language barriers, as the English language becomes more and more the world language. More and more information available in different languages is being translated into English making it possible to find out about remote cultures and realities.

**Potential impacts**

The potential impacts would be the successful fight against hunger at global level and a drastic reduction in conflicts and crime, as well as a greater level of well-being and democracy in the world. The stronger cooperation will pursue a united vision of the world, projected towards future technology achievements and the conception of an advanced society.
## Potential actions

### Policy actions

**Early actions:** Early action could consist of taking the possibility of such development and advancement into account, in order to explore possibilities to improve the life conditions and eventually to achieve higher standards of living. Political movements could plan possible pathways towards these kinds of advancements.

**Early reaction:** Planning policies able to maintain the system and improve it.

### Business actions

**Early actions:** Promote more participation in global governance systems with fair and unbiased trade policies; adhere to global standards of well-being and commit to international (trade) treaties. Develop direct democracy systems to achieve wider citizen participation in decision-making processes.

**Early reactions** Assist corporations and enterprises to establish new international relations, in order to maintain and improve the system.

### Research actions

**Early actions:** Promoting research on socio-economic science and humanities, also connected with sustainable development achievements. Promoting research on international politics and conflict resolution. Promoting a better understanding of science amongst citizens and policy-makers. Studying citizens’ participation for democracy and development purposes.

**Early reactions:** To increase research in economics and political science and related fields: exploring ways to maintain and further develop the system.
Empowerment of women: increasing trends towards female power

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH) and Security.

RESEARCH TOPIC
The meaning of gender equality: does female empowerment require detachment from natural functions or, on the contrary, can it take place through recovering ‘the natural role’ and enhancing natural capabilities without discrimination?

OBJECTIVE
Understanding what are the societal and political structures which could make equality possible without generating ethical, child-rearing and gender conflicts. Understanding how to achieve women’s emancipation through enhancing and evaluating their natural capabilities, in relation to those of men. Understanding the opportunities and risks of reproductive technologies.

EXPECTED IMPACT
Producing a deeper awareness of rising trends of equality in respect to possible risks or society disruptions.

IMPACT FOR EUROPE
Addressing social development pathways and ethical principles in female emancipation and against discrimination, in relation to different European cultures.

Gender equality and empowerment of women in various fields has progressed a long way in the last 50 years, creating conditions for further development of social change. This wild card explores the realisation of a further trend towards a more matriarchal society, where female power becomes a leading force within society. In such a context, in the western world, the majority of leading positions and executive bodies are occupied by a female labour force. This wild card assumes the realisation of gender equality has taken place at some levels worldwide, while in some contexts, such as the occidental world, women have achieved power and dominate, resulting in a reversal of the usual situation in human history, where men have almost always held the dominant role within society.

FP7 Themes

ERA Goals

Author(s): Maurizio SAJEVA, Leena SAARINEN (Finland Futures Research Centre)
Contributor(s): Tampere Office of Finland Futures Research Centre
**Surprises (‘wild’ scenario features)**

The wild element to be found here is a world where there is not only gender equality but also such a significant social change that the expected norms and roles for females and males have been erased and women have gradually achieved more political, economic and social power within society. The feminisation of workplaces has made it more acceptable and usual for women to work in senior positions and more typical for men to be involved in routine everyday duties and low level jobs. In brief, women have not only broken out from the archetypes of mother, dependant and nurturer, which were typical of the past, but have also broken traditional patterns in politics and in cultural and social institutions, including motherhood, in addition to rather deep-rooted phenomena like gender roles and normative behaviours, as we can see in many cases today. Women, thanks to their capabilities and having had the occasion to demonstrate them, have inverted the trend and become the major social, political and economic actors of the society.

**Possible interpretations**

There are several different possible interpretations of this wild card. This situation can produce the long-term promotion of gender equality through education (within the EU Member States or larger regional contexts), and changes in the curricula of elementary and comprehensive school to contain, for instance, gender studies and feminist perspectives in education. The increasing number of highly educated women forms elites and thus changes in the (political) atmosphere.

Technological advances have already altered the desirable age of becoming pregnant. From a more feminist point of view, new innovations and developments in the field of medicine and clinical research (reproductive technologies, fertility treatments etc.) could in the near future enable alternative ways to have children, for instance, women may not need to give birth to children.

From a point of view more inclined to promote the promotion of the natural gifts of women and men, the wild card may refer to a situation in which women have demonstrated their capabilities and have shown themselves to be even more able than men to maintain peace and organise and rule societies. They have gained the political favour of populations thanks to their natural abilities and their inner strength and tendency to realise egalitarian societies. This empowerment is the result of the preference for brainpower and less aggressive but more efficient strategies, instead of brute strength, with a consequent reduction in conflicts of various natures. In this view, women may reach a situation in which they are proud to give birth to their children, and they are able, at the same time, to proceed with their career and develop further their own capabilities. This is possible, thanks to good organisation of work, where their men collaborate and often even keep and organise kindergartens.
Key actors
The key actors could be identified in the various political institutions, women’s movements, and in the equivalent male communities, where egalitarianism, awareness of the value and the natural capabilities of women are promoted. This trend is manifested, for instance, through the creation of more equal conditions in societies and the fight against crimes against women. This is not something new in European or Western politics. Several other key actors could be related to this wild card, such as, for example, research facilities in diverse fields (Medicine, Philosophy, Gender studies, Social Science etc.), pharmaceuticals, universities, public media, civil society organisations and NGOs (such as the UN women’s watch, the EU gender institute, UNIFEM, Amnesty etc.), as well as other institutions such as feminist associations, churches and religious groups.

Weak signals
Several weak signals could enable the occurrence of such a wild card: the increasing female majority attending universities and holding higher university degrees (in the West); the spread of information about sexual minority rights within different communities and institutions such as governments, NGOs and churches; advances in medicine (such as fertility treatments, artificial insemination, contraception, cloning etc.); changes in the attitudes and division of labour in both male and female dominated fields. Media coverage and the increase in the amount of alternative media displaying gender-related issues and debates; visibility of gender-related questions in the EU, e.g. gender equality considered as a common value and taken into consideration in the legislation of the EU; promotion of women’s capabilities in the different economic, social and political sectors.

Potential impacts
The potential impacts of this strong trend towards female power could include, for instance, an increase in the respect of rights of sexual minorities, changes in social norms and in the composition of families and an increase in the tolerance towards LGBT parenting. Some other impacts can have regard to possible misogynous attitudes.

Potential actions
A significant increase in female power and a radical social change reached in a fairly short period of time could, on the one hand, raise protests from different religious and ideological groups against reproductive technologies and promote traditional heterosexual norms. On the other hand, the change in the atmosphere could radically improve the situation among other sexual minorities, creating a more tolerant environment and possibly also influencing government policies, nationally and internationally.

Policy actions
Early actions: Promoting gender equality in policies by taking all genders into consideration; by promoting the enhancement of women’s natural capabilities and attitudes, by introducing ideas of gender studies or gender equality, in the consideration of women’s and men’s natural differences and peculiarities; by implementing legislation to ensure that the social arrangements are implemented in accordance with the economic ones (for example, adequate parental leaves); by creating new legislation on the use of reproductive technologies and operations of pharmaceuticals; by creating better surveillance of discrimination based on gender (e.g. increase in transparency on wages).

Early reaction: Promoting gender equality through legislative acts; promoting capabilities and supporting them. Policy-makers should respond quickly to social changes and take action to avoid misuse of new medical innovations (for instance, regulate the use but fund the research to explore the real effects on health and on societies).

Business actions
Early actions: Promoting regulatory and corporate governance approaches in order to simultaneously pursue scientific development of reproductive technologies, corporate social responsibility policies and ethics. Business should continue developing and implementing non-discriminatory policies towards employees and customers.

Early reactions: Promoting regulatory and corporate governance approaches in order to avoid misuse of reproductive technologies and promote ethics.

Research actions
Early actions: Increasing the application of approaches of gender studies and philosophy (e.g. ethics) in the fields of medicine, social science and political science. Exploring new ways for achieving a more egalitarian society; emphasis could be placed on ethical aspects but also the sociological aspect concerning social change should be considered.

Early reactions: Ethics would still need to be focused on, as well as research in sociology and philosophy.
New Pro-War President Elected in the U.S.

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH) and Security.

RESEARCH TOPIC
Effects of democracy failures on the geopolitical equilibrium of a multi-polar world.

OBJECTIVE
Studying democratic mechanisms and their possible weaknesses in respect to peace-keeping at global level. Researching possible prevention policies and legislation to reinforce democratic decision-making processes. Reinforcing participation in decision-making by extended communities of stakeholders and citizens. Researching the role of media and information sharing in respect to these matters.

EXPECTED IMPACT
Possible legislative, political and institutional reforms or changes which can prevent the production of such failures in democratic systems production of failures in democratic systems.

IMPORTANCE FOR EUROPE
Improvement in the success of European democratic systems and the role of the EU as a supranational Institution.

Radical changes in the U.S. leadership create an unexpected rise in American imperialism and deepen nationalism, considerably more than in the past. American policies become more aggressive and intolerant with respect to other world powers. This happens when China’s rise in power is felt more strongly as an unbeneficial factor in the U.S. and strong barriers to diplomacy are being raised. Struggles also emerge in commercial markets. The world is split into three main blocks: Asia, the U.S.-U.K. and the Middle East; in these blocks independence and protectionism suddenly gain prominence. The rest of Europe remains divided and uncommitted in its support and allegiance to any one block and follows several different paths. The result is a tendency towards chaos across large parts of Europe.

FP7 Themes

ERA Goals

Author(s): Maurizio SAJEVA, Leena SAARINEN (Finland Futures Research Centre)
Contributor(s): Burkhard AUFFERMANN (Finland Futures Research Centre), other participants in Prague security workshop
Wild features

The wild features are mainly related to an unexpected global destabilisation occurring in a quite short time. The surprising feature here would be the sudden and strong need to quickly resolve the questions concerning defence policy in Europe and the EU. Furthermore, within the EU, the emphasis on deepening political integration could reach an impasse and lead instead to fragmentation and generation of blocks, partially due to the unbalanced division of NATO and non-NATO members within the EU. This could result in rising levels of violence, migration flows and a sensation of chaos and anarchy. Another wild feature could be the creation of trade barriers and high tariffs between the U.S. and China, eventually causing a trade war, with immediate effects on the world economy. Following increasing protectionism, according to a new world division into three blocks, both the U.S. and China suffer serious losses (China is in fact the third biggest trading partner of the U.S.) While the economic and political cooperation between China and the Middle East increases, tensions are also growing between the Middle East and the U.S. (or the west). An economic depression hits first the U.S. and then Asia, particularly China, where growth slows down or gets stalled.

Economic depressions and trade barriers would cause unemployment, while deteriorating living standards and resource scarcity, as well as differentials in wealth within and between regions could catalyse small, possibly escalating, struggles. The war, even if not characterised by traditional open conflicts, but more terrorism-like (i.e. terror attacks or acts of boycotting), might become global and perhaps cause disruptions in communications and transportation systems.

The situation would assume the characteristics of a Cold War between the three main actors and the battles would be hidden in terrorist and cyber-attacks or disturbance actions by secret services. These events would eventually result in the complete closure of borders and the adoption of very strong control systems and ‘Big Brother’ security policies.

Possible interpretations

The main interpretation could be related to the growing tendencies towards aggressive and imperialistic international policies. This wild card assumes fragility in the economic situation and the failure of current Governments to solve internal economic crises. Moreover, this wild card assumes the failure of diplomacy and ex-ante conflict resolution policies, as well as a political incapability to solve armed conflicts ex-post. This situation sustains and deepens economic depression, with a general feeling of insecurity and widespread fear of terrorism. Trust in national governments and international agencies is seriously damaged. Last but not least, and on top of this situation, the world must address a growing need for natural resources and the impacts of climate change.

Key actors

Quite a few actors could be implicated by such a wild card, for example: national governments, mainstream political parties or right wing parties, public media, civil society, social movements, transnational institutions (such as NATO, the EU, multinational corporations).
Weak signals
There are several diverse weak signals that might suggest an occurrence of this wild card. The most important ones could be related to the economic ties between different global regions (such as Asia and the Middle East, U.S. and UK) and imbalances between exports and imports and the availability of natural resources. Regional discrepancies in economic development and other related factors cause migration flows, increasing intolerance and decreasing social coherence. Exacerbated and unresolved environmental problems and social inequalities can also represent weak signals. Some weak signals can also be found in the political dimension; for example, in the rise of strong nationalist movements, due to intolerance towards immigration or to some failures of diplomatic or security policies (i.e. continuation or deepening of the war in the Middle East, Afghanistan or Northern Africa). On the other hand, weak signals can also belong to the socio-economic dimension: financial crisis, loss of jobs, growing concerns about migration and its effects and the psychological need to protect one’s own citizens (i.e. combating xenophobia, anti-immigration attitudes and the fear of a political Islam).

Potential impacts
Potential impacts of a rise of a pro-war President and the beginning of World War III may vary in different parts of the globe. Although the actual warfare or terrorist attacks would probably affect less the continents of Africa and South America, nevertheless the poorest countries in these continents would most likely suffer socially and economically, as the richer regions start to protect their own interests. The wealth gap between poor and rich would deepen in both “the global South” and “the global North”. Infrastructures, diplomatic ties, trade and economic relations would be greatly affected, while protectionism policies and intolerance towards other nations and regions would emerge. National security and defence policies would be tightened, human rights or civil liberties would be reduced, freedom of speech would be restricted and the public media would be censored more strongly, together with the use of propaganda. The result could be the redefinition of security policies, inward-looking societies characterised by high surveillance of citizens. The reshaping of international communities would include new regulations on immigration and citizenship rights.

Potential actions
A new pro-war US President, instigating World War III and producing a new world order and a new Cold War could lead to structural changes in the political arena, with a shift from international (political, economic, social, cultural) cooperation to national or regional levels. Nationalist and religious Christian extremist groups could gain a stronger foothold in Europe. Conversely, in the East, stronger Islamic groups would arise.

New types of terrorist attacks, using information technology or smart weapons would appear. The implementation of exclusive national laws and regulations for citizens’, goods’ and capital protection would be set. Episodes of discrimination and violation of human rights would also increase. Actions need to anticipate the pros and cons of such effects.

Policy actions
Early actions: Further development and employment of soft power and diplomacy in international politics; deepening of the political integration of the EU, e.g. through credible and functional common foreign and security policies; increase in democracy and transparency within the EU; serious commitment and promotion of equality, multiculturalism/tolerance and human rights worldwide; promoting education and understanding the lessons learnt in the past. Implementing stronger political control systems of Head of States.

Early reaction: In order to avoid a new World War bursting into flames or to continue further, stronger international cooperation, political and economic governance has to be implemented, for the reconstruction of international communities, the enhancement of diplomatic relations and the promotion of peace through mediation and conflict resolution initiatives. The cooperation efforts have to involve the third sector, humanitarian aid institutions and forces engaged in peace-keeping actions.

Business actions
Early actions: Enhancing fairer and unbiased trade policies; commitment to international (trade) treaties and participation in governance, for the definition of regulatory standards and codes of conduct at global level.

Early reactions: Assisting corporations and enterprises to establish new international relations and controlling them in respect of standards and ethical codes.

Research actions
Early actions: To promote research on multiculturalism and political science; searching the roots of social coherence and nationalism in order to understand how to solve the connected problems; increasing research in global economic and social development and policy etc.; increasing research into conflict prevention and resolution.

Early reactions: Increasing research in economics and political science and in related fields: exploring ways to prevent the occurrence of the domino-effect in terms of conflicts.
Critical Information Infrastructure Collapsed: Back to the 80s!

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH), Security, Physical infrastructure, Virtual infrastructure, Social welfare, Economy, Policy and governance, Science, technology and innovation (STI)

RESEARCH TOPIC
Security and reliability of the Critical Information Infrastructure

OBJECTIVE
Understanding the criticality and reliability of the Critical Information Infrastructure and the consequences of its failure. Studying recovering procedures and the possibilities to use older technologies in situations of crisis. Studying simple systems able to ensure a satisfactory reliability of the system.

EXPECTED IMPACT
Producing a deeper consciousness of critical infrastructures in respect to possible risks or disruptions.

IMPORTANCE FOR EUROPE
Addressing development pathways for a governance of critical infrastructure able to prevent risks and set appropriate countermeasures.

This Wild Card puts forward the hypothesis that a terrorist cyber attack, a non-authorised intrusion, a technical mistake or instead a misuse of technology by official administrators or security institutions would provoke the collapse of the entire critical information infrastructure. This could happen, for instance, by a powerful and unexpected virus spreading simultaneously on different branches of the network. This situation would have a great impact for several main reasons:

- All infrastructures are controlled by information infrastructures, and interconnected at various levels.
- A main critical infrastructure, the electric power infrastructure, is also controlled by information infrastructural systems, so that it would be enough to affect their functioning to make all other systems collapse. The systems and systems-of-systems are in fact interdependent on each other in both directions.
- The great uncertainty and unpredictability of cause-effect relations and cascading effects within a single system, or between systems and systems’ operators. This defines a situation of high complexity, in which urgent decision-making has to take place in conditions of great uncertainty.
- These infrastructures constitute the foundation of entire economies, so that their disruption may cause great losses in various economic sectors or in whole economic systems. They are in fact public assets, critical infrastructures determining the economic development of entire economic systems.
- The possible future impact scenarios are therefore very difficult to determine with adequate certainty. One impact scenario could be a situation in total chaos.

FP7 Themes

ERA Goals
Wild features

The main wild feature consists of the collapse of entire socio-technological systems and the need to go back to older technologies, in order to recover interrupted services, limit economic losses and try to continue carrying out all social and economic activities. The situation would be very wild for the reason that, from a real and also a psychological perspective, people would have to jump back into the past (e.g. make use of older telephones and search for older mechanical systems, wherever they might be available, to generate and transmit electric power). These methods would need to be used until successful countermeasures (e.g. the implementation of adequate antivirus systems) were in place and perhaps for long periods. But future generations may not be able to operate older (forgotten) technologies. All systems, business or public services, dependent on an internet interface would be unavailable. Services still having offices open to the public would be overloaded.

Possible interpretations

Possible interpretations to this wild card require assessment of the vulnerability of technological systems and the impact of malfunctioning on citizens’ life. Security and video systems control could, for instance, fall into the wrong hands and cause major security and privacy issues. The malfunctioning of automated security systems may prevent police forces from operating adequately in the region, with a consequent increase in criminality, terrorism or, in general, of conflict situations and possible total chaos.

Key actors

The key actors related to this wild card could be represented by all systems operators, policy makers in the field, security institutions, producers of goods and services in the field, personnel who should recover old systems to guarantee services, and, in general, all concerned stakeholders, defence forces, emergency services etc.

Weak signals

The weak signals related to this wild card could be identified in typical examples of systems failure, such as damage caused by non-authorised intrusions, including informatics students’ pranks. Weak signals could be seen sometimes in the complete dependency of systems on informatics and in the total failure of the systems at times of unavailability of services, which are not so rare. Other weak signals could be seen in the inability of different interconnected networks, belonging to different administrative centres or going beyond national borders, to communicate. This kind of disintegrated management at the administrative level of interconnected systems at the physical level may generate situations of failure. An example could be related to the collapse of the Italian electricity network and the consequent nationwide blackout, due to a simple storm occurring in Switzerland. The disruption occurring on the main transmission line, overcharged other lines and provoked, in an unpredictable chain reaction, the automatic closure of other transmission substations due to overload.
**Potential impacts**

The potential impact, as mentioned above, could lead to the total collapse of critical systems, at the base of the functioning of the society and the consequent return to the past, to less efficient but perhaps much more reliable systems. The generalised impact could be economic depression, unemployment and total chaos, loss of security and inability to face such complexity but greater reliance on local resources and community spirit and enterprise.

**Potential actions**

**Policy actions**

**Early actions:** Promoting and supporting governance of complex systems and administrative and management integration, and setting common security standards, financing security and reliability connected research and promoting effectiveness and simplicity of systems.

**Early reaction:** Activating alternative systems as soon as possible, jointly with recovering activities of the failed systems.

**Business actions**

**Early actions:** Improving the communication and integration of activities between different system operators. Integrating the operations whenever required and keeping constant contact. Promoting joint governance activities for setting common security and reliability standards. Involving enlarged participation of all concerned stakeholders.

**Early reactions:** Promoting regulatory and corporate governance approaches and recovering procedures.

**Research actions**

**Early actions:** Increasing research on systems’ integration and reliability and on complex critical systems’ governance. Planning research activities for the simplification of systems and for recovering procedures, i.e. the simultaneous functioning of older technology, not based on informatics. Telephones, for instance, may work without the help of any information technology or electricity network. In case of blackout, older technology is much more reliable. Pushing research on new systems, electricity and informatics free. Simulation of emergency procedures and contingency planning.

**Early reactions:** Perhaps to the trend towards a technological development, with much more attention to the simplicity and reliability of systems, as well as to the planning of recovering alternative mechanisms.

**References**


SAJEVA, M., A Methodology for Quality Assurance of statistical indicators. The communication of risks and uncertainties for a continuous improvement (EUR 21547 EN) 02/2005

SAJEVA, M., The Technological Risk and Uncertainty in Governance and Economic Development (EUR 21548 EN) 02/2005
The rise of a new world

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH), Social Welfare, Economy, Policy and Governance.

RESEARCH TOPIC
Socio-economic development through participatory governance.

OBJECTIVE
Understanding how the joint participation towards objectives of development can create synergies for the rise of population towards well-being, sustainability and human development.

EXPECTED IMPACT
Producing a deeper consciousness of rising trends of equality in respect to possible risks or society disruptions. Suggesting a third way towards development, overcoming the nuances of the western development model.

IMPORTANCE FOR EUROPE
Understanding the importance of the African rise for Europe and the need to establish relations. Seizing the opportunity to build relations and participate in this rise, building governance processes. Addressing social development pathways and ethical principles, in relation to different cultures, integrating and understanding cultures.

Following in the wake of the present North-African movements, other African countries (in Central and Southern areas) experience similar internal disruption. Some enlightened and capable leaders are supported and elected, with political support from Europe. As a consequence, the future of Africa seems to be characterised by strong trends of development and cooperation, towards the constitution of a completely renewed African Union. Joint efforts undertaken first in some leading countries and then in others, generate a relatively fast development, innovation, investments in a knowledge-based society, and a higher level of democracy. These changes lead to a strong economic rise and to increased well-being. Moreover, whenever the production of energy from macroscopic algae seems viable, the African context becomes a centre of interest around the world.

Following in the wake of the present North-African movements, other African countries (in Central and Southern areas) experience similar internal disruption. Some enlightened and capable leaders are supported and elected, with political support from Europe. As a consequence, the future of Africa seems to be characterised by strong trends of development and cooperation, towards the constitution of a completely renewed African Union. Joint efforts undertaken first in some leading countries and then in others, generate a relatively fast development, innovation, investments in a knowledge-based society, and a higher level of democracy. These changes lead to a strong economic rise and to increased well-being. Moreover, whenever the production of energy from macroscopic algae seems viable, the African context becomes a centre of interest around the world.

FP7 Themes
ERA Goals

Manifestation
Relative fast development

Importance
★★★★★

Likelihood
★★ by 2030 ★★★★ by 2050

Impact on EU
Very positive

EU preparedness
★★

Inspired by
Prague workshop

Related to
FP7 projects:

Key words
Economic and human development, politics, minority rights, sustainable development, ethics, social change

Potential impacts in Europe

Infrastructures
★★★

People’s Lives
★★★★★

Legislation & Regulation
★

Economy & Business
★★★

Defence & Security
★

Government & Politics
★★★★★

Environment & Ecosystems
★★★★★

Science & Technology
★★★★★

Low ★ Medium ★★ High ★★★ Very high ★★★★★

Author(s): Maurizio Sajeva (Finland Futures Research Centre)
Contributor(s): Yriö Myllylä, Jari KaIVO-OJA (Finland Futures Research Centre)
Photo: Maurizio Sajeva, from “Tampere village of the Future”, photographic show and workshop of Finland Futures Research Centre
Wild features
The wild features are mainly the rise of democracy and the application of the principles of good governance, the tendency to fight against corruption towards a deep social change by groups of leaders. These trends lead to enhanced education, knowledge intensification and citizen participation. Another wild feature is the revival of more ancient lifestyles and cultures, integrated into a more developed economy and society. For instance, the revival of social groups with their own ancient lifestyles, living a nomadic life in the desert or elsewhere, boosts local commerce and biological production (including a wider range of food sources). This is connected to new activities, for instance, of energy production, by the development of large areas covered by photovoltaic plants, sometimes in cooperation with European actors.

Possible interpretations
There are several different possible interpretations of this wild card: it would mean on the one hand a very positive impact for African and whole world development, but it would also mean the rise of a very strong competitor to the western world. Interested parties could therefore be tempted to boycott such a rise. The realisation of this wild card could, on the other hand, generate a migration from Europe back to Africa.

Key actors
Key actors, besides local populations and Governments could be European Institutions and businesses, investors, and academic Institutions.

Weak signals
Clear signals are the recent rise of Northern African countries. Other weaker signals are the spread of information through the internet, social networks and other virtual spaces, which increase people participation and consciousness of global challenges and individual empowerment and personal opportunity. Shared information and awareness of human rights may lead to a rise in the numbers of people participating in political life. Another weak signal could be the trend towards production of renewable energy, also in African areas, and the growing investments from foreign countries in African regions.
**Potential impacts**

The potential impacts of a strong and rapid African rise and socio-economic development could have an immediate impact on an emigration flow contrary to what we are experiencing now, due to the willingness of emigrants to go back home and try to build there a better life.

Impacts could be produced in the area of international relations. The production of energy from algae could radically change the geopolitical balance in that African areas would be suddenly at the centre of interest from all over the world.

**Potential Actions**

### Policy actions

**Early actions:** Enhancing diplomatic relations and cooperation programmes between Europe and Africa, strengthening relations, looking for opportunities which would produce a win-win result between the two continents. Emphasis could be placed on the construction of alliances between Europe and African countries, to front globalisation challenges.

**Early reaction:** Setting good immigration policies and promoting relations which aim at local development.

### Business actions

**Early actions:** Promoting regulatory and corporate governance approaches in order to pursue at the same time scientific development, corporate social responsibility policies and ethics. Promoting business cooperation and joint ventures between European and African companies.

**Early reactions:** Building companies with shared capital between Europe and Africa, trying to ensure equal treatment for workers in both continents. Building strong alliances.

### Research actions

**Early actions:** Increase in applying approaches of governance and geopolitical studies. Exploring new ways to achieve human development and to promote cooperative initiatives in sustainable economics and development.

**Early reactions:** Establishing agreements in the Mediterranean area.
The Poor Old

RECOMMENDED RESEARCH

THEMATICAL AREA
SSH

RESEARCH TOPIC
Analysis of potential old-age poverty in the EU.

The EU-population is ageing. Thus, in the future, pension schemes will face huge problems as continuously less employees have to compensate for an increasing number of pensioners. Social changes and old-age poverty are inevitable in many, especially rural areas, across the EU. The elderly, living under increasingly bad conditions will lose faith in their governments that failed to secure their means of subsistence. Moreover, they will be disappointed by society that allowed social exclusion. Some will even be forced in desperation to commit crimes – the victims will become perpetrators.

OBJECTIVE
Even though the demographic challenges are broadly known, it seems that there are no holistic concepts on how to deal with them and how to take early action. The objective of the project would be an EU-wide regional analysis of the future population structure with a focus on people above 60 and their risk of living below the poverty line. The aim would be to firstly develop a comprehensive approach on how to deal with these risks and to secondly define concrete recommendations for actions for different regions.

EXPECTED IMPACT
Increased research on this topic would firstly illustrate that a lack of sensitivity to the problem might have dramatic impacts on EU societies and economies and secondly could show what kind of early actions could help to curb these effects.

IMPORTANCE FOR EUROPE
The European Union and its member states face a huge challenge: its ageing population. The increasing ratio of elder people will shape the structure of future society. Skilled labour to serve the aging population are already recognised problems and are openly discussed but combined with the economic impoverishment of this large sector of population as well as other factors as outlined above, social cohesion and economic vitality will be jeopardized.

In all member states of the EU, social systems are overburdened because of increasing life expectancy, rising costs of medical treatment, inefficiencies in pension systems and unfavourable developments in the labour markets. The social security systems collapse or at best provide only a very low income, far below the level required for a worthwhile life in old-age. A new stratum is established: The Poor Old. This undesirable wild card would have negative impacts on society as well as on the economy, e.g. rising crime rates amongst the old, social tensions and fragmentation, ghetto communities, declining purchase power with associated economic and social consequences.

FP7 Themes
ERA Goals

Author(s): Ines LIETZKE (Z_punkt), Sivert VON SALDERN (Z_punkt)
Image: iStock photo
**Wild features**

Slowly and at first unnoticed, more and more elderly people quietly experience and suffer from declining income. In the beginning, they are still optimistic about their future and do not lose their faith in an improvement of their situation, e.g. that their family or the government will find a solution. But no solutions are found and the situation worsens. Pension levels fall below poverty levels. Although old age-poverty is already widespread, the wider public does not recognise its severity and full extent; affected elderly people hesitate to disclose their situation, because of feelings of shame.

But later a situation is reached when elderly people (and societies such as Age Concern which represent them) can no longer disguise their plight. An increasing number of elderly people depend on charitable institutions such as charity shops or sponsored food banks and seek financial and emotional support from family and friends – but often, there is no one left or available to respond. They feel socially ostracised. They are cut off from mainstream public life and escape into communities (ghettos) and lifestyles where similar people – elderly poor – can co-exist without attracting attention or disturbing the social conscience. “Elderly slums” are established; especially women and migrants are affected and live under very bad conditions.

The situation becomes even dangerous in some areas as criminal acts and illegal employment in the low income sector rise immensely and become a threat for the stability of society.

**Potential impacts in Europe**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Negative</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key actors**

Key actors related to this wild card, include:

- **Scanners or “early warners”:** There is a growing attention in the public and political discussion about demographic change, declining pension levels, rising unemployment and its possible impacts on old-age poverty. Newspapers, scientific magazines and TV-documentations increasingly dedicate themselves to this issue. A striking example is the German TV-documentary “2030-Rebellion of the Elder”.

- **Shapers (i.e. enablers/inhibitors):** The most important shaper of this wild card is demographic change in Europe. Whereas the problem about it is that politics, society as well as economy fail in preparing for the change. Pension schemes, for example, still rely on old demographic realities, products are developed for young affluent individuals and the society longs for eternal youth and closes its eyes to the rising number of poor and needy.

- **Stakeholders:** Elderly people both as victims and perpetrators, insurance companies, employers, political decision-makers but also society as a whole...

**Potential impacts**

Elderly people could increasingly become depressive by a growing feeling of inferiority and social exclusion. Suicide rates might increase rapidly. Additionally, it might become common across the EU that criminal acts such as mugging, bank robberies or drug dealing are committed by the old poor – to supplement their meagre income. Security institutions would probably not be prepared for such situations and would need to re-orientate themselves.
There would also be a major economic impact since an increasingly large proportion of the population would have no disposable income and hence role in the economy, reversing the expectations of a perceived encroaching ‘third age’ or ‘silver market’ era as investigated and predicted throughout the 1990s and 2000s. The pressure on public social transfer expenditures would rise even more. Positively thinking, this could lead to a long overdue reform. Families would have to carry higher burdens due to providing care and financial support for older relatives. They might not have the financial and mental power to deal with the situation and family cohesion might be disrupted more severely.

**Business actions**

**Early actions:** Insurance and financial institutions might be asked – possibly in cooperation with companies – to offer attractive private pension insurances and saving plans to young employees who would typically be expected to depend only on public pension schemes. The consumer industry is challenged to focus on less affluent customers.

**Research actions**

**Early actions:** Increased research should focus on estimations about the future number of elderly who are in danger of living below the poverty line. Research projects should further identify the regional specific early actions to counter this challenge – these could reach from small actions such as initiatives for flat-sharing communities for senior citizens to major actions such as an adjustment of pension schemes.

**Weak signals**

A growing number of old-age crimes can already be observed in regions which are extremely affected by demographic change, particularly in Japan, but also in the European Union; e.g. in the beginning of 2010, three pensioners hold their investment consultant as hostage to make him responsible for their financial losses. As a result of continuing advances in medical treatment the elderly population is kept alive for much longer. However many cannot live on their own anymore and must move (or be moved) to degrading nursing homes. Media reports on bad practices in nursing homes become more frequent but policy and community responses are inadequate: the elderly grow lonely, are neglected, and in some cases abused. Often, it is the lack of skilled personnel in elderly care that leads to such circumstances.

**References**


Total control by Big Brother technologies

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities; ICT; Security

RESEARCH TOPIC
Secure society under control of “big brother” technologies.

Development and deployment of new large automatic intelligent networks of surveillance systems may increase security for society, e.g. via automatic detection of malicious intentions by individuals inside peaceful crowds. Concepts of privacy, individuality, and society are changing. However, there is always a trade-off between security and human rights which should be considered and solved in a well-informed way. Surveillance system operations should be transparent to society and for the well-being of society.

OBJECTIVE
Research should assess not only the technological aspects of modern security solutions, but also related ethical and social aspects including changes in the perception and meaning of privacy and attitudes in society. The technology can easily be misused so reliable governance systems need to be designed. Another important aspect is that such technologies could be adopted by terrorists and organized crime even before police forces have started to use them.

EXPECTED IMPACT
ICT and security research should be oriented to develop suitable surveillance technologies which provide genuine security for society. Examples include techniques for semantic analysis of communications and techniques for data mining to identify threatening patterns.

SSH research should a) increase awareness of the associated ethical dimensions; b) devise strategies for appropriate policy responses across the EU; c) inform common legislation and regulation across the EU; d) inform business enterprises and innovation intermediaries in this field.

IMPORTANCE FOR EUROPE
European society is exposed to increasing danger of terrorist attacks and organized crime. Appropriate “big brother” technologies may help deal with these threats. There is potential positive impact on economic growth, costs of policing and state administration (e.g., immigration authorities) and greater levels of comfort and satisfaction for citizens. However, it is necessary to prevent misuse of the technologies and assure continuity of democracy. It is vital that policy response which would aim to control and regulate this issue is informed by research into the foreseeable social implications of these developments. In future it may be furthermore important for the EU to form a coherent legislative response and to guide member states in forming their legislation.

Large automatic intelligent networks of surveillance systems are developed and deployed, and are used to automatically detect malicious intentions by individuals in peaceful crowds. This provides some comfort and assurance but there are moral and legal issues. For example, who will decide what the word malicious exactly means and how the technology might interpret this definition, and under which kinds of circumstances? An intention to rob or kill somebody might be clearly interpreted but what about ‘unsuitable’ political opinion? What if the personal information from the surveillance system might fall into unauthorized hands or be misused by organized crime? Who will be able to guarantee that the system will always protect the population and public interests and that it will not be abused against people?
In 1949 George Orwell wrote his legendary novel ‘1984’ and described a totalitarian society under the omnipresent supervision of ‘Big Brother’ technology. Later on this kind of surveillance became reality in significant parts of the world. East European countries escaped from it 20 years ago, but the idea is not dead and the mentality of society is changing. A policy of radical measures against crime and terrorism seems to be politically successful in various countries and makes the trade-off between security and human rights a hot topic for discussion. The danger of "big brother" lies in the centrality of information - knowledge about everybody can be controlled by just a few. Therefore the proposed wild card system should be transparent to society and for the well-being of society. What if some features of monitoring systems (e.g. virtual social networks on the Internet and customer loyalty cards in supermarkets) are developed not to serve people, but to spy on them?

Potential impacts
Key actors related to this wild card include:

- Researchers (first of all ICT specialists), who will develop and test the technology
- Security experts, who will be interested to ensure security of the system
- European and national governments, which will have to create appropriate laws and rules for use of the technology
- Police and security force, which will use the technology for the well-being of the society
- Ordinary people, who will have to trust the system
- Organized crime, criminals and terrorists, who can strive to misuse the system for their illegal business.

Potential impacts
Positive potential impacts of the wild card include increased security, and reduced crime and terrorism. In addition the system can identify interesting information for improving other areas of life. Demonstration of the wild card can have huge positive impact on business of ICT companies, which will sell this technology to governments.

However there is range of possible negative impacts and threats: the threat of rule by a few; increase of costs of the police state administration; business abuse; misuse by organized crime; loss of privacy and changes in the concept or perception of privacy.
Potential actions

To support demonstration of the wild card and at the same time to prevent its negative impacts is an objective which requires a range of co-ordinated actions in policy, business and research. Actions are desirable both before and after the wild card demonstration.

Policy actions

Early actions: Stronger legislation for privacy; fight with strong disapproval of public (by policy campaigns); create fully transparency on all levels (state, business etc.); prevent central data collection; create decentralized systems

Early reactions: Allow a big brother “free zone”; transparency; limiting restrictions; social resistance; prevent control of data by a few persons/companies

Business actions

Early actions: Develop applications based on big-brother data; weaken related power; secrecy of cooperation; new equipment to be developed/installed/maintained; new employment opportunities/new kinds of employment

Early reactions: Marketing of anti-big-brother products; growth of personalized services; growth of economy due to the safety feelings that foster investment

Research actions

Early actions: Research on population behaviour changes; research on change for the political system; image processing and understanding; data mining to identify threatening patterns; data extraction; segmentation of information; profiling of actors; Analyze communications semantically

Early reactions: Research on social consequences; research on population behaviour changes

Weak signals

There are numerous weak signals which can indicate oncoming manifestation of the wild card: toll and sensor systems to control driver’s behaviour; scanning at airport security control; accepted data collection by private companies (e.g. Google Gmail); enormous efforts in automated data analysis; centralization of data collection/data integration; data collection related to bank transactions; increasing use of electronic rather than cash transactions (credit cards, mobile payments, smart cards); use of CCTV systems; customer loyalty or reward cards collecting data on consumer behaviour; market research and intrusive phone calls with hidden caller identity, purporting to offer products and services but gathering intelligence; general tolerance of the public towards GSM trading, surveillance cameras and social media systems such as Facebook.

References

Robots & iCare for the Aged

THemetAic AREA
Social Sciences and Humanities; ICT; Health

Recherche Topic
Aging and healthcare through technology
Currently EU states’ budgets on healthcare for the ageing population are rising dramatically. However, in future the technology may offer cost saving solution, which is massive use of robots and other self-acting technology in caring for the elderly people. New technology will save money to people and state budget and make possible independently life of elderly people, but alternatively it may have unfavourable impact on social inclusion and psyche of the elderly people.

Objective
Research should assess not only the technological and medical aspects of the elderly people treatment automation, but as well the ethical and social aspects of the issue. There is a need to deal with mental barriers of elderly people against new technologies. The social worker will be more technicians as caregivers. And there is a risk that at the end elderly people will only get the care of robots without contact with "humanity".

Expected Impact
eHealth and ICT research should be oriented to develop suitable ways of communication and interaction between people and robots. The SSH research will a) increase awareness of ethical dimensions of technology supported aging and healthcare; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and innovation in this field; e) inform educational and health strategies on the subject of technology supported aging and healthcare.

importance for eurOpe
The technology supported aging and healthcare can potentially have enormous effects on contemporary system of care for elderly and in long term diseased people. Implementation of new technologies can lead to healthier society in long-term view and can improve the health care as such contributing to more competitive Europe even with aging “problem”. However it is necessary to ensure balance between physical and psychological care and as well ensure the social inclusion of people who will be under care of robots. It is vital that policy response which would aim to control and regulate this issue is informed by research into foreseeable ethical implications these development may have. In future it may be furthermore important for EU to form a coherent legislative response that could guide member states in forming their legislation.

Currently state budgets on healthcare for the ageing population are rising. This wild card revolves around robots and technology being used more in caring for the elderly, especially to save on costs. This already happens in other sectors, e.g. in banking; people no longer visit bank counters and get a human service but instead use a cash machine or the internet to do most of their bank transactions. Similarly elderly people will in the future receive a lot of ‘automatic’, ‘robotic’ or ‘self-administered’ medical care using ‘self-help’ and assistive technologies. The workload for doctors, nurses, and other healthcare workers will change accordingly, with financial savings or budget reallocations. However there is a danger of elderly patients suffering from alienation and social exclusion. Therefore it will be necessary to develop suitable tools to compensate such feelings.

FA7 Themes

ERA Goals

Author(s): Martin FATUN (Technology Centre ASCR)
Contributor(s): Mikolaj DORNAK (Cyber Fox), Luca DAVIDOVA (BIC Group), Sabine PAYR (CSA), Sanri FORT (Barcelona Media - Innovation Centre), Ladislav KOVAC (BIC Group), Yanuar NUGROHO (MIOIR The University of Manchester)
Wild features

The wildness comes from the idea that robots would take sufficient care of the elderly instead of human carers. Technological solutions are not a difficult challenge, the sensors and hardware exist, what is needed are applications. We need to develop ways that machines can read the signals of the human body, to understand them and to react to them.

The controversial issue is the fact that elderly people will get their care predominantly from robots or machines and not from human carers. Humans will become technicians overseeing the operation of numerous robots and machines. It will be extremely important to overcome the mental barriers of elderly people against new technologies and to combine their physical and psychological care appropriately. For this purpose some elderly-friendly virtual social networks could be developed although this type of support is itself contentious.

Possible interpretations

Positive interpretation assumes that the wild card can help the elderly people to live independently. They may be healthier without visiting a doctor. There is possibility to effectively prevent diseases in a preliminary phase. Technology-assisted care in the future can be done more professionally, faster and cheaper than today.

Such technology might offer individuals the advantage of convenience and encourage pleasant independent living instead of hospital treatment. But unpleasant social and psychological side-effects are likely including isolation (e.g. they would miss their conversations with friends in the physician waiting room). Another consequence would be the transfer of life experiences from the older to younger generations and hence less learning amongst younger workers about the healthcare needs and services of older people.

From the ICT point of view the development of new nursing hardware and software as well as advanced social network systems for elderly people and to exchange experience between generations can provide interesting motivation and business opportunity.

Quite negative interpretation assumes that details on person’s health and mental state will leak out of the system and will be misused, which can have whole range of unpleasant and/or dangerous consequences for individuals and society.

Key actors

Key actors related to this wild card include:

- Researchers (first of all ICT specialists, physicians), who will develop and test the technology
- Elderly people, who will have to get a trust in the system
- Health care administration and professionals, because the treatment will be cheaper and less demanding on medical staff; more technical skills will be needed
- Electronic & robotics & software industry, who will provide the solutions
- Security experts, who will be interested to ensure security of the system
- European and national governments, which will have to create appropriate laws and rules for use of the technology
Potential impacts
There is a wide range of positive potential impacts of the wild cart, which include more successful and cheaper care for elderly people. This can lead to decreasing mortality, better healthcare expense planning, state budget savings and more competitive national and European economy in general, even with the „aging” problem.

Demonstration of the wild card can have huge positive impact on business of ICT companies, which will sell this technology to citizens and governments. Rather negative impact can feel medical staff (especially the less qualified ones) in form of unemployment. However there will increase demand for staff with technical and ICT skills.

Possible negative impacts include social exclusion and mental deprivation of the elderly alongside a dehumanization of the health and social care profession.

Potential actions
To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card demonstration actions:

<table>
<thead>
<tr>
<th>Policy actions</th>
<th>Business actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong></td>
<td><strong>Early actions:</strong></td>
</tr>
<tr>
<td>Create the social framework; establish the non discrimination policy towards elderly people; flexible limits for retirement; sustainable research; good health care system; education for seniors (possibility to switch profession)</td>
<td>Affordable products for seniors helping them in daily life; business models for seniors; new work force about knowledge and experience:</td>
</tr>
<tr>
<td>Early reactions: Establish the privacy policy; reform of health system; social workers requalification</td>
<td>Early reactions: New strategy for elderly people - not only clients but also partners in business; new products (travel, leisure etc.) for aging people</td>
</tr>
</tbody>
</table>

Research actions

| Early actions: Robotics and smart houses research; Interface oriented technology research; social research (life models); research on demoscopic impact |
| Early reactions: Research on prolonging of active life; sociologic and psychology research on consequences (are they happy?) |

Weak signals
There are numerous weak signals which can indicate oncoming manifestation of the wild card: more of affordable technologies to help older people; higher spending on R&D as % of GDP; demographic pressure on public finance & cost of human caretakers; people are getting need to living individually and to being supported by ambient technology -> old age is a continuation; smart home technology is available; research on “intelligent monitoring” is going on; increase of taxation; increase of social changes; family structure - no or single child families -> burden of caretaking is too much for one; raise of “human hyenism” where older people are exploited by making of false promises or hopes; old people remain active longer -> empowerment by technology is necessary.

However there are as well weak signals pointing to possible fear of the new technology: mental barriers of elderly people against new technologies; feeling of alienation and/or social exclusion; increase of hacking. As usual there are two sides to this story and the wild card is not clearly positive or negative.

References
LeadingAge Center for Aging Services Technologies (CAST) http://www.aahsa.org/cast.aspx
Center for Technology and Aging http://www.techandaging.org/about_us.html
SENA – Social Engagement with Robots and Agents, Project of FP7 (ST FP7 2318680), http://project-sena.eu/
Recommended Research

Thematic Area
Social Sciences and Humanities, ICT, Health

Research Topic
Advancement in brain scanning technology.

Brain/thoughts scanning and imaging is an ongoing trend. There are some signs that the development is moving forward – progress in brain research, mapping of emotions etc. (e.g. the Blue Brain Project at http://bluebrain.epfl.ch). Development of universal translator of brain impulses and patterns may be really useful e.g. in form of software application, which would be able to analyze, process and structure the captured ideas directly into coherent text draft form. However there were some downsides identified with this invention as well. Not all thoughts would be desirable on paper.

Objective
Research should assess not only the biological and informational aspects of the brain scanning issue, but as well the ethical and security aspects. Automated read-out of information from the brain may save the author typing all the ideas into text form and all that would be left would be editing them. But as we already know from the Facebook or Twitter Experience, easy sharing of ideas may easily lead to loss of privacy with many negative or even dangerous consequences. SSH research should identify sources of this dangerousness in patterns of social and human behaviour and prepare methods, techniques and measures for dealing with it.

Expected Impact
Bio-information research should be oriented to develop brain-computer interfaces, brain simulation and brain mapping tools. The SSH research will a) increase awareness of ethical dimensions of brain/thoughts scanning; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and innovation in this field; e) inform educational and health strategies on the subject of brain scanning.

Importance for Europe
Brain/thoughts scanning technology can potentially have enormous effects on contemporary society. Positive impacts comprise efficient improvement of human work, knowledge and learning improvement, possibility of lie detection and potential for inclusion of severely impaired people into society. Negative impacts comprise brain hacking, misuse of information and private identity risks. It is vital that policy response which would aim to control and regulate this issue is informed by research into foreseeable ethical and security implications these development may have. In future it may be furthermore important for EU to form a coherent legislative response that could guide member states in forming their legislation.

This wildcard was generated from the Grand Challenge Work Life Balance. The original idea was derived from a work saving aspect whereby thoughts could be transferred via a “thinking cap” device straight from the brain onto software similar to Microsoft Word. The software/application would also be able to analyse, process and structure the ideas into coherent text ready for editing. It would be powerful ‘office productivity’ software. However there were some downsides identified with this wild card, associated with the potential loss of privacy and security. Not all thoughts would be desirable on paper.

Wild Card

FP7 Themes

ERA Goals

Author(s): Martin FATUN (Technology Centre ASCR)
Contributors: Miroslav DORNIAK (Cyber Fox), Lucia DAVIDOVA (BIC Group), Sabine PAYR (OFAI), Santi FORT (Barcelona Media - Innovation Centre), Ladislav KOVAC (BIC Group), Yanuar NUGROHO (MIOIR The University of Manchester)
Wild features

Brain scanning, brain imaging etc. are ongoing research fields. Such technology does not however take ideas straight from the brain and record them in a coherent way using familiar language. For this to be possible various significant ICT developments are required. Currently research is focused on chemistry – pathologies of the brain. However for the wild card to manifest in the future programs are needed to translate brain patterns. It would need a better understanding of different cultures. We might also need different applications for women, men and children and perhaps for those who are left handed or right handed etc. It is interesting also to consider if this technology could be extended to animals so that we could understand their thoughts.

Possible interpretations

Positive interpretation assumes that the wild card will lead to easy sharing of ideas, which will increase the level of understanding and cooperation among scientists and innovators all around the world. Likewise it could be a big chance for those disabled persons who are not able to communicate their thoughts and ideas in the usual way.

On the other hand the wild card may be interpreted as undesirable because of its potential to violate privacy. Not everything which is thought will deserve to be published or shared with other people. Also there is a probability that the technology would be (ab)used to monitor thoughts (e.g. of accused criminals or for security intelligence) and/or to control crowd behaviour. However distant into the future such capability might be, there will be a need for an ethical code regarding its application.

Key actors

Key actors related to this wild card, include:

- Researchers, who will test and use the technology for transcription and sharing of ideas
- Disabled persons, which may use the technology for day-to-day communication
- Security experts and spies, who will be interested in use of the technology for espionage/counterespionage purposes
- Stakeholders, European and national governments, which will have to create appropriate laws and rules for use of the technology

Potential impacts

There is a wide range of positive, negative or mixed potential impacts of use of the “thinking cap” device. The positive ones include improvement of sharing ideas and knowledge across different languages, cultures and social groups, which can lead to strong improvement of knowledge, innovation and efficiency of human work in EU countries and worldwide. Very important positive impact of the technology can be putting severely impaired people back to community and allowing them not only to communicate but as well to actively contribute to common knowledge. As “value added” features we can get e.g. effective tools for language translation, lie detection or communication with animals.

However there is serious risk of breaking of privacy and legal rights of people using the “thinking cap” technology. It can be easily misused to monitor their thoughts (brain hacking) or in the utmost point even to control their behaviour.
In combination with other technologies (chips in human body, artificial organs and parts of human body) this technology may lead to genesis of cyborgs or “trans-humans” and formation of gap between “classic” and “enhanced” human beings.

**Potential actions**

To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card actions as well:

<table>
<thead>
<tr>
<th><strong>Policy actions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Information about opportunities and risks; support schemes for R&amp;D of brain and IT; prepare appropriate legislation and regulation.</td>
</tr>
<tr>
<td>Early reactions: New privacy and security policy; personal IPR protection; brain drain regulations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Business actions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Information about opportunities and risks; support schemes for R&amp;D of brain and IT; raising awareness on positives of the technology; software business go open minded; involve medical companies in research.</td>
</tr>
<tr>
<td>Early reactions: Active collaboration in dealing with undesirable consequences; development of next generation products; raising awareness on positives of technology; involve medical companies in research.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Research actions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Neuroscience plus ICT -&gt; interdisciplinary research; decreasing the cost of neural net producing; research on brain simulations; new technologies for data compression and storage; research on suitable legislation; research on consequences for brain manipulations.</td>
</tr>
<tr>
<td>Early reactions: Analysis of mental structures to improve computational structures; consequences of return to nationality.</td>
</tr>
</tbody>
</table>

**Weak signals**

Brain scanning and brain imaging, etc. are ongoing research areas. There are some signs that the necessary fusion between ICT and biological research of the brain has already started. E.g. there is a project in Switzerland called the Blue Brain Project (http://bluebrain.epfl.ch/), which aims to model the human brain. Other symptomatic weak signals may be: progress in brain research and mapping of emotions for specific activation patterns; development of social networks (aka Facebook); development of a universal translator of brain impulses and patterns; Stephen Hawking and his theories; collaboration of EU and US and Japan on brain research; release of intelligent robots recognizing emotions and able to communicate.

However there are also some filters or barriers which could prevent the occurrence of the wild card. Primarily the security issues would have to be taken into consideration. Undoubtedly nobody wants to be hacked and also nobody clearly wants to put all his thoughts down on paper without restriction.

**References**

3D media trustworthily copying reality

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities, ICT, Security

RESEARCH TOPIC
Advancement in 3D virtual reality. Advanced 3D technology is used for image data recording and presentation, which can perfectly imitate reality. Practically anything from personal meetings to trying on new clothing can be done in 3D virtual space instead of a real pub or shop. Such a new technology has a potential to change the usual patterns of everyday life, including work, shopping and entertainment. This would also mean that avatar design could take off; you could send your avatar to virtual meetings in case you yourself would not be able to attend. Virtual senses could be just around the corner. People would be able to see through the eyes of the avatar with webcam technology, taste and small sensors would be utilized.

OBJECTIVE
There could be benefits of acceptance of 3D virtual reality mainly in environmental area. People would not need to travel so much – especially for business. But this development can as well potentially lead to social exclusion of some groups of people and also to even greater identity theft. A big question is, who owns your face – are others allowed to use it for their avatars? SSH research should identify sources of this potential danger in patterns of social and human behaviour and prepare methods, techniques and measures for dealing with it.

EXPECTED IMPACT
ICT and security research should be oriented to develop all the new and secure technologies for 3D virtual reality. The SSH research will a) increase awareness of ethical dimensions of 3D virtual reality environment; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and innovation in this field.

IMPORTANCE FOR EUROPE
The 3D virtual reality technology can potentially have enormous effects on contemporary society. Positive impacts comprise efficient improvement of human work, knowledge and learning improvement and potential for inclusion of seriously impaired people (such as paraplegics) into society. Negative impacts comprise social exclusion and security risks, especially identity theft and targeted misinformation. It is vital that policy response which would aim to control and regulate this issue is informed by research into the foreseeable ethical and security implications that these developments may have. In future it may be furthermore important for the EU to form a coherent legislative response that could guide member states in forming their legislation.

Advanced 3D technology is used for image data recording and presentation, which can perfectly imitate reality. Practically anything from a personal meeting to trying on an item of new clothing can be done in 3D virtual space instead of in a real pub or shop. Such technology can change our usual patterns of everyday life, including work, shopping and entertainment.

FP7 Themes

ERA Goals
This wild card is first and foremost about communication. This virtual 3D reality exists in some way already. There are places where you can upload your image and try on haircuts on the Internet and there are also places where you can try on clothes online. This has however never taken off. 3D TV is around the corner, the technology exists but there is almost no content yet.

This would also mean that avatar design could take off; you could send your avatar to virtual meetings in case you yourself would not be able to attend. The strategy “think globally – act locally” may be finally fulfilled. There could be benefits of this, especially environmental. People would not need to travel as much – especially for business. But this could also potentially lead to even greater identity theft and the big question is, who owns your face – are others allowed to use it for their avatars? Virtual senses could be just around the corner. People would be able to see through the eyes of the avatar with webcam technology, taste and smell sensors would be utilized etc.

Very important there will be social aspect of the wild card demonstration. What about “digitally shy” people refusing presence in the virtual world? Will they be socially excluded in new world of digital social interactions?

Positive interpretation assumes that the wild card will lead to simply easier communication and sharing of ideas in many cases including business, learning, entertainment etc. Especially in research it can significantly increase levels of understanding and cooperation among scientists and innovators all around the world. It can provide better opportunities for disabled or shy persons to share and communicate their thoughts and ideas with surrounding society.

On the other hand the wild card may be interpreted as undesirable because of a security threat. It can increase the possibility of misleading buyers, business partners, readers, users etc, by false (or stolen) identities and 3D disinformation. What we see need not to be what it really is henceforward. Fakes can look real and simulations, and movies can look like reality and misrepresent reality.

The wild card can address and create problems associated with social inclusion and exclusion. (e.g. disabled or elderly people might be more easily included in groups; persons with strong virtual presence or personality might be deliberately excluded). These issues need to be carefully examined.
### Key actors

Key actors related to this wild card, include:
- Researchers, who will develop the technologies
- Businesses (including new ones such as avatar designers), which will sell the technologies
- Users, who should accept the technologies
- Disabled persons, which may use the technology for day-to-day communication
- Stakeholders, European and national governments, which will have to create appropriate laws and rules for use of the technology

### Potential impacts

There is a wide range of positive, negative or mixed potential impacts of use of 3D technologies. The positive ones include more effective business, saving of energy, environment protection, enhanced communication among people and enhanced sharing of ideas.

However there are negative impacts as well, such as loose of social interaction and risk of abuse of the technologies by criminal. There are as well potential negative economic impacts, e.g. bankruptcies of travel agencies and decrease of number of plastic surgeries.

### Potential actions

To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card actions as well.

### Business actions

**Early actions**: Information about opportunities and risks; raising awareness on positives of the technology; development of new business models and opportunities

**Early reactions**: Active collaboration in dealing with undesirable consequences; implementation of security policy; development of next generation products; raising awareness on positives of the technology; replacement of old written off businesses (e.g. travel agencies) by new ones (e.g. virtual travel agencies and shops)

### Research actions

**Early actions**: Research on augmented reality, research on new technologies for data compression and storage; research on suitable legislation; research on image processing and understanding; research on virtual eyes and other human senses; research on social aspects of 3D virtual reality

**Early reactions**: Research on virtual eyes and other human senses, research on direct links to mental processes, research on social aspects of adoption of 3D virtual reality; research on population behaviour changes, research on demographic changes

### Policy actions

**Early actions**: Information about opportunities and risks; prepare appropriate legislation and regulation; prevention of abuse of the technologies; increase of R&D spending as % of GDP; support of business and research clusters

**Early reactions**: Rising awareness of public (positive campaign); establish new security policy; establish new system of personality rights and IPR (face protection, avatar libraries and their protection)

### Weak signals

There are many signals of the incoming trend of 3D virtual reality: 3D movies (like Avatar) and TV sets; there are places where you can upload your image and try on haircuts on Internet; there are places where you can try on clothes online; there are possibilities of virtual walks through various towns (Google Maps); there are various virtual worlds and spaces on Internet; people like to share images and videos through virtual social networks. They will probably like to share 3D virtual reality as well; many extraordinary applications are expected, so there is an excitement about new “sexy” technologies.

However there are also signals of possible security threats and abuse of the technologies: identity theft, infringement of personality rights and IPR, numerous cases of hacking, phishing etc. Rising addiction of people to virtual social networks can lead to significant increasing of social exclusion in future.
Free Time Society in Europe

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH).

RESEARCH TOPIC
Foresight of social trends, Future of education.

OBJECTIVE
Research should assess the future technological trends and their impact on the labour market and economical growth. Research should assess changes in time usages of the individual and their implications on the possible imbalance between paid work time and free time.

EXPECTED IMPACT
Research will:

a) Increase awareness of the various dimensions of this phenomenon.

b) Help policy makers and decision makers responses in all levels.

c) Inform business stakeholders on new opportunities opened due to these developments.

Better design and plan of future urban centers to cope with the “Free Time” dimension of the future society.

IMPORTANCE FOR EUROPE
Growing free time of the European citizen can result in positive as well as negative consequences. On the one hand it will raise the quality of life but on the other hand it might result in increasing crime and violence. It is vital for Europe to be prepared in advance to such an era which will require more involvement of the central governments and will need new innovative policy tools.

The balance between free time and working time is significantly shifted towards more and more free time. Current socio-economic trends will cause dramatic changes in the labour market and patterns of employment. New technologies will increase the use of machinery and robotics in production processes and will have an impact on employment. The “Free Time Society” will be created, in which most of the population within the working age is not occupied most of the time. Thus, the free time of people is much longer then the time they have to devote to paid work.

Definitions

Time usage of people is divided into three types:

a. Time for paid work.

b. Time for necessities (e.g. sleep, eating, etc.).

c. “Free time” - the time remaining after deduction of (a) and (b)

We divide the free time further into two types:

a. Structured free time – the time devoted for various planned activities according to human choice (e.g. leisure activities, volunteering, education etc.)

b. Unstructured or real free time – time of the individual which is not planned and not pre-allocated for a specific activity.

FP7 Themes

ERA Goals

Author(s): Yair Sharan, Tal Soffer – The Interdisciplinary Center for Technology Analysis and Forecasting at Tel Aviv University (ICTAF)
**Wild features**

The wild factor here is that the balance between the time people have to devote to paid work to guarantee their living and the remaining free time is significantly shifted in favour of free time. The labour force is significantly declining and production and economical growth is more and more guaranteed by the use of robots and other new technologies. Technology replaces human force. Only a small fraction of society elite will control the economy. Most of the people will be unemployed with no structured and binding framework. Free time culture will dominate day to day life. Risks of potential violence and crime might emerge. Furthermore, future medical treatments might reduce the time required for sleep – thus increasing the free time even more.

**Possible interpretations**

Most of the interpretations focus on how people will accept the new situation being unemployed and having to plan their free time. Their social status will have to be redefined as well as their social networks. People might look for alternatives of unpaid work or invent new employment patterns.

---

**Potential impacts in Europe**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✦</td>
<td>★★★★</td>
<td>★★</td>
<td>★★★</td>
<td>★★</td>
<td>★★★★</td>
<td>★★</td>
<td>★★★★</td>
</tr>
</tbody>
</table>

---

**Key actors**

Actors belong to three pillars:

- The policy makers including governmental agencies, municipalities, NGOs, educators, etc.
- Employers and service providers in all sectors.
- The citizens.

**Weak signals**

- Increasing pressure from workplaces to shorten the working days / hours.
- Increased use of new technologies (especially robotic systems) in industry and in the services.
- Growing rate of unemployment.
- Increasing ICT capabilities globally which result in working force decline.
- In Western Europe in the 1960s and 1970s the ‘leisure society’ concept was widely promoted as a likely future scenario; it is somewhat surprising that it has NOT happened.
- Some economists have a rule of thumb related to GDP per person and necessary working hours.
Potential actions
No doubt that Europe should prepare for such an era in which more and more people consume more and more services which fill their free time. Actions will be needed especially to take care for those who find it difficult to manage their free time. Some might find solutions in negative activities including crime. Actions in national and municipal levels should be prepared to cope with such a development.

Policy actions
- Policy makers would need to respond to these changes of day to day life of citizens.
- New education programs for people in all ages should be developed and realized.

Business actions
- New business opportunities will be opened. People will be ready to consume and pay for services like leisure, tourism, health and education, sport and so on.
European Commission scrap research support projects

**RECOMMENDED RESEARCH**

**THEMATIC AREA**
Social sciences and humanities, Capacities (Coordination and Support Actions)

**RESEARCH TOPIC**
Studies into the effectiveness and efficiency of research funding schemes and projects.
Small scale projects to address the impact of previous research projects and consultations on what research support and infrastructures are required to promote participation in European collaborative research projects. Research should address best practice for implementing projects to maximise results, and also look at barriers to why some key stakeholders and organisations are not participating in funded projects.

**OBJECTIVE**
The key objective of such research is to assess what support and infrastructures are required to promote European research opportunities. Research into effectiveness of previous projects would also be beneficial to ascertain which projects are having the desired impact and whether there are any trends in projects that are hindering exploitation of outputs (ultimately not providing sufficient return on investment for Europe).

**EXPECTED IMPACT**
The impact of such studies should provide an insight as to what types of projects are effective and efficient in terms of research outputs and generating new knowledge in Europe. This allows the future of the Framework Programme to be structured in the most efficient and effective fashion.

**IMPORTANCE FOR EUROPE**
This issue is key to Europe’s research agenda, and it is looking at making FP7 more effective and efficient in its implementations. This issue may have an adverse effect on the link between policy makers and researchers, and a shift change in research agenda may be required to ensure the quality of research does not diminish through less dissemination and exploitation of outputs.

The European Commission decide that research support projects do not provide a sufficient return on investment and are not viable. These funding schemes (Coordination and Specific Support Actions) are scrapped, and there are no alternative infrastructures put in place to support European research. Public sector research falls and corporate/private funding is more prevalent with manipulation of the research agenda for personal gain.

**FP7 Themes**

**ERA Goals**

Author(s): Anthony WALKER (RTC North), Rafael POPPER and Thordis SVEINSDOTTIR (University of Manchester)
Wild features

The ‘wild’ factor here is that if the infrastructure is not in place to support cutting edge research and development then there could be a dramatic drop in the quality of research undertaken at European level. This will hinder the possibility of new companies to be involved in funded R&D as the routes to access are drastically reduced. With the reduction of industry participation (particularly SMEs), there will be much less exploitation of research results ultimately leading to a lack of practical outputs from funded research.

Further surprising features related to this wild card include that even if more funding is provided for technical or blue sky research, without sufficient support, the quality of research and the stakeholders involved may be reduced, even though the decision to ‘scrap’ research support projects was taken to further promote scientific research.

It is also worth considering that along with the negative effect on European competitiveness, this may also lead to the manipulation of the research agenda for organisations to establish a monopoly or create a scenario where economically viable projects become more important (for example, more research on plastic surgery techniques and Viagra rather than on water cleansing or famine cure).

Possible interpretations

The main interpretation of this wild card is with no projects funded to support technical research the quality of actual research will diminish. This could obviously lead to lack of participation of new companies or high quality researchers and organisations seeking alternative collaborations outside of Europe. There is also the possibility that there will be a decrease in the research topics available for funding which could be less ambitious with less innovation, new products and drastically reduced advances in science. This will clearly impact on economic growth and European competitiveness.

Key actors

There are several actors that would be interested in this wild card including: individual researchers, research organisations, SMEs, Higher Educational Institutes, NGOs, national governments and European policy makers. Clearly, any individual or organisation that has an interest in collaborative research and development would be affected by this wild card. Also, organisations that provide business support would be interested in this wild card as would actors who are involved in trade associations or those who support organisational growth and operational change.
Weak signals

‘Hard’ or technical European research has been complemented over the years by further schemes established to support organisations who are conducting the research. This is typically through coordination and support actions (CSAs) to disseminate knowledge, assist with the implementation of the Framework Programme and to stimulate participation (particularly for SMEs).

There is currently pressure on governments to curb financial spending and this may impact on R&D funding. It may be that some projects that are not seen as ‘scientific’ in scope would be high on the agenda to be cut first.

In the UK, R&D investment is already being decreased, and R&D departments in large organisations are being restructured.

Debates in the European Commission by policy makers regarding the structure of future Framework Programmes are ongoing and the results of such discussions will make interesting reading.

Potential impacts

If there was insufficient infrastructure in place to support technical research, the impacts would potentially be fairly dramatic. It is likely there would be less participation of new organisations involved in funded collaborative research as the routes to becoming involved would be limited. Equally, the quality of research undertaken may be reduced as the most suitable partners would not be involved due to perceived barriers or lack of support in encouraging participation. Potentially, there will be less exploitation of results as industry participation in funded projects is reduced.

Ultimately, there would be less innovation, new products and technological advances leading to a slowdown in the knowledge economy. There may be a growth in non-knowledge economy industries and a new equilibrium of priorities established (for example, less focus on research, slower pace of life, less collaboration etc.)

Potential actions

In order to prepare for such a wild card, there are a number of actions, opportunities and risks identified pre-wild card (early actions) and post-wild card (early reactions).

Policy actions

Early actions: Policy decisions can be made to further promote research activities whether it is through coordination and support actions or other research support mechanisms. The effectiveness of existing projects can be monitored and perhaps consultations conducted with key research players and stakeholders regarding the future scope of support projects.

Early reactions: Monitoring of the effects, reactions to limit problems.

Business actions

Early actions: The main actions taken by business are to lobby policy makers to ensure that effective and efficient infrastructures remain in place and potentially suggest how these could be improved.

Early reactions: Adaption to new rules and legislation. Further lobbying could be undertaken to provide sufficient support infrastructures. Organisations may need to build on their own relationships to encourage participation in funded research.

Business actions

Early actions: As with business actors, the research sector could lobby, and potentially provide evidence as to how and why sufficient support mechanisms are required.

Early reactions: Similarly, adaption to the new rules and legislation is required. Further focus on networking, exploring new partnerships and relationships required to ensure participation in future collaborative funded research activities.
Cyber crusade: Massive e-sabotage by ‘hacktivists’

RECOMMENDED RESEARCH

THEMATIC AREA
Social science and humanities, Information and Communication Technologies, Security

RESEARCH TOPIC
Research on socially beneficial use of ICT, system security and cyberethics.

The issues presented here would address improved ethical thinking around IT use and on system security to prevent against cyber attacks. Network security would need to be upgraded to avoid major disruption of electronic commerce. In addition to the technological research it is important to address the social and political issue (for example unemployment) that is one driver towards cyber attacks.

OBJECTIVE
The research would look to improve education of the socially accepted use of IT, but more pressingly would focus on network and system security to prevent against hackers and cyber terrorists. This would be especially important due to the global reliance on e-technology.

EXPECTED IMPACT
The impact of the technical research would help improve the security of technology dependent systems and networks. Equally, with addressing political and social issues, the number of cyber hackers would reduce.

IMPORTANCE FOR EUROPE
Europe and the world are now heavily reliant on e-technology, and security of networks and systems is paramount. This is not only important for security organisations, hospitals, airports and the like, but also to inspire confidence of society in e-commerce. This wild card highlights the need to undertake further research on the social benefits on IT, system security and cyberethics.

Growing social and economic pressures in Europe result in massive protests and e-sabotage by underemployed IT activists. A “Cyber Crusade” (or CyberJihad) emerges with the aim of reshaping major socio-economic policies, so as to reduce inequalities, increase employment, and promote civil liberties. This may especially feature policies connected with information technologies (IT) and their use (including offshoring, access to infrastructure, surveillance, etc.). As well as inconveniencing existing e-commerce and e-government sites, the media are used to expose injustice and corruption, promote the new movement, and succeed in winning over many uncommitted people.

FP7 Themes

ERA Goals

Author(s): Rafael POPPER (University of Manchester), Anthony WALKER (RTC North)
Wild features

There are numerous wild issues related to this wild card. In particular it implies that political activists and others can rapidly innovate around security procedures. In addition to this, there are likely to be efforts to clarify and improve ethical thinking around the use of IT. If this wild card manifests, we are likely to see a major disruption of the electronic commerce, and sensitive infrastructure and facilities, like hospitals and airports, will require sophisticated safety precautions.

Cyber-attacks across national borders would be harder to pin down on established state agents and non-state actors making some forms of state action easier but possible stoking up international tensions.

There could also be a reduction in quality of life as e-commerce and e-services go down, dramatically affecting those who rely on electronic transactions.

Finally, security agencies will be heavily involved in precautions against cyber-attacks. This could involve intelligence agencies and such like who would police domestic cyber crime and political activism and the result could be high profile civil liberty abuse.

Possible interpretations

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. If this wild card occurs, we are likely to see a major disruption of the electronic commerce, and sensitive infrastructure and facilities, like hospitals and airports, will require sophisticated safety precautions.

Key actors

Due to the reliance of e-technology in the modern world, clearly this is cross cutting across many sectors and will be of interest to many actors including: industries reliant on e-technology, civil society, public media, national governments, extremists, youth organisations, mainstream business, insurers and the legal profession, police and security organisations amongst others.

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Gradual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>⭐⭐⭐⭐</td>
</tr>
<tr>
<td>Likelihood</td>
<td>⭐⭐ by 2030 ⭐⭐⭐⭐⭐ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Negative</td>
</tr>
<tr>
<td>Preparedness</td>
<td>⭐</td>
</tr>
<tr>
<td>Inspired by</td>
<td>FP7 Socio-economic Sciences and the Humanities Projects: YOUNEX</td>
</tr>
<tr>
<td>Key words</td>
<td>Youth, underemployment, movement, protest, pressure, cyber, ITfunding</td>
</tr>
</tbody>
</table>

Low ★ Medium ☆☆ High ☆☆☆ Very high ☆☆☆☆☆

Potential impacts in Europe

- Infrastructures: ⭐⭐
- People’s Lives: ☆☆☆☆☆
- Legislation & Regulation: ⭐⭐
- Economy & Business: ⭐⭐⭐
- Defence & Security: ⭐⭐⭐
- Government & Politics: ⭐
- Environment & Ecosystems: ⭐
- Science & Technology: ⭐⭐
Weak signals

In December 2010 a group of “hacktivists” called Anonymous organised a number of systematic attacks that targeted “anti-Wikileaks” firms (including PayPal, Visa and MasterCard). This new kind of large-scale politically motivated attack on Visa and MasterCard services required the involvement of some 2,000 and 400 “hacktivists”, respectively. One significant enabler of these type of attacks has been that a growing number of people were able to voluntarily download the so-called “botnet tool”, which activates an “army of machines” capable of launching multiple attacks. Overnight, several hundreds/thousands of people joined up this hacktivist movement in what has been described as a “war of data”.

Cyber-attacks, such as distributed-denial-of-service (DDOS) have become more common in recent years and there are numerous forums setup to encourage ‘cyber hacking’ such as www.cybertackers.org Cyber crime has escalated in recent years particularly as a large majority of sectors are becoming increasingly reliant on e-technology.

Unions also fear the spread of civil unrest across Europe, and the current wave of social unrest in North Africa may spread unless more jobs are found, according to the international trade union umbrella organisation. Philip Jennings, secretary-general of the Nyon-based UNI Global Union, told www.swissinfo.ch that a chronic shortage of work was one reason behind the so-called Jasmine Revolution that recently unseated the Tunisian president.

Potential impacts

The immediate and dramatic impact of this wild card would be a major economic crisis and social unrest in Europe. There is the potential for the social unrest to gather momentum and recruit many other people to its campaign making it hard to stop.

Potential actions

This is a particularly interesting wild card as it deals with e-technology and cyber crime, and the possibility of social unrest in Europe. With the reliance on e-technology in the modern world, there are a number of early actions (pre-wild card) and early reactions (post-wild card) that are worth considering.

Policy actions

Early actions: Responsibility to find new ways to reduce unemployment.

Early reactions: Attempts to minimise damage, and educate and encourage ‘hacktivists’ to be more responsible with their actions. Legislation required punishing ‘hacktivists’ who are causing trouble and mayhem.

Business actions

Early actions: To explore new business models capable of creating new jobs and opportunities for employment.

Early reactions: Ensure security of systems and provide solutions to enable customers and clients to have confidence in e-technology.

Business actions

Early actions: Research on e-systems to make them as secure as possible and limiting the effects of cyber crime.

Early reactions: Minimising the damage, and creation of new secure systems to give consumer confidence.
Israel & Palestine are admitted to the EU

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH).

RESEARCH TOPIC
Future changes in Europe’s political landscape.

The redrawing of Europe’s boundaries to include Israel and Palestine would change the political landscape of Europe in ways that would need to be studied carefully. Specifically, the effects of the inclusion of a Muslim Arab country within the EU would not need to be examined, in terms of culture, politics and economics.

OBJECTIVE
The objectives of post hoc research into the wild card would be to understand as well as possible the processes that led up to it. This might be with the aim of reproducing similar processes elsewhere in the world, or with the aim of clarifying the process of European expansion.

IMPORTANCE FOR EUROPE
The expansion of Europe so far beyond its traditional geographical and cultural boundaries would have to be properly understood – both in terms of the processes that led up to it and the consequences and implications (social, cultural and economic) of such a move.

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

FP7 Themes

ERA Goals
A number of features of this process might be seen as wild. To start, the notion that the EU would be the peace-broker between Israel and Palestine runs contrary to the current balance of power, whereby the United States is the major intermediary between the two conflicting sides. Second, at this stage, a permanent peace deal between Israel and Palestine would itself appear to be a wild card. Third, the accession of two countries, both of which are located in the Middle East, and one of which would be a Muslim Arab country, to the EU would be an extremely surprising eventuality, especially given Turkey’s efforts at being granted membership. Further wild features include a possible drastic improvement in the west’s relationship with the Arab world following an Israel-Palestine peace deal and the stabilization of the entire region.

Possible interpretations

Interpretations would probably be mostly positive. The Israeli-Palestinian conflict is one of the more intransigent and certainly one of the most publicised conflicts in the world, and its resolution would spread a sense of optimism based on the thought that if they can settle their differences, then surely other parties in conflict should be able to settle theirs too. However, other interpretations might be less generous. For instance, the inclusion of a future Palestinian state within the EU might cause upset among pan-Arabists; certain actors might see such a move as the cooption of the Palestinian people by the west; and so on.

Key actors

The key actors in relation to such a wild card would mainly come from the political elites of Israel, the Palestinian Authority, and EU countries. Indeed, this wild card would only come about following actions by politicians at the very highest levels. At the same time, one might surmise that journalists and key public opinion shapers might also play a crucial role.

Weak signals

An existing weak signal could be the fact that a large number of Israeli Jews (and a small number of Palestinians) already have EU citizenship. In recent years, more and more Israelis with European ancestry are applying for EU passports, especially after the accession of eastern European countries. It is estimated that since the EU enlargement, every fifth Israeli is eligible to receive an EU passport. A 2009 survey commissioned by the Konrad Adenauer Foundation’s Israel office found that more than 75 percent of Israeli Jews and 40 percent of Israeli Palestinians would like Israel to join the EU. In Europe there are already millions of immigrants from Arab countries who possess EU citizenship. Furthermore, Israel has already the status of “associated country”.

A number of future signals might indicate the emergence of this wild card. Firstly, we might see the parallel election into power of dovish parties in both Israel and the Palestinian Authority. This would perhaps indicate a change in public opinion among both constituencies that a peaceful way forward must be sought. Secondly, there might be a shift in power from the US to the EU that might indicate the latter’s growing involvement in the process. Perhaps the US might simply tire of its involvement in a seemingly never-ending conflict, or perhaps the EU might take an even more pro-active role and assume the role of the leading diplomatic body in the conflict.
Thirdly, talks about EU accession with North African countries might suggest that there would be room in the EU for an Arab country such as Palestine, should it come into being.

**Potential impacts**

The impacts would be enormous. The impacts of a permanent peace deal for ordinary Israelis and Palestinians should be felt very quickly, particularly in economic terms: for Israelis, because they might expect a peace dividend due to falling military expenditure; for Palestinians because they would be able to import and export like any other country and enjoy direct trade relations with the rest of the world. Security implications are almost obvious. As said before, the resolution of the central and bitter middle-east conflict would spread a sense of optimism and promote peaceful resolutions of other conflicts as well. A peace deal between Israel and Palestine would reverberate throughout the Middle East, possibly changing the area’s entire relationship with the west.

There could be other, perhaps surprising impacts on both Israel and Palestine: if the accession of both implies free movement of people across borders, including movement of Palestinians (from Palestine and Europe) into Israel, and movement of Jews into Palestine – would it mean a realisation of the Palestinian “right of return” and legitimate Jewish settlement in the Palestinian areas considered a historical “land of Israel”?

There would also be impacts to Europe, perhaps more cultural than economic. Palestine joining the EU would mean that there was a Muslim Arab country will full membership of all European institutions. This could have potentially divisive implications, with some countries possibly quite strongly opposing the move. Economic impacts would be related to the problem of the very large gap between the Palestinian and EU economies, in particular following the recent crisis of the Greek economy and its EU-wide implications.

**Potential actions**

Were Israel and a newly-created Palestine to be admitted to the EU, this would require a reassessment of foreign policy towards the Middle East (if such a reassessment hadn’t already taken place as part of the processes building up to the realisation of the wild card). It might also bring the private sector to realign its activities with the new reality in the Middle East.

**Policy actions**

**Early actions:** To promote peace and dialogue between Israelis and Palestinians. EU leaders would need to take a more dominant role in the Israeli-Arab conflict.

**Early reactions:** To reassess policy towards the Middle East. To build on the momentum of such a peace deal to further dialogue with other countries in the Middle East.

**Business actions**

**Early actions:** To promote research on conflict-resolution and dialogue. To explore opinions and views about expanding the EU into the Middle East. Evaluation of the implications of accession of different societies to the EU, and in particular the issue of large economic gaps.
Nano-lab inside your body

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities; ICT; Health; Nano-sciences

RESEARCH TOPIC
Nano-lab in your body.
Progress in fields of e-Health and nano-technologies may lead to development of health monitoring chips, which could be inserted in human body at birth. These chips will monitor the body and prevent diseases. They will be in touch with remote medical centers and as well they will be able to heal the body if necessary. This invention may lead to significant improvement of healthcare quality and efficiency, but there are some potential security and social risks as well.

OBJECTIVE
Research should assess not only the technological and medical aspects of chip-in-your-body invention, but as well the ethical and security aspects. These include security risks connected with hacking and misuse of personal information, mental barriers of people against new technologies and distrust of security of the system. Transmission of images from inside of own body may become popular content for new social networks on Internet with potential influence to common ethical and social norms.

EXPECTED IMPACT
eHealth and nano-technology research should be oriented to develop suitable and safe nano-lab chips and remote monitoring systems. The SSH research will a) increase awareness of ethical dimensions of nano-lab-in-your-body implementation; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and innovation in this field; e) inform educational and health strategies on the subject of nano-lab-in-your-body technology.

IMPORTANCE FOR EUROPE
The nano-lab-in-your-body technology can potentially have enormous effects on contemporary health care system. The method allows to discover and to treat the diseases in early stage, which will increase success rate and decrease cost of the treatment. There will be better evidence of the health state of population which will be useful for planning of health policy. The issue will as well provide huge space for business activities of nano-technology, ICT and eHealth oriented private companies Negative impacts comprise health treatment security risks and misuse of information risks. It is vial that policy response which would aim to control and regulate this issue is informed by research into foreseeable ethical and security implications these development may have. In future it may be furthermore important for EU to form a coherent legislative response that could guide member states in forming their legislation.

Chips and micro robots are inserted into the human body at birth, which will monitor vital functions and inner conditions, prevent diseases and heal the body if necessary throughout the person’s entire life. They can also communicate with a health centre and ask for medical intervention and healing. People will no longer need to visit the doctor. Healthcare will be more straightforward, more individualized and cheaper.

Wild Card

FP7 Themes

ERA Goals

Author(s): Martin FATUN (Technology Centre ASCR)
Contributors: Miloslav DORNAK (Cyber Fox), Lucia DAVIDOVA (BIC Group), Sabine PAYR (OFAI), Santi FORT (Barcelona Media - Innovation Centre), Ladislav KOVAC (BIC Group), Yanuar NUGROHO (MIOIR The University of Manchester), Rafael Popper (University of Manchester)
Wild features

There are many reasons for employment of this wildcard, which include e.g. high mortality of some diseases because of their late identification and/or laziness of people to go to doctor for preventive medical examination. The “chip in body” solution can eliminate this issue and as a network of sensors it can even be used to provide epidemiological monitoring and foresight.

The controversial issue might of course be the cost of such a solution. However the main “wild” danger can be seen in aspects of security and private data protection. How might the misuse of this technology to harm or kill somebody be prevented? Might governments misuse the technology to control population patterns or to disable political opponents? Might people be so foolish that they will stream information directly from their chips to their social media (e.g. Facebook) profile? Might this become a vogue or even a social necessity? Or will many parents resist the technology (because of ethical concerns or conservatism) or because of ‘irrational fears against “chipping” their babies’?

This wild card can truly change the performance of a healthcare system, but at the same time it can endanger democracy and the social stability of society.

Possible interpretations

Positive interpretation assumes that the wild card can make people healthier without visiting a doctor. There is possibility to effective prevent diseases or threat them immediately at their start phase. It can be done more professionally, faster and cheaper than today.

Disputable is a question whether people may be treated “automatically” without their permission or even without informing them that they are treated. Will they have a choice to refuse the treatment?

From the ICT point of view having micro or nano robots transmitting images and other information from inside of human body can provide large amounts of new “food” for Web 2.0 and new virtual social networks. To display your beating heart or breathing lungs can turn you into a new celebrity.

Quite negative interpretation assumes that details on person’s health state will leak out of the system and will be misused, with a wide range of unpleasant and/or dangerous consequences for individuals or society.

Key actors

Key actors related to this wild card include:

- Researchers (first of all ICT specialists, physicians), who will develop and test the technology
- Individuals, who will have to trust the system
- Health care administration and professionals, because the treatment will be cheaper and less demanding on medical staff
- Security experts, who will be interested to ensure security of the system
- European and national governments, which will have to create appropriate laws and rules for use of the technology
### Potential impacts

There is a wide range of positive potential impacts of the wild card, which include more successful treatment of diseases in their early stage, elimination of unnecessary surgeries and better evidence of the state of health in the population. These can lead to decreasing mortality (especially in young age), healthier population, better healthcare expense planning, state budget savings and more competitive economy in general. On the other hand possible “reprogramming” of the chips and nano robots by hackers can cause serious problems including e.g. outbreak of a new, yet unknown disease.

Demonstration of the wild card can have huge positive impact on business of ICT companies, which will sell this technology to citizens and governments. Rather negative impact can feel medical staff (especially the less qualified ones) in form of unemployment. However there will increase demand for staff with technical and ICT skills.

In combination with other technologies (artificial organs and parts of human body) this technology may lead to genesis of cyborgs or “trans-humans” and formation of gap between “classic” and “enhanced” human beings.

### Potential actions

To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card demonstration actions:

#### Policy actions

**Early actions:** Prevention of abuse; increase of R&D spending as % of GDP; support of business and research clusters; more freedom to experiment with humans

**Early reactions:** Raising awareness of public (positive campaign); reform of state health system (social contributions, infrastructure); establish new privacy and security policy; ensure option to “switch the system off”

#### Business actions

**Early actions:** Proper deep testing; initiation of technology platform on nano-diagnostics; establish new business about data extraction and user profiling

**Early reactions:** Implementation of security policy; emerge of private medical centres; keep full control of individual over system and data

### Business actions

**Early actions:** Research on nano-diagnostic methods; evidence based medicine; development of non-invasive treatment; development of application software for nano-chips: research on suitable options for policy and regulation

**Early reactions:** Stress to data analysis; development of “personal firewall”; development of inside-your-body drugs dispenser

### Weak signals

There are numerous weak signals which can indicate oncoming manifestation of the wild card: new research results of diseases diagnostics -> detection of weak signals in our body; there is a huge trend to develop more and more of the nanotechnology; the diagnostics is developing and tries to identify illness as soon as possible; higher spending on R&D as % of GDP; governments are trying to push down the costs of healing (healing at an early phase of illness is much cheaper than later); telecommunication technologies are developing very fast; people do not take proper care about their health; new lobbying initiatives of companies’ clusters pushing on governments; many ordinary things are becoming common, so people are easily excited about new “sexy” technologies (i.e. 3D movies).

However there are as well weak signals pointing to possible fear of the new technology: initiatives & movement of NGOs against the trend of chipping people; threat of terrorist attacks -> the atmosphere of fear in society; there are many hackers in the world trying to hack any kind of DB; emerging new crypto/analysis methods.

The oncoming new era of internet and social networks content could be signalized if e.g. a celebrity is broadcasting images of her gastroscopy. The historical experience says that when webcams come up, ordinary people suddenly started to exhibit their private life publicly.

### Weak signals


The lottery: the way to the perfect world

**THEMATICAL AREA**
Social Sciences and Humanities (SSH), Security, Social welfare, Economy, Policy and governance, Environment & ecosystems, Science, technology and innovation (STI)

**RESEARCH TOPIC**
Human development: how to ensure human development and world prosperity without conflicts? How to reach a global equilibrium, with special reference to birth rates? How to ensure resources and well-being for everybody?

**OBJECTIVE**
Understanding what are the societal and political structures, which could make equality possible without generating ethical concerns about life.
Understanding what could be a system ensuring well-being for everybody and population balancing, which could be realised without the occurrence of wars or diseases and without the promotion of very strange lotteries. Understanding what are the opportunities and risks of birth policies.

**EXPECTED IMPACT**
Producing a deeper consciousness of rising trends of equality in respect to possible risks or society disruptions.

**IMPORTANCE FOR EUROPE**
Addressing of social development pathways and ethical principles, in relation to different European cultures.

The starting point of this wild card is the continuous increase of the world population, due to improvements in human conditions in many areas with a very prosperous period free of conflicts and disease, following important technological breakthroughs (including medical and information advances) and successful international cooperation. However the initially promising situation appears gradually to deteriorate, in spite of technological development, mainly due to perceived shortages of arable land, resources, space and clean water. On the wave of a global and generalised fear of future problems associated with unsustainable population growth and an inability to maintain standards of living, new religious factions become favoured by populations and a new realisation of the necessary sacrifice arises. Reducing the population to a sustainable level becomes an objective in many people’s mind. This leads to the planning of programmes of voluntary sacrifice in the name of saving the world. In the US, the leading political party creates a lottery, the winners of which will have the opportunity to experience a period in their lives without worries, in which all desires will be satisfied. The price of this experience is a sweet death, by the injection of a drug, giving very pleasant feelings of happiness and beauty. This will help to decrease the population and help other citizens to maintain greater prosperity. The benefits of the lottery diffuse and other countries start to adopt similar methods, especially in overpopulated regions. Some time after introducing and operating the lottery, applicable areas will look like a ‘perfect’ world, where everyone can have sufficient resources for his own well-being.

**FP7 Themes**

**ERA Goals**

---

Author(s): Maurizio SAJEVA (Finland Futures Research Centre)
Contributor(s): Jari KAIVO-OJA and Yriö MYLLYLÄ (Finland Futures Research Centre)
Photo: Maurizio Sajeva
Wild features

The main wild feature of such a Wild Card is its seeming improbability. However, futures researchers should consider not only probable but also improbable events. A parallel can be drawn with the likelihood and value 100 years ago of somebody hypothesising World War II. Many unbelievable things, still unbelievable to us now, occurred during and as a result of the war. We cannot know what kinds of changes can take place in human minds, and these thoughts can lead to further very improbable but still possible changes. For this reason, this seems to be a very Wild Card, with huge impacts and very little probability of occurrence. So, this is probably a very good example of a Wild Card, actually developed on the basis of a SciFi production.

Possible interpretations

A possible interpretation is connected with the combination of a fear (losing the present level of affluence) with the power of religion, in conditions of high uncertainty, to promise a new life after death. In the world of today and in human history as well, there are plenty of examples of people sacrificing their own lives in the hope of getting to Heaven.

In such a new world, there would probably be non-religious people, who would benefit from such a lottery, and those who, perhaps the poor, who would be inclined to believe in the promise of Heaven.

In older times, and even perhaps today, wars and diseases, and deaths from famine, hunger and crime, have contributed to an equilibrium in the world population. This wild card is in a sense an equivalent to war in a peaceful world. The lottery can be considered a more pleasant method than dying through disease or open conflict.

Key actors

The main key actors related to such a Wild Card would probably be the religious groups spreading the idea of sacrifice, as well as the political parties linked to them, probably winning the elections. Other actors could be the opposition, perhaps reduced to a minority and perhaps even persecuted or banned, the police forces dedicated to repressing opposition, if such a situation of citizens’ control arises.

Weak signals

A weak signal related to such a situation might be seen in the growing development of the ‘developing’ world and the spread of a western standard of living. Such a wild card could be played when the danger of not having enough resources for everybody becomes real. If the ‘western world’ consumption model does not change in advance, then it is likely that Chinese and African consumption will also continue to grow. A difficult to imagine scenario is needed to anticipate possible circumstances and implications when the consumption per person of most Chinese, many Africans and South Americans approaches that of current Americans and Europeans.

Potential impacts

The potential impacts could be the empowering of a political class using religion and people’s beliefs to control them. Resources will be redistributed to a smaller number of citizens ensuring their wealth, happiness and prosperity. A ‘perfect world’ with no wars, little crime, rare cases of diseases and automatic population control. Such a ‘perfect’ situation could, on the other hand, generate opposition movements of smaller groups, fighting to guarantee life to everybody.
Potential actions

Potential actions should be undertaken in advance, even now, at the present moment.

Policy actions

**Early actions:** These kinds of actions should be addressed to quickly change the development model and to show the developing countries that the best way of development is not that which has taken place from the industrial revolution until the present day. A new sustainable model should be adopted immediately and made available in economic terms to everybody. It should show that the new way can be immediately adopted in depressed areas: for instance, sustainable business, joined to socio-economic policies and human development, establishment of human rights and global governance controlling the power of multinational companies.

**Early reactions:** Reactions could be related to the fight for life, united to a global governance of birth control, trying to avoid situations of uncontrolled birth rates in depressed areas. In some areas of the world, cultural patterns are such that men and women have to have children to feel strong and to have a feeling of well-being with themselves and of self-actualisation. This is perhaps one of the reasons why in poorer countries the birth rate is higher. Another reason is the social structure. As people can rely only on their own family for subsistence, having more children means having a bigger family and more support.

Business actions

**Early actions:** To promote regulatory and corporate governance approaches in order to pursue at the same time scientific development, corporate social responsibility policies and ethics at global level. All businesses should participate in a world governance forum where development and social standards are set, with the participation of all actors and stakeholders involved. In the absence of ruling powers at global level, the role of governance is to ensure the fulfilment of basic, general standards, with special reference to human rights.

**Early reactions:** To promote regulatory and corporate governance approaches with special reference to ethics. To fight for life, proposing at the same time alternatives for a future of prosperity.

Research actions

**Early actions:** Increasing the application of approaches of philosophy (e.g. ethics) in the fields of medicine, social science and political science, among others. Exploring new ways to achieve a more egalitarian society and emphasising the ethical aspects. Also the sociological aspect concerning social change could be considered. Exchanging cultures, providing education and aiming at human development all over the world. Studying governance systems as possible ruling approaches at global level.

**Early reactions:** Focusing on ethics and promoting research in sociology and philosophy.
The great tide: a new planet

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH), Security, Physical infrastructure, Virtual infrastructure, Policy and governance, Environment & ecosystems, Science, technology and innovation (STI).

RESEARCH TOPIC

OBJECTIVE
Understanding what are the societal and political structures, which could realise the avoidance and sustainability of conflicts. Understand what are the opportunities and risks of technologies.

EXPECTED IMPACT
Producing a deeper consciousness about the possible risks of technological development, failure of diplomacy and conflict situations. Create the social consciousness for conflict avoidance and sustainable life styles.

IMPORTANCE FOR EUROPE
Developing the concepts of a European social model and spreading them all over the world, in order to induce better development and global cooperation. Spreading an idea of peaceful living, together with concepts of sustainability and respect for the Earth.

Due to the rise in conflicts and the use of weapons of mass destruction, global warming is no longer a prediction: it is reality. After some small signs, great tides flow over the continents and reshape geographical maps. All humankind has to start a new era, with new economic patterns and changing lifestyles. In one sense a background of advanced technologies is still present but in another sense very often scientific achievements and materials are destroyed or located under the sea. A new life has to start and often it starts from more traditional lifestyles, such as agriculture. Only some new islands or regions are technologically advanced and new geopolitical equilibriums arise.

FP7 Themes

ERA Goals

Author(s): Maurizio SAJEEVA (Finland Futures Research Centre)
Contributor(s): Jari KAIKKO-OJA and Yriö MYLLYLÄ (Finland Futures Research Centre)
Photo: Gliese, the planet similar to the Earth, source http://scienzaweb.blogspot.com/2010/09/scoperto-pianeta-simile-alla-terra.html
Photo: Maurizio Sajeva
Wild features
The main wild feature is the actual production of global warming, and quite suddenly, with respect to the general belief, with the consequent reshaping of territories, as lots of lands are now under the sea. The other wild aspect is the need to start a new life in a changed world. This means the generation of different social dynamics with respect to the past.

Possible interpretations
A first interpretation is related to the consequences of human activity, which can be unexpected and sudden. The uncertainty of human actions means that we may not know that we do not know. We believe we know something but in reality we don’t, at least not every aspect of it.

Such an interpretation leads to the consideration that, in spite of our present knowledge, we should have the consciousness to live in a chaos, in which nothing is to be considered as a certainty and we should be prepared for the impossible.

Key actors
Key actors for this wild card are the Governments which were engaged in conflicts and which made use of weapons of mass destruction. Secondly, key actors are also the scientists who were called in to evaluate the probabilities of global warming actually happening, especially after the occurrence of large-scale conflicts. The underestimation of uncertainties and the culture of certainty of decision-makers is the main source of the production of this wild card.

Weak signals
Weak signals can be found in the continuous rise of conflicts, with special reference to the contraposition of the occidental culture and the Arabian countries’ culture. In spite of the awareness of the need to maintain peace, the memory of past wars seems to be lost and new conflicts continue or arise around the world. Moreover, weak signals are also the lack of sufficient communication between scientific discoveries or concerns and the political world.

Potential impacts
The main impact of such a wild card is the need to start a new life and rebuild societies, a challenging path starting from a situation of great knowledge but scarce resources. The impact of a new planet where continents are greatly reduced, new islands are present and old islands have often disappeared. Some contexts are still advanced, while others have to restart life in a more traditional way. New dynamics between different populations are generated, with the search for new society settings.
**Potential impacts**

The main impact of such a wild card is the need to start a new life and rebuild societies, a challenging path starting from a situation of great knowledge but scarce resources. The impact of a new planet where continents are greatly reduced, new islands are present and old islands have often disappeared. Some contexts are still advanced, while others have to restart life in a more traditional way. New dynamics between different populations are generated, with the search for new society settings.

**Potential actions**

Potential actions should mainly focus on peace-keeping and a strong willingness to avoid conflicts. Secondly, strong investments, research and effort should be directed to the monitoring of climate and to the suppression of all human activities having strong impacts on the environment.

<table>
<thead>
<tr>
<th>Policy actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> The early actions would concern the avoidance of conflicts and the development of diplomacy, towards international cooperation. On the other hand, further studies on climate change and its effects, together with activities for dealing with possible emergencies, could be undertaken.</td>
</tr>
<tr>
<td><strong>Early reactions:</strong> Establishing new society dynamics and learning from the past to make efforts for conflict avoidance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Promoting ethics (i.e. weapons-producing companies).</td>
</tr>
<tr>
<td><strong>Early reactions:</strong> Limit the production of armaments.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early actions:</strong> Researching conflict resolution and security assurance. Promoting the idea of the unsustainability of conflicts. Researching climate change and linking science, society and decision-making.</td>
</tr>
<tr>
<td><strong>Early reactions:</strong> Ethics would still need to be focused on; also research in sociology and philosophy. Studying the dynamics of the new world, planning a global governance and a peaceful future.</td>
</tr>
</tbody>
</table>
Major EU state elects neo-fascist leader

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH) and Security.

RESEARCH TOPIC

Future changes in Europe’s political landscape. Recent electoral results in various member states demonstrate a gradual shift to right-wing and nationalist politics. Members of far-right wing and extreme nationalist parties are also winning seats in local, national and EU governmental institutions. The reasons for the shift by voters to the far-right could be attributed to, among other factors, the increasing power of global actors (i.e. loss of the national vision/ agenda) and increasing migration. Recent history has demonstrated the consequences of unbridled right-wing extremism and research is vital to determine the cause of recent shift toward this ideology so that appropriate response can be formulated.

OBJECTIVE

Research could focus on shift in public perception which gives rise to far-right electoral shift by studying the roots of right wing support. Research could, for that purpose, focus on analysing mass media and political discourse in order to understand attitudes towards far-right ideology. Research can be both backward and forward looking in that it examines past and contemporary far-right support as well as the future of far-right support in Europe. Research could focus on challenges such as poverty, inequality and immigration to determine their role in public support for far-right ideology.

EXPECTED IMPACT

Research should a) determine the scale of the shift towards far-right political ideology; b) determine variations and commonalities between far-right movements in Europe; c) devise strategies for appropriate policy responses across EU; d) inform common legislation and regulation across EU; e) inform educational strategies that will increase democratic participation and teach the history of far-right movements and their influence on European history.

IMPORTANCE FOR EUROPE

Europe has seen, in recent history, the devastating effect of extreme far-right support. It is vital that policy responses which aim to monitor and respond to this shift are informed by research which aims to understand this attitude shift as well as predict foreseeable implications these changes may have. It is furthermore important that EU forms a coherent legislative response that could guide member states in forming their legislation.

Current socio-economic challenges in Europe (such as demographic pressures and growing unemployment) are creating the conditions for far-right parties to make major gains in the European political arena. Security fears associated with militant Islamism fuel distrust and suspicion about specific ethnic and religious minorities. These developments could eventually create the conditions for a major EU state electing a neo-fascist leader.

FP7 Themes

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

ERA Goals

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
Wild features

The existence of political parties with far-right agendas is not a new feature in European politics. What is really ‘wild’ or surprising in this event is the achievement of sufficient political momentum for a major EU state to elect a neo fascist leader, bringing these movements from the fringe to the centre of politics, and potentially fuelling other far-right parties in Europe and possibly globally. Extreme nationalist feelings could destabilise European political and economic co-operation, while racism and authoritarian practices could undermine fundamental European values and ideals such as the need for social cohesion and social inclusion.

It remains to be seen whether far right movements across Europe could co-operate on matters other than those involving common enemies. The result would be a climate of uncertainty and lack of consensus on the democratic constitution of European societies. An atmosphere of extremist philosophy, harsh policy and political intolerance could possibly lead to the differentiation between first, second and third class citizens.

Possible interpretations

There are different readings of such a wild card, for example: the failure of mainstream politicians to respond effectively to current challenges and to engage with shifting populations; the growing power of communicational platforms (e.g. social networks, Internet, tabloid press) making it possible for political narratives of far-right to prevail and gain momentum; the success of some far-right political parties in targeting and promising the ‘rule of the young’, the growing need for redistribution of resources, political and economic power, among others. Another possibility is the emergence of coalitions founded very much on the notion of threat from alien enemies – at present, Islamists are the prime candidates, but European neighbours could find themselves targets (e.g. consider the claims of some Greeks about German superiority and enmity).

Key actors

Key actors related to this wild card, include:

- Scanners or “early warners” such as social and political scientists like the Extreme Right Electorates and Party Success Research Group (EREPS) and investigative journalists;
- Shapers (i.e. enablers/inhibitors) such as the education system, mainstream political parties (potentially entering into coalition with the far right, and/or adopting similar policies and programmes), right wing populists, social movements, youth organisations, (trans)national civil society organisations (e.g. Human Rights Watch), and the media; and
- Stakeholders positively or negatively impacted such as national governments, civil society, NGOs promoting human rights and minority welfare, the police and law enforcement agencies, among others.

Potential impacts

The impacts of a major EU state electing a neo fascist leader could include: the rise in xenophobia and fears (and associated responses) on the part of minorities and affected groups such as women; the European Union turning inwards (i.e. reducing trade and cooperation with Asia and other regions, including North America); the rethinking of many human rights, including the right for political asylum, in Europe; the development of a “strong state” with punitive policies in social welfare, schools, the justice system, etc.; the intensification of discrimination and lack of tolerance nationally and regionally; the development of national oriented politics; the loss of credibility in the democratic system; the rise of new forms of resistance (including wars), for example.
Potential actions

A neo fascist government in Europe would probably lead to new legislation (criminalising some activities now legal, for example), intensive media campaigns proposing “new” welfare solutions, the rise of groups defending basic human values and, at the same time, an increased number of extremists on all sides promoting conflicts and social polarisation. For that reason, a number of early actions (pre-wild card) and early reactions (if the wild card occurs) should be considered:

Policy actions

**Early actions:** To make far-right movements more visible (e.g., including lessons from history in education); To reduce social polarisation in education; To enhance democratic participation and consensus building practices; To provide real and practical solutions to problems such as poverty and inequality; To promote community integration programmes;

**Early reactions:** To avoid radical changes in legislation; To avoid drastic changes in police and law enforcement policies; To defend minorities law; To use soft power to negotiate with far-right regimes; To concentrate power within government alliances; To welcome the displaced and dispossessed.

Business actions

**Early actions:** To promote corporate social responsibility; To use business power to promote equality and human rights; To make sure equality and human rights are respected in the workplace; To research into integration models.

**Early reactions:** To continue promoting the above and making sure that that racist/neo-fascist discourses do not dictate their practices; To continue trade with countries outside of EU.

Research actions

**Early actions:** To promote research on mass media, political discourse and electoral census analysis; To increase research on the current and future effects of migration; To research the roots of far-right wing support and, in contrast, openness and tolerance and how they may be fostered; To review lessons of authoritarian personalities; To identify and analyse social mechanisms hampering democracy; To explore new ways of addressing inequalities and delivering social change;

Early reactions: Continued research focus on the issues named above. Research community would need to continue presenting research findings that would promote understanding of immigration, inequalities, multiculturalism, tolerance and human rights.

Weak signals

There are several signals warning us about the probability of occurrence of such a wild card. Some of these are related to the political environment, for example: the domination of right wing parties in the last elections to the European parliament; the break away from mainstream parties to the far right; the political momentum gained by the recently created Alliance of European National Movements (AENM), which up to now brings together far-right parties in nine countries (Belgium, France, Hungary, Italy, Portugal, Spain, Sweden, Ukraine and the UK); and the power gained by far-right parties in recent elections in terms of new Members of the European Parliament (MEP) with 3 MEPs for the French National Front (FN), 3 for the Movement for a Better Hungary (Jobbik) and 2 for the British National Party (BNP). Distrust in, and disaffection with, established political parties and elites is a major contributory factor, and is associated with a more general distrust of many experts and their claims – e.g. about climate change. Intimately linked to these political signals, we can see major achievements in terms of media coverage (e.g. the BNP leader was able to reach more people after his appearance in BBC’s main current-affairs debate programme Question Time) and the growing number of alternative media, blogs, tabloid press and newspapers endorsing some far-right policies and politicians. Among the socio-economic signals, we can include: the popular backlash against the spread of globalisation; the shift back to nationalism across the EU, which in some countries translates into resentment of outsiders and Islamophobia; the growing concerns about large and uncontrolled population movements (e.g. migration and refugee situations); and the negative impacts of the financial crises (e.g. reduction of public and private investment, loss of jobs, increase of poverty and revival of historical controversies polarising society).
China’s investment and services “great wall”

RECOMMENDED RESEARCH

THEMATIC AREA
Social science and humanities, agriculture, energy, ICT, transport and security.

RESEARCH TOPIC
European response to major changes in global foreign direct investment strategies. Contemporary society relies on a globalised and market economy system driven by international trade and foreign direct investment strategies of state-owned enterprises (SOEs) and transnational companies (TNCs). As new states enter the system, many of which have the potential of becoming major players it is vital that an understanding of the current system is gained in order to predict how it will respond to large scale changes and also to prepare current stakeholders for the possibility of vast changes to the market environment.

OBJECTIVE
Research could focus on examining the nature of outward foreign direct investment strategies (OFDI). Research could focus on developing strategic country-specific OFDI options for EU Member States. Research could identify areas of vulnerability (e.g. natural resources). Research could furthermore use foresight methodologies to examine how European society could be prepared for a significant change in trade, investment and technological leadership patterns in developing countries.

EXPECTED IMPACT
Research should aim to a) inform the development of strategic OFDI for EU Member States; b) devise strategies for major changes in OFDI of key economic actors; c) monitor and analyse OFDI strategies of major SOEs and TNCs; d) inform relevant policy, legislation and regulation across EU; e) inform business enterprise and innovation in this field.

IMPORTANCE FOR EUROPE
In order for the EU’s continuing successful participation in the market system, research is key in forming a response to imminent changes. It is vital that any response, which would endeavour to monitor and respond to this shift, is informed by research which aims to understand the changes as well as predict foreseeable implications these may have. It is furthermore important that the EU recognises any current weaknesses in its systems in order to strengthen their participation in as many areas of trade and business as possible. It is also of great importance that the EU forms a coherent response that could guide member states in forming their own responses, in accordance to changes to their circumstances.

Aggressive Chinese outward foreign direct investment (OFDI) outstrips and halts European and US investments and technology leadership in Africa and developing countries. While China’s OFDI is characterised by being politically unconditional, therefore highly welcomed, the predominance of state-owned enterprises (SOEs) investing in Africa and other developing countries could eventually become a “great wall” or major extension of China’s defence, security, science and technology policies. Such a pervasive OFDI strategy could sooner or later create natural market barriers for European and north-American firms to operate in some sectors and industries dominated by China (mainly in the tertiary and the manufacturing sectors, but also in energy and natural resources).
Surprises (‘wild’ scenario features)

With a steady GDP growth, nearly 2 trillion USD in foreign exchange reserves, and a healthy current account, it is not surprising to see the rapid growth of Chinese investments abroad. So the unexpected element of this wild card would be size and pervasiveness of China’s OFDI growth to the point that it becomes a serious challenge for global players. China’s thirst for natural resources and amazing capability to provide affordable and reliable solutions in the service industry may result in the capture and control of raw materials such as oil so that China could control prices and commodity markets. This leads to a major shift of global power and, possibly, to truly multi-polar world with environment-friendly and fair-trade policies driving competition. New political allegiances may arise in line with the new distribution of global investment and humanitarian aid. China could increase its political power becoming the dominant super power – or an idealistic power with production outsourced to Africa, Latin America and the Caribbean. In the long run China-US conflicts could lead to new “cold war” situations but China’s new investment and services “great wall” successfully contains any coordinated effort to stop Chinese influence.

Possible interpretations

This wild card has multiple interpretations. People eager for a revolution to bring about change in global politics would see Chinese’s influence expansion as a positive step toward a truly multi-polar world. However, the conservative political and economic elite would interpret this as a major threat that requires urgent action in order to maintain the status quo. Politicians, industrialists and the civil society in Africa and developing countries would see this as a major opportunity to develop new infrastructures, promote industrialisation and achieve major technological and socio-economic development goals. Some researchers and social activists would see this wild card as a sign of cultural shift towards collectivism.

Key actors

Key actors related to this wild card, include:

- Scanners or “early warners” such as international and national financial institutions monitoring OFDI (e.g. OECD, Eurostat, the World Bank, and the International Monetary Fund, etc).
- Shapers (i.e. enablers/inhibitors): Chinese State Owned Enterprises (SOEs) in China, transnational companies, financial institutions and global aid and humanitarian agencies.
- Stakeholders positively or negatively impacted include governments as well as public/private actors in China, African countries, developing countries, USA, Russia, Iran and European countries with interests in Africa, among others.
Potential impacts
The impacts of China’s investment and services “great wall” could include: Manufacturing activities being reduced in China and outsourced or increasingly provided by Africa and developing countries. China could eventually control global CO2 policy, export media and culture as well as global poverty reduction solutions. Consequently, the EU and USA may get closer.

Potential actions
This wild card may be associated with Chinese science and technology overtaking Europe and the US. The current European policy based on leading the global knowledge economy would be undermined. Would the maturation of China follow conventional routes and how this will affect Chinese communism? Will China be more capitalist? Can Europe have an influence on this? Will China dictate ideas and cultures to the world in a way that happened with the US with beverages, fast food and via Hollywood etc? Could Chinese become the dominant language of the web or global lingua franca? For that reason, a number of early actions (pre-wild card) and early reactions (if the wild card occurs) should be considered:

Policy actions
Early actions: Strengthening national/EU business enterprises; Paving the way for European businesses and corporations worldwide; Strengthening EU/national relationships with African countries; Investment in science and technology research; Focus on education policy is vital.

Early reactions: Putting in place policy measures that protect EU businesses (imports and exports) Continuing investment in science and technology research.

Business actions
Early actions: Strategic innovation to compete with Chinese SOEs, strengthening of business relationships with African countries.

Early reactions: Continuing innovation and relationship building with Africa, as well as with the rest of the world.

Research actions
Early actions: Focus on the legislative environment of businesses, innovation research; Research into Chinese business models and ideology.

Early reactions: Continuing focus on innovation, science, technology, business and economic research to support the EU market system.

Weak signals
There are many observables warning us about the probability of this wild card. For example: Western investors in Africa have either left or reduced their presence as a result of the recent economic and financial crises. Consequently, Chinese SOEs (practically unaffected by the global recession) have been able to take up abandoned businesses in Africa. According to the OECD, China’s accession to the WTO in 2001 has transformed the country’s trade, investment and financial regimes and the recent announcement of a “go global” policy has lead to an average annual OFDI growth rate of 116% from 2000 to 2006, which is certainly one the fastest in the world. Since then, China has made even bigger investments in more than twenty African countries, including: Algeria, Angola, DR Congo, Egypt, Ethiopia, Gabon, Guinea, Ivory Coast, Kenya, Libya, Madagascar, Mali, Morocco, Niger, Nigeria, South Africa, Sudan, Tanzania, Zambia and Zimbabwe, among others. The “aggressiveness” of Chinese investment is reflected in the large variety of investment areas, which include: services (mainly banking, construction, insurance and transport), oil and mining (including iron, ferrochrome, chromium ore, gold and copper, among others), telecommunications and manufacturing (e.g. electronic goods, automotive industry, etc.). Among the political signals we can see the government officials in Africa openly declaring that China is seen as a new strategic partner and that the fact that there is no colonial history between Africa and China makes the relationship extremely special. In addition, Chinese partnerships come without conditions as opposed to Western deals which typically impose a number of trade and aid policies often disguised with “human rights” labels.
Abrupt disintegration of the Euro Zone

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities (SSH).

RESEARCH TOPIC
Future changes in Europe’s monetary landscape. Recent shifts in the monetary landscape in Europe indicate that stability is a key issue that needs to be carefully monitored. Recent events in Greece and Iceland, and worries over the state of affairs in Spain and Portugal, demonstrate how quickly financial problems can escalate and bring down a nation state’s entire economy. This has brought on civil unrest and governmental crises. Research in the field of European monetary policy is needed in order to provide an informed policy response in the face of financial crises.

OBJECTIVE
Research could focus on current economic models and could be either forward looking, i.e. with a foresight element or backward looking, i.e. historical economics in order to provide knowledge and analysis of past chain of events in order to explore which steps should be avoided when financial crises strike. Foresight research could focus on exploring what future crises may entail, whether we can spot any current weak signals and how best these may be responded to.

EXPECTED IMPACT
Research should a) determine the chain of events leading to financial crises; b) determine variations and commonalities between recent financial crises within different European states c) devise strategies for appropriate policy responses across EU; d) inform common legislation and regulation across EU; e) inform European monetary policy on how to best tackle financial difficulties of member states.

IMPORTANCE FOR EUROPE
Europe has seen, in recent history, the devastating effect of financial crises of European states. It is important the EU is sufficiently informed about recent events, i.e. chain of events leading up to financial crises so lessons may be learned. Also, it is important to look to the future and prepare for scenarios to do with potential rapid developments within EU financial markets. Preparedness is vital for a quick response, which would limit the damage done to people’s lives and infrastructures within Europe.

In order for this to be classified as a wild card this would have to happen quite rapidly. It would be largely unforeseen and any weak signals would go unnoticed. There is a chance that this might benefit some nation states whilst others would be worse off. The impact of this would be on a massive scale and this would lead to the collapse of governments and international institutions. This could potentially give the power over financial practices back to some of the nation states.

FP7 Themes

ERA Goals
**BLUE SKY POLICY ALERT 36 - ABRUPT DISINTEGRATION OF THE EURO ZONE**

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Rapid development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★★★☆☆ by 2030 ★★★★★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Very negative</td>
</tr>
<tr>
<td>Inspired by</td>
<td>Brainstorming session and group discussions in the iKNOW Workshop in Manchester (February 2010)</td>
</tr>
<tr>
<td>Key words</td>
<td>Euro zone, financial crises, civil unrest, financial markets, economic crises</td>
</tr>
</tbody>
</table>

**Potential impacts in Europe**

<table>
<thead>
<tr>
<th>Infrastructures</th>
<th>★★★★★</th>
</tr>
</thead>
<tbody>
<tr>
<td>People’s Lives</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
<td>★★★☆☆</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
<td>★★★☆☆</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>★★★★☆</td>
</tr>
</tbody>
</table>

**Surprises (‘wild’ scenario features)**

What would be wild about this card is that the economy of the EU will be brutally affected and the deregulation between countries will be evident. The flow of capital and the role of Euro will drop leading to a competitive devaluation of “new” countries in Europe. There will be huge speculation and proposals of the Deutschemark as de facto European currency.

Also, what could be considered wild will be the apparent failure of Euro based common currency as all efforts to integrate member states’ monetary systems come to nothing. Countries pull out of the Euro and revert to national currency or perhaps an entirely non European Currency like the Yen or the Dollar? The EU might disintegrate into different currency zones.

Loss of balance and widening of gaps among the European countries. Rich countries increase the gap against poor countries. Loss of economic integration affects political and cultural integration. Loss of funding of the European project. What is also a wild feature here is the scale of the impact of this wild card, which will be felt throughout societies and even throughout the world.

**Possible interpretations**

There are many possible interpretations of this wild card, for example: a shift in international spheres of influence disaggregates the EU; is Europe as a union too farfetched an idea as there are too many conflicting local interests?; a failure of fiscal monetary policy and models underpinning the Euro Zone evolution; national resentment and conflict especially of countries that “broke” the euro (e.g. Italy, Greece, Spain); succession of defaulting countries leads to fast decline in value of Euro which results in Bank and stock market crashes, governments’ disagreements, break down of internal market; more successful countries are not happy about burden sharing of weaker countries; lack of harmonized politics (vs. Maastricht!); refuse to give up their sovereignty on EU matters).

**Key actors**

Key actors related to this wild card, include:

- Scanners or “early warners” such as economists, analysts, social and political scientists, EU and local governments;
- Shapers (i.e. enablers/inhibitors) such as governments, EU, speculators, IMF, World Bank, EUROSTAT.
- Stakeholders positively or negatively impacted include the public of European countries, governments, financial markets and financial institutions. European research and technology development initiatives (e.g. Framework Programme) would probably see a considerable reduction in funding.
Potential impacts
With this wild card impact will be colossal and will be felt throughout Europe and the rest of the world. Potential impacts are for example: resurgence of nationalism in individual European countries; decline of single market, further European stagnation (hanging apart – not hanging together); serious economic crises, unemployment, unrest, conflict; loss of trust in integration & cooperation processes; return to Darwinist ideologies; return to a global system based on nationalism, bankruptcy of several European countries; EU economy blocked and the EU budget affected; the disagreement in politics becomes even more evident; trade will be blocked; deterioration of European position in the world; weaker role of Europe in multi-polar world; stricter border control and member states become more insular.

Potential actions
A rapid disintegration of the Euro zone could potentially lead to the creation and development of new stability policies or measures to achieve equilibrium among European countries. The emphasis will be on news styles of social and economic action, local production, trade, etc. Increased EUROSTAT control will be needed on national reports and data. Clear EU control of budget and expenses of member states that experience difficulties.

Policy actions

Early actions: Implement stability policies; regulate financial markets; EU policy formed on how best to assist countries in dire financial condition.

Early reactions: Regulate and monitor the situation to avoid it spiralling out of control; Keep tight reins on policy response, avoid panic and make sure that response is evidence based.

Business actions

Early actions: Invest in European markets, goods and services; Support national and European policymakers in the implementation of economic measures.

Early reactions: Avoid price speculation or drastic decisions; Try to continue “business as usual” for a few months until new economic situation becomes much clearer.

Research actions

Early actions: To promote research on the Euro zone and its strengths and limitations; Research should aim to pinpoint areas of weaknesses and suggest solutions; Research in economics and economic models will be necessary to better respond to a sudden disintegration.

Early reactions: Continued research focus on the issues named above; Research community would need to continue presenting research findings that would promote understanding of markets, currency, economics, businesses and also social sciences should focus on keeping track of quality of life of EU residents and report any drastic changes so they may be tackled without delay.

Weak signals
There are several signals warning us about the probability of occurrence of such a wild card. Most recently the global financial crisis brought financial trouble to several European states, most notably Greece and Iceland, although different brought in its wake governmental crises and civil unrest. The collapse of the Greek economy has worried stakeholders and governments throughout the Eurozone as it has the possibility to drag other economies down with it due to investment and financial ties with Greece in the form of exports and imports.

Other European states are currently struggling to bring their deficits under control and face governmental crises as a result, such as Spain and Portugal. It is feared that these troubles may start to spread across Europe. Investors are also starting to refrain from any investment in European financial markets, which further exacerbates the crises.

Governments in financially trouble countries also have to face fierce resistance to their plans of cutbacks in public spending. This has in some instances resulted in protests and civil unrest causing injuries and loss of life as well as damage to infrastructure.

These financial crises touch the lives of ordinary citizens and many face bankruptcy and extreme financial difficulties. Individual bankruptcy and unemployment is on the rise and families face loosing their homes and livelihood. As well as this putting the strain on families it is also a heavy burden to bear for already straining public services systems. These are all weak signals for rising public disillusion with politics and the financial systems, which potentially puts at risk the social treaty people have with their governments. Governments and banks are no longer trusted and widespread lack of trust could potentially lead to further civil unrest as the aforementioned have lost their legitimacy in the eyes of the people.
Transhumanism becomes a significant force

**RECOMMENDED RESEARCH**

**THEMATIC AREA**
Social sciences and humanities (SSH), health, ICT, nanotechnology and security.

**RESEARCH TOPIC**
Ethics of human technological enhancement. Human technological enhancement (HTE) is a fast moving trend and which promises much, but which has important ethical considerations that need to be assessed for the successful furthering of this endeavour. Current examples of HTE are bionic limbs used by amputees, and implantable microchips used for ID and tracking purposes and in experimental procedures to restore eyesight and hearing. Ongoing developments within the field of human enhancement also include cosmetic surgery and lifestyle drugs.

**OBJECTIVE**
Research should pinpoint and assess the strategic implications of human technological enhancement, i.e. what impact these activities will have on people’s lives (e.g. health benefits/detriments), contemporary society (e.g. new inequalities) and culture (new ideologies and attitudes to the body and mind), and business ventures (e.g. IPR). Research could further identify political and media discourses surrounding human enhancement in order to understand the development of debates around the issue. Research should take into account basic philosophical questions such as, ‘what makes us human’ and examine the changing boundaries between humanity and technology.

The emergence of movements that support and oppose various forms of human enhancement is another central research theme.

**EXPECTED IMPACT**
The research will a) increase awareness of ethical dimensions of human technological enhancement; b) devise strategies for appropriate policy responses across EU; c) inform common legislation and regulation across EU; d) inform business enterprise and innovation in this field; e) inform educational and health strategies on the subject of human enhancement; f) inform the general public about a spectrum of developments that are liable to profoundly shape culture and society in coming decades (even without a strong transhumanist movement).

**IMPORTANCE FOR EUROPE**
Human technological enhancement is a growing field and one that can potentially have enormous effects on contemporary society. It is vital that policy response which would aim to shape and regulate this industry is informed by research that could guide member states in forming their legislation and listening to emerging voices and opinions.

Human enhancement techniques are developing rapidly. This wildcard explores the notion that Transhumanism (promotion of technology enhanced humans) becomes a significant force in society rather than a fringe phenomenon. The wildcard assumes that relevant technologies will be widely available and welcomed.

**FP7 Themes**
- [ ] Health
- [ ] Nanoscience and Nanotechnology
- [ ] Information and Communications Technology
- [ ] Research Infrastructure
- [ ] Science with Society
- [ ] The Environment

**ERA Goals**
- [ ] Growth and Competitiveness
- [ ] Environment and Climate Action
- [ ] Education and Training
- [ ] Research Infrastructures
- [ ] Society and Security

Authors: Thordis SVEINSDOTTIR, Ian MILES, Yenuar NUGROHO, Rafael POPPER, Joe RAVETZ (University of Manchester)Contributors: Julia DE CLERCK-SACHSSE (European Commission), Dalina DUMITRESCU (Institute for Business Administration in Bucharest), Gabriele GRIFFIN (University of York), Dirk JOHANN (Austrian Centre for Social Innovation), Javier MEDINA (Universidad del Valle), Konrad MICIUJKIEWICZ (Planning and Landscape Newcastle University)

Artist: Joe Ravetz
BLUE SKY POLICY ALERT 37 - TRANSHUMANISM BECOMES A SIGNIFICANT FORCE

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Gradual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★★★★ by 2030 ★★★★★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Uncertain (possibly negative)</td>
</tr>
<tr>
<td>Inspired by</td>
<td>Brainstorming session and group discussions in the iKNOW Workshop in Manchester (February 2010)</td>
</tr>
<tr>
<td>Key words</td>
<td>Human, enhancement, transhumanism, technology, ethics, convergence, inequality</td>
</tr>
</tbody>
</table>

**Potential impacts in Europe**

| Infrastructures      | ★★★★                    |
| People’s Lives       | ★★★★★★                  |
| Legislation & Regulation | ★★★★              |
| Economy & Business   | ★★★★                    |
| Defence & Security   | ★★★★                    |
| Government & Politics| ★★★★                    |
| Environment & Ecosystems | ★                |
| Science & Technology | ★★★★                    |

Low ★ Medium ★★ High ★★★ Very high ★★★★★

### Surprises (‘wild’ scenario features)

The wild factor here is that commonplace assumptions about boundaries that have been drawn between humans and technology are substantially undermined. This means a process of redefining human identity, i.e. what makes us distinctively human, what we value about this, and rethinking expectations about human capabilities. The possibility of human enhancement here gives rise to large strident social movements who welcome increased efforts to augment human minds and bodies. Some relevant technologies may be cheap – “smart drugs” and the like. Some may be relatively expensive – prosthetics (and human-computer interfaces), gene therapy, etc. There may be new divides opened up, with new elites who live longer, are healthier, more intelligent and “beautiful”, and who (having selected the most promising foetuses) have their children further enhanced to ensure they have the best start in life. People who cannot afford or do not accept biological and transhuman manipulation will ‘lose out’ on jobs, partners and income. Ideologies that justify or challenge these new social gaps may take bizarre forms, since traditional Darwinist and racist arguments do not fit the new scenario. Furthermore, transhumanists now tend to be libertarians. Finally, there could be distinct subcultures stressing specific aspects of enhancement – cosmetic appearance, sporting prowess, intellectual abilities, even emotional features of personality. There are historical experiences of people hoping that their child would be the “chosen one”: now they may have a chance to design such a child!

### Possible interpretations

Some possible interpretations of this wild card focus on how people will no longer accept the inherent limitations of being “just human”. The human body is as open to technological manipulation as anything else: valued features can be enhanced, deficiencies reduced or even eliminated. Why not use modern knowledge to become the best you can be (however that is defined)? Population ageing may be a driver here: people no longer want to become old but want to remain capable as long as possible. More general shifts in values towards self actualisation and social recognition may also shape the degree and direction of interest in enhancement.

### Key actors

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as educators, scientists, health professionals, governments and regulators, as well as defence and security actors (including private security contractors) are monitoring potential opportunities and threats of transhumanism.

- **Shapers** (i.e. enablers/inhibitors) such as the World Transhumanist Association, Humanity+, the Mormon Transhumanist Association and similar groups are among the promoters of the development of the “transhuman movement”. Among the inhibitors we can find the Catholic Church and bio-ethical committees and regulators, for example

- **Stakeholders** positively or negatively impacted such as private medical, cosmetic and pharmaceutical companies, entertainment and sporting organisations. Religious bodies would have varying views on specific instances of enhancement, and would in general be likely to strongly oppose full-blown Transhumanist ideologies.
Potential impacts
Potential impacts of Transhumanism becoming a significant force would be varied, but could include changes in most areas of society. Ethical dimensions would have to be redefined and new boundaries drawn. New and different social inequalities might become rigid sources of social fragmentation and conflict. At the workplace, demands to work longer hours (and even to undertake some enhancements) might be likely. One potential positive impact of this would be cuts in healthcare spending, for example as some sorts of disability are eliminated (though other costs might rise). The implications of extended longevity and active old age are profound and poorly understood: we might expect significant changes in values and social norms.

Potential actions
Were Transhumanism to become a significant force in Europe it is clear that there would be a need to negotiate new rules and compromises. Education would have to be adjusted to teach ethics and respect for transhumans. Regulation of all transhuman projects would have to be strictly adhered to and common rules agreed across the EU states.

Policy actions
**Early actions:** Policy makers should regulate, examine appropriateness and agree on common rules and standards across EU for areas such as gene therapy, embryo selection, smart drugs and microelectronic implants. The rules would need to encompass consumer protection, business liability, quality of life and human rights. Policy should aim to protect workers’ rights (e.g. to ensure that transhumans are not given preferential treatment). Education and sports organisations need to be proactive in developing policies – and to be more open-minded in their attitudes to performance enhancement.

**Early reactions:** Policy makers would need to respond swiftly to technological developments and to possible changes in our understanding of Human Rights. There may be a need to make sure that Transhuman Rights are respected. Policy makers should regulate the workplace in order to make sure they are still humane places to work in, e.g. trends in working hours and mental and physical effort.

Business actions
**Early actions:** Transhumanism would present many opportunities for business ventures. Businesses would have to agree on quality control and to discourage cheap and unreliable imports (or transhuman tourism growing in the way that cosmetic and medical tourism have in recent years). IPR would need to be protected and legal liabilities would need to be clarified. Lawyers may see many opportunities here.

**Early reactions:** Businesses would have to increase their concerns for social responsibility and make sure that “non-enhanced” workers are not discriminated against in the workplace. An important question would be whether (or when) businesses can insist on transhuman workers for specific jobs?

Research actions
**Early actions:** Mass media and political discourse analysis, together with more conventional social research, to assess people’s views on Transhumanist ideas and practices. Research would have to explore social and ethical implications of transhumanism, especially in terms of implications for human identity, and might extend into action research (consensus conferences, etc.). Research would also need to focus on the social control of converging technologies. Finally, it would be important to explore “vanguard groups” and practices, and identify how some activities have moved into the mainstream, with what effect.

**Early reactions:** Again, social and cultural dimensions would need to be explored in research. Educational research would need to be carried out to determine what effect enhancement would have on educational results and qualifications. Research would need to go back to tackling fundamental questions concerning human identity: What are the key elements of being human? What needs to be preserved, and what could be changed?
Weak signals

There are several signals or observables warning us about the probability of occurrence of such a wild card: Increasing pressures from workplaces to work longer, faster and with more productivity. This has led to, for example, growing popularity of stimulants, relaxants and lifestyle drugs. There are large markets for “energy drinks” that promise heightened performance and relaxing drinks to soothe anxiety and aid sleep. Universities are considering how to stop students using smart drugs to boost examination performance. Plastic surgery has fast become a normal everyday activity, rather than an extreme and unusual one. This indicates that we are slowly becoming accustomed to the human body being enhanced: the ideological jump towards more significant enhancements should not be too large. Microchips have been implanted into people (a commercial example of this is the nightclub in London that offers to implant an RFID chip into members’ arms to ensure they can skip the queue, and some parents have expressed the wish to have their children implanted with microchips so that parents can know where they are at all times). There is much effort to develop technologies to help people suffering from blindness, hearing loss, cognitive impairment, etc.; these may well be applied to much wider populations.
Rise of Africa

RECOMMENDED RESEARCH

THEMATIC AREA
Social Sciences and Humanities; Security

RESEARCH TOPIC
Responsible attitude to problems of Africa
Europeans are still feeling guilty for a lot of crime and exploitation in Africa; today’s problems in Africa are results of Europeans’ activities in colonial times. However there is enormous wealth of raw materials in Africa today. There is big influence and investment of China, which tries to meet its rising demand for resources. But there is strong need of self-reliance (Do It Yourself strategy) as well. In case of stopping civil wars and lethal epidemics, fair land distribution and increasing of education Africa may become important player on the economic map of the world.

EXPECTED IMPACT
SSH and security research should be oriented to solving of main problems of Africa, e.g. improvement of the education and information infrastructure, stabilisation of democracy, stabilisation of environmental problems, solving of ethnic/religions conflicts, efficient use of energy resources, return of well educated citizens, building of strong African self-confidence and identity. SSH research should as well increase awareness of ethical dimensions of the issue and devise strategies for appropriate policy responses across EU.

IMPORTANCE FOR EUROPE
There are significant security threats for Europe in case of unfavourable development in Africa (undesirable immigration, background for terrorists) which are balanced by possible advantages in case of favourable development (advantageous economic and research cooperation). It is vital that policy response which would aim to control and regulate this issue is informed by research into foreseeable social implications these development may have.

If it were free of civil wars and lethal epidemics, if land were more equitably distributed and if education could be improved then Africa could become an important economic player in the world. There is an enormous wealth of raw materials and natural resources, a big labour force potential and big consumer potential. It is for these reasons that today the ‘Black Continent’ is in the viewfinder of China and other emerging economies. The contemporary problems across Africa seem to be the result of European rule during colonial times but despite this there are significant possibilities for European countries to help Africa and to participate in its economic growth.

FP7 Themes

ERA Goals

Author(s): Martin FATUN (Technology Centre ASCR)
Contributor(s): Burkhard AUFFERMANN (Finland Future Research Centre, FFRC), Vivienne SOYKOVA (Faculty of Transportation Sciences, Czech Technical University in Prague), Pavel KOLAR (Institute of Criminalistics Prague), Maurizio SAJEVA (Finland Future Research Centre, FFRC), Ines LIETZKE (Z_punkt), Santi FORT (Barcelona Media - Innovation Centre), Frank NIKLUS (KTH – Royal Institute of Technology)

Artist: Joe Ravetz
Surprises (wild features)

There are many specific wild features of life and economy in Africa. Distinctive attitude to land and work, tribal communities, gender question. There are big regional differences, especially among North, sub-Saharan and South Africa. And there is one very important issue, which is the strong belief in self-reliance with an accent on Do It Yourself strategy.

The scenario of an economically rising Africa requires solutions for ethnic conflicts and wars, promoting greater tolerance, increases in security and political stability, the return of well educated diaspora, the fair distribution of land, indigenous economic recovery (with less dependency on international companies), strengthening of African union, minimising the impact of environmental problems, and efficient use of energy resources.

Possible interpretations

Positive interpretation assumes that the wild card can help people of Africa overcome the inauspicious heritage of the past times and head for peace and prosperity. The identity of Africans can be strengthened on the basis of self-reliance traits and a respect for local specifics.

From the European point of view a close cooperation with a stronger Africa can help the European economy to succeed in tough raw material resources wars, with emerging countries such as China or India. A successful strategy supporting self-reliance in Africa could cause temporary disadvantage to some multinational companies, especially those who are thought to take advantage of the chaos and corruption. However in the longer term such transitions should be ironed out.

Last but not least, the consolidation and economic strengthening of Africa should reduce levels of immigration from Africa into Europe, with consequential savings.

Key actors

Key actors related to this wild card include:

- African Union (AU), which need to strengthen its authority and influence
- Governments of African countries, which should create suitable conditions for transformation
- People of Africa, who should support the idea of transformation and believe in it
- African diaspora, because the return of well educated citizens is necessary
- European governments, companies and NGOs, which should strive for cooperation and support transformation of Africa
- Researchers, who will develop new technologies and methods assisting to transformation (agriculture, health, learning, energetics, security etc.)

Potential impacts

Positive potential impacts of the wild card include stronger self-reliance of Africa, partnership with Europe, stabilization of economic growth, increase in security (as well for Europe) and increase of political influence (permanent seat in UNSC for Africa). Important issues are as well increase in education, stabilizing of environmental problems, efficient use of land and efficient use of energy resources.
Potential actions
To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card demonstration actions:

**Policy actions**

*Early actions:* Ensure environment protection; support return of emigrants to Africa; funding for research institutes in Africa; orientation of economies on higher-added value sectors; joint strategy of African status; attraction of new investments; prepare contents to be delivered in different languages; dissemination of local ideas and traditions to foster the social acknowledgement; meetings to align needs of various parties.

*Early reactions:* Ensure environment protection; stabilization of economies and ensuring continual GDP growth; attract brains; join the free trade zone; relationships beyond economic or security outcomes.

**Business actions**

*Early actions:* outsourcing of production to Africa; sustainable investments; encouragement of business interactions.

*Early reactions:* global shift of production; new processes derived from changes in raw materials cost/prices.

**Research actions**

*Early actions:* environment protection; ensure a technology for self-sustainability; research on policy impacts and consequences; research on the key factors for improvement; use of “control system theory” form ICT research to understand the complex systems and effects on policy settings.

*Early reactions:* environment protection; research on sociological and political consequences; specify key research priorities; ensure a technology for self-sustainability.

Weak signals
There are numerous weak signals which can indicate oncoming manifestation of the wild card: regional economic integration in southern Africa; increasing role of Africans all over the world; African Union taking over more responsibility (supported by EU); EU promotes African capabilities for peace keeping; increasing cooperation with EU-North Africa (Mediterranean policy); contradictory signs (investments, wars etc.) –> Africa is getting important; football world championship in SA –> strengthening of the region; food crisis increasingly under control; growing economic health (due to raw material resources); increasing awareness in the EU to support Africans.

References
First contact with Extraterrestrial Intelligence

RECOMMENDED RESEARCH

THEMATIC AREA
Space

RESEARCH TOPIC
Dealing with mass hysteria: soothing an agitated public. Whether or not an alien ‘invasion’ is actually going to occur (a true wild card, if ever there was one), there will almost certainly be instances in the future when a certain populace would be lead to believe that contact has been made with extraterrestrial intelligence. Such instances can lead to mass hysteria and acts that take in view only the short-term consequences. People might take extravagant loans or mortgages, acting under the belief that money would soon lose its meaning altogether. Many families would resort to buying and hoarding preserved foodstuff, leading to a steep rise in food prices. Parents would equip their children with cellular phones to make sure they know their whereabouts at all times. Shootings and lynches of suspected aliens are likely to occur especially in areas where carrying firearms is legalized. These are all the results of mass hysteria of the public as a whole, stemming from the belief that aliens exist and have made contact with human beings – regardless of the truth.

We would suggest concentrating research effort on describing previous events of mass hysteria and figuring out methods and ways to calm the public. Without such methods at hand, the effects of mass hysteria could be devastating for an entire nation.

OBJECTIVE
The objective of the research actions mentioned above aim at reducing the injurious response of the public to the statement that contact has been made with extraterrestrial intelligence. This objective is also valid, however, for any case in which the public stands to experience the effects of mass hysteria. Therefore, it is not limited to this wild card alone.

EXPECTED IMPACT
Research on the subject of mass hysteria would reduce the risk of nations losing control over their citizens at a time when humanity as a whole must show a united front. It would also aid national governments in taking care of events of mass hysteria stemming from other roots.

IMPORTANCE FOR EUROPE
The European Union is on its way towards being one of the most prominent and influential mass of citizens in the current century. While the first contact with extraterrestrial intelligence would make a change for all human beings and countries, Pasteur teaches us that – “Luck favours the prepared mind”. The EU should prepare itself for an eventuality in which contact with aliens is achieved, to maximize the benefits and minimizing the risks – especially in such a wild card where the benefits are practically endless, while humanity itself stands on the balance.

Evidence of the existence of intelligent life on another (extra-solar) planet is obtained. First contact (by using appropriate communication technology) is established with this extra-terrestrial intelligence.

FP7 Themes
ERA Goals

Author(s): Roey Tzesana(CTAF)
The search for extraterrestrial life forms has been on the run for the past few centuries, with telescopes searching the skies and the SETI program’s antenna dishes on the lookout for any sign of unusual radio activity. While none of the above have come up with any evidence for the existence of aliens, it is not inconceivable (though highly surprising and unexpected) that even tomorrow SETI’s scientists would pinpoint a radio transmission that contains messages from another planet.

Surprise might be even more prominent should the aliens decide to contact us via unconventional means, as defined by our current limits of knowledge. A large part (not to say, probably all) of the people who claim to communicate with aliens using their minds, and heal others using ‘alien energies’ are misguided at best, or crooks at worst. However, as our science evolves we might uncover new understanding regarding the brain’s functions, or new sources of energy which would seem as incredible and magical to ourselves as the idea of invisible electromagnetic radiation would seem to our ancestors. In Arthur C. Clarke’s words of wisdom, “Any sufficiently advanced technology is indistinguishable from magic”. Consider, then, how surprising it would be to discover that aliens are suddenly making dozens of very real contacts (and providing evidence, such as the solutions to mathematical problems) using the minds of everyday people, or in a cruel twist of fate – the minds of those who claimed to meet them before and utilize their ‘powers’.

Last but not least, one cannot neglect the possibility that the aliens come en masse in a space ship. The ship might be veiled as an asteroid, or somehow otherwise camouflaged so as not to alert the citizens of Earth right up to the point where it’s orbiting the planet. Or, it might enter the solar system as brazenly and prominently as any European warship would do when making first contact with the savages of the Americas in the days of old.

Surprises (wild features)

The search for extraterrestrial life forms has been on the run for the past few centuries, with telescopes searching the skies and the SETI program’s antenna dishes on the lookout for any sign of unusual radio activity. While none of the above have come up with any evidence for the existence of aliens, it is not inconceivable (though highly surprising and unexpected) that even tomorrow SETI’s scientists would pinpoint a radio transmission that contains messages from another planet.

Surprise might be even more prominent should the aliens decide to contact us via unconventional means, as defined by our current limits of knowledge. A large part (not to say, probably all) of the people who claim to communicate with aliens using their minds, and heal others using ‘alien energies’ are misguided at best, or crooks at worst. However, as our science evolves we might uncover new understanding regarding the brain’s functions, or new sources of energy which would seem as incredible and magical to ourselves as the idea of invisible electromagnetic radiation would seem to our ancestors. In Arthur C. Clarke’s words of wisdom, “Any sufficiently advanced technology is indistinguishable from magic”. Consider, then, how surprising it would be to discover that aliens are suddenly making dozens of very real contacts (and providing evidence, such as the solutions to mathematical problems) using the minds of everyday people, or in a cruel twist of fate – the minds of those who claimed to meet them before and utilize their ‘powers’.

Last but not least, one cannot neglect the possibility that the aliens come en masse in a space ship. The ship might be veiled as an asteroid, or somehow otherwise camouflaged so as not to alert the citizens of Earth right up to the point where it’s orbiting the planet. Or, it might enter the solar system as brazenly and prominently as any European warship would do when making first contact with the savages of the Americas in the days of old.

**Manifestation**
Probably in a pervasive way (contagious or transmissible)

**Importance**
★★★★★

**Likelihood**
★★ by 2030 ★★ by 2050

**Impact on EU**
Unplanned consequences of events/trends/situations

**Inspired by**
Fiction books/movies.

**Key words**
Space, life, intelligence, contact, communication, exobiology

---

**Potential impacts in Europe**

| Infrastructures | ★★★ |
| People’s Lives | ★★★★ |
| Legislation & Regulation | ★★★★ |
| Economy & Business | ★★★★ |
| Defence & Security | ★★★★ |
| Government & Politics | ★★★★ |
| Environment & Ecosystems | ★★★★ |
| Science & Technology | ★★★★ |

---

**Key actors**

Key actors related to this wild card, include:

- **Scanners or “early warners”:** Should the aliens come on masse, the astronomers would probably alert us (or perhaps more specifically the intelligence authorities) of their presence. It is quite likely that one of the dozens of thousands of amateur astronomers, who scan the night sky every day, would raise the call even earlier than an official body would. SETI is another early scanner, though it is also an enabler of the contact itself. Lastly, should the aliens indeed pick the highly surprising route of making contact through people’s minds, there might be a class of especially susceptible human beings who will storm out to the streets in large numbers and warn the populace of the incoming visit.

- **Shapers (i.e. enablers/inhibitors):** If the aliens are not creating real and intentional contact, then SETI is the only real enabler because of its ability to derive meaning out of radio transmissions that arrive from the aliens’ planet or spaceship. The government body in charge of SETI is expected to hold back the information at that point, so as to prevent the interpretation of that knowledge by other nations.

- **If the aliens come to us intentionally by spaceship, then the national governments will be in charge of creating contact with them, either by radio transmissions or by sending astronauts as close to the spaceship as possible – and possibly to be picked up by it. The UN and its flock of smaller countries would attempt to make their voice heard, but it is likely that the larger countries with their independent ability for space launch would be the real ones to represent the human race in the actual face-to-sensory-organ encounter.**
• **Stakeholders:** The stakeholders are likely to be the entire human race. This includes societies as a whole (as well as the concept of society) business enterprises, public institutions, travel providers, airlines, health care, religious bodies and system and more.

**Potential impacts**

The first contact with aliens is likely to be traumatizing to human beings on many levels, but also has the potential to provide incredibly large benefits. We will divide the impacts into three simplified categories: Beneficial, Injurious and Uncertain.

**Beneficial:** Should the first contact be one-sided on our part, meaning that SETI actually finds alien transmission and makes sense of it, unknown technologies and information could come out of the link. One could also claim that an alien civilization would be so much more evolved and developed from human society, that the aliens would be generous enough to provide us their support and knowledge completely altruistically. This would be highly surprising (to say the least). A more likely scenario is one where alien scouts arrive the Earth only to be shot down from orbit, and the remains of their spaceship are scoured for new technologies.

**Injurious:** It is much more that the alien technology would be sophisticated enough to overcome human defence technology, especially if they use highly developed nano-technology, where a single cubic centimetre could contain both the means to demolish the planet or its inhabitants (using nano-machinery and specialized versions of ‘grey goo’) and the genetic information to repopulate it as the aliens see fit. It is not inconceivable to say that should the aliens be even one centimetre ahead of us in science, they would be able to eliminate every living being on the planet without too much of an effort.

**Uncertain:** Assuming that the aliens wish neither to destroy us, nor to share with us their knowledge and good fortune, the impacts of the first contact cannot be evaluated ahead of time in terms of ‘what the aliens would give us’. The effect on the human sociology, however, would be grand even if the aliens simply orbit the Earth without actually making contact. The knowledge and understanding that we’re not alone in the universe would cause widespread panic, riots and looting. Terrorists and fundamentalists might make a stand to uphold their beliefs, seeing the aliens as messengers from God almighty, or from Satan itself. People might choose to convert to either fundamental religion or atheism. Most would likely stay on the fence, but become somewhat more extreme, since it would seem that the moment of judgement is at hand. Most countries would put aside their differences and avoid violence and military clashes until they see what the aliens want.

Other countries would utilize this pause to strike hard and definitively against their enemies. In short, while the aliens might indeed cause a complete change of the playground eventually, up until that point human beings will be the same as always.

**Potential actions**

To support demonstration of the wild card and at the same time to prevent its negative impacts is a goal which requires whole range of co-ordinated actions on fields of policy, business and research. Some actions should be undertaken prior to the wild card demonstration, as well as there are post wild card demonstration actions:

**Policy actions**

**Early actions:** Projects like SETI, which could indicate the existence of an alien intelligence before it actually reaches us, should be encouraged and supported, within reasonable limit. It is possible that general guidelines for first contact with alien should be determined in the UN, so that if this W0 occurs and the aliens come into orbit tomorrow, all the different will know the pre-determined routine and their place in it. This is possibly an effort in vain, since it is likely that many national governments would largely ignore the guidelines and attempt making contact all by themselves by radio transmission. The right to make first physical contact, however, should be reserved to a team selected by the UN according to those pre-determined guidelines. And while China, the US, India and other countries with space launch capabilities might attempt to circumvent this, the guidelines would at least provide an initial set of rules for the first encounter.

**Business actions**

**Early actions:** As soon as the presence of extraterrestrial beings becomes a very real possibility, a mass hysteria is likely to occur in places around the globe, leading to hoarding of preserved foodstuff and bottled water (a possibility for profit for food distributors). People are also likely to buy weapons for self defence, leading to a rise in firearm sales. Children will be ‘armed’ with cellular phones, so that their parents can know where they are at all times.

There is also a distinct possibility that people will tend to be less responsible with their loans, mortgages and lifestyle, believing that ‘when the aliens arrive, everything will change’ (and perhaps rightly so). People are likely to spend more, under the belief that the monetary value of things will soon change rapidly, and perhaps lose its meaning altogether. The end result would be an inflation of prices, especially of food, firearms and cellular phones.
Research actions

**Early actions:** Research funds should be invested in linguistics and cryptography, two topics which might prove necessary to decipher the aliens’ language – whether they make physical contact or communicate by radio transmission. Consideration should be given to distributing additional funds to SETI and similar programs.

Weak signals

The signals that could indicate oncoming contact with an alien intelligence are numerous. In the case of radio transmission, they include in particular a case in which SETI discovering a certain radio transmission with a peculiar pattern that repeats itself. In the case of physical contact with aliens, the signals include an indication that a certain asteroid or other extraterrestrial bodies are moving in an unexpected way, possibly because they have engines of some sort. There is also a possible case of aliens actually manifesting their presence on the Earth, in a manner similar to the ‘flying saucers’. The ‘saucy’ weak signals occur nearly every week, but can largely be attributed to psychological elements and events of mass-hysteria. An actual landing or appearance of aliens on Earth should have extra-ordinary evidence, which the current ‘landings’ do not provide. Such evidence could include contact of world leaders with an alien life-form, a dissection or scientific investigation of an allegedly alien life-form by expert scientists who can verify that its source is extraterrestrial, etc. Should these requirements be met, the event could be declared a weak signal.
Individual Nano-Enabled Safety Capsule

RECOMMENDED RESEARCH

THEMATIC AREA
Material Sciences, Security, Nursing Sciences, Economics.

RESEARCH TOPIC
Nano-materials with improved safety properties:
Recent technological improvements indicate that after a long period of rather incremental improvements in material sciences for security applications, major disruptions are on the way in the near future. The objective is to develop nano-tech based “textiles” that become very stiff and tremendously strong when hit so that they can be used in protective suits. These textiles must be thin and lightweight and, at the same time, be able to absorb kinetic energy. They must also be environmentally stable and guarantee no nano-particles being released into the atmosphere.

Future benefit of the use of ultraprotective suits in elderly care: The cost and benefit of these textiles in protective suits for soldiers and policemen is rather obvious. The question is whether these suits can also be suitable to help care for old people. Typical injuries that might be prevented and the associated healthcare costs have to be analysed. The special requirements of old people including their attitudes to such new materials have to be taken into account in improving suit design.

OBJECTIVE
The idea is to enable European research and business to participate in the development and to make the disruptive technology accessible to the non-defence sector as early as possible. A preferred and accelerated distribution of the technology into the elderly care sector might discourage applications diffusing into the lifestyle business where negative societal consequences are possible.

EXPECTED IMPACT
Research should determine business models for the spread of safety suits in elderly care. The cost and benefit analysis might show that health insurances should be addressed as customers in case the safety suits’ free distribution to old people is in their interest. The expected impact is a society with a decreased health burden and EU business to catch up in an innovative market.

IMPORTANCE FOR EUROPE
Due to the demographic situation in Europe compared to the US and other countries, the spread of the disruptive technology in non-defence sectors should be a vital interest of the region. Catching up in nanotechnology development is also important from an economic point of view since the chemical industry in Europe is strong and mature.

A new kind of nano-tech based “textiles” that become very stiff and tremendously strong when hit are used in protective suits. Anybody wearing such a suit could be shot, hit by a car, fall off a bridge etc. without getting hurt. The demand for body protection is particularly high in the context of military and homeland security, in heavy industry, personal transport, extreme sports and geriatric care. The breakthrough of an ultraprotective textile may be expected in the defence industry and is likely to spread to the other sectors soon after.
Surprises (wild features)

Protective equipment is nothing new in the defence industry. It is as old as war itself, with roots reaching back to the ancient world. However, over time the materials used in protective equipment have changed from leather, iron, steel, ceramic to synthetic and nano fibres. Modern body armour often combines a ballistic vest with other items, such as combat helmets. In general, there is a trade-off in body protection between performance and weight.

A strongly improved performance weight ratio would be the first ‘wild’ or surprising feature of nano-enabled safety capsules. Only nano-enhanced materials could reach mass values considerably lower than today’s 8 kg/m² for multi-threat vests and at the same time multiply their kinetic absorption (up to 500 tonnes per cm²). A second surprising element would be the substitution of traditional non-individual protective measures by individual safety suits and the diffusion of this technology into new application contexts. Moreover, the safety standards to be adopted in these contexts needs to be considered. This might include the replacement of airbags in cars and the use of safety suits for pedestrians.

There are potential behaviour changes to be expected if people start to wear ultra-protective textiles; there would be wider implications in a society where these textiles are widely used (e.g. individuals would be inclined to take more risks, a greater sense of adventure could be experienced (“more risk – more fun”), insurance premiums could be tuned to ownership of protective suits, a kind of arms race between police and criminals might occur with stronger and stronger protective suits – and stronger firearms at the same time.

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as Science Fiction authors and futurists, and investigative journalists with regard to military inventions;
- **Shapers** (i.e. enablers/inhibitors) such as corporations from the defence industry, the chemical industry and private military companies (early actors in the breakthrough stage), companies from the extreme sports sector, the textile industry, the work clothing industry and the health sector (actors in the diffusion stage); and
- **Stakeholders** positively or negatively impacted such as soldiers, policemen (tactical units) and criminals, firemen and other security personnel, heavy industry workers, old people, travellers and extreme sportsmen.

<table>
<thead>
<tr>
<th>Manifestation</th>
<th>Disruptive Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Likelihood</td>
<td>★★ by 2030 ★★★ by 2050</td>
</tr>
<tr>
<td>Impact on EU</td>
<td>Very negative</td>
</tr>
<tr>
<td>Inspired by</td>
<td>Discussions on the generation of new wild cards related to science fiction in the SciFi working groups in the iKnow expert workshop in Cologne, Germany</td>
</tr>
<tr>
<td>Related to</td>
<td>Science Fiction</td>
</tr>
<tr>
<td>Key words</td>
<td>Safety, Security, Nano, Capsule, Nano-enable safety capsule</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential impacts in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructures</td>
</tr>
<tr>
<td>People’s Lives</td>
</tr>
<tr>
<td>Legislation &amp; Regulation</td>
</tr>
<tr>
<td>Economy &amp; Business</td>
</tr>
<tr>
<td>Defence &amp; Security</td>
</tr>
<tr>
<td>Government &amp; Politics</td>
</tr>
<tr>
<td>Environment &amp; Ecosystems</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
</tr>
</tbody>
</table>

**Low ★ Medium ★★ High ★★★ Very high ★★★★★**
**Potential impacts**

The invention of nano-enhanced safety suits will drive the individualisation of risk and safety. It is highly probable that these suits will be very expensive, leading to a dual safety gap within and between societies with both positive and negative consequences. High-tech soldiers from more affluent countries might be better protected in military conflicts. The same applies for policemen in the context of petty crime, which, over the years, has become more brutal. However, organised crime, being more capital intensive, “profitable” and long-term oriented, is likely to catch up with the improved safety equipment of the police, and their arms race might be complemented by a “shield” race. In the end, possibly only the collateral damage will increase. If politicians decide to restrict access to this kind of passive armament, the emergence of a black market for safety suits could emerge.

Also, in public and individual transport the gap between safe and unsafe travellers may rise. Protective suits might be free in airplanes’ first class departments only and lead to an increased survival probability in case of a crash. Concerning road traffic, the consequences might be similar to the safety belt. When it became obligatory, the number of traffic deaths increased because people changed their driving behaviour. However, in the case of relatively expensive safety suits the gap will not rise between car drivers and pedestrians, but between rich car drivers and pedestrians on the one side and poor car drivers and pedestrians on the other.

The invention of individual safety suits might also lead to a massive rise of the extreme sports sector and eventually a more risk-taking society (“more risk, more fun”). In contrast to that, protective textiles for very old people, the fastest growing population segment in Europe, seem far more likely. Special health insurance fees for old and young people wearing a safety suit are imaginable.

**Potential actions**

### Policy actions

**Early actions:** Assuming a rather positive assessment of the wild card’s overall impacts, the direction of potential policy actions would be not to stop, but to guide the development in a direction beneficial for society at large and to support the relevant business in Europe. Regulations might forbid the sale of ultraprotective suits to persons with criminal records. The market launch for such suits could be supported by purchasing agreements in pilot markets including soldiers, policemen and politicians. Also, the regulation of car safety might allow for protective suits instead of traditional measures; the possible impact of this on automotive safety R&D might be considered. Depending on the materials to be used, the recycling of the nano fibres should be dealt with. Policy makers might also have to define non-usage zones such as banks or schools and ways to enforce deactivation or non-usage in these areas.

### Business actions

**Early actions:** EU companies involved in the development and marketing of safety suits might first address market segments with lower commercial risk, such as the defence sector and rescue services, and therapeutic and heavy industry applications. Then, premium customers in the lifestyle segments will follow. As a consequence, a window of opportunity for new extreme sports will open. Relevant companies will have to develop testing procedures and sales channels for the new product, and they will have to find ways to protect themselves against the marketing of fake suits. Some companies from the traditional safety equipment industries, such as airbag manufacturers, will have to redefine their business and such companies may be early innovators.

### Research actions

**Early actions:** Research has to find and improve nano-materials with the characteristic properties and mobile energy sources for the suit. Also, the material’s eco efficiency, medical extra functions and self-repairing properties might become long-term research issues. Social sciences and humanities might explore the people’s acceptance of the safety suits and possible behaviour changes when the technology spreads. Also, strategy changes in the defence and insurance sectors are matters of interest.
Weak signals

There are several signals underlining the probability of, both, the invention of ultraprotective textiles and the demand of personal safety and security equipment in a growing number of application fields. Nanomaterials are already implemented into body armour production. One method is based on nanoparticles within the suit, which become rigid and protect the wearer as soon as a kinetic energy threshold is surpassed. These fabrics were licensed by BAe Systems in 2008. As early as 2005 an Israeli company developed a nanocomposite that was able to withstand shocks generated by a steel projectile travelling at velocities of up to 1.5 km/s and shock pressures generated by the impacts of up to 250 metric tons-force per square centimetre. During the tests, the material remained essentially unmarred. Both the British and American militaries were reported to be interested in these technologies and are actively supporting its research.

Apart from that, the ongoing privatisation of security services (e.g. in safe rooms), the increasing market for car safety equipment, rising media coverage of natural and technological disasters such as airplane crashes, and increasing personal responsibility for one’s health are weak signals for the diffusion of this technology from the defence to the non-defence sector.
Revolutionary Space Propulsion

RECOMMENDED RESEARCH

THEMATIC AREA
Space, SiS

RESEARCH TOPIC
RTD of innovative space propulsion technologies;
Foresight studies (including scenarios and
Roadmapping) on future space transportation;
Evaluation of societal and economical aspects of
future space technologies;
Technology Assessment and R&D on space-based energy systems (e.g.
large scale solar arrays), taking into account future
(affordable) positioning of large payloads in space.

OBJECTIVE
The objective of the research actions mentioned
above aim are threefold:
(1) to make an assessment of potentially revolutionary
space technologies in light of current knowledge and
new/emerging technologies;
(2) To bring potentially revolutionary space propulsion
technologies closer to reality
(3) To better evaluate the long-term potential
implications (societal, environmental, economical etc.)
of revolutionary space propulsion technologies. This
would also include potential negative aspects (e.g.
more space debris, or potential misuse/abuse).

EXPECTED IMPACT
Better understanding of long-term impact of
revolutionary space transportation technologies;
Advancing space-based energy solutions;
Providing new business opportunities for the
European space industries as well as new
entrepreneurships (including SME’s) that could find
new opportunities in this field;
“Democratisation” of space transportation.

IMPORTANCE FOR EUROPE
The far-reaching implications are important for Europe
as for the entire world.
In the medium term exciting new business
opportunities could emerge for various sectors of the
European industry, also beyond the existing space
sector, including SME’s and innovative start-ups.
The “democratisation” of space would make space
science and related activities much more accessible
to children and youth, potentially attracting more
young people to Science in general.

New space propulsion technology (not based on chemical rockets) enables a dramatic reduction in the
cost per pound payload to get a satellite into orbit or to propel a spacecraft to its destination in space.
This is achieved because the need to carry fuel with the rocket is eliminated. Instead, the energy for
propulsion is supplied from the ground (e.g. laser beams) or from space (e.g. solar “wind” or
“scooping” hydrogen molecules).
A revolutionary means to reach space, based on the “free” energy available in space, implies at least two wild features. The first would be the obsolescence of all the “conventional” space propulsion technologies and the traditional space industries based on these technologies.

The second would be making space and space travel affordable to small and medium size enterprises, possibly even to private people, with almost endless potential implications (see Potential Impacts below). Even wilder features (depending on the technologies to be developed) could be practical space travel to other solar systems at near light-speed velocities.

The wildest feature could be achieving faster-than-light speeds (based on new discoveries in physics – such as “loopholes” in Einstein’s theory of relativity). There are wild implications on opportunities such as physical contact with extra-terrestrial civilisations; this assumes of course that there might be such civilisations in existence in our galaxy (or even beyond).

A particularly wild feature of travelling at near-light speeds would be that travellers returning to Earth after a few years (in spaceship time) would find that time on Earth was thousands of years into the future (because of relativistic effects).

Key actors related to this wild card, include:

- **Scanners or “early warners”** such as Science Fiction authors, visionary thinkers, futurists, technology foresight researchers...
- **Shapers** (i.e. enablers/inhibitors) such as scientists, aerospace engineers, entrepreneurs, enthusiastic citizens organisations,...
- **Stakeholders** such as the aerospace industry, the energy industry, research institutes, S&T policy makers...

Potential impacts

The impacts and potential applications are numerous. A dramatic reduction in the cost of launching payloads to space means a dramatic cost reduction putting satellites in orbit (which suggests scope for “toy satellites” for hobbyists or schoolchildren to perform experiments in space). Other applications include: cheap satellite communications and cheap “spy” satellites, and affordable construction of space stations for space factories (new materials might be enabled by using micro-gravity conditions etc).

Moreover, solving the world’s energy problem by placing large arrays of solar collectors in space may become an economically viable solution.

Similarly, affordable space travel will bring to reality the visions of space colonies (in orbit or on other planets).
Using limitless energy available in space (solar wind, hydrogen, etc.) will provide a constant thrust and acceleration to space vehicles, which means the possibility to reach near-light speeds. Taking into account relativistic effects (“slower” time inside the spaceship), this will ultimately enable practical travel to extra-solar planetary systems (located several or many light-years from earth).

Ultimately, the survival of humanity may depend on practical space propulsion. As Michael Griffin, NASA’s director, once said: “In the long run, a single planet species will not survive... We must ultimately populate other planets. One day, there will be more people living off of Earth than on it.”

Potential actions

Policy actions

Early actions: Supporting research on new space propulsion technologies and on related economical implications (e.g. space-based sustainable energy solutions).

Business actions

Early actions: Creative thinking about practical and profitable utilisations of technologies that already exist in laboratories or are described in scientific publications. In particular, “old” ideas for space propulsion that are becoming practical thanks to progress made in advanced materials, more efficient solar cells and the like.

Research actions

Pursuing research (in particular experimental research) on “non-conventional” space technologies (see examples in the “weak signals” section below); Foresight research on economical, environmental, and societal implications of affordable space travel.

Weak signals

Important weak signals are the numerous ideas (some highly speculative, but other are considered practical) that have been published over the years. These ideas point to potential alternatives to conventional space propulsion and may revolutionise space travel (e.g. by eliminating the need to carry the energy source with the space vehicle). We mention here several illustrative examples:

A well-known (but hard to realise) concept is the “Space Elevator” (inspired partly by Science Fiction books like “The Fountains of Paradise” by A.C. Clarke). A related weak signal is the extensive research on Carbon Nanotubes (CNT), potentially leading to super-strong cables or ribbons that may make the idea of the space elevator feasible.

As a potentially more practical alternative, a recent scientific paper proposed a giant inflatable tower that could carry people to the edge of space without the need for a rocket, and could be completed much sooner than a cable-based space elevator.

The idea of “solar sail” dates back to Kepler (1611), but the term was coined and popularised in Science Fiction, again by A.C. Clarke. In 2010, Japan Aerospace Exploration Agency launched the first interplanetary solar sail spacecraft “IKAROS” to Venus, followed by an experimental “NanoSail-D” deployed on NASA’s microsatellite in January 2011.

A “ramjet fusion engine” (originally proposed by R.W. Bussard back in 1960) could scoop hydrogen available in space, making it essentially an inexhaustible source of energy – if the proton-proton fusion reaction proves feasible.

More speculative ideas include for example “wormholes” in space or hypothetical “Propellantless Space Propulsion” (recently suggested by W. Dröscher and J. Hauser). Such propulsion is based on the interaction of generated gravity-like fields with the space-time field and involving virtual particles of imaginary mass, responsible for the conversion of electromagnetic into gravitational fields. Some controversial ideas of this kind are supposed to enable even faster-than-light (FTL) travel.

A related weak signal was the study of similar ideas funded by NASA for several years in the “Breakthrough Propulsion Physics Project” (BPP), aiming to explore revolutionary concepts which would require breakthroughs in physics before they could be realized.

Another weak signal was generated in September 2011. CERN employees published data for public scrutiny which seemed to indicate sub-atomic particles can travel faster than the speed of light; they have published the data to check further for errors in their measurements across 15,000 experiments.
Female-centric projects a turn-off for women

RECOMMENDED RESEARCH

THEMATIC AREA
Cross cutting across all themes, Science and Society, Capacities Programme

RESEARCH TOPIC
Promotion of female science careers. It is essential that the feelings of females (and males) are taken into account on the best way to promote science careers. Education of society is required to alleviate discrimination in the workplace and encourage more careers in science regardless of gender.

A wider range of initiatives are required to look at gender responsive budgets by governments, gender balancing in decision bodies, integrating gender in research agenda and programmes and implementing diversity management in industry.

Evaluation of performance needs to be addressed in particular between gender diversity and research performance to determine (and/or demonstrate) that gender equality has quantifiable benefits that can be linked to economic growth or social outcomes.

OBJECTIVE
Young female researchers are already turning their back on careers in science due to the negative perception of opportunities for females in science. The main objective of such research is to promote science careers for females in a way that will engage the public rather than act as a potential barrier.

EXPECTED IMPACT
The desired impact of studies will result in not just greater numbers of females undertaking science related careers, but also gender equality to ensure the right employee is in the right job regardless of gender. There will potentially be societal impacts relating to better home-work life balance and greater respect for females in the workplace.

IMPORTANCE FOR EUROPE
Gender equality is a high priority for Europe, and the production of gender-aggregated statistics is essential to analyse trends and outcomes and monitor progress of gender equality. It is essential that Europe does not lose a whole generation of knowledge due to gender issues.

Projects set up to help females engage more in science are deemed sexist and patronising and are a reason behind women in the workplace getting less respect from colleagues than their male counterparts (“You only got this job because we ‘needed’ to have a woman on board”). More women are turning their back on a career in science in protest of such projects.

FP7 Themes

ERA Goals

Wild Card

Author(s): Anthony WALKER (RTC North)
Wild card surprises (wild features)

This is a particularly interesting wild card as it considers the reverse impact of projects and schemes focused on promoting female participation in science and research. The wildness of this issue concerns the fact that the efforts for more inclusion of women in science actually lead to less involvement, and the knowledge, skills and potential expertise of millions of women is lost. It could be taken a step further too, whereby the sexist view of science not only causes women to turn away, but also their male counterparts in moral protest.

In addition to men supporting women with this view of science as sexist or non-inclusive, it should also be considered that this could result in a rift between male and female scientists, leading to rifts in other careers and potential resentment in home-life.

Further wild features of this issue could be a complete shift in research priorities and environments as they become (even more!) dominated by males.

The planned consequences of trying to promote careers for women in science having the exact opposite effect, and the high risk of not having the ‘right’ employee for the ‘right’ job, causing gender barriers in the workplace is certainly a risk!

Possible interpretations

The most obvious interpretation of this wild card is that women turn their backs on careers in science and this is as a direct result of initiatives to actually promote careers. It should be considered that if this was the case, a whole generation of potential scientists would be lost.

This would clearly have an impact on the European knowledge economy as scientific progress is reduced falling behind in the global competitive market as a consequence.

Of course, this is a global issue and different situations arise in various countries and regions of the world where there are numerous cultural differences apparent.

Key actors

This wild card would be of interest to almost all businesses and organisations, not only in science-related sectors, but other sectors too. Key stakeholders who would be affected include policy makers, NGOs, governmental departments, government, civil society, public media, human rights organisations along with the whole of the female (and male) race!
Weak signals
In the past, positive discrimination has resulted in resentment in the workforce. The goal of having more females with science careers is yet to be achieved. Generally it is perceived that there is a lack of promotion in the workplace for women in all sectors, with a lack of respect for women's opinions against that of men.

There are numerous current debates on gender equality which is meant to be ‘post-feminist’.

Both the UN Commission and UNESCO have made many useful suggestions as to what might be done by governments, industry, scientists, and NGOs to move to gender equity in science and technology. Both organisations however have encountered the problem of defining recommendations which would have universal validity when there is so much variation between countries.

Young researchers are perhaps already turning their back on careers in science due to the negative perception of opportunities for females in science. Equally, there are already enormous initiatives based around gender equality in the workplace.

Surveys have suggested that women leave scientific and engineering careers because of issues such as working conditions, pay, promotion opportunities, job location and family-related reasons. More than 60% of women leaving engineering did so because of dissatisfaction with pay and promotion opportunities, and it doesn’t have anything to do with the nature of the work according to a paper by McGill University economist Jennifer Hunt.

Guidelines are already in place to ensure that gender issues are correctly implemented. Gender equity policies in science have become an important issue in all EU member states. Apart from Equal Treatment laws, many countries have also passed a “gender mainstreaming” legislation and integrated these into administrative procedures. Several countries have also devised direct support measures, such as improved child care or specific mentoring programmes.

Potential impacts
This wild card would bring about immediate impacts as fewer women would be inclined to take up careers in science. There is a significant risk of not having the ‘best’ employee for the ‘best’ job as whole sections of society are alienated. As the timeframe continue, more and more female workers may turn their backs on science due to the male dominated workforce until in the longer term there are no females involved in science at all. There may also be societal problem as with limited females in the workplace, certain roles where it would be deemed beneficial to have a female in place would be occupied by a male counterpart.

For example, it female medical practitioners will become non-existent and a patient may not be comfortable seeking a male. Less people seek the required medical attention required, and health declines.

Potential actions
This wild card clearly deals with a subject that needs to be governed by legislation to successfully promote gender equality in roles and avoiding isolation of gender interaction in the workplace. There are a number of early actions (pre-wild card) and early reaction (post-wild card) that should be considered.

Policy actions
Early actions: Guidelines and policies should be put in place to ensure that gender issues are correctly promoted. Governments need to ensure they implement policies and recommendations. Consultations (with males and females) to how gender equality can be achieved in the workplace. Policies to educate and re-educate to ensure that society understands gender issues.

Early reactions: Development of new legislation as necessary to repair the damage caused by previous initiatives.

Business actions
Early actions: Businesses could ensure gender equality in the workplace, and actively promote the concept of the ‘right’ person for the ‘right’ role.

Early reactions: Adhere to legislation, and follow implementation of policies and recommendations.

Research actions
Early actions: Promote women in science in a positive and responsible way. Ensure employees are selected on quality rather than gender.

Early reactions: Adhere to legislation and policies.

The media also has a responsibility to ensure the subject is not over dramatised, and could be utilised to promote careers in a more subtle way.
Universities close as research doesn’t meet industry needs

**RECOMMENDED RESEARCH**

**THEMATIC AREA**
Cross cutting across all themes, Science and Society, Capacities Programme

**RESEARCH TOPIC**
Promotion of female science careers. It is essential that the feelings of females (and males) are taken into account on the best way to promote science careers. Education of society is required to alleviate discrimination in the workplace and encourage more careers in science regardless of gender.

A wider range of initiatives are required to look at gender responsive budgets by governments, gender balancing in decision bodies, integrating gender in research agenda and programmes and implementing diversity management in industry.

Evaluation of performance needs to be addressed in particular between gender diversity and research performance to determine (and/or demonstrate) that gender equality has quantifiable benefits that can be linked to economic growth or social outcomes.

**EXPECTED IMPACT**
The desired impact of studies will result in not just greater numbers of females undertaking science related careers, but also gender equality to ensure the right employee is in the right job regardless of gender. There will potentially be societal impacts relating to better home-work life balance and greater respect for females in the workplace.

**IMPORTANCE FOR EUROPE**
Gender equality is a high priority for Europe, and the production of gender-aggregated statistics is essential to analyse trends and outcomes and monitor progress of gender equality. It is essential that Europe does not lose a whole generation of knowledge due to gender issues.

Research interests of Universities do not meet the needs of Industry and there is a large divide between industries wanting to work with Academic institutions. This lack of technology transfer leads to industry-led research in the private sector and a complete breakdown of working relationships with Universities. The financial loss to Universities is catastrophic.

**Wild Card**

**FP7 Themes**
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

**ERA Goals**
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

Author(s): Anthony WALKER (RTC North)
Wild features
There are a number of features which give this issue the ‘wild’ factor even though it is perhaps already considered commonplace that universities and industries have a number of barriers that hinder prosperous collaboration. However, the wildness of this is that a complete breakdown of the relationship between industry and academia would lead to a vote of no confidence in university research from the private sector, and as such, eventually force universities to close. It is imperative that universities conduct research and training, but also of growing importance to transfer technology and exploit outputs – without the collaboration of industry this would be almost impossible. With this in mind, this wild card has repercussions across all sectors and themes and would have impacts on business, education, consumers and markets, technology and global affairs. With the potential collapse of the higher education system as we know it in Europe, academic institutions would lose the capacity for research leading to a ‘brain drain’ or lack of knowledge in future generations. In tandem with the lack of capacity to conduct research, the brain drain would continue with a paradigm shift of top quality researchers to the US or Far East where greater opportunities for science and research careers are offered.

Possible interpretations
There are a number of ways that this wild card may be interpreted and one that is immediately apparent is the negative impact of university closing leading to a lack of capacity to conduct research and potential knowledge gap in Europe. However, it could also be considered as an opportunity for private research centres to be established, or ‘corporate new universities’, designed by industry for industry. As such, research would be determined not by government policy but driven by industry needs.

Managing the agenda and expectations of collaborative working is essential in order for all parties involved to gain maximum benefit from the working relationship, whether that be the opportunity to publish journal articles, transfer existing technologies to new applications, open up new market opportunities or exploit results for financial gain. Of course this is not an exhaustive list of possible outputs, and most organisations involved in collaborative working will have a number of results that they are hoping to achieve, but this merely shows that there may be different reasons why different organisations are collaborating.

Key actors
Several actors could be related to such a wild card obviously including universities, business and government agencies – multi-nationals, SMEs, government laboratories and other private research institutes etc. Other stakeholders brought into play by the occurrence of this wild card include policy actors who may want to monitor the situation and perhaps even look at investing to promote strong collaborations.
Weak signals

There are already in existence a number of barriers that are hindering collaboration between academia and industry, and there are clearly national and international initiatives that are promoting collaboration between industry and academia (such as FP7, national programmes – for example through the Technology Strategy Board in the UK). There are incentives globally (e.g. in China, the Ministry of Education has recently passed rules governing industry-academia collaborations to encourage working relationships). Also, 98% of Taiwan businesses are SMEs. Due to their small size, it is hard for them to set up a R&D department or hire fulltime R&D personnel to conduct R&D. Since nearly 70% of all Ph.D.s work in universities, promoting industry-academia collaboration can allow academia to share R&D resources with industry, prompting connection between R&D results and industry needs. Moreover, industry’s practical experience can be introduced to academia to bolster the momentum of reforming schools’ teaching and achieve a win-win situation for industry and academia.

In order to remain competitive, Bill Gates (Microsoft Chairman) indicated in 2002 that collaboration between industry and academia is crucial to future innovation to create the next generation of computing technology. There is a lot of effort being put into encouraging industry and academia to forge working relationships, and in line with the Lisbon agenda of making Europe the most dynamic knowledge-based economy in the world, it is key that industry and academia work together to become more innovative and remain globally competitive.

Potential impacts

There are a number of impacts brought about by this wild card. On the negative side, there would be a dramatic loss of capacity to conduct research as one of the key types of institute responsible for research will be closed. Clearly, without the teaching aspect and education that universities offer, there would be a lack of knowledge should they close perhaps leading to a ‘brain-drain’ and a lack of innovative technologies being developed.

In the short term, following the manifestation of this wild card, there would be the opportunity for industry to conduct their own research, focusing on issues that are directly relevant to their own areas of interest. The reasons why industry has increasingly been sponsoring university research in recent years would effectively be overturned.

Potential actions

There are already initiatives in place that are designed to promote industry and academia collaborations. Should universities close, this would probably lead to the drastically reduced capacity to conduct research, and a knowledge gap for future generations. There are potentially a number of early actions (pre-wild card) and early reactions (post-wild card) that can be considered.

Policy actions

Early actions: Perhaps key to this wild card is limiting the possibility of it occurring. The situation should be monitored and as necessary addressed by government initiatives or investment in promoting collaborations.

Early reactions: Policy makers would need to respond in a swift manner should this wild card occur. Further promotion of collaborative working would be required.

Business actions

Early actions: Monitoring the situation and looking for opportunities to collaborate.

Early reactions: Business actors (including SMEs) could take advantage of the opportunity to drive their own research actions, and also seek funding that would normally be utilised by universities.

Research actions

Early actions: Maintain links with industry and keep an eye on objectives of research. Ensure the expectations of organisations working within a partnership are managed accordingly and met, and promote further collaborations.

Early reactions: Research base would need to ensure the capacity of conducting research is maintained through industry-industry collaborations.

The media would also have a responsibility to report the situation in a responsible manner.
Severe accident of a nuclear power plant

RECOMMENDED RESEARCH

THEMATIC AREA
Nuclear Research

RESEARCH TOPIC
Implementation of nuclear security standards in various socio-economic contexts.

With the increasing dependence of advanced countries on fossil fuels in production of energy in the context of increasing demand for energy, further spread and development of nuclear energy sources is expected to take place also in third world countries. While the advanced countries have developed a highly complex system of security measures preventing a potential accident in the nuclear power plants, the third world countries have no experiences in this field.

OBJECTIVE
Production of energy from nuclear sources in the third world countries brings about the need of having also a security system, which would prevent potential accident in the power plants. For this reason, international cooperation with the ones “more experienced” is necessary. The objective of this call is therefore to set up international R&D&I teams in the field of nuclear security. The aim is to implement the complex of security measures into the operation of power plants built in the third world countries.

EXPECTED IMPACT
The enhanced security of third world nuclear power plants will contribute to the more positive attitude of the global society towards nuclear energy. In the context of the technological development of the nuclear energy production (i.e. development of nuclear reactors with inherent safety), the nuclear energy would have the potential to become widely acceptable source of energy.

IMPORTANCE FOR EUROPE
One of the impacts of this call is that European research teams will establish closer link and cooperation with research teams from the third world countries and thus contribute to higher flow of know-how from advanced to developing countries. European R&D teams will also gain knowledge on implementation of the security measures into different socio-cultural and technological environment.

Although the risk of a severe accident of a nuclear power plant is extremely low, it is still not a zero-risk. In the past, at least two major accidents of nuclear power plants occurred – in Three Mile Island and Chernobyl, which had a tremendous global impact on attitude of the public towards risks linked with the nuclear energy. Severe accidents of a nuclear power plant in the future would have again a tremendous impact and in turn would have negative impact also on future development of the whole sector.

FP7 Themes

ERA Goals
The production of energy from nuclear sources is expected to spread all over the world including third-world countries that can afford the investment. The spread of nuclear energy to less developed countries introduces a tremendous threat to security and safety in nuclear power plants. In contrast to the United States and Europe, the complex security systems and organizational measures that are needed are more difficult to install and maintain.

Accidents in nuclear power plants are caused by a coincidence of various factors, with the human factor being the most significant. Security systems can be designed to operate in developed countries very effectively and can eliminate a high proportion of human factor risk. This is clearly not the case in third world countries.

Although overall the probability of a nuclear power plant accident is very low, it is still relatively high in third world countries. If an accident happens, it is expected that it would release a dangerous amount of radioactivity and cause a lot of immediate casualties. The released radioactivity is then expected to pollute soil, water and air in a wide surrounding area. Relocation of the endangered local population is necessary and significant effects are discernible internationally.

There are different readings of such a wild card. For example some might see this event confirming that nuclear power is too risky and dangerous. Wide international sympathy with this view might lead to a world-wide ban on nuclear energy. Alternatively it might be perceived as an exceptional event which can be solved by technology, stricter enforcement of security measures, and implementation of global nuclear security standards.

Another possibility is that this event may trigger more rapid development of generation IV. nuclear reactors with inherent safety.

Key actors related to this wild card, include:
- Scanners or “early warners” such as security experts, journalists, or local activists;
- Shapers (i.e. enablers/inhibitors) such as the education system, nuclear power plant engineers, management and staff of the power plant or media;
- Stakeholders positively or negatively impacted such as national governments, civil society, anti-nuclear NGOs, or safety regulation offices.
Potential impacts
A severe accident in a nuclear power plant could reinforce prevailing negative attitudes and cause the closure of all nuclear power plants, resulting in a global energy shortage and hence problems satisfying energy demand. Europe in particular would be even more dependent on imported energy. On the other hand such a wild card could trigger research and development towards higher efficiency and utilisation of alternative energy fuels.

As to the affected regions, mass pollution of water, soil and air is expected; these territories will be hostile for human inhabitants. Relocation of inhabitants from the affected regions to other places may cause ethnic or racial tensions between the domestic and immigrant populations. A tremendous humanitarian aid will be needed to avoid health problems and starvation.

Potential actions
Severe accident of a nuclear power plant would have impacts on various spheres of human society. To avoid this wild card happening, policy, business and research actions should be undertaken. In addition post wild card actions should be anticipated.

Policy actions
Early actions: Formulate and implement national and international nuclear security standards and ensure that these standards are fulfilled in every country possessing a nuclear power plant; introduce information campaigns on nuclear energy, so that the civil society is not threatened by an irrational fear from nuclear energy; guarantee that the risk of an accident is reflected in the cost of energy.

Early reactions: Verify emergency procedures and compliance of countries to the international nuclear safety regulations; continue providing transparent and fast information about the current situation.

Business actions
Early actions: Implement high policy standards in utilization of new nuclear energy.

Early reactions: Actively participate in the situation after the accident by e.g. sponsoring humanitarian and other aid; renewal of credibility of the nuclear sector; the companies responsible for the accident must admit full responsibility with all their assets.

Research actions
Early actions: Research on new generation of reactors (with inherent safety); research on new/alternative sources of energy; research on risks involved; research on follow-up costs (nuclear waste).

Early reactions: Research on causes and consequences of current situation; development of new security systems; development of new health-related practices.

The media would also have a responsibility to report the situation in a responsible manner.

Weak signals
There are several signals warning us about the probability of occurrence of such a wild card. The expected spread of nuclear power plants and production of nuclear energy to third world countries rises up the question of a satisfying number of a qualified labour force in these countries. This can be considered as a weak signal, since qualified labour force is not of an adequate number in these countries nowadays.

Building of the new nuclear power plants in the third world countries is expected to be done by western private companies, which often strive for maximum profit while minimizing the costs. This kind of exploitation of third world resources takes place nowadays and there is no reason to except that foreign companies would behave differently in case of building power plants. There is therefore a certain danger that these companies will try to avoid the security standards and costs. Weak signal in this case is the missing international nuclear security standards which are approved and implemented in any country possessing a nuclear power plant.
Entering new energy era

RECOMMENDED RESEARCH

THEMATIC AREA
Nuclear Research

RESEARCH TOPIC
Technology foresight in nuclear research.

With the overall development of science, research and development in the developed countries, technological breakthroughs and new discoveries take place in nearly every field of science. This is important especially in the area of nuclear energy, where technological advancement substantially contributes to increasing effectiveness of energy production from nuclear resources.

OBJECTIVE
For the above-mentioned reason, research should focus on risk analysis and technological assessment of the emerging technologies and new materials. The aim is to assess under which conditions and in what applications the technologies and materials would be potentially harmful, both in the limited sense (restricted to e.g. a particular industrial sector), or in terms of its broader impact on society and/or environment. The research project is to use foresight methods.

EXPECTED IMPACT
The research should examine the limits of utilization of the new technologies and new materials in particular industrial sector and also in the energy production from nuclear sources. With a special focus on nuclear research, the project is to find the most efficient way of utilizing new technologies and materials for the efficient production of energy; at the same time, to secure high standards of security.

IMPORTANCE FOR EUROPE
Nuclear energy production is often seen as a steady and enormous potential threat to the wide society and natural environment. It is therefore in the interest of the nuclear production to maintain itself as safe as possible also with the implementation of new technologies and materials in the process of energy production, which cause its higher efficiency.

A significant breakthrough in physics of materials has been made to further increase efficiency in the production of energy. New non-fragile carbon composites were developed as well as new superconductors. Implementation of these new materials in nuclear energy production suddenly makes energy very cheap.

FP7 Themes

ERA Goals
Wild features
Constant development of materials science and continuing research in this scientific field brings about new, improved materials; some of the improvements can be classified as breakthrough discoveries. The use of these new materials in new forms of energy production from nuclear sources would have dramatic implications for the production and distribution of energy and the efficiency of energy production.

These new materials can be further specified: they can be e.g. new photovoltaic materials with high efficiency, non-fragile carbon composites or superconductors, or basically materials with significantly improved properties than of today, which enable development of new or significantly improved technologies. Utilization of new materials in nuclear energy production can allow a completely new design of reactors, with improved security.

Possible interpretations
There are several different interpretations of such a wild card. Development and discoveries of new materials and technologies and generation of knowledge can be interpreted as a shift to more knowledge-based economy or even to resource-based economy.

Higher efficiency of energy production would change the dependency of countries, regions or cities on external energy sources. The new methods would encourage the deconcentration of energy sources, since due to improved materials, any country, region or a city would be able to build its own (nuclear) source of energy.

One can also perceive this wild card as a win-win principle: there will be nearly unlimited resources of a clean energy, which would not pollute the natural environment. The efficient energy resources would also be a great incentive for businesses.

Key actors
Key actors related to this wild card, include:

- Scanners or “early warners” such as journalists, managers of science, philosophers;
- Shapers (i.e. enablers/inhibitors) such as the support system to R&D&I, researchers, manufacturers, media;
- Stakeholders positively or negatively impacted such as national/regional governments, civil society, research and development organizations, radioactive waste agencies, producers of electricity, regulatory authorities.
Potential impacts

The existence of new materials utilized in nuclear energy production would cause significant shifts in the priorities of research and development in various countries. Research and development especially in the area of nuclear research, would be focused on construction of small-sized nuclear reactors used for electricity production in cities, villages, enterprises, hospitals, or in less inhabited or remote areas with limited access. By this process, the rise of importance of regional/local policy is inevitable.

This building of new energy infrastructure would cause a high diversification of the electrical network and increasing independence on large centralized sources of energy. European countries would thus become less dependent on imports of fossil fuels. Small-sized nuclear reactors are furthermore more flexible in terms of satisfying the changing demands of end-users as to electricity, heating, hydrogen production or water cleaning.

The unlimited energy could also diminish the threat of political or even war conflicts on energy. On the other hand, nuclear reactors based on new materials and technologies would not be afforded by every country in the world. This unbalance can cause further polarization of the global society. There can also be a risk of distribution of nuclear material to various places instead of to few large nuclear power plants, since this deconcentration of nuclear material can cause its lower possibility to be controlled.

Potential actions

Development of new materials and consequent production of efficient and cheap energy would have impacts on various spheres of human society. In order no to make this wild card happen, policy, business and research actions prior to the wild card should be undertaken, as well as post wild card action, if the wild cards manifests at the end:

### Policy actions

**Early actions:** Create a safeguard against monopolization of production of small-sized nuclear reactors; make material research one of the priorities in European as well as national research agendas; provide support to innovations and public research and education in S&T, promote open collaboration with businesses.

**Early reactions:** Introduce new measures of ethics of use of new energy; secure social stability worldwide; introduce new energy strategy as well as free-licence policy.

### Business actions

**Early actions:** Higher cooperation with the research sector.

**Early reactions:** Implement and utilize new materials; try to find new ways of utilization of the new energy (e.g. in transportation etc.).

### Research actions

**Early actions:** Higher R&D cooperation with the industry.

**Early reactions:** Change of research priorities; research of new environment-friendly technologies using new energy (transportation etc.).

### Weak signals

Weak signals associated to the wild card can be observed in industries and scientific fields not related to nuclear research. It is for example the development and introduction of new materials into the aircraft industry which can subsequently be used in nuclear research. Also developments in material sciences, which are underway, contribute to further advancement of properties of various materials and technologies (e.g. development of low-induced activity).

Progress in other related fields is also important. The most significant is progress in the ICT sector, which allows material simulations that were impossible years ago.

Another weak signal is perceived in the structure of national support to R&D; in recent years, increasing financial support to materials research R&D tends to be made available. The probability and potential to introduce new discoveries in this field of science therefore rises.

References

http://www.mrs.org/s_mrs/bin.asp?CID=12527&DID=206719
Appendix:

Dynamics of the iKnow Workshops in Pictures

**WI-WE Analysis Task**

**WI-WE Actions Task**

**Raw results of iKnow workshops**
The iKnow system can be accessed at the following address:
www.iknowfutures.eu

Please register and explore our 7 iKnow Technologies: