BOOK OF ABSTRACTS

Technology Assessment and Policy Areas of Great Transitions

1st PACITA project conference

March 13 – 15, 2013

Prague, Czech Republic

PACITA
www.pacitaproject.eu

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Foreword

Questions that we are facing in society and policy making often indicate upcoming great transitions connected to scientific and technological developments on a global level. Great transitions such as in the fields of health care in an ageing society, climate change, energy supply in the aftermath of the Fukushima disaster, or changes regarding societal relationships through ICT are topics of highest societal relevance. Technology Assessment as a concept of problem oriented research, policy consulting, and societal dialogue is aiming at supporting society and policy making in understanding and managing these problems.

This book presents the abstracts of the first European conference focused on the subject of „Technology Assessment and Policy Areas of Great Transitions" that will take place in Prague (Czech Republic) from March 13th to March 15th, 2013, and will be organised by the consortium of the EU 7th Framework programme project PACITA. In this conference, one objective of the project PACITA is meant to be implemented, i.e. the spread of knowledge about TA, especially the transfer of scientific knowledge relating to technological questions into knowledge on societal and political processes. The primary objective of the project is to establish Parliamentary Technology Assessment (PTA) in European countries and to set up a discussion platform on the practical application of PTA. To this end, the conference makes an important contribution.

A Planning Committee that discussed the conference topics was established. It was constituted of renowned representatives of academia and parliamentary institutions from several European countries and from the USA. Around 100 abstracts for 18 thematical sessions and four parallel events have been handed in. The speakers will come from various European countries as well as from the USA, Australia and Asia. In this copy, the abstracts are presented categorised by the individual sessions. Here, the contents and the objectives of the sessions are described by the chairs. The Book of Abstracts is one of the main outcomes of the PACITA conference and serves as an input for the conference discussions.

The organisers of the conference, the Karlsruhe Institute of Technology (ITAS/KIT), and the Technology Centre of the Academy of Sciences of the Czech Republic (TC ASCR) are planning to publish a printed proceedings version after the conference. It is meant to document the conference and to serve as a preparation for the second conference that will take place at the end of 2014 in Berlin.

The organisers give their thanks to the members of the Planning Committee and to the chairmen of the workshops for their competent work in setting up the programme.

Lenka Hebakova and Constanze Scherz on behalf of the organizers

Lars Klüver on behalf of the PACITA project coordinator

Keynote speeches

PACITA Conference, Prague

Keynote speech: **Stefan Böschen**

Karlsruhe Institute of Technology

Opening the Black box: Scientific expertise and democratic culture

Participation and contextualisation seem to be the magic formula to solve conflicts over chances and risks of innovation and to guarantee precaution and control. Against the old paradigm of solving these conflicts, bundled as "technologies of hubris", Sheila Jasanoff proposed to establish "technologies of humility" which are characterized by framing, vulnerability, distribution, and learning. "Democratization of Expertise" is the overarching catchword. But why are these plausible demands so difficult to realize? There are two aspects to be considered: On the one hand, the ideas of the "technologies of hubris" are continuing to influence and to dominate the public debate by labels such as "sound science" or an "evidence-based approach" which are used to stabilize technocratic thinking and institutionalization. On the other hand, the new ideas of "technologies of humility" promise not only new solutions but are also connected to new problems and dilemmas. Their inclusion of non-knowledge or future-knowledge creates new needs for decision-making. Moreover, the "participatory turn" can also provoke legitimatory problems or support the diffusion of responsibility. Therefore, the fundamental question has to be addressed: How to design processes of participation and contextualisation to be stable and legitimate?

To answer this question, we have to take into account the peculiarities of contextualization and participation in the horizon of decision-making. Decisions refer to interests, power, and orders of value. Against this background, knowledge used for decision-making needs certain qualities to make it less challengeable and refutable. Otherwise it cannot serve to improve the problem description or to legitimate decisions. Therefore, knowledge has to meet the above mentioned qualities to not only guide policies but to stand up in negotiations as well as in court. The problem is aggravated by the increasing use of non-knowledge in public debates with regard to matters of precaution or the prevention of business restrictions. How to come to an uncontested expertise that creates strong incentives for actions and unfolds regulatory

potential – although “facts are uncertain, values in dispute, stakes high and decisions urgent” (Ravetz)?

This presentation tries to answer both of the outlined questions by emphasizing the thesis that the opening up of processes of expertise-building – the opening of the “black box” of scientific expertise-building – will only be successful, if our knowledge about expertise is enhanced and new forms of meta-expertise are created. Meta-expertise has to be seen as a link between epistemic und cultural values. It therefore allows a political debate about the problem-centred evaluation of different “offers of expertise”. Additionally, a second aspect must necessarily be considered: the creation of institutions that enable participation and contextualisation to be socially effective and legitimate. The effectiveness of meta-expertise depends on its institutional embedding. Without institutionalization there is no development of democratic culture.

Keynote speech: **Rut Bízková**

Technology Agency of the Czech Republic

Smart infrastructure as a prerequisite for competitiveness

Strategy for international competitiveness, which was approved by the Czech Cabinet of Ministers in 2011, sets three pillars of competitiveness of the country - institutions, infrastructure and innovation. While good conditions in the first two areas are primarily the responsibility of the government, innovation activities are in hands of various entities on the market with products and services.

War strategists know that logistics is in the background of many great victories and losses, and we do not only mean Napoleon in front of Moscow. Although the specifications and conditions of our activities change, the basic scheme of human activities remains the same. Good infrastructure is important for being successful on the market today as it was in the past. If not, then Ford's method of success "just in time" would not exist.

In the Czech Republic, we have experienced this after 1990, when most of the transport shifted from rails to roads. Increasing industrial production has become more effective; roads are overloaded by trucks what is the main cause of the worsening quality of the environment in the Czech Republic.

With changing technical capabilities, the infrastructure should be more "smart". This applies to all network industries - energy, transport, communication, supply of companies and population with energy, water and waste management.

Smart infrastructure is the prerequisite of competitiveness not only in terms of logistics for goods production and sale. Moreover, smart infrastructure creates conditions for human wellbeing; makes certain areas more attractive for housing, employment or social life. In the times when human potential becomes a decisive factor of competitiveness, smart infrastructure has the growing importance.

These reasons led to the European strategic energy technology plan (SET Plan) - Towards a low carbon future - adopted at the end of 2007, which through 8 action plans and initiatives, emphasizes the involvement of smart infrastructure and smart technologies into day-to-day mainstream activities. Although the energy and sustaining of lower costs and higher performance of existing technologies are primary areas of interest for the SET Plan, it just opens the door for the increased competitiveness through using innovation.

The current strategy Europe 2020, where five defined objectives match the SET Plan, emphasizes increasing energy efficiency, reducing greenhouse gas emissions and increasing use of renewable energy sources. Increasing investments in R & D are one of tools to implement measures to meet these objectives which lead to increased competitiveness.

Ahead of us is a series of challenges in the areas of smart infrastructure. Besides the energy infrastructure it is ICT, transport, water and waste management, utilities and other new areas that are under investigation. It's smart to find smart solutions.

Thematic sessions

PACITA Conference, Prague

I. Thematic Session: Institutionalization of TA

Chairs: **Leonhard Hennen**, **Linda Nierling**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

In this session, new trends in the development of Technology Assessment in Europe, Asia and the US will be jointly discussed. Hereby the focus lies on national cases of "emerging" TA-initiatives and networks across Europe as well as TA-approaches and initiatives in Asia. The presentations will reflect on sharing experiences with regard to institutionalization processes of TA in different national contexts, on the one hand, and pointing out differences of national contexts with regard to specific political cultures, on the other.

In the light of the fragility of institutionalization processes of TA (c.f. recent experiences in Europe) this session intends furthermore to contribute to a global TA community which might support emerging TA initiatives.

1.

M. van Oudheusden/ N. Charlier/ B. Rosskamp/ P. Delvenne: Technology assessment in transition: Mapping the interplay of policy paradigms and TA in Flanders and Wallonia

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Scope:	Technology Assessment, Strategic Science, Science and Technology Innovation Policy
Keywords:	Belgium, Comparison, Strategic Science, Technology Assessment, STI Policy

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In this paper, we inquire into the dynamic co-evolution of technology assessment (TA) and the institutional setting of which TA is a part. We focus on the regions of Flanders and Wallonia in Belgium where from the 1980s onwards science and innovation policy took on distinctly different forms, thus setting different contexts and timescales for science-society modulation. We indicate how in Flanders successive generations of TA emerged with, and partly mediated, consecutive generations of innovation policy, while in Wallonia the idea of TA has gained traction only more recently. We explain these different momentums by linking the rise of TA to the institutionalization of strategic science as a new policy regime. Our analysis brings a macro-sociological and political sensitivity to bear on TA. Rather than conceiving of TA as a mere management tool or governance technique, we suggest that TA processes enact, as well as counteract, dominant innovation policies. How TA positions itself or is positioned in relation to these policies, is particularly relevant to consider in view of the Flemish Government's recent decision to scale back its parliamentary TA institute and the Walloon Government's intention of erecting one. We conclude with suggestions for studying the dynamic relation between TA and wider society through empirically-driven comparative analysis.

1. Introduction: TA in transition
2. "Innovative Flanders" and "Creative Wallonia"
3. Scope for comparison: Strategic science as a new policy regime

4. Conclusion

Drawing on documentary data, interviews with key innovation actors, media reports, and participant observation, the paper illustrates how TA has evolved in conjunction with, and in reaction against, dominant innovation policies. In Flanders, TA emerged, in various forms, in opposition to a large-scale reform program initiated by the Flemish Government called 'Derde Industriële Revolutie Vlaanderen' (DIRV). The DIRV program can be read as the Flemish response to the advent of strategic science. The reforms envisioned in DIRV (marketization of science, public sector reform, strong focus on entrepreneurship) gave TA impetus, as sociologists of science mobilized TA in an attempt to counteract and "remedy" the shortcoming of DIRV (e.g. lack of debate on the role of the state in technology innovation). To garner support for their cause, they aligned themselves with trade unions and political parties on the left. Since DIRV, TA has continued to play a – modest – role in Flemish STI policy. The paper illustrates how Flemish TA was institutionalized in the Flemish parliamentary TA institute IST in 2000, and how three waves of TA potentially mediated three waves of innovation policy.

In Wallonia, TA has not been institutionalized. An initial attempt in the late 1980s to politically validate TA was not successful; another attempt in 1994 at the Walloon Council for Science Policy was, but did not last. In 2008, Parliament expressed interest for a TA policy of some kind. This renewed interest for TA should be understood alongside the Regional Policy Declaration in 2009 and a formal joint decision from Walloon and Federation Wallonia-Brussels Governments to initiate a PTA pilot-project in May 2011. The paper presents recent developments initiated by the paper's authors, among others, to put TA on the political agenda and institutionally embed it.

Drawing together the cases of Flanders and Wallonia, the paper argues that the emergence of TA (and its potential development) can only be understood within the context of the advent of strategic science. Whereas strategic science was a reality in Flanders in the late 1980s, it emerged in the early 2000s in Wallonia. This link corroborates other comparative analysis of PTA in STI regimes in the STS literature (Vig and Paschen 2000; Delvenne 2011). For TA practitioners and analysts, it underlines the importance of considering TA in a wider institutional and political context, as this context impinges on TA processes and programs.

In the regions of Flanders and Wallonia, science and technology innovation and innovation policy have taken on distinct forms. Whereas the Flemish Government structured technology innovation around a neoliberal reform agenda in the 1980s, Wallonia has responded and adapted to the global move towards marketization, privatization, and public-sector reform more recently. The different momentums help explain why technology assessment emerged in the Flemish and Walloon regions at different intervals, and shed light on the distinct character of Flemish and Walloon TA. Drawing on documentary data, interviews with key innovation actors, media reports, and participant observation, the paper illustrates how TA has evolved in conjunction with, and in reaction against, dominant innovation policies. It is argued that TA provides an analytical lens to better situate and understand the nature and orientation of science, technology, and innovation policy, as TA becomes a player in systems of knowledge production, notably strategic science. Drawing attention to the

interconnectedness between TA and macro-economic and macro-policy shifts renders TA thinking and activities deeply “political”; that is, TA positions itself, or is positioned, in relation to dominant imperatives, such as strategic science. TA is better understood, and can perhaps be more effectively repositioned, when these political dynamics are mapped out and attended to by TA actors.

2.

A. Augustinaitis/A. Kiškienė: Barriers and communication in making political technology assessment decisions in Lithuania

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Scope:	Political technology assessment decisions, factors and barriers for effective technology assessment process
Keywords:	Decision-making, technology assessment process

The aim of the presentation is to analyse the process of making political technology assessment decisions in Lithuanian, to identify main factors and barriers for effective decision-making, and to propose possible solutions for better communication between the government and society in the technology assessment process.

The first part of the presentation analyses technology assessment and political decision-making traditions in Lithuania and their implications for current problems in this field. It is argued that Lithuania has experienced two stages in the evolvement of traditions in political technology assessment decision-making. First stage – soviet stage – which can be characterised by: 1) centralised planning and political decision making; 2) militarised industry and technological perception of global competition; 3) strong expert institutions; 4) establishment, implementation and control of technological conditions of society existence by the government. The technology assessment process in the current – post-soviet – stage is highly influenced by the traditions which are inherited from the soviet stage and it also faces new developments: 1) new technologies and rapid technological change; 2) unprecedented growth of consumption; 3) increasing role of commercialisation.

The second part of the presentation focuses on the analysis of the factors and barriers for the effective technology assessment process and political decision-making in Lithuania. It is evident that when soviet structure with the existing institutions collapsed, the interception and conversion to the new system did not happen. Several unfavourable factors are identified: 1) civic factors; 2) activity of scientific institutions; 3) political decisions and priorities; 4) strategic planning; 5) coordination and communication between stakeholders; 6) legal basis; 7) qualifications and specialists. Currently Lithuanian public sphere is dominated by the industrial way of thinking and technological development is treated as systemic, but not organic, separate, but not integrated part of social development. Civic factors mainly consists of weak civil society and unprofessional civil society organisations, which carry out only lobbying functions

for business and political interests in narrow sense. Scientific institutions try to form policies, however their role and decision power is not sufficient and they do not have any influence on the political technology assessment decision making. Universities do not implement the function of foresight and decision formation, since that is left for the expert groups, controlled by administrators and politicians. Political decisions and priorities in the field of technology assessment are unprepared, chaotic and populist. Examples, such as the referendum on the atomic power plant, show the lack of ability to make political decisions. Strategic planning does not embrace broad (horizontal) strategies in technological development and technology assessment. Lack of planning is evident in the regulation of solar power technologies and biofuel. There are no common strategy of state development, which would include criterions for technology assessment according to the vision and strategic aims of the state. New mechanisms for strategic planning, which could combine technological development with culture, values, social and economic development, and regional development, do not exist. Coordination and communication mechanisms between the different stakeholders (society, public administration institutions and political institutions) in the technological development are lacking. Legal basis, which would create system for technology assessment and political decision-making, is also lacking. Moreover, there are not enough qualified specialists who could participate in technology assessment process. There can be identified few interest groups: 1) narrow technological specialists and experts, who are analysing different alternatives of technological perspectives; 2) green movement, which demonstrates/defends more ideological and elusive position, influencing political climate as a pressure agent; 3) political populists veering according to the political orientations; 4) mass media playing on everyday common sense and instincts of their clients; 5) powerful layer of governmental administration and its clannish interests, pushing beneficiary oriented arguments . All those agents act without systemic justification from the side of the public sphere – bodies for strategic planning and coordination with expert groups, social partners, CSOs and other institutions.

In general, current values, cultural and mental layers are dominated by pragmatic and utilitarian, but not by political, state and strategic perception. The concept of socio-technological life is non-existent. Decision makers are more concerned with the price and current gain but not with the development of society in general. The public opinion is formed by politicians, business sector and mass media, but not by other important stakeholders, such as scientific institutions and experts, who usually give individual and non-authoritative opinions. Only a few future foresight studies were conducted in the last couples of years and the first examples of perception of our national specifics emerge in the form of the discussions about smart specialisations.

In conclusion, the authors argue that the role of higher education institutions in the technology assessment process has to be increased in order to overcome analysed barriers for political technology assessment decision making. Higher education institutions, such as universities or research institutes, can become intermediaries between society and government and carry out important function of researching and forecasting the impact of technologies on the development of society. Universities and their think tanks can provide the necessary components for the technology assessment: autonomy, interdisciplinary approach (combining social sciences and technology research), specialists and scientific rigidity, necessary for the forecasting.

3.

I. Dvořák: Responsible research and innovation for great transitions in a small CE country

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Scope:	Problems of R&D&I governance and financing in the Czech Republic
Keywords:	Great transitions, responsible research, innovation support system, technology assessment

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Intensive implementation of results of R&D and massive deployment of innovations are our only tool to cushion negative impacts of coming Great Transitions induced by demographical, sociological, technological, and economical development.

In addition to well-know problems of the whole Europe (aging population, impact of global climatic changes, financial and economical crisis) there are special problems endangering a small country in the middle of Europe, like the Czech republic:

- strong influence of local economic and social development by the external (EU-wide and international) factors,
- limited financial resources even tightened by the impact of global economic crisis,
- social mind set of the population following from the welfare-state expectations reflected by the large portion of the political elite,
- inappropriate structure of decision making process in the field of innovation and competitiveness support, reflecting rather historical that rational reasoning.

As a result, competitiveness of the Czech Republic slowly, but steadily decreases.

Whilst the first three items are a sort of historical, geographical, and political constants that cannot be changed fast, the last one may be changed and should be discussed.

In this contribution I discuss some ideas circulating and introduce also some new ones. We focus on four questions:

1. Formulation of the competitiveness strategy.
2. Collaboration in R&D&I within EU.
3. Responsibility for financing of research, development and innovations.
4. Role of public and private subjects in implementing and promoting innovations.

I propose various measures, implementation of which – though surely not being a complete solution - could significantly improve the situation being. TA is surely one of

promising approaches. However, more new ideas, methods and approaches should be developed and studied in tune with those coming from more advanced and experienced countries.

Each crisis should be regarded also as an opportunity and we should think hard how to make use of it. Technology Assessment is an example of a strong method that can significantly improve the quality of decision making process in responsible research and innovation.

4.

L. Hennen/ L. Nierling: A second wave of technology assessment? Comparative findings from Europe

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Scope:	Development of TA institutions
Keywords:	Technology Assessment, Comparative approach

The basis for Technology Assessment lies in the 1960s and 1970s, conceptually having its origins in systems analysis, planning and forecast, but also with an early connection to the political sphere, since TA-based policy advice started already in these years. Until today, the field of TA has developed further, conceptually with regard to different approaches of TA (e.g. participative TA, constructive TA, interactive TA) as well as methodologically, as a broad set of different research methods are used within this field today. Hereby, the interdisciplinary research approach of TA has always been closely connected with the political side, namely with policy advice. Starting with the US-American OTA model in the 1960s until today, different models of TA institutions have been established in Western and Northern European parliaments.

Drawing on these European developments, the ongoing European project PACITA (Parliaments and Civil Society in Technology Assessment) explores further opportunities as well as barriers for strengthening the concept of TA in national political contexts in Europe. In countries in which TA is not institutionally established so far an exploration process took place during 2012. The seven countries included in this process were Bulgaria, the Czech Republic, Hungary, Ireland, Lithuania, Portugal and Wallonia. In an “action-research”-like approach, not only interviews with relevant actors were conducted in the respective national contexts, but also two national workshops provided a platform for debate on the concept of TA among relevant national actors from politics, civil society and industry.

This paper aims to discuss the major outcomes of these processes in a comparative perspective. Hereby not only different national developments in the field of TA will be pointed out. Also major similarities and differences between the countries in the process of exploration of TA – at the parliamentary, the governmental and the academic level – will be highlighted. Last but not least, the historical perspective will be used to outline the major differences for an evolving TA context of today to its origins nearly 50 years ago. In order to understand current interests, engagements but also skepticism with regard to the idea of TA, it is important to reflect both, the socio-political background of its development leading to its institutionalized forms in

Northern and Western Europe as well as the current societal context: In the 1970s and 1980s, parliaments and governments actively expressed their demand for an informed basis for decision-making with respect to the political regulation of fast developing scientific and technological innovations. These needs were further triggered by massive public opposition against certain technological developments in these years. In contrast, today the case study experience from the countries explored in the PACITA project provides a different political and societal picture: Parliaments and governments seem not to explicitly articulate an interest in TA. Science and Technology policy is regarded mainly as a means for economic development to keep pace with globalization. Furthermore the civil society seems to be far less active in its interest in (not to speak of resistance against) technological innovations and large-scale technological projects.

Nevertheless, the country experiences show an interest in science-based policy making not least to fill a gap in often missing democratic decision-making structures in S&T. Furthermore, the TA-concept is demanded for new, sometimes very specific conditions of practice, e.g. TA in an economic function used for the development of national innovation strategies or for the evaluation of national R&D programs with respect to restructuring national science systems.

The authors will conclude with a discussion on the current landscape of TA in Europe. On the one hand it will be discussed which role TA can (or should) take over against the background of current societal contexts and whether the new demands expressed are compatible with current conceptions of TA. On the other hand, the potential of actual initiatives strengthening the TA-landscape will be discussed which might contribute to an “expanded TA-landscape” in the future.

5.

Jinha Kim/ Hongbum Kim: Technology assessment system of Korea for national S&T

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Scope:	Technology Assessment as a preliminary evaluation
Keywords:	Technology Assessment, Preliminary Evaluation, National R&D Program, assessment item and index

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This presentation introduces the newly launched evaluation system for the development of national science and technology, Technology Assessment (TA), as one of Korea's S&T policies. The tendency of R&D programs' massiveness and convergence between them due to sustain growth of S&T's role has caused governments to recognize the importance of the efficient management and execution of national R&D programs and S&T budget. Accordingly, most governments of both advanced and developing countries are trying to find the effective way to control and manage R&D programs and their budgets. National Science and Technology Commission (NSTC) of Korea, as one of the solutions, has established TA system on 2011.

The goal of TA system as a preliminary screening step is to select proper R&D programs that deserve to move on to the next evaluation step, R&D Feasibility analysis. R&D Feasibility analysis system founded on 2008 by MSF (Ministry of Strategy and Finance) analyzes the validity of government R&D programs if they are eligible to get the budget and to be executed. This feasibility analysis system, however, has had the limits in that it only focuses on the relevance of individual R&D program without the overall consideration for the developmental direction of national S&T. To complement this defect, TA system is established with macroscopic, multilateral, and long-range perspectives on R&D programs as a preliminary evaluation system. As a result, all R&D programs from government departments could be controlled by these two evaluation systems, and most of all, TA system plays a significant role in managing national R&D programs and S&T budgets as the first preliminary screening step.

TA system evaluates R&D programs with 6 assessment items and 14 indexes. 6 items are following; the trend analysis, the necessity analysis, the urgency analysis, the doubleness analysis, the concreteness analysis of a R&D program's technology, and the

eligibility analysis for government aid. Moreover, 14 indexes are subordinate to 6 items by grouping and consist of essential ingredients in planning government R&D programs to check the properness of a R&D program's strategy and the level of related technologies. Since these indexes are based on large-scale and multilateral perspectives, TA system could appraise R&D programs under macroscopic viewpoints considering the market and industry trend, national S&T policies, national R&D investment plans and the white-space analysis from IP portfolio.

Technology Assessment system of Korea is settled down and stabilized as the essential preliminary evaluation system for national S&T. Even though TA system has implemented three times since 2011, it starts to get affirmative results in its role and effects on managing government R&D programs, operating R&D budgets efficiently, and promoting the development of national S&T. The future works of TA system would be to develop more objective evaluation standards and various viewpoints for national S&T improvement. Moreover, to look for the way to keep the objectivity and the consistency on Technology Assessment would be another important assignment to study because the speed of S&T change get quickening and R&D programs from governement departments get diversifying more and more.

6.

T. Kamisato/ M. Hosono/ G. Yoshizawa: Creating a hub for ELSI/TA education, research and implementation in Japan

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Scope:	Education and research of TA in the context of ELSI
Keywords:	Evidence-based policy-forming; ELSI; public engagement; science, technology and innovation policy

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With the deepening of the relationship between science & technology and society, there is an increasing consensus that science, technology, and innovation policy (STIP) need to foster and obtain public understanding, trust, and participation. This consensus rests on several points: that it is necessary to understand the influence and impact of STIP on society and make them visible to the public; that it is needed to rationalize the policymaking process and make it more objective and evidence based; and that this will lead to improved accountability of STIP-makers to the public.

With such contexts, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) since 2011 has been promoting a “Science for RE-designing Science, Technology and Innovation Policy (SciREX)” program that aims to prepare a system and foundation for the realization of evidence-based policy. Currently, SciREX consists of four sub-programs: mission-oriented research on STIP, infrastructure construction for STIP data, research grants for STIP, and the creation of a research/education hub for STIP.

Five institutions were selected as “research/education hubs” in FY2011; the “Program for Education and Research on Science and Technology in the Public Sphere (STiPS)” at Osaka University and Kyoto University is one of them.

Among the programs, STiPS is distinguished by the enormous importance it places on fostering personnel capable of conducting activities on public engagement from the perspective of ethical, legal, and social issues (ELSI) in science & technology. These personnel are also expected to

Creating a hub for ELSI/TA education, research and implementation in Japan contribute to policymaking by intermediating between academic disciplines as well as between the academy, policymakers, and society. Naturally those activities would include technology assessment (TA). This reflects the concern of the designers of the STiPS program that SciREX might otherwise be supported only by objective evidences based on quantitative.

For the kind of public engagement described above, it is necessary to secure, survey, and analyze the participation of various stakeholders, including citizens, in each stage of policymaking, even in the earliest stage, agenda formation. It is also necessary to identify challenges emerging from stakeholders' expectations, concerns, and issues, and to reflect these results in policy, research planning, TA, and efforts at social consensus-building.

To carry out these activities successfully, it will be important to foster personnel who are capable enough to think beyond their own specialized fields and to meet science & technology and social challenges from perspectives that are adequately comprehensive and diversified to ensure success.

To achieve these goals, in the spring of 2013 STiPS will establish a minor course as a part of its existing graduate programs, and will promote education and research reflecting the needs and characteristics of the Kansai region through fostering cooperation between Osaka and Kyoto Universities based on their inter- and multi-disciplinary strengths.

In our presentation, we would like to show you an outline of the STiPS in SciREX program and describe its progress. We will be happy if by doing so we can offer material for discussion in relation to the topic of TA education.

7.

P. Ashworth: Raising the profile of TA in Australia's national science agency

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Scope: Science and technology assessment, need for participation, challenges for implementation, role of trust, cultural change, processes for reporting results

Keywords: Science, technology, participation, engagement, strategy

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Like many of the countries involved in the PACITA project, Australia is not immune to the challenges of emerging science and technology developments and the associated consequences (both positive and negative) of their implementation. These challenges include: identifying the processes for critically evaluating the associated risks, uncertainties and controversies of new science and technologies; clarifying the role various Australian institutions should play in conducting the processes; and how best to share the findings with those responsible for establishing the governance structures around the new innovations being assessed. Whether it is assessing the long term impacts of Australia's ageing population, the latest projections for our changing climate, or the local impacts of an exploding coal seam gas industry, there is currently no single agency responsible for providing advice to decision makers and society on the findings. Over time this has led to failed technology transfer or delay, most often resulting from a lack of engagement with key stakeholders during the development phase. With the increased need for accountability and independence of advice, it is timely to explore how best to coordinate STA practices in Australia. This presentation seeks to understand the role for Australia's national science agency, the CSIRO, within this process.

In operation since 1926, CSIRO has been described as one of the largest and most diverse research agencies in the world. CSIRO's purpose is defined through the functions legislated in the Science and Industry Research Act (1949) which are:
(a) to carry out scientific research for any of the following purposes:
(i) assisting Australian industry;
(ii) furthering the interests of the Australian community;
(iii) contributing to the achievement of Australian national objectives or the performance of the national and international responsibilities of the Commonwealth;
(iv) any other purpose determined by the Minister;

(b) to encourage or facilitate the application or utilization of the results of such research.

A broad remit for any one organisation, but it highlights the significance of CSIRO to Australia and the national innovation system and perhaps why it is considered the most trusted institution in the country.

To achieve the functions in the Act, CSIRO's mission is to *deliver innovative solutions for industry, society and the environment through great science* that *is used to make a profound and positive impact for the future of Australia and humanity*. CSIRO sets out to realise these goals through their National Research Flagships - established in response to major national challenges and opportunities. Currently there are eleven Flagships established around challenges such as Biosecurity, Digital Productivity, Energy, Climate Adaptation, Sustainable Agriculture, Oceans and Minerals. Each Flagship sets their priority research areas and then draws on expertise from the 4000 scientists across the organisation, to enable a multidisciplinary approach to research problems. Over time, key achievements have included the control of pests and stock disease, the introduction of radar and rainforest research, the development of plastic bank-notes, dual cropping plant seeds and treatment for flu, and the invention of wireless technology for homes and offices.

Within this structure one might expect that STA would be well entrenched in CSIRO culture. However, while across the organisation there are examples of STA, the size, relevance and extent of CSIRO's work in the STA space are currently disjointed and often go unnoticed in the role and impact they provide to wider society. There is also a question of whether these assessments are participatory in nature and involve all the necessary stakeholders. Therefore, a more coordinated investment in STA by CSIRO represents a dual opportunity to increase CSIRO's science impact, not only internally but more broadly within the innovation system.

To successfully institutionalise STA in CSIRO it will be necessary to garner support from senior leaders or the organisation. It will also be critical to develop an appreciation, by those in the technical and engineering science domains, of the value of participation in STA. To raise the understanding, that without participation STA does not really exist. The Science into Society Group at CSIRO - comprised of a range of researchers from across a number of the social science disciplines - has been doing this through their applied research approach. Working across the range of Flagships, their work involves designing participatory processes to understand the perceptions of experts and the lay public to new technologies and complex issues (e.g. carbon capture and storage, in-situ leaching for minerals extraction, sea floor mining). The results from these activities are shared with fellow researchers, politicians, bureaucrats and broader society. Testament to the growing interest in this approach is the unprecedented growth that has taken place in this Group over the past five years, from 3 to 32 researchers.

CSIRO is well placed to work towards developing and leading a more coherent strategy for STA in Australia. As the strategy is developed it is likely that PTA would be a natural component of the process. However, the challenge remains how best to coordinate CSIRO efforts, both internally and with other Australia research organisations. How to

maximise the benefit to Australia without compromising CSIRO's independence and integrity? The opportunity to learn from organisations more experienced in the delivery of STA and PTA, such as those in PACITA and others across Europe, becomes critical in creating the competitive advantage for Australia. It will also allow the opportunity to identify areas for caution when formalising such a process.

8.

T. Persons/ N. Barkakati: TA in the US: Reinvigoration and Reinvention

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Scope:	TA methods, institutionalization, and quality assurance
Keywords:	TA Methodology, TA Quality Assurance, OTA, Policy Analysis

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Emerging science and technology (S&T) developments continue to influence almost every aspect of the American society. As an example, products involving nanotechnology are both relevant to policy goals as well as to the health and safety of the American public. The Government Accountability Office (GAO), an independent and non-partisan agency working for the U.S. Congress, provides expertise in analyzing such complex S&T issues by making them more accessible and presentable to inform and improve policy making.

After the closing of the Office of Technology Assessment (OTA) in 1995, Congress directed GAO to conduct a technology assessment (TA) pilot program. Between 2002 and 2006, GAO completed four TA reports – use of biometrics for border security, cyber security for critical infrastructure protection, technologies for protecting structures in wild land fires, and cargo container security technologies. To illustrate the results of a report, GAO found that though biometrics technologies could be used to secure the border, it had limitations in fingerprinting and facial recognition systems. An immediate impact of the report was a congressional testimony on the use of biometrics which, in turn, helped to inform U.S. national security reform efforts. GAO reports, which are made available to the public, have become essential vehicles for understanding S&T implications of policies considered by the Congress (*cf.*, www.gao.gov).

Since 2007, Congress has established a permanent TA function within GAO. This new operational role augments GAO's performance audits related to S&T issues, including effectiveness and efficiency of U.S. Federal programs. In the last three years, GAO has completed TA reports on three topics – rail security, climate engineering, and alternate neutron detectors. As an example of one such report, Congress requested GAO to examine three areas: the current S&T state of climate engineering, views of experts on the future of climate engineering research, and potential public responses to climate engineering. When GAO receives a request to conduct TA, it utilizes existing processes

in five phases, which include selecting the topic and initiating the TA plan (i.e., Acceptance phase 1 and Planning phase 2), then conducting TA (i.e., Data Gathering and Analysis phase 3), followed by developing the report and ensuring its accuracy and integrity (i.e., Product Development and Distribution phase 4), and finally receiving feedback from Congress and developing lessons learned to enhance the TA process (i.e., Results phase 5).

GAO defines TA as the thorough and balanced analysis of significant primary, indirect, and delayed interactions of a technological innovation with society, the environment, and the economy and the present and foreseen consequences and impacts of those interactions. This broad working definition enables GAO analysts to utilize TA as a tool for policy analysis. Technology assessments at GAO are conducted in accordance with GAO's quality assurance framework. GAO initiates technology assessments through congressional mandates, requests from congressional leaders, and through the authority of U.S. Comptroller General.

As the TA program is maturing, GAO is looking ahead to three next steps. First, while GAO has utilized the quality assurance process for conducting performance audits, it is also developing the quality assurance framework specifically for conducting technology assessments. Second, in order to support GAO analysts for efficient and effective work, it is developing a guidance document addressing the logic and design of technology assessments. Third, as GAO is interested in measuring the impact of its TA reports, there are plans to develop metrics for impact which will help to identify ways to improve the quality and efficacy of TA.

PACITA Conference, Prague

II. Thematic Session: TA and Governance

Chair: **Stefan Böschen**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

Under a Governance perspective TA institutions became itself a Governance actor within the field of regulating socio-technical problems. Moreover and with respect to the advisory function of TA, the theoretical-analytical question has to be addressed which linkages between knowledge and governance exist. Easy to imagine that there are differences between governance of knowledge, governance with knowledge or governance through knowledge. As TA is mainly an activity to produce knowledge for decision-making processes, we have to rethink the TA situation of expertise production and particularly the steering function of knowledge for governance. And the analytical lens of Governance is really helpful for that. The presentations in this session will address the question of the linkage of TA with Governance from different starting points. Against this background, we will get a deep impression about the challenges for TA under the new regulative situation.

1.

C. Büscher/ C. Orwat/ P. Sumpf: Smart grid as black box – the role of consumer trust in the governance of future energy systems

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Scope:	Energy Transition, Socio-Technical Systems
Keywords:	Risk, Trust, Governance, Prosumer

Current systems of energy supply in North America and Europe, especially in Germany in light of the current "energy turn", are supposed to undergo radical changes within the upcoming decades. Future energy systems are envisioned in a decentralized way, weaving a network of various energy sources, distributive structures, storage capacities and, additionally, including active end users. Overall, new relations of system elements are to be expected: technical and social components of generation, distribution, administration and governance inversely coupled as well as numerous, heterogeneous actors with multiple functions of invention, innovation, implementation, regulation, consumption, etc. As a result, an anew increase in complexity through tight couplings between technical and social elements may be reasonably expected which is a possible trigger of yet unknown *systemic risks* in socio-technical systems.

One essential feature of this so called "Smart Grid" is the implementation of a growing amount of information and communication technology (ICT), e.g. devices like "smart meters", enhancing two-way communication between consumers and suppliers. As a consequence, formerly passive consumers are supposed to increasingly turn into "prosumers", developing an active future role in dealing with electricity devices as well as being able to act as electricity vendors in "Virtual Power Plants" and "Smart Markets". This experience is likely to transform formerly *latent* information (permanent supply of energy driven by unreflecting demand) into *conscious,* potentially modifying action preferences (volatile, supply-driven distribution of energy and decentralized market decisions) and consequently raising new questions concerning degrees and forms of trust consumers and associated actors invest into these novel technologies and the system encompassing them.

Accompanying the described energy visions is the need of equilibrium *of demand and supply* of energy which is supposed to rule out expected volatility problems with the

supply of renewable energy by smart grid activities and concomitant efforts. Thereby, a typical neglect in technology-oriented energy visions is the dimension of *social volatility*, meaning potentials of atypical, dysfunctional consumer behavior which may impede the desired smart grid operations. In sum, the relationship between energy volatility and behavioral volatility is of central importance in transition issues, leading to the underlying question of weak and strong ties among technical and social components in future energy systems.

In light of the expected future development of power grids towards smart grids questions of potential catastrophic consumer perceptions like power outages, data protection problems or loss of control frames against the background of increasingly autonomous software agents and realization of energy volatility become particularly relevant. Fears of observers in the field cover the idea of collective or public distrust towards the new grid or parts of it. Following this scenario, consequences of lacking trust could be a failure of the system function in terms of smart meter refusal by broad consumer groups as they do not fathom its algorhythmic depth, as black boxes. Similar experiences have been made with E10 biofuel in Germany, for instance. Therefore, dispense and withdrawal of trust and the mechanisms and consequences surrounding it develop a special significance within energy market processes.

With reference to the equilibrium paradigm, quite the opposite scenario is conceivable as well: Insofar, an extensive increase of (potentially unjustified) trust into technologies and software agents like the smart meter by broad consumer groups in transformed energy systems could similarly lead to the creation of (systemic) risk as a lack of trust could with resulting dysfunctionalities of the system's operations. Trust in this way becomes effective as a "risk fertilizer", as blind trust which raises risk dynamics through unreflect demand and operation. In analogy to the global financial system, "guardians of trust" (e.g. rating agencies) can additionally boost the acceleration of system operations by providing supposedly trustworthy decision support in intransparent social constellations. In smart grid visions, comparable organizations are prominent such as online platforms, certification agencies or market intermediaries. In this connection, trust develops a role as *reverse salient* – it is likely to become the crucial resource in socio-technical energy constellations, determining the possibilities of future transformation of energy systems either as enhancing or blocking component.

Concluding, the equilibrium between trust *and* distrust as complementary social mechanisms plays a key role in the future governance of smart grid energy systems respectively. Therefore, conventional trust governance by means of detailed regulation and legal intervention could be complemented by a stronger focus on *trust symbols*, commonly responsible for modifications in trustworthy behavior. While it takes a long time to accumulate trust in brands, software or abstract systems like certificates, its erosion can be induced by minor occurrences as numerous examples demonstrate. The remaining question is: Where are the tipping points?

2.

J. Lacey/ K. Moffat: A new application for TA: Assessing technologies in the mining and minerals industry

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Scope:	Applying TA in a new context, TA as a vehicle to bridge socio-technical concerns in mining sector, deliberative democracy and citizen participation, addressing knowledge production and social power structures, representativeness in decision making
Keywords:	Mining, minerals, technology, democracy, knowledge

Technology assessment (TA) is applied in a wide variety of contexts around the world. However, there is currently no significant body of TA work that focuses explicitly on technologies used within the mining and minerals sector. This paper explores an innovative new application for TA that is currently being developed by Australia's leading national science and technology organisation, the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Our aim is to assess these technologies not only from the perspective of their economic, environmental and social impacts but also as a potential site of democratisation of mining and minerals development in Australia.

In Australia, the mining industry is significant in both its scope and size. Australia is a major supplier of minerals globally, and as a major export industry, mining brings significant financial benefits to the nation. Technology plays a central role in mining activities throughout Australia and these technology choices have been focused on achieving greater economic and environmental efficiencies. Equally, our choices about which technologies to develop, adapt and deploy in the landscape reflect one of the most critical interfaces between mining and society. These choices are particularly important to understanding this interface because they play a central role in the way mining is conducted, and how it is experienced by local communities.

In the past, these choices have tended to reflect the dominant position that scientific and technical knowledge has held over other forms of knowledge. This has important implications for those who live and work near the operations where these technologies are deployed. While there are numerous well established and legislated methods for assessing the environmental, economic and (some limited) social impacts

of mining technologies, the broader social, ethical and political concerns have not been as easy to assess. This provides scope for thinking about how broader and more diverse social interests can be incorporated into decision making processes. In this respect, TA can play two key roles. First, it provides a vehicle for introducing more deliberative democratic processes that allow us to consider and assess the social values and trade-offs involved in decisions about mining technologies and second, it allows us to incorporate the wider representation of knowledge required to reach those decisions. In these ways, TA provides us with a way of moving beyond simplistic technocratic thinking to address some deeper socio-technical concerns, particularly those that are now beginning to emerge around the use of more controversial mining technologies in the Australian landscape.

In response to these challenges, we propose an integrated TA framework that provides an approach to assessing mining technologies across a variety of design, performance, investment and decision contexts so as to:

- inform technology (re)design within R&D institutions and organisations
- inform technology options for deployment in new or existing mines
- inform policy development and approaches to regulation of new and existing technologies
- enable communities to develop and articulate the attributes that will underpin local and societal acceptance of new technologies or mining practices

Our purpose is to develop a framework that has multiple uses and can serve the interests of multiple social actors in Australian society. An important component of this framework is its development and adoption through a series of case study applications. Thus we outline this emerging program of mining TA research and touch upon why turning our attention to mining TA is also critical to exploring, and making explicit, some of the broader connections that mining has with our other technologies and social choices.

3.

D.K.R. Robinson: Patterns in Science and Society in transition

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Scope: Exploring the potential re-contextualization of science and society

Keywords: TA, science-society interactions, governance

We are currently in a period of major transitions (including environmental and financial crises, globalization, Web 2.0, food security issues, ageing population). Faced with these rapid changes, institutions must react and develop new structures and new spaces dedicated to exploring the relationship between science and technologies and their embedment into societies. This is particularly true for institutions of scientific knowledge production. An abundant literature focuses on the contemporary transformations of the relations between science and society, this literature leads to point to the emergence of a new discourse. This discourse has not necessarily translated into practices of stakeholders and this gap between rhetoric and practice is one of the points of a recent study conducted by TEQNODE Limited on practices and evolutions in the interactions between science and society in a number of European countries.

We observe a shift in the forms of interaction and engagement between knowledge producers and citizens which are dependent on country and domain context (nanotechnology, biodiversity etc.)

In this presentation I will outline some of the insights from our work over the past years:

- On the shifting nature of interactions between knowledge producers and citizens
- The forms these interactions are taking in Europe (drawing on examples from different domains and in different member states
- The increasing role of intermediaries in the form of consultants and social science scholars in the evolving patchwork of TA practices and science-society linkages.

In presenting these findings, I hope to contribute to the discussion of an important transition, that of the arenas in which science and society engage, with a view to what this means for PTA and for foresight / TA practitioners.

4.

M. Barland/ W. Peissl: Making cross-European Technology Assessment

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Scope:	The added value of cross European TA, structures and incentives for cooperation, vision for European TA 2020
Keywords:	Cross European, technology assessment, cooperation, projects, vision

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This paper is written as part of the PACITA project, and discusses the past, present and future cross European work going on in the field of Parliamentary Technology assessment. PACITA (Parliaments and Civil Society in Technology Assessment) has set an aim to broaden the European field of technology assessment (TA) and create a vision on the future of cross European TA.

The paper derives findings from several case studies of finished "cross European TA" projects and discussions from two workshops organized by the PACITA project, in June and November 2012. Based on these we will present a vision for "European TA 2020" showing how cross European TA may continue to develop in the future.

The whole of Europe is getting more closely connected, the European Union is growing and with the rapid technological development, there is a need for establishing networks and knowledge bases in a cross European manner.

The technological development is more than ever taking place on an international level. Therefore, it is logical that the assessment of this development also has an international or European level. This has already been identified in the area of European science policy, moving from "science in Europe" to "European science". Focus has moved from coordination of national projects, to the development of a more integrated, pan-European science base. PTA has to play a role in this.

Main questions to be dealt with in this paper will be:

- Why is there a need for Cross-European TA?
- How can it be established in a most efficient way?

To answer these questions we studied several cases of finished (P)TA projects. It turned out that the project structure i.e. organization and funding are crucial parameters for success or failure of such projects. Another structural challenge is the

tension between national/regional scope of (P)TA institutions and the efforts necessary to go European. When topics are relevant across borders, it's reasonable to think that it would be more effective to make projects on a cross European basis, than every unit doing similar projects in their country/region. However there are only few examples to be found. Despite the fact that technological issues are going to be more and more international, there is not a clearly defined "European" addressee of (P)TA. Cross European projects are vulnerable to time and resource demands, making cheap and yet consistent methods necessary. The conceptualization of cross European TA is still in its creation. An important aspect of this is the identification of efficient, high-credibility cooperation modes for national actors and actors on the European level.

The most important overall goal of the vision for European TA 2020 and of TA in general is **making an impact**. A growing TA community in Europe will demonstrate the relevant addressees that TA is important and make them seek advice from TA institutions. Projects like PACITA can contribute in making technology assessment a player on both international and national/regional level, by broadening the field of TA and supporting a strong TA community in Europe.

There are many arguments that prove the added value in doing cross European work in the field of technology assessment. Lowering the threshold for doing (P)TA across borders depends on several factors, some structural, external factors, and some factors that the Institutions involved can influence themselves.

Taking a more inclusive and diverse approach, is something that might help creating a stronger TA community in Europe. Including institutions beyond parliamentary technology assessment will broaden the field and create a stronger basis for impact on decision-making on the European and national/regional levels.

Having an impact on decision-making and knowledge production in Europe should be an overall goal of European (P)TA institutions. This demands more activity by the institutions and a strong presence in the European arena. All (P)TA units more or less have to deal with the same or similar technological trends in society. Even though the political culture might vary in different countries and regions, one can learn from each other and give input to the policy-making processes, also in a cross European manner.

PACITA Conference, Prague

III. Thematic Session: Evidence-Based Policy Making

Chair: **Tore Tennoe**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

Most policy making processes take place in a continuous stream of information. Researchers, NGOs, governmental agencies and industry provide a never-ending flow of data, proposals and analyses. It is impossible for policy makers to read and digest all this information. A specific policy decision will never be the single logical „conclusion" to the evidence at hand. Rather, we have to develop processes and methods that enable policy makers to make decisions that are sufficiently well informed. Understanding the complexity of the issues at hand and the interests and values at stake is also crucial.

The aim of the session "Evidenced-based policy making" is to explore how technology assessment can help in these respects. The session will mainly discuss two questions: How can TA aid policy makers to address and deal with complex policy issues? Which methods and techniques does the TA community have at hand?

1.

J. Staman: TA as a model for the good evidence practice in policy and politics

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Scope:	TA as a model for Evidence Based Policy (EBP)
Keywords:	Evidence Based Medicine, The Academia, Regulatory Sciences, TA and the meaning of Aims, Interests, ELSA and Process Handling in EBP

The Practice of Evidence Based Medicine (EBM) does not provide proper guidance for the development of Evidence Based Policy (EBP). Nevertheless it is common that in defending EBP one refers to the successes of evidence based medicine. One should consider however that clinical medicine is a highly technocratic practice which consists mainly of two categories of protocols. A diagnostic and a therapeutic one. EBM deals with the rationalization of these protocols. This techno-practice has very little to do with the practices of evidence based policy and politics which are characterized by problem definitions based on interests and comprehensive views and which usually have a societal and political character and certainly not a scientific one. These problem definitions are usually contested mainly because of conflicting values norms and interests. Solutions should work in the political realm.

(P)TA however has very strong connections with the practice of policy making and political decision making and it is based on the ideals of democratic values. Here we defend the idea that EBP certainly cannot do without the current state of 'sound scientific evidence'. But this evidence gets meaning only in combination with an assessment of the conflicting values, norms, interests and aims involved. In many cases of EBP the classical ELSA issues should be properly addressed, and participation of experts in the agenda setting process in policy and politics should be emphasized. The scientific community should be aware that the mere presentation of 'sound scientific evidence' (increasingly) on behalf of the scientific community is by far not enough to get connected to the realm of Policy and Politics and the problem definitions within that practice. We will pay attention to the initiatives of the Academia to provide in well-organized procedures within the Academia for delivering 'sound scientific evidence' only, and the expectation that this evidence (because of the high quality of the procedures and of the scientists involved) 'fits for all' In our contribution we defend the idea that providing evidence to politics and policy is a specialized expert practice which should be distinguished from providing sound scientific evidence.

Many parts of the working programs of the Rathenau Institute deal with recent perspectives on 'Good EBP'. In 2012 we analyzed the opinions on EBP in the Dutch scientific and political community (Marjan Slob and Jan Staman. *Policy and The Evidence Beast*. Rathenau Institute, The Hague, 2012). The Institute has currently taken the initiative to organize a (bi) annual international training course for EBP in cooperation with The University of Tokyo (prof. Shiroyma), Ristex (prof. Arimoto) and ITAS (Dr. Decker). Other Rathenau projects which are directly connected to 'Good EBP' are the projects on the future of the Regulatory Sciences, the project on Societal Trust in Science, the project on Disruptive Emergencies and the Grand Challenges and the project on Co-creation for the Grand Challenges. In our presentation we will provide some insight into these projects and we will present the current state of the aforementioned training course.

2.

M. Matsuo/ M. Matsuura/ H. Shiroyama/ A. Kishimoto/ M. Tachikawa/ N. Iseki: Towards a more collaborative and evidence-based decision making - Incorporation of Joint Fact-Finding (JFF) in science and technology governance

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Scope: Collaborative evidence based decision making by incorporation of Joint Fact-Finding in science and technology governance

Keywords: Joint Fact-Finding, governance, evidence and facts

The unprecedented Fukushima nuclear disaster following the Great East Japan Earthquake on 11 March 2011 has made us reconsider about science and technology and their relationships to politics and society. Decision-makers in Japan for nuclear related policies have been confronted with public distrust more than ever. Expert advice upon which they relied is also being contested. To overcome these challenges and to ensure public trust in science and technology, a new innovative approach is required to enable better understanding of the basis (evidence and the "facts" that forms the basis of evidence) among any stakeholder involved in decision making.

Joint Fact-Finding (JFF) is a collaborative and participatory approach to such issues as mentioned above. It provides a forum for all actors (i.e. decision-makers, scientific/technical experts and other stakeholders including public) for (a) co-framing what problem needs to be explored and (b) co-producing "jointly-found facts," that would include identification of points in agreement and disagreement. The JFF approach can contribute to the development of a more transparent and evidence-based decision making. It also enhances credibility and legitimacy of the policy decision. The JFF approach was developed in the United States primarily for use in the field of environmental policy, thus it has less been used in the field of Technology Assessment (TA) so far. However, it sees that the approach has a lot in common with the TA activities, so it can be considered as a variant of TA.

This study considered how the JFF approach could be embedded in the current decision making framework for application of science and technology in society and politics in Japan. It examined similarities and differences between the JFF approach and the tools and methods developed in the field of TA by looking into the past TA literatures. It explored critical components of evidence for decision/policy making, to address a need for clarification of the "facts" including scientific fact as well as other social, economic facts. Our project also introduced a thought experiment using a hypothetical JFF process for reconsidering an appropriate standard for radionuclide contamination in food (work in progress). The experiment would suggest potential advantages and challenges of applying JFF approach in decision-making procedures.

Note: This study is part of the outcome of the project, "Integrating Joint Fact-Finding into Policy-Making Processes Project (iJFF)," funded by the Research Institute of Science and Technology for Society (RISTEX) within the , Japan Science and Technology Agency (JST). It is a spin-off out of the I2TA project (Innovation and Institutionalization of Technology Assessment in Japan, 2007-2011).

3.

J. Fixdal: Disputed evidence and robust decision making – the case for cross-disciplinary expert groups in TA

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Keywords: Experts groups, complex TA issues, controversy, policy making

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A typical TA project at the Norwegian Board of Technology has three core characteristics; it is complex, empirical data plays an important role, and both the evidence at hand and the values at stake are disputed.

TA-institutions need to develop TA-processes that enable them to understand the various aspects of the topic and the interests at stake. The process should also help identify the most relevant policy issues and formulate relevant policy advice.

This paper discusses why cross-disciplinary expert groups can be a valuable tool in TA-projects with the above mentioned characteristics. Such experts groups are used regularly at the Norwegian Board of Technology, and they have proven very suitable to some of the main challenges faced by a TA project.

The paper starts out with a description of three typical characteristics of many contemporary TA-topics: they are complex, empirical data plays an important role, and both the evidence at hand and the values at stake are disputed.

This is followed by a discussion of why these characteristics represent a challenge not only for the TA practitioner, but also for policy makers. How can policy makers make decisions that are “robust”: they should be sufficiently well informed while also being based on processes where the key positions and groups of actors have been heard.

The paper then goes on to discuss how cross disciplinary experts groups, typically with 5-8 members, can help produce a thorough understanding of the issues at hand, identify relevant empirical data, and also provide a basis for discussions of the values at stake. These discussions are supported by examples from recent projects at the Norwegian board of Technology. The examples clearly illustrate the value of expert groups.

The final section of the paper is a discussion of key issues to keep in mind when organizing cross disciplinary expert groups. Among these issues are: the number of expert groups members, how to compose expert groups tailored to the topic at hand, the role of the TA practitioner as project manager, and how starting early with writing the report can help ensure satisfactory progress.

Cross-disciplinary expert groups have proven to be a most valuable tool in dealing with several contemporary TA issues. They are instrumental in structuring complex issues, identifying and discussing empirical data as well as the values and interests at stake. In so doing, they can provide policy makers a firm basis for making robust decisions.

4.

H. Acheson: What role for Future-oriented Technology Analysis (FTA) in the EU's Joint Programming process

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Scope:	Structuring ERA; Joint Programming (multi-annual); Strategic Research Agendas; Transnational priority-setting ; Optimizing research investments
Keywords:	Enhanced research co-operation

The European Research Area (ERA) concept was introduced in January 2000 in the Communication "Towards a European Research Area". Following the widespread adoption of the ERA concept the EU Commission introduced a number of instruments including ERA-NET, ERA-NET Plus and Article 185 initiatives to help develop the ERA. In 2008 the Commission introduced Joint Programming (JP), a new approach for structuring research in Europe and making better use of Europe's public R&D funds.

The concept proposed requires Member States to engage voluntarily and on a variable-geometry basis in the definition, development and implementation of common strategic research agendas based on a common vision of how to address major societal challenges. The process is managed by the High Level Group for Joint Programming (GPC - Groupe de haut niveau pour la Programmation Conjointe) which is a dedicated configuration of ERAC[1]. It is responsible for identifying the themes for joint programming and contributes to the preparation of Council decisions in this area.

The JP process should be designed to ensure the optimization of existing and future research efforts at the level of Member States thereby reinforcing cross-border cooperation and the coordination and alignment of national publicly funded research programs in a limited number of fields, each addressing a specific societal challenge. Since 2009, 10 Joint Programming Initiatives (JPIs) have been launched, six only within the last year. The author has chaired the independent Expert Group which reviewed the process and which reported in October 2012.

The Expert Group found that the Joint Programming process has got off to a good start. However, the process can only reach its full potential if commitment and

1 ERAC (European Research Area Committee) is the new name for CREST, the advisory body assisting the Council of the European Union and the European Commission in the field of research and technological development. It was created through a new mandate for CREST which was decided by the Council in May 2010. The main mission of ERAC is to provide strategic input on any research and innovation issue relevant to the development of ERA.

financial support from national level administrations continues. Moreover, to be sustainable, JPIs require time to build up the necessary trust to engage in the full policy life-cycle and to commit to multi-annual joint programming.

The definition of the 10 final themes was only partly the result of systematic and evidence-based priority setting strategic intelligence tools were used only in some cases. Furthermore, the themes are in many cases quite wide in scope. Nevertheless, the Expert Group reported that the process started quicker than it might otherwise have done if a more rigorous and systematic approach had been adopted. (A quick start was politically necessary at the time.)

A key Recommendation from the EG is ***that the identification of future themes and the development of Strategic Roadmaps should make use of more robust Future-oriented Technology Analysis (FTA) techniques.***

A second and related Recommendation is that ***the GPC should consider and prepare a systematic process that can be used for deciding on future Challenges. The process should include the use of monitoring, evaluations and other forward looking activities including EFFLA (European Forum on Forward Looking Activities).***

Overall, the challenge set by Joint Programming is that it requires a new mindset in the Member States. It requires concrete commitments and actions and a rethinking and re-organization of the way national research programs are defined and implemented by refocusing them towards common objectives or “areas of great transitions”, agreed by the MS together.

The PACITA /ETA Conference offers the opportunity to have a highly interactive discussion regarding possible approaches which could be used by the GPC in identifying new themes, for the purposes of future Joint Programming Initiatives.

5.

R. Prabhu: Opportunities and limitations of “Big Data” in evidence-based policy making

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Keywords: Big Data, data analytics, evidence-based policy

Every day, modern society generates copious amounts of data. From traffic flow logs and medical records, to social-media streams and digital traces left by mobile phones, we produce ever larger amounts of data in our daily interactions with our environments. The emergent proliferation of low-cost sensors allows us to track and monitor new objects and mechanisms in ways that were previously impossible.

At the same time, our capacity to store, process and share information is growing rapidly – and as data collection becomes more pervasive in society, we have the potential to sense the world in new ways. Over the decades the data volumes of both public and private sector entities have increased manifold. There is a growing sense that such data, when properly utilized, may provide unique new insights into our surroundings – not only into the behavior of systems, but also people and their interactions.

Poised to become one of the most important global trends of the coming decade, it is interesting to explore the extent to which this “Big Data” paradigm provides new windows for leveraging quantitative data analyses and employing novel forms of evidence in technology assessment, e.g.:

- visualizations of sensor data may uncover new patterns or help constrain a problem

- automated mining of large volumes of online digital texts may assist trend analyses and forecasting efforts

- predictive analytics may be used to assess aspects of the future evolution of an emerging technology based on the historical development patterns of established technologies

And as internet access and usage becomes ubiquitous across the population demographic, “crowdsourcing” may provide new avenues for engaging citizens in TA processes, from the early stages of brainstorming and discussion, to developing strategies and implementing policies.

This talk will explore the scope and limitations of incorporating “Big Data” in evidence-based policy making.

PACITA Conference, Prague

IV. Thematic Session: TA Methods and Tools

Chair: **Lars Klüver**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

The aim of this session is to discuss new developments in TA methods, tools and approaches. What can they deliver? Are they really new? Are they TA? Can they be distinguished from other activities normally not seen as TA? What can they bring to countries, like the Czech Republic, where TA is emerging? TA methodology will be approached from many perspectives, such as citizen participation, parliamentary practices and global governance. We will explore the vague picture of future paths in methods, tools and approaches – thereby exploring the future paths of TA.

1.

M. Heerings/ S. van Egmond: What can TA learn from stories

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Scope:	Developing TA-methods, User perspective on complex socio-technical systems, Health care reform, hospital care.
Keywords:	Narrative methodology, TA-methods, User perspective, socio-technical systems, health care.

We will present the preliminary findings of an experimental research design to assess the functioning of complex social technical systems. Technological developments have influenced the landscape of health care in many ways. New possibilities for organizing care came with developments such as e-health and telecare. But technological developments also limited us, for instance due to the complexities of these systems. The hospital is an example of a highly complex socio technical system. To find out how social technical systems function we have set up a research design in which we collected and analyzed human experiences with the hospital. We focused on the experiences of patients with hospital care.

The patient has in recent years been assigned a more active and auditing role due to developments in the Dutch care sector towards demand driven and patient oriented health care. In line with ideas of competition in health care, the 'ideal' patient has become a well-informed and autonomous being. The question is, however, whether such standards for patients are feasible. The complexity of the hospital gives rise to the question if patients are sufficiently supported to have the necessary insight into the system to exert these roles. Despite the existence of performance indicators, currently the Dutch patient lacks the means to make an informed judgment about hospital care. Furthermore, hospitals are complex socio-technical systems that slowly adapt to the call for more transparency and the new position of the patient. With narrative methodology we hope to add to a solution of these problems.

We assessed the experience of patients with hospital care by means of narrative methodology. We collected and analyzed online stories of positive and negative experiences of patients with hospital care in the Netherlands. We collected these

narratives by means of an interactive website where others can read and react on the stories told. The website can be visited at www.patientenwetenbeter.nl. Thematic and Narrative analyses were conducted on the stories. The narrative analyses delivers 'scripts' that can be used to understand how humans in a social technical system came to have the experience (good or bad) that they got. We also plan to verify the results of the narrative analyses with health care professionals by means of interactive focus groups, and to conduct interviews with relevant stakeholders. Furthermore we conduct a discourse analysis on the health care professional-perspective on patient oriented care. The results will be published in a manifest that will be offered to decision makers.

In our presentation we address two questions. First, how patients and their loved ones experience the quality and safety of hospital care. Second, how the voice of the patient can contribute to an increase of the quality of hospital care. We find that patient stories largely overlap with themes found in patient satisfaction literature but interesting differences were also found. Stories of patients discuss the professional expertise of the health care professionals and notice lack of efficiency in the hospital system. Also narrative analyses shows a variety of needs patients express to their role in the system. This offers new ways to look at patient oriented care. Furthermore, we want to discuss the effectiveness of our methodology as a useful tool to influence the (debate about) quality and safety of hospital care in the Netherlands. Finally we want to look into narrative analysis as a method for technology assessment.

2.

J. Visser/ I. van Keulen: SuperHuman - a social game for the iPhone: Communicating dilemma's on human enhancement

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Scope:	Stimulating public debate on human enhancement using a serious game
Keywords:	Human enhancement, serious game, social game, public debate

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Ira van Keulen

The Rathenau Instituut has developed SuperHuman, a social game on human enhancement for the iPhone in cooperation with the Dutch game developer IJsfontein. The game is meant to encourage players to think about the ethical dilemmas on human enhancement. In three different mountaineering missions, a team of players can either train themselves or use light to heavy enhancements to reach the top of the mountain.

Human enhancement technologies can help people to become stronger, fitter and more beautiful or focused. Such medical technologies are developed for people with a disorder but are now increasingly used by healthy people to improve their performance or appearance. Popular examples are Viagra for men to improve their performance in bed, cosmetic surgery like liposuction to remove fat from the body or ADHD drug Ritalin to increase concentration before an exam.

The Rathenau Instituut aims with this social game to invite people to think about the broader trend of public acceptance of healthy people using enhancement technologies in a playful way. Secondly, we want to encourage a broader and balanced debate about human enhancement. In most European countries, the debate on enhancement is mostly alive amongst academics. Public debate is rare and only happening when the use of an enhancer is momentarily in the news, like botox or Ritalin. With SuperHuman we hope to reach a younger (age 20 till 40 years) and (non-academic) broader audience in all segments of society. Moreover, the debate is very polarized between advocates of enhancement (transhumanists) and critics (religious groups or

naturalists). With the game the Rathenau Instituit want to stimulate a debate on the question which enhancers are in which situation morally justifiable and which aren't.

SuperHuman forces players to think about and discuss the use of human enhancements within their team. Players can sign up for three different missions: As a group or as an individual you can decide to either put a lot of time in training or use enhancements.

The Rathenau Institute thinks a social game is an effective way of making a broad audience think about an issue like human enhancement. The players get insight in existing and experimental human technologies. They are challenged to think about the question how far they would go to reach their goal.

In this presentation I would like to demonstrate the game, explain the choices we have made, lessons learned, talk about the experiences of the players and assess social games as a way to communicate with a broader audience on science and technology dilemmas.

3.

N. Bobylev/ I. Jefferson: Tools for technology assessment

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Scope:	Quantitative and qualitative tools for TA, effectiveness, credibility, and quality of TA
Keywords:	Technology Assessment, Multiple Criteria Decision Analysis, Analytic Network Process, Technological Innovations, Urban Underground Space

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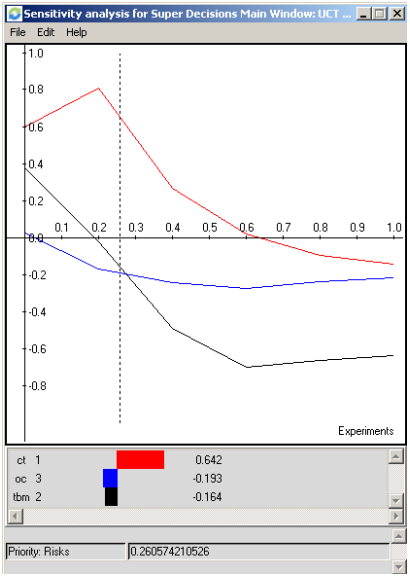
Technology Assessment (TA) has been developing as a practice intended to address a whole range of social impacts that science and technology brings since 1950s. TA is a practice intended to enhance societal understanding of the broad implications of science and technology (Sclove, 2010), which creates the possibility of better outcomes of research and development activities. Having difficulty in establishing itself as a scientific discipline, technology assessment has been facing lack of assessment methods (Bobylev, 2011b). Similar to Environmental Assessment practices family (EIA, SEA, HIA, SA), TA could use methodological approaches established in other domains of science. Operations research and Multiple Criteria Decision Analysis (MCDA) methods and tools can be successfully implemented to complex TA tasks, combining quantitative and qualitative information for the assessments.

MCDA has been applied to consider emerging and envisaged in the future technologies for Urban Underground Space (UUS) development. Underground construction has been a technology intensive field since Brunel's first tunneling shield was designed in 1818, and contemporary innovations in underground construction allow fully automated excavations (e.g. microtunnelling). Apart from localized technologies, having impact on neighboring urban societies and the environment, increasing desire and technological opportunity to use geothermal energy, opens up the broader discussion on urbanization, climate change impacts, and UUS. In brief, use of geothermal energy can significantly help to mitigate climate change impacts, but can cause local earthquakes (e.g. Basel, Switzerland, 2006-2007). The use of UUS for a variety of purposes will significantly increase in the future (Bobylev et al, 2013), and the technological change is an important component of the whole discussion on a sustainable limits for UUS resources (space itself, water, geomaterials, energy) exploitation.



Two MCDA methods has been tested to investigate a problem of the impacts and risks of intensified UUS use from a (1) technological innovations (implementation of the existing research findings), (2) the environmental, and (3) social perspectives. Analytic Network Process (ANP, by Saaty, 2005) and M-Macbeth (by Bana e Costa and Vansnick, 2000) has been applied using qualitative data; inclusion of quantitative data (e.g. risks estimates, CO_2 emissions associated with particular technologies) is an ongoing research. The figure shows an example of sensitivity analysis, performed during a previous study focused on the environmental impacts of a three tunneling techniques (Bobylev, 2011a), executed in the ANP "Super Decisions" software. Keeping in mind that TA should include wider professional community, and lay public, sensitivity visualization is important to open up discussion and facilitate expression of opinions based on structured information that reflects complexity of the technologies itself. In this sense, lay public and policy makers can structure and gasp a complexity of decisions (evaluations) without being experts in a particular technological field. Sensitivity in MCDA methods allows weights and priorities change for particular criteria, reflected instantly visually in the overall result.

MCDA family presents a useful array of tools for TA, as our application of ANP to technological futures of UUS use has shown. One of the most beneficial features of the MCDA methods in the TA applications is sensitivity, which allows visualized analysis that can be performed in a group or individually, involving the widest array of stakeholders. TA is an important component of futures UUS research.

Acknowledgments

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References

Bobylev, N. (2011a) Comparative analysis of environmental impacts of selected underground construction technologies using the analytic network process. Automation in Construction, 20(8), pp.1030-1040.
Bobylev N, Hunt DVL, Jefferson I, Rogers CDF, (2013) Sustainable Infrastructure for Resilient Urban Environments. In: Advances in Underground Space Development – Zhou, Cai & Sterling (eds), Research Publishing. pp. 906 – 917.
Bobylev, N. (2011b) Analytic Network Process application to technology assessment. In Russian, Применение метода аналитических сетей в оценеке технологий. Научно-технические ведомости СПбГПУ. 3(121)2011 стр 113-117.
Sclove R (2010) Reinventing Technology Assessment: A 21st Century Model (Washington, DC: Science and Technology Innovation Program, Woodrow Wilson International Center for Scholars, April 2010).

4.

F. Lucivero/ P. Delvenne/ M. van Oudheusden: Bringing back the normative content into (Parliamentary) TA: A trade off between substantial and procedural deliberative democracy

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Scope:	Normative dimension of Parliamentary Technology Assessment
Keywords:	Parliamentary Technology Assessment, normativity, deliberative democracy

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Parliamentary Technology Assessment (PTA) is an attempt of modern societies to overcome a technocratic approach in Research and Development (R&D) policies and to democratize the governance of new and emerging science and technologies (NEST). First established in the form of institutional offices that supported national Parliaments with scientific reports dealing with cutting edge science and technology, TA has evolved towards a multiform array of approaches involving an increasing variety of stakeholders and activities (Smits, et al 1995). In this evolution, a dominant top-down technocratic government of the impacts of emerging technologies is challenged, complemented and sometimes replaced, by a bottom-up approach to governance of the innovation process, in which diverse stakeholders are involved in the process of early stage assessment of technological development (Smits, et al 2008).

These trends potentially enact a process of democratization (Van Eijndhoven, 1997) in evaluating technological innovation. In some of its forms, TA progressively endorses a deliberative democracy model. According to deliberative democratic theories, in fact, institutional policies are legitimated on the ground of the process of articulating and discussing reasons (Dryzek, 2000; Gutmann & Thompson, 2002)

The normative democratic ideal within TA is seriously undermined, when participation is considered as much as traditional expertise subject to framing conditions (Blok, 2007; Bruun Jensen, 2005), when (asymmetrical) power relations are downplayed or ignored (Mouffe, 1993, 2000), when strategic behaviour in participatory processes is overlooked (Van Oudheusden, 2012; Stirling 2008), when participation is organised as

a lab experiment controlled by professional participation specialists (Bogner, 2012), or when participation intentionally or unintentionally reduces diversity for the sake of reaching consensus. The latter is problematic when participation creates "false consensusness", i.e. forms of consensus that are inauthentic or overtly ideological in character (Horst and Irwin, 2009). In addition, little attention has been paid to the normative choices of social scientists when engaging in TA participatory practice (Laurent and Van Oudheusden, 2013).

In another but complementary vein, some authors have pointed out a "normative deficit" in institutional (participatory) forms of TA (Grunwald, 1999). According to this critique, although stakeholders and lay publics involved in TA activities are well placed to discuss the desirability of emerging science and technology, the normative dimension of such discussions is often neglected. In particular, TA focuses on stakeholders' factual acceptance and dodges evaluative exercises on the normative acceptability of technologies. The normative value-related positions are considered as subjective and equally valuable, while the "transubjectivity" of the normative positions is not discussed. Also, Sclove (2010) notices that in an expert-based assessment moral issues are often excluded from the discussion concerning the consequences of emerging technologies. When only "organized groups", rather than broader publics, are engaged in transactions and negotiations, some values that do not appeal to the factual interests of these groups are neglected. In this way, the interests of the public or the society about questions of the "good life" are not explicitly addressed. Along the same line, Swierstra and Te Molder (2012) explain that some concerns about emerging technologies raised by citizens (for example, the question of "naturalness" in food industry) are discarded and minimized by technology developers. These concerns, typically non-quantifiable and ambiguous, are considered as less important "soft" impacts that do not deserve attention within risk assessment activities.

Our reading of the existing literature suggests a normative gap in Parliamentary TA (PTA) activities. Such activites enact false expectations about the normative ideals of democratic governance of NEST through the inclusion of broader perspectives in technology assessment. We argue that this normativity is only procedural and not substantial: some substantial discussions about ideas of good, values, worldviews remain outside the TA agenda.

Based on Lucivero (2012), we suggest that pragmatist ethics (Keulartz et al. 2004) and Vision Assessment (Grin & Grunwald, 2000) can provide conceptual and methodological tools to address this gap and improve PTA's ability to cope with normativity while avoiding the reification of deliberative democracy ideals.

Lastly, we offer concluding thoughts about the normative grounds on which future forms of PTA could be expected to rely, taking into account the great transition currently facing PTA organizations threaten by abolishment or forced to shift part of their missions/clients.

5.

B. Bedsted: Citizen participation and global governance – the WWViews method

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Keywords: Citizen participation, global governance, democratic gap

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This presentation will outline experiences and perspectives of the two first global citizen participation projects, World Wide Views on Global Warming (2009) and World Wide Views on Biodiversity (2012). Both projects engaged partners and citizens in countries worldwide, linking to UN Conferences of the Parties (COPs) to international conventions on climate change and biodiversity.

As more and more political decision-making processes become global in scale, the democratic gap between policymakers and citizens grows. WWViews is an attempt to help close this gap by introducing a method and precedence for including citizens' views in international negotiations and ongoing policymaking efforts.

The WWViews method is a cost-effective tool for offering policymakers unique insight into the views of citizens on complex technical, scientific and political issues, unfit for opinion polls. It is a testing ground for citizens' views on policy initiatives under consideration and it is a safeguard against introducing policy measures with no public support.

The presentation will give an overview of the WWViews method, of lessons learned, and of future perspectives for the use of the method on both the European and the international level.

6.

T. Schuitmaker/ A. Roelofsen/ J. Broerse: Dialogue as a tool for societal valorisation of environmental and industrial biotechnology

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Scope: Bio-based economy, Societal valorisation, Constructive Technology Assessment, Unravelling systemic barriers for innovation, Science-society dialogue

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Environmental and industrial biotechnology has the potential to make a major contribution to the transition towards a more sustainable bio-based economy. In the fields of ecogenomics research, including metagenomics, data mining, ecotoxicogenomics and ecosystem functions, there have been impressive achievements. For instance, for determining hazards of new and existing environmental chemicals, DNA barcoding-based monitoring and next generation arrays for sensing soil health status have been developed. However, several barriers for implementation of new technologies exist, both of a practical and of a more social and ethical nature. Academic excellence will not necessarily result in societal valorisation. Societal valorisation implies that scientific knowledge, besides creating economic value, also contributes to important societal themes like health, safety, education, sustainable development, and opens options in complex societal problems, such as aging, obesity, pollution, etc.

To enhance the societal valorisation of science and technology, various scholars have argued that a science-society dialogue is needed so as to ensure that more aspects are included and more actors (particularly stakeholders) are actively engaged in the innovation process, and jointly with scientists search for win-win design options. The notion of a science-society dialogue is often operationalised as a structured deliberation in which participants engage in a joint exploration, reflect on their own and each other's views, discuss and weigh the different arguments, and eventually

come to a decision on a preferred course of action. A science-society dialogue in this sense has been piloted in relation to ecogenomics by the Athena Institute of the VU University within the framework of a large public-private research collaboration: the Dutch Ecogenomics Consortium. This dialogue was shaped as a Constructive Technology Assessment process. An evaluation of the CTA process showed that it succeeded in (1) interesting a wide range of societal actors to participate in the innovation process at an early stage (upstream engagement), (2) gaining insight into a wide range of opportunities and concerns with respect to ethical, legal and social aspects, and (3) facilitating a mutual learning process [1]. Indications of concrete impacts of the CTA process were found on three levels: (1) at the individual level of the ecogenomics researchers, (2) at the programme level of the Ecogenomics Consortium, and (3) at a cross-institutional level (ref). However, in terms of societal valorisation, the results of the CTA process on ecogenomics also show the difficulty of translating the results from a dialogue into real-time action. The CTA process on ecogenomics functioned as a protected space. Beyond this protected space, factors like power relations, institutional structures and system dynamics, limit the room to manoeuvre and influence the follow-up of results [1, 2].

In this paper we start from this challenge, and develop a novel CTA approach that focuses on enhancing societal valorisation. This approach is applied within the framework of BE-Basic, a large Dutch research program on environmental and industrial biotechnology that aims to develop industrial biobased solutions for a sustainable society. The CTA approached developed on ecogenomics is combined with the UPP framework. This framework for unravelling persistent problems has been developed in the area of transition management and system innovation studies and can help to identify and unravel how power relations, institutional structures and system dynamics impede the implementation of innovations that might contribute to social themes, like sustainable development [3, 4]. The CTA approach that is conducted within the BE-Basic program is shaped along three phases: (1) actor guided system analysis, (2) deepening understanding, and (3) action-oriented integration.

The actor guided system analysis, in which problems and solutions as perceived by relevant actors are linked to systemic elements, started from the experiences and actions of the actors within the BE-Basic program. In this phase we identified both internal and external barriers to societal valorisation, and a number of relevant stakeholders outside the program. The internal barriers stress the challenges in cooperation between scientific disciplines, and between academic and non-academic partners. An example of external barriers can be found in both the content and the process of construction of guidelines for assessing soil quality, which currently intervenes with the development of marketable tools for the actors involved.

These results are the point of departure of the subsequent phases in the CTA process, in which first the visions of other relevant actors and barriers from their perspective

are explored. Subsequently, the analyses of phase one and two are integrated in a reflection-action process in which BE-Basic actors in cooperation with relevant societal actors construct alternative implementation routes. This integration of an action oriented CTA approach with the UPP framework for unravelling barriers for sustainability aims to contribute to a transition to a bio-based economy.

References:

[1] A. Roelofsen, W.P.C. Boon, R.R. Kloet, J.E.W. Broerse, Stakeholder interaction within research consortia on emerging technologies: Learning how and what?, Research Policy, 40 (2011) 341-354.

[2] A. Roelofsen, Exploring the future of ecogenomics: Constructive technology assessment and emerging technologies, in: Athena Institute, Faculty of Earth and Life Sciences, VU University, Amsterdam, 2011.

[3] T.J. Schuitmaker, Identifying and unravelling persistent problems, Technological Forecasting & Social Change, 79 (2012) 1021–1031.

[4] T.J. Schuitmaker, Persistent problems in the Dutch health care system: learning from novel practices for a transition in health care with the UPP framework, in, University of Amsterdam, Amsterdam, 2013.

PACITA Conference, Prague

V. Thematic Session: Participation within the Field of Climate Change

Chair: **Georg Aichholzer**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

This session assembles a set of contributions which will allow exploring the participation of citizens, households and local communities in climate change policies, with a special focus on the role of ICT-supported methods and their effects. A common point of reference is the challenge to decrease the carbon footprint and to bring about a change to sustainable patterns of consumption, being aware of the limits of behavioral change programs. Employing a variety of methodologies, the presentations will tackle this from different perspectives and offer fresh empirical evidence on impacts.

The first part concentrates on participation initiatives using online CO_2 calculators as "change agents" and on e-participation strategies of local governments. Special aspects are quasi-experimental design elements and experiences with long-term participation. The second part is devoted to extending the scope and means of intervention to stimulate climate-friendly consumption patterns and to deepening the view on social and cultural factors, particularly at local and regional levels. This includes assessing the outreach and potential of measures addressing private households comparatively, studying different incentives in green web applications and analyzing the role of cultural practices, local knowledge and different stakeholders for the response to climate change. The rich combination of quantitative and qualitative methods together with the multi-national and multi-disciplinary scope provides additional value.

1.

R. Cimander/ H. Kubicek: Project design and ecological impacts of the *e2democracy* research collaboration

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Scope:	*e2democracy* research design, ecological impacts of (e-) participation
Keywords:	E-participation, climate change, behaviour change, ecological impacts

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For some time it has become clear that achieving ambitious climate protection targets is not possible without sufficient cooperation from consumers and changes in everyday practices and individual life styles. Governments deploy an increasing array of approaches and instruments for promoting climate-friendly behaviour in private and corporate consumption. For example hundreds local governments in Europe have signed the Aarhus Convention or the Aalborg commitments to involve their citizens in their local climate change policy programs in order to contribute to CO_2 reduction objectives, which include citizen participation and regular monitoring.

The rationale behind such participation processes is to turn individual commitments into effective climate protection. Transformation shall be achieved by enhancing problem awareness, identification with public objectives, and information on behaviour impacts, together with providing support in changing to climate-protective behaviour, and exploiting advantages of electronic media for facilitating participation and the pursuit of these targets. However, so far there is no valid evidence that participation, and e-participation in particular has broader and long lasting impact on behaviour.

The international research collaboration *e2democracy* tries to provide for more rigorous assessment (http://www.e2democracy.eu). It studied the impact of (e-) participation in the context of local climate policies in seven European cities of different size, including both urban and rural regions in Austria, Germany and Spain. Between June 2009 and October 2012 *e2democracy* has set up citizen panels in each of the seven local communities, in which participants were offered an array of information, discussion, and exchange facilities around the topic of climate protection for up to two years. Moreover, panellists were regularly provided with their individual CO_2 balance that has been calculated based on their consumption behaviour in all areas of their daily life (habitation, mobility, nutrition, consumer goods). Bi-monthly feedback on their individual climate balance over time, various comparison

opportunities together with information and exchange facilities was meant to change attitudes and habits in favour of a better climate.

The success of the citizen panels was analysed in three different ways:

a) by simple calculation of the consumption figures and CO_2 emissions of participants over time,

b) by three accompanying panel surveys on the ease of use of the CO_2 monitoring, perceived learning effects and lifestyle changes, attitudes towards further participation activities etc.,

c) by assessment of the expectations and experiences of the local managers from public administration and climate protection agencies organizing and running the seven panels.

Item a) is content of this article, b) and c) are presented in the related contributions of the research partners from the Austrian Institute of Technology Assessment and the University of Zaragoza /Spain.

In all seven sites, the target was to reduce the CO_2 emissions by 2% per anno compared to the starting year. Measured were the CO_2 balances of each participant as well as the CO_2 balance of the overall panel, which is the sum of all individual balances divided by the number of panellists. Because of a rather high variation of the CO_2 emissions within the panels the average calculated by the arithmetic means yields different results than the average calculated by the median. Therefore we used both calculations in our analysis. Moreover, one factor distorting the averages of a panel are individual flights by some of their members. Therefore we analysed the CO_2 emissions and savings with and without emissions caused by individual flights. Depending on the point of view and the calculation method used, certainly, results vary among and within the seven citizen panels.

In sum, the overall results show that there has been a positive ecological impact of all seven local climate dialogues. However, achievements were not made in all areas of CO_2 balancing to the same extent. While there were mostly improvements in the areas of habitation (heating energy, electricity) the achievements in the mobility sector vary. In the area of nutrition and consumer goods, often panellists have deteriorated their climate balance.

Even though positive and sustainable ecological impacts could have been ascertained in the seven citizen panels, the achieved results are as heterogeneous as the cities and regions involved. The specific context factors of the organising city like e.g. its size, density, or available traffic infrastructure play a key role for the achievements made as well as the quality of activities and information material provided for panellists. Beside these rather organisational and structural aspects, the specific nature or characteristic of the participation subject itself is important for the impact assessment of an (e-) participation offer. In the present participation processes environmental psychology and sociology aspects have to be considered. The change of behaviour interferes in the autonomy of individuals. Possible inner conflicts between climate friendly behaviour

on the one side and other preferences in life like e.g. exploring far-away countries by plane or providing guests with strawberries in winter on the other have to be mitigated by the citizens. But above all, the long-term monitoring periods of up to two years have shown that (e-) participation can have a broader and long lasting impact on the improvement of the participation object.

2.

G. Aichholzer/ D. Allhutter/ S. Strauss: E-participation in local climate initiatives: participants' assessments of impacts

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Scope:	Participants' profiles; attitudinal and behavioral impacts of (e-) participation
Keywords:	E-participation, climate change, local governance, behavior change, impacts

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Citizen participation in climate policies, particularly via electronic means, is still largely unexplored. Viewed from a functional perspective such a participation approach holds potential, which ranges from information sharing, awareness raising and mobilisation of collective effort to collaborating on policy decisions, their implementation, and thus, enhanced problem solving. Recent developments in the field of ecological-feedback technologies offer potential synergies with participatory approaches. Carbon calculators are of special relevance for climate protection strategies as they inform about the "carbon footprint" of individuals, households or businesses.

The e2democracy project has been studying citizen participation in local climate policies, particularly the use and effects of electronic means, in seven cities and regions, respectively, in Austria, Germany and Spain over two years. The European collaborative research project has been funded by the Austrian Science Fund (FWF): I 169-G16 as well as the German and Spanish national research funds within the EUROCORES programme of the European Science Foundation. This contribution summarises the results with a focus on the participants' profile, their views of the participation process and their assessments of impacts.

The empirical results build on three surveys (N = 342 – 495) among the citizen panels in the seven locations, representative population surveys in each of these (N = 502 – 926) and the link to results from the CO_2 monitoring among the citizen panels. In this collaboration between citizen panels and local governments participation with free choice between e-participation and traditional media/in person, to allow for widest possible inclusion, involved three types of interaction: (1) provision of information offering guidance on climate-friendly behaviour, (2) bi-monthly documentation of

individual consumption data with subsequent feedback of CO_2 balances; (3) various forms of theme-oriented meetings and exchange. The hypotheses behind the participatory approach were to achieve a reduction of CO_2 emissions by supporting and encouraging increased awareness and a change to (more) climate-friendly behaviour. Collective social action combined with individual information feedback including comparison and competition elements were expected to stimulate community experience, joint effort, increased awareness and reinforcement of commitment, issue-oriented exchange and social learning, a backing of individual efforts, and an empowerment for at least partial removal of constraints to sustainable behaviour, even if this cannot extend to changing social practices at large. The expectable contribution of e-participation was to enlarge participation opportunities and to reduce participation effort through economising effects and information advantages.

The overall results show that the participants of these local climate dialogues are characterised by significantly higher levels of interest in the issue of climate change and its mitigation, of sensitisation and issue knowledge, and of beliefs in efficacy of targeted action. However, not all are “environmentalists”; a group to be called “sensitised” constitutes the majority and around one fifth were citizens with little interest in climate issues at the outset.

Overall a clear majority of panellists made use of the opportunity to inspect their CO_2 balances, frequently or even after each data entry. A still higher percentage confirmed learning effects, awareness raising and valuable guidance on points for improvement of their balance. The opportunity to compare one’s balance with others (panellists in the same region or country) was of less priority than expected, and only every second panellist ascribed an effort enhancing effect to it. Community building effects are clearly observable but community experience seems to have decreased somewhat after one year. A majority of participants reported that the collective process alleviated barriers encountered at an individual level and that it strengthened individual efforts to change climate-related habits.

The final panel survey at the end of the participation process conveys a picture of positive impacts among a significant portion of the panellists: in terms of increased attention to climate-relevant behaviour implications and in terms of climate-friendly behavioural changes triggered in various relevant fields of everyday action. As self-reported observations tend to be biased, validation has been sought by employing multiple methods of inquiry and consistency checks, among others with links to the partly more detailed metering data from the CO_2 calculator. The main result is confirmed, however, revealing also some inconsistencies. Like on other issues, a further disaggregation of the analysis shows a more differentiated picture, in particular differences between regions.

This form of technology-supported citizen participation for improving climate protection at local level shows positive impacts on climate relevant attitudes and behaviour. Offering choice and providing for a “media-mix” in participation are crucial. E-participation is preferred, however, not more effective as regards impacts. Major

challenges include widening and deepening participation, measuring and validating material impacts, and reaching beyond constraints constituted by social practices.

3.

B. Acerete/ S. Royo/ A. Yetano: E-Participation on environment-related policies. An assessment of European local government practices

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Scope:	Local governments, environmental policies, citizen participation, e-participation assessment, transparency, interactivity, determining factors
Keywords:	e-participation, local governments, environmental policies, Aalborg+10 commitments

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There is widespread acceptance that current institutions are inadequate to address the challenges of sustainable development. At the same time, there is an urgent need to build awareness and increase capacity for promoting action with respect to climate change at the local level.

This paper analyses the websites of the environment departments of European local governments signatories of the Aalborg+10 commitments with the aim of establishing to what extent they are making use of the Internet to promote e-participation in environmental topics and to determine the drivers of these developments. The potential drivers considered are the public management culture, urban vulnerability, external pressures and the local government environmental culture.

The sample of our study was defined as European cities of over 50,000 inhabitants that have signed the Aalborg Commitments, but we had to limit the number of cities studied in Italy and Spain, because of the huge number of signatory cities in these two countries, that would have distorted the composition of our sample. The methodology applied for data gathering is a website content analysis. We have evaluated 67 European local government websites in 19 countries for the presence of 134 items grouped into 4 categories: transparency, interactivity, usability and website maturity.

Results show a moderate degree of development of e-participation among the biggest European cities that signed the Aalborg commitments. Transparency is the dimension that scores the highest average value. On the contrary, the possibility of citizens interacting online with the environment department is the dimension with the lowest

score. So, the creation of a true e-dialogue seems to be still a pending issue for EU local governments fighting against climate change, even in local governments committed to promoting citizen participation in environmental topics.

As regards the factors fostering citizen participation in environmental topics, transparency is being promoted by most local governments, but that the steps towards *real* e-participation are only taken by local governments that belong to a public management culture that is more friendly towards e-participation (Anglo-Saxon, Nordic and Germanic local governments). External pressures have proven to have a greater influence on the disclosure of environmental information than on the consultation-active participation side. So, external pressures seem to be favouring a narrow approach to the implementation of e-participation climate initiatives. With regards to the local government environmental culture, only local governments with an active commitment (having submitted the Covenant of Mayors plan) show greater developments in interactivity and the total e-participation scores. So, it could be argued that signing the Aalborg commitments, in some cases, is just window dressing behaviour in order to show an image of modernity, global citizenship and commitment towards the environment, but without promoting significant changes in government-to-citizen relationships.

Overall, these results are an example of 'politics as usual' in the adoption of new technologies, since local governments that are traditionally more concerned about citizen participation and environmental issues are those that make more use of new technologies to promote environmentally-friendly behaviours among citizens and offer more possibilities for e-participation.

4.

V. Peters/ J. Vávra: GILDED research project carbon calculator: Methods and results

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Scope:	Assessing the potential and limitations of calculating CO2 footprints with survey data
Keywords:	Households, carbon footprints, energy consumption, data collection

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We will present the methodology (with special attention paid to the challenges and disadvantages) and the most important results of the personal carbon calculator employed in a survey in Czech Republic and Germany in the context of the 7th EU FP research project GILDED. For the analysis of the influence of socio-economic as well as structural variables on households' environmental impact the carbon footprint of the households was estimated. The structure of the carbon calculator was based on the methodology of German Federal Environment Agency (Umweltbundesamt), national data and coefficients of different countries were used when possible. The respondents were asked to fill in their behavior and energy consumption in six categories: heating, electricity, car using, public transport, flights, and food.

Not accounting for indirect emissions from the public sector and emissions embodied in non-edible consumer goods we see average per year per capita emissions of 6,7 tons in our Czech case study and 6,4 tons in our German case study. It is rather surprising that the per capita emissions are higher in the Czech case. This is mostly explained by significantly higher emissions through housing energy: heating emissions are on average higher in the Czech case, mostly due to the large share of coal usage (mainly in the urban central heating station). The emission factors hide the fact that Czech respondents actually consume less energy for heating. This has a lot to do with differences in household structure, with the Czech respondents more often living in larger households, resulting in less m^2 per person.

Also the average electricity emissions appear to be higher in the Czech case study. The German samples' mean electricity emissions are actually lowered quite substantially by

the 13% of the respondents that obtain electricity from green energy providers – compared to only 0.4% in the Czech case.

Emissions from space heating clearly dominate the total household emissions in the Czech sample, while respondents in the German sample emit almost as much through car transportation as through heating. In general the Czech respondents have significantly lower transport emissions than the Germans, also because few people make use of air transportation. On the other hand German respondents also seem to make more use of public transport and thereby emit more CO_2 in this sector. However the high number of missing values lowers the quality of the CO_2-calculations for public transport and indicates that it was especially difficult for respondents to estimate the magnitude of their demand for trains and buses.

We conclude that while the carbon calculator itself is a feasible and interesting tool to estimate the environmental impact of individuals, follow-up analysis indicated that the collection of data could definitely be improved by putting even more effort into the collection process and preferably conducting direct interviews rather than using questionnaires respondents have to fill in themselves. This most common type of sociological research substantially increases the amount of missing data, because it is difficult for respondents to find the right information in their bills and equipment or to come up with reasonable estimations about their demand.

5.

C. Scheele: Assessment of three Danish green web applications

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Scope: Motivating Behaviroual Change using Green Web Applications

Keywords: Climate, CO2-Emissions, Green Web Applications, Behavioural Changes

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Climate change caused by increasing carbon emissions constitutes a global problem of epic proportions. There is a broad political consensus in Denmark on the need to address this problem. It has been decided that, by 2050, Denmark should satisfy all its domestic energy needs without the use of fossil fuels.

Traditional "one size fits all" information campaigns aimed at motivating more sustainable behaviour with regard to energy consumption have been proven not to be efficient. One reason for this is that households are too diverse for standardised information to work. Information has to be personalised to be effective. It has been shown in a Dutch experiment that web applications such as the ones analysed in this paper – i.e. personalised large-scale approaches with automatically generated energy reduction options and feedback – are potentially successful and can reduce energy consumption by more than 8%.

Applications like these may also have potential in a Danish context because levels of Internet access are similar to those in the Netherlands. At a more general level, interactive websites make it possible to create a more personalized user experience and to gather information about the user for future development and communication. Developers can modify the site as they gain more knowledge about user behaviour. These are some of the reasons that green web applications have potential for policy makers.

When trying to make assessments regarding how web applications function there is a distinction that can be made: Understanding how green web applications work and whether they are effective. This paper will address the first question. Examining their effectiveness is a separate research project beyond the scope of this paper. It is, however, an important question and research is being conducted that is designed to answer it.

"Assessment of decision-making models and incentive structures in different green web applications". The answer to the research question has value for software

developers, policy makers, and public administrators if they want to use green web applications as tools to motivate sustainable behaviour. There can be a political dimension in the choice of which decision-making model to use, and which incentives to put in play. It is important for politicians and public administrators to be aware of whether the green web application is based on a view of people primarily as rational actors in constant pursuit of the best possible economic output or on a view of people primarily as members of social communities who are looking for approval from others as they construct their identity in a postmodern society.
The research question examines decision-making in the context of energy use and incentives employed in different Danish green web applications. The suggestion is that these applications may try to appeal to different types of human motivation, e.g. conventional economic gain, behavioural economic gain or socio-psychological motivation.

This section contains a description of different green web applications and the incentives that they can be argued to contain.

Green web application 1: "www.goenergi.dk" (translates into "GoodEnergy")

Web app "Goenergi.dk " is an interactive energy calculator that gives the user two types of advice. The first suggests physical changes to the owner's home that will reduce energy consumption. The application generates advice with economic saving potential – e.g. "insulate the walls and save DKK 5,000". The types of advice can even be sorted according to how large an economic gain a given change will produce. The second type of advice is based on suggested behaviour changes that will reduce the amount of energy used, e.g. turning down the thermostats on the radiators. Both types of advice revolve around an economic incentive.
The application also makes use of ranking or "benchmarking" as a tool where a user is depicted in as being in the "red zone". This signals that too much energy is being used. Traditionally benchmarking is a tool used in conjunction with economic or fiscal analysis. However, in this context there is no economic information in the benchmarking instrument shown in the figure. Instead, the focus is placed on behavioural incentives rather than economic ones because the benchmarking display makes use of framing as a potential driver for behaviour change.

Lastly, "Goenergi.dk" may be said to contain an element of the "socio-psychological" approach – it can be argued that our decisions are always part of a complex relationship between (social) institutions and norms in society. The use of the application can promote certain norms and values. The red area in the benchmarking display is not where sustainable energy users would like to see themselves. However, the socio-psychological approach is considered to have little importance in this application.

Green web application 2: "www.klimabevidst.dk" (translates into "Climate Awareness")

"Klimabevidst.dk" revolves around the possible economic gains that can be achieved by changing behaviour and reducing energy consumption. The "energy reduction guides" or "energy savings guides" contain economic information on the amount of money saved and depreciation period of the investment necessary to implement the guide.

Thus the primary part of the application is based on a conventional economic incentive.

Each guide also tells the user the reduced amount of CO_2 that will be emitted as a result of implementing the recommendations in the guide. This information is not strictly relevant for the user when selecting one guide rather than another. Because of this it can be argued that the application also contains a behavioural incentive.

The second part of the application is a "climate battle" that records energy saving achievements in terms of points. Here the incentive is to win a competition – and with it a climate-friendly reputation - which can be seen as a behavioural incentive. In the climate battle there is also an apparent socio-psychological element. It is, in principle, a battle for glory, i.e. a normative battle where the contestants compete to see who can implement the recommendations of the most energy saving guides and thus gather points. When gathering points, the contestants also experience positive economic effects but the theme of the game is to challenge friends, family or colleagues. These groups of people all belong to the inner circle – some more, some less – of the contestant's personal and professional life.

Green web application 3: "www.mapmyclimate.com"

Mapmyclimate is based on a simulation of the climate in and around the Greater Copenhagen area in the year 2100. The user loads energy consumption data into the application by answering a survey. Consumption is measured using different parameters that affect the climate, such as domestic heating, electricity consumption, eating habits, and use of a car. The application uses this information in its simulations of the climate in Denmark in 2100 – i.e. air temperature, water temperature and air pollution. The simulation is based on the concept of how the climate will be in 2100 *if everybody were to have the same consumption as the user*. If the user consumes too much energy and subsequently emits too much CO_2, Copenhagen is flooded and polluted by 2100. In order to prevent this, the user can go on a tailor-made CO_2-diet. The application does not address other benefits from going on a CO_2-diet, e.g. better personal health or money saved on groceries and petrol.

The application plays on our sense of responsibility towards our community by showing the consequences of our behaviour on the entire city. It could be argued that the threat of having one's city flooded in the future would constitute a behavioural incentive for users living in Copenhagen. However, this incentive is considered weak and perhaps only valid for users who expect to have (great) grandchildren living in the Greater Copenhagen area. The reason the incentive is weak is that, even if users reduces their energy consumption it will have very limited effect.

The application focuses primarily on morally responsible energy behaviour. The principle in the application matches Kant's concept of the Categorical Imperative which states that a person acts morally if the maxim or rule of conduct on which he acts could be willed as a universal law that would govern all people in similar circumstances (Kant 1785). This application is an example of an almost pure socio-psychological incentive.

Conclusion

The paper aims to demonstrate how conventional economic, behavioural economic, and socio-psychological incentives are used in the context of energy use. It can be difficult to distinguish the incentives from each other completely. In some cases they also overlap. Conventional economic incentives may in some circumstances also function as behavioural economic incentives. It can also be argued that both the conventional and the behavioural incentives can function as catalysts for the socio-psychological incentive – and vice versa. In most cases it can be argued that several incentives are employed simultaneously – but with different visibility - in the application. The conclusions are displayed in the table below. The different incentives are ranked according to how visible they are in the application.

	Key concept	Behavioural aim	Incentives
Goenergi	Online, 3D, climate-friendly home refurbishing guide Sub functionality: Benchmarking display	Physical adaptations of the user's home in order to reduce energy consumption Reduce energy consumption when being compared to similar residential users	Refurbishing guide: Highly visible conventional economic incentive; very slightly visible socio-psychological incentive Benchmarking display: Visible behavioural incentive, slightly visible socio-psychological incentive
Klimabevidst	Catalogue of energy-saving guides Sub application: Climate battle competition	Carry out energy-saving guides, reduce energy consumption and collect points Compete on who can carry out most energy guides and collect points	Energy guides: Visible conventional and behavioural economic incentive Climate battle: Visible conventional , behavioural incentive and visible socio-psychological incentive
Mapmyclimate	Climate simulator covering Copenhagen	Go on a “radical” or “easy” CO_2-diet and thereby reduce CO_2-emission	Highly visible socio-psychological incentive.

Comparing applications

There are also challenges with regard to using web applications as a large-scale approach. The challenges can be divided into two categories. These two categories consist of practical issues and methodological issues - in some cases they overlap.

With regard to the practical problems it is important that the information is as personalised as possible. The energy-saving information should be designed to suit the user or household that requires it in order to avoid overloading them or giving them information that is irrelevant. This principle is equally important for feedback.

With regard to the methodological challenges, public administrators must consider the disciplinary approach employed in the web application. It has been shown that there are different spatial and temporal scales of decision-making – individual to social, psychological to contextual, and short- to long-term, as shown by the categorisation of the incentives in the analysis. One approach is not more correct than the other. The best possible solution is one in which the disciplinary approaches are integrated into each other.

A very important question that remains to be answered in a Danish context is whether the web applications have effect. It has been shown in Holland that a web application can reduce energy consumption by 0,85 % (Benders et al. 2006). Less than one per cent might not sound as much, but if the cost of achieving this effect is compared to the cost of developing the application it is worth taking into consideration for policy makers. Secondly, the applications might also have an effect with regards to awareness that also has value. If the applications make us more aware of the problematic issues associated to our consumption of energy derived from fossil fuels we might be more open to legislation that reduces this consumption – even if it means increased energy prices. Lastly, an increased awareness on unwanted climate changes might also affect which policy makers are being placed in office.

6.

F. Rubik/ M. Kress: Experiences with municipal measures to influence the carbon footprint of private households' daily routines

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Scope:	Climate protection, consumption routines
Keywords:	Private consumers, bottom-up measures, consumption routines

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In industrialized countries, private households have great impact on greenhouse gas emission and climate change. Most emissions refer to the key areas housing and energy usage, mobility and nutrition. Municipalities are able to set important framework conditions for individual behaviour in these areas and to influence climatically relevant behavior of consumers through different measures and instruments.

The project "Klimawandel und Alltagshandeln: Potenziale, Strategien und Instrumente für CO2-arme Lebensstile in der Null-Emissions-Stadt (KlimaAlltag)" [Climate change and consumption routines: potentials, strategies and instruments for low CO2-lifestyles] is funded by the German Ministry for research and Education (BMBF) and is managed by the Frankfurt based ISOE. Further partners are the University of Graz (Austria), and the Consumer North Rhine-Westphalia, for more information see http://www.klima-alltag.de. The still ongoing research is carried out at the examples of the two German cities Frankfurt/Main and Munich, both cities with a high engagement in climate protection. The main objectives are to analyse the potentials of "Bottom-up" approaches of cities in the area of climate protection and to contribute to relevant future strategies also considering social justice challenges.

Our task was to assess climate measures and activities of these both cities addressed towards private consumers in the core areas housing and mobility.

Against this background the presentation is focused on our analysis of Frankfurt/Main and Munich. Both cities pursue a strategy to decrease the carbon footprint in the coming decades. They have introduced a couple of programmes and measures.

We will present first experiences with measures addressing private households in two key areas with high priority regarding GHG-emissions: housing and mobility. The focus is on measures and activities which intend to stimulate private households to reduce their carbon footprints in their daily routines in the mentioned two areas. Exemplary

local measures are energy consulting, financial incentives, maps with regard to potentials of solar energy or dialogic marketing concepts.

We analyzed these measures on the basis of a combination of qualitative and quantitative methods:

- a status-quo analysis of the set of climate-change relevant instruments was carried out based on desktop research and interviews (with municipal authorities and local experts).
- analysis of some selected instruments by four focus groups and
- a representative quantitative survey of inhabitants of both cities regarding their popularity, usage and evaluation.
- a qualitative evaluation through expert interviews.

The status quo analysis showed the wide range of different measures of the two cities - with involvement of various stakeholders - in both areas. Besides interventions focused directly on daily routines (for example knowledge transfer, incentives, activation of social/environmental standards) we found important infrastructural measures (especially in the mobility area) and measures to influence strategic/investment-related consumption decisions (especially in the building and living area) with great possible impact on GHG-emissions.

Based on the combination of the different qualitative and quantitative results of the methods mentioned above, we will present first qualitative assessments of the outreach of these measures and future potential - based on the 4-E-Model of the UK „Sustainable Consumption Roundtable“ and complementary categorization and models of climate relevant measures and behaviour.

The measures of both cities which we analyzed contribute to certain, but minor degree to climate protection. We identified several clusters of barriers and challenges which limit the potentials of the local measures, e.g. insufficient information dissemination towards consumers, missing internal networking among municipal departments or modest co-operation with external NGOs.

To realize the potentials of the current instruments and measures, both cities need to deal with these challenges. Structural reforms and inherent improvements might increase the potentials of local measures to influence consumption routines.

7.

S. Böschen: Regional climates: Instrumental knowledge and democratic culture

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Scope:	Regional aspects of climate change
Keywords:	Climate change, knowledge, community research, democracy

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The sociological research to climate change is confronted with a fundamental dilemma. Researchers are acting in a field which is predefined by natural scientists and therefore also pre-structured in a specific way. In many cases, sociological research to climate change takes shape of an applied science, for example to evaluate specific options for action and problem-solving which are defined by the results of a scientific climate research and often seen as “without any alternative”. In short, here is a conflict between instrumental knowledge and democratic culture, but this conflict is in many cases not really seen. With respect to the fundamental quality of change addressed by the climate change problem, this situation is not sufficient.

Against this background, the project “Regional Climates” directs its focus on the variety of regional possibilities for action which are produced and balanced to counter climate change and its consequences. At the core of the social science project are the perceptions of climate change in the Alpine communities of Bavaria and South Tyrol and the measures that are being undertaken in this regard. Following questions are important: Which stakeholders in politics, business or civil society regard climate change as a reason to plan anew and strategically in the future and how do they accomplish this? What cultural practices, narratives, interpretations and types of knowledge play a role in the organization of climate-relevant action? What about the outcomes of politics between top-down and bottom-up-strategies in communities? Answering these questions, we get clues for the importance of participation and the limits of this approach for collective problem-solving and therefore hints for the further development of democratic culture.

This project is based on a combination of different methodologies of social science research. Strategies of ethnography were combined with methods of community development and also statistical analysis. Through the combination of these methods we are allowed to explore the different strategies of the actors, the importance of different knowledge resources, the inconsistencies between talk and action, and finally the influence of the cultural and institutional contexts.

One finding is that the processes of social change under the impression of climate change works often as a sort of “add-on” explanation for change activities in direction of sustainable development. Another: To learn something about that it is key to show how the different communities of knowledge are linked and which narratives of community development can be employed to solve the coordination problem arising from cultural disagreements about climate change. Without such a narrative it is nearly impossible to form a coalition of different actors and to bring into play all the knowledge resources necessary for the definition and resolution of problems.

The tension between instrumental knowledge and democratic culture seems to be limited firstly in the context of scientific research by combining the different research methodologies and therefore contextualizing the own findings by process. Secondly, this tension is not really a leading problem in such communities, where we find a vital culture to explore the options of community development collectively.

PACITA Conference, Prague

VI. Thematic Session: Neurodevices

Chair: **Ira van Keulen**

Date: Wednesday, March 13th, 2013

Concept of the thematic session

The neurosciences are the new cutting edge in biomedicine: yet, they are more than a collection of scientific practices – they offer new ways of thinking about mind, body and society. A good reason for technology assessment practitioners to pay attention to this relatively new area of the natural sciences. Up to now, it has been mostly ethicists who have opened up discussions on the important sociotechnical issues neuroscientific research raises. As the neurosciences gain more traction within professional arenas – also outside the medical arena in domains like education and justice – policy processes and popular culture, it is time for the TA community to contribute to this fast developing scientific field.

In this session, five presentations with different TA perspectives will focus on (neuro)imaging technologies for research and diagnostic purposes as well as on therapeutic neurotechnologies like deep brain stimulation (DBS), trans cranial magnetic stimulation (TMS) and EEG neurofeedback.

The three presentations from the VU University of Amsterdam entail a constructive technology assessment (CTA) approach. The aim of their research (programme) is socially responsible innovation of neuroimaging applications in different domains: health care, justice and security and education. Their research facilitates a dialogue between neuroscientists, end-users and other stakeholders which should result in directing neuroimaging innovations in an early phase towards shared desirable applications with few or at least manageable negative impacts.

The contribution from the University of Lisbon has a health technology assessment approach. It investigates how socially responsible access to (neuro)imaging technology for a growing ageing population living in the Portuguese countryside can be facilitated.

The last presentation from the Rathenau Institute takes on a TA approach in which the legal embeddedness of three therapeutic neurotechnologies in European law is researched. The aim of the study is to investigate whether such neurodevices enter the European market in a socially responsible way: can safety and performance be sufficiently guaranteed?

Questions for the discussion will be: what is the distinct contribution of the different TA approaches to the field of the neurosciences? Does TA research in the neurosciences differ from TA research in other biomedical fields? How can these TA contributions be effectuated in (socially responsible) policy and decision making? And others.

1.

M.E. Arentshorst/ T. de Cock Buning/ J.E.W. Broerse:

Future-oriented technology analysis: Steering medical neuroimaging

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Scope:	Socially responsible innovation of neuroimaging in health care
Keywords:	Responsible innovation, Neuroimaging, CTA, Health care, Participation

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Innovations in neuroimaging technologies, for example functional Magnetic Resonance Imaging (fMRI), Magneto-encephalography (MEG) and Positron Emission Tomography (PET), make it possible to image and study the function, connectivity and biochemistry of the brain non-invasively. Future developments of these technologies are expected to contribute to solutions for some of the health challenges high-income countries are facing. The challenges are the result of an ageing population, rising trends in the number of chronically ill patients and increasing demands for adequate evidence-based care. However, besides opportunities, concerns are raised. For example, should people who do not display any symptoms know that they have a subclinical disorder? What is the individual and societal impact of receiving such a diagnosis before the onset of symptoms? Will a person at risk of developing a certain brain disorder endure stigmatization and discrimination when seeking medical insurance or employment? Will the growing knowledge on the brain further increase disease mongering and thereby raise the demand for medical services, medicines and other products (Fuchs 2006; Glannon 2006; Illes and Racine 2005)? Without due attention, concerns may impede successful realization of the intended benefits (Chilvers & Macnaghten 2011).

The research presented here is part of a project which aims to direct medical neuroimaging innovations in an early phase towards shared desirable applications with few, or at least manageable, negative impacts.[2] Hereto, we apply a specific operationalization of a CTA approach, the Interactive Learning and Action (ILA)

2 This research project is funded by the thematic programme Responsible Innovation. Ethical and societal exploration of science and technology (MVI) of the Netherlands Organisation for Scientific Research (NWO).

approach (Broerse and Bunders 2000) combined with vision assessment (Grin and Grunwald 2000) that offers the opportunity to critically investigate the mechanism of hype-horror (Swiersta and Rip 2007) and promise-disappointment cycles (Brown et al. 2003) and the social-technical system surrounding innovations.

In depth semi-structured interviews and visioning workshops with technical and medical neuroimaging experts show that future advances in neuroimaging technologies, such as increased resolution and improved options for data-analysis, are expected to deliver more insight into the brain and its disorders. This is expected to result in the development of improved diagnosis and treatment options. Above all, neuroimaging technologies could contribute to novel options for prevention, which are absent at the moment (Arentshorst et al., forthcoming). Concerns articulated relate to general health discussions (e.g. privacy) and applications outside the domain of health care (e.g. enhancement). Focus group mediated discussions with Dutch citizens show that citizens regard applications in the field of diagnosis and treatment as mostly desirable. However, options for prevention, especially those focusing on predispositions, were considered as non-desirable unless they are applied under strict conditions.

Underlying the expert visions, a society is envisioned in which everyone is 'normal', disorders are prevented, and people who develop a disorder are treated as soon as possible. This desire implies a redefinition of what cure, care and prevention is and, even more, it will change the definition of clients/patients from being a health care consumer towards a manager of their own health and disease. Dutch citizens framed prevention not primarily from a macro public health problem but rather from an individual centered micro perspective. They immediately relate the outcome of preventive neuroimaging to their private life, such as: what is the impact of this (uncertain) knowledge for me as an individual, a parent, and as an employee? The contrast of the desirability of preventive neuroimaging seems to be a challenge to bridge in order to come towards responsible innovation of medical neuroimaging.

In our presentation we will show our approach to steer emerging technologies towards responsible developments, illustrated with findings of our research project.

References:

Arentshorst, M.E., Tj. de Cock Buning and J.E.W. Broerse. Towards socially responsible neuroimaging applications in health care: guiding visions of scientists and technology developers. Accepted for publication in: *Responsible Innovation, Volume 1: Innovative Solutions for Global Issues* (forthcoming). Editors: van den Hoven, J., B.J. Koops, H. Romijn, T. Swierstra, and N. Doorn. Dordrecht: Springer.

Broerse, J. E. W. and J. F. Bunders. 2000. Requirements for biotechnology development: the necessity for an interactive an participatory innovation process. *International Journal for Biotechnology* 2(4):275-296.

Brown, N. and M. Michael. 2003. A sociology of expectations: retrospecting prospects and prospecting retrospects. *technology analysis & strategic management* 15(1): 3-18

Chilvers, J. and P. Macnaghten. 2011. *The future of science governance: a review of public concerns, governance and institutional response.* BIS/ Sciencewise-ERC.

Fuchs, T., 2006. Ethical issues in neuroscience. *Current Opinion in Psychiatry* 19:600-607.

Glannon, W. 2006. Neuroethics. *Bioethics* 20(1):37-52

Grin, J. and A. Grunwald. 2000. *Vision assessment: shaping technology in 21st century society; towards a repertoire for technology assessment.* Berlin: Springer.

Illes, J. and E. Racine. 2005. Imaging or imagining? A neuroethics challenge informed by genetics. *American Journal of Bioethics* 5(2):5-18.

Swierstra, T. and A. Rip. 2007. Nano-ethics as NEST-ethics: patterns of moral argumentation about new and emerging science and technology. *Nanoethics* 1:3-20

2.

M. De Jong/ F. Kupper/ A. Roelofsen: Responsible innovation of neuroimaging technologies in justice and security

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Scope:	Socially responsible innovation of neuroimaging in justice and security
Keywords:	Responsible innovation, neuroimaging, CTA, justice & security, participation

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From the new millennium onwards, 'responsible innovation' (RI) has gained increasing attention in the science policy domain in the US, the European Union, the UK, Flanders and the Netherlands (Barben, Fisher, Selin, & Guston, 2007). In stressing the relevance of societal needs, issues and concerns, public funders have begun to require grant applicants to identify societal and ethical issues in their proposals (Owen & Goldberg, 2010). This can be considered as an attempt to shape research and innovation activities in such a way that social impacts are considered and acceptable and desirable outcomes are achieved (Rip, 2005).The increase of such funded programs as well as the substantial amount of money involved are indicatory of a political redirection of science, the natural sciences in particular.

A domain, in which a philosophy of 'responsible innovation' could be particularly useful, is the application of neuroimaging in the field of justice and security. Neuroimaging findings touch upon fundamental human experiences such as thoughts and emotions, and intermingle with conventional beliefs about human nature and identity, the growing importance of neuroimaging in society is accompanied by ethical issues and societal concerns. For example, as neuroscience might change ideas about criminal responsibility and human agency, could this paralyze foundations of the justice system? (Goodenough & Tucker, 2010; Greely, 2007)

Despite its progressively common use, it is not clear what actually constitutes responsible innovation, and thus how this philosophy will work out in practice. The aim of this research is to explore the potential of 'responsible innovation' as a guiding principle in a constructive technology assessment (CTA) project in which we work towards the societal embedding of neuroimaging in justice and security. We therefore

looked at negotiation of meaning on 'responsible innovation' in the scientific literature at large and how it is informally framed among neuroscientists potentially related to the field of justice and security. We performed a literature review using a systematic search, yielding 70 sources, and in depth semi-structured interviews with 20 neuroscientists.

Different aspects of responsible innovation are the subject of meaning negotiation within the literature. Firstly, these include recurring themes, for example 'impacts' were framed less in economic and technical terms, but in terms of a contribution to the collective good; 'risks' were described with respect to their management in the face of uncertainty and ignorance; a 'broadening' of the issues considered during the technology development, most importantly societal and ethical issues; 'upstreaming' was described with respect to the engagement with publics and other stakeholders and to anticipating and intervening in technology development. In these themes, responsible innovation was substantiated with regard to the research and innovation process as well as the (product) outcomes of concrete applications. Secondly, responsible innovation was framed as being instrumental to overcoming challenges (e.g. disasters of the past). Interestingly, the negotiation of meaning taking place in literature was hardly done by natural scientists themselves, the ones at the receiving end of the redirection of science.

The neuroscientists had difficulties relating to the concept of responsible innovation. They struggled with framing it, and some were particularly skeptic towards it. Interestingly, non-skeptics intuitively related it to their own role responsibilities as scientists, while process and product dimensions were hardly mentioned. RI was located downstream, impacts were often framed as a technical cost-benefit analysis, and the use of public engagement was at times heavily criticized. Importantly, innovations were considered responsible when they were based on 'evidence'.

Change agents wishing to use 'responsible innovation' as a guiding concept in their CTA process have to take into account that it carries considerable different connotations for natural scientists. This does not necessarily mean that they wholly disagree with the goals, procedures and purposes of responsible innovation as a concept. Change agents need to identify where this lack of overlap is a mere question of wording and were natural scientists hold a different perspective regarding responsible innovation. 'Responsible innovation' as a guiding concept is thus in need of operationalization within the specific context in which it is used. This research suggests that stimulating a process of meaning negotiation on 'responsible innovation' among natural scientists provides a valuable starting point for such an operationalization.

References

Barben, D., Fisher, E., Selin, C., & Guston, D. H. (2007). Anticipatory governance of nanotechnology: Foresight, engagement, and integration. The handbook of science and technology studies, 3, 979-1000.

Goodenough, O., & Tucker, M. (2010). Law and Cognitive Neuroscience. Annual Review of Law and Social Science, 6(1), 61-92.

Greely, H. T. (2007). Neuroscience and criminal justice: Not responsibility but treatment. Kansas Law Review, 56, 1103-1138.

Owen, R., & Goldberg, N. (2010). Responsible Innovation: A Pilot Study with the U.K. Engineering and Physical Sciences Research Council. Risk Analysis: An International Journal, 30(11), 1699-1707.

Rip, A. (2005). Technology assessment as part of the co-evolution of nanotechnology and society: the thrust of the TA Program in NanoNed. Paper presented at the Paper contributed to the Conference on "Nanotechnology in Science, Economy and Society". Retrieved from http://www.nanoandsociety.com/ ourlibrary/documents/NanNed.pdf

3.

R. Edelenbosch/ F. Kupper: Neuroimaging and personalised learning: Reflections with potential end-users

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Scope:	End-user participation, CTA, neuroethics
Keywords:	Neuroimaging, personalised learning, end-user participation, CTA, neuroethics

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The emerging technology of neuroimaging may contribute to personalized learning, which is the adaptation of teaching methods to individual learning needs. In order to gain more insight into opportunities and concerns regarding this potential application of neuroimaging, we are in the process of conducting a dialogue experiment following the Interactive Learning and Action (ILA) TA approach. In this paper we would like to discuss the results of the second phase of this dialogue experiment, in which we reflected on this possibility with potential end-users. We conducted 10 focus groups with potential end-users: 3 focus groups with randomly selected parents of one or more children attending secondary school (n=19), 3 focus groups with randomly selected secondary school teachers (n=23) and 4 focus groups with secondary school children (n=30) attending one particular school. We first constructed visions concerning personalised learning in general, followed by a discussion of the technology of neuroimaging as an instrument contributing to personalised learning. In our analysis, we paid specific attention to participants' framing of the elements of 'learning', the 'child', the 'brain' and 'brain scans', and the way this influenced their general perception of the use of neuroimaging for personalised learning.

Our results show how a different framing of the individual elements above can lead to a different attitude towards the application. For example, although many participants mentioned some form of reductionism, they had different ideas about which elements would be reduced by this application. Some participants argued that children were reduced to learning machines, others were of the opinion that intelligence was reduced to a neuroimaging measurement, and yet others were afraid that a child would be reduced to his brain. These different framings generally led to different ideas about possible applications, varying from no potential for application at all, to the discovery of a child's talents, to early identification of learning problems.

The next step in this ILA approach will be the organization of dialogue meetings about desirable applications of neuroimaging in the domain of education with

neuroscientists, policy makers and end users. It is deemed important to anticipate on the encountered argumentation patterns in the structuring of the dialogue, in order to have more a more constructive interaction in which ethical issues are not reduced to scientific ones and an environment is created in which it is possible to discuss what is at stake.

4.

M.J. Maia/ A. Moniz: Equity in access to MRI equipment in an ageing society: a TA approach based on the Portuguese case

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Scope: The aim of this paper is, in a first part, to understand the equity in access to MRI equipment by the Portuguese population inside the country. For this purpose, a geographic identification of the technology in Portugal was done. For the second part, the aim is to comprehend how TA can give it's contribute when it comes to the decision making processes for this equipment allocation.

Keywords: Technology Assessment, Equitity, Magnetic Resonance, Decision-making, Portugal

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We are facing an era, where pressures on health costs are extremely high, and reforms in health system are almost constant. Over time, one factor remains unchanged: technology continues to be the support of health care improvement. Radiology is with no doubt, a clear example of technology application in order to obtain the medical examination of a patient. Radiology is also certainly a clear example of the application of technology to obtain exams of high importance in the diagnosis and the medical decision process, and treatment of numerous pathologies.

However, within this variety of existing technologies related with Radiology, one stands out... Magnetic Resonance Imaging (MRI), because it differs from other imaging techniques, since it allows a high sensitivity to fluids movements, including blood and cerebrospinal fluid. This can be critical for an accurate medical examination. MRI does not use x-ray radiation to obtain images, since they are based on the tissue own physical and biochemical properties, and therefore there is some easiness in observing tissue surrounded by bone structures.

In Portugal the National Health Service (NHS) covers all residents in the country; it is universal, comprehensive and almost free at the point of use (in accordance with the Portuguese Constitution, Article 64). However there are gaps in providing health care's, due to geographical imbalances, with some areas unable to provide certain specialized services, as hospitals in the countryside do not provide all medical specialties.

Portugal has also a large independent private sector that provides diagnostic and therapeutic services to NHS users under contracts called conventions (contractual agreements). These medical contracts cover ambulatory health facilities for laboratory tests and examinations such as diagnostic tests and Radiology.

In Portugal almost half of the population lives in urban areas. The population is ageing. Recent projections shows that the Portuguese population will most probably stabilize or even decrease between 2008 and 2060 due to the combination of an increase number of deaths and decrease in the number of live births.

In the year 2000, there were 105 813 deaths in Portugal. Most of these deaths resulted, as has succeeding the last twenty years, from the two following death causes groups: circulatory diseases (cardio-vascular diseases), which continue to remain the first major cause of death Portugal - 40 994 deaths (39% of total), and - malignant tumors, accounting for 21 461 deaths (20% of total) (Instituto Nacional de Estatistica 2002)

Taking into account the importance of MRI in the diagnosis and evaluation of stroke, and the high rate of occurrence of this event in the Portuguese population, this image technique increasingly assumes a greater relevance, nationally.

In Portugal there are 5 firms identified as the companies competing in MRI technology marketplace: Philips, Siemens, General-Electric (GE), Toshiba and Hitachi. In 1998, an equipment chart was developed with information referring to 1995/96. It established national and regional ratios for the major medical technologies for diagnostic imaging (including MRI equipment). Since then, new equipment have been introduced and the growth in diagnostic imaging examinations has been increasing. The number of MRI units per million population in Portugal, more than doubled between 2003 and 2007, from nearly 4 to 9. This was close to the average of the EU 15 countries for which 2007 results were reported. In 2008 (latest year available), Portugal had 9.2 MRIs per million population, less than the OECD average of 12.5. However, there is no evidence of any health impact of these increases and there for no technology assessment study.

In 2010, there were 105 MRI equipment in Portugal, distributed within the public (29) and the private (76) sector. In terms of geographic distribution, there is a higher concentration of these type of equipment in the north and centre of Portugal, and very few are in the interior. In terms of geographic distribution, there is a higher concentration of these type of equipment in the north and centre of Portugal, and very few are in the interior.

With the continuous growth of expenditure in healthcare, the emergence of new technologies and changes in the epidemiological profile of the population, new mechanisms of coordination between the sectors involved in the production, development and use of technology and service sectors, together with regulators, policy and management of the health system should be taken into consideration. The role of HTA in Portugal is currently limited to pharmaceutical products. There are some emerging needs to apply HTA to medical devices.

HTA can play an useful and important role in helping the decision-makers to explore potential gains that might be achieved by introducing a more rational decision making into health care management, namely into the Radiology area, regarding the allocation of MRI equipment. The decision-makers need to evaluate the effectiveness and efficiency of MRI equipment, with variable costs and limited resources available during the decision-making process for the acquisition and allocation of such technology.

Decision-makers need to support their answers in HTA studies, since these studies provide a set of TA information, which can be reliable and synthesized on the effects and costs of health technology. A full societal perspective should be considered when undertaking HTA, to ensure efficient resource allocation at the level of the society.

This paper aims to promote a bridge of scientific knowledge between the gap on research and policy-making through TA, that can emerge as a tool to aid decision-makers in the organization of health systems.

To accomplish this, we intended to develop a work, focusing only MRI equipments, based on the already published Study on Competition in the Imaging Sector (2009) by the Health Regulatory Agency (HRA). For this purpose, initially a technology park at national level for the RMI will be drawn, ie, a survey on the number of MRI equipments in Portugal, both within the private and public sector will be characterized. Their geographical location will also be studied. In a second phase, a three level analysis will be made:

- accessibility to the technology (temporal dimension) – it will be defined the population's areas of influence, set in turn based on a reference maximum travel time between the residence and the provider;
- capability analysis - ratio on the number of MRI per million inhabitants, by RHA;
- competition analysis (market concentration by MRI and group of providers will be evaluated).

In the end, the goal is to promote health policies targeting health gains and reduce health inequalities in health sector, ensuring that decisions and investments are planned and undertaken together, based on TA basis, since a critical element in improving health system performance with limited resources is, the ability to make policy choices to allocate resources, in areas where they can be most effective, improving health and equity, providing the most benefit to all Portuguese population.

References

Banta, David and Wija Oortwijn. 2001. Health Technology Assessment and Health Care in the European Union. TA-Datenbank-Nachrichten 1 (10): 29-37.

Barros, Pedro, Sara Machado and Jorge Simoes. 2011. Health Systems in Transition: Portugal. Health systems in transition. Vol. 13. May.

Bütschi, D., R. Carius, M. Decker, S. Gram, A. Grunwald, P. Machleidt, S. Steyaert, and R. van Est. 2004. The Practice of TA; Science, Interaction, and Communication. In Bridges between Science, Society and Policy. Technology Assessment - Methods and Impacts, ed. M. Decker and M. Ladikas, 13-86. Springer.

Chrzanowski, R, and Felix Gutzwiller. 1986. The assessment of medical technologies. Examples from Switzerland. Health Policy 6: 45-55.

Fernandes, Adalberto Campo. 2011. Mudar o Presente para Garantir o Futuro. In Três Olhares sobre o Futuro da Saúde em Portugal, 83-98. 1st ed. Cascais: Princípia.
Garrido, Marcial Velasco, Juan Antonio Blasco Amaro, Americo Cichietti, Davide Integlia, Inger Natvig Norderhaug, Beatriz Valentin, and Annette Zentner. 2008. Health Tecnology Assessment in Europe - overview of producers. In Health Technology Assessment and Health Policy-Making in Europe - Current status, challenges and potential, 79 - 107. WHO Regional Office Europe.

Goodman, Clifford S. 2004. HTA 101 - Introduction to Health Technology Assessment. Journal of the American College of Radiology. Vol. 6. The Lewin Group.

Instituto Nacional de Estatística. 2002. As Causas De Morte Em Portugal 2000. Lisboa.

Instituto Nacional de Estatistica 2012. Censos 2011 - Resultados Definitivos. Vol. 26. Lisboa - Portugal.

Kearney, Peter, Graham Stokoe, Günter Breithardt, Carole Longson, Jean Marco, John Morgan, Silvia Priori, Alric Ruether, Rod Taylor, and Michaël Hertog. 2006. “Improving Patient Access to Novel Medical Technologies in Europe.” European Heart Journal 27 (7) (April): 882–5.

Maia, Maria João. 2011. “Decision-making Process in Radiology: The Magnetic Resonance Example in the TA Context.” Enterprise and Work Innovation Studies (7) (November 22): 75–101.

OECD. 2010. “Rational Decision Making in Resource Allocation.” In Value for Money in Health Spending. OECD Publishing.

OECD. 2011. Health at a Glance 2011: OECD Indicators. OECD Publishing.

Pinto, M M, F Ramos, and J Pereira. 2000. Health technology assessment in Portugal. International journal of technology assessment in health care 16 (2) (January): 520-31.

Sorenson, Corinna, Michael Drummond, and Panos Kanavos. 2008. Ensuring Value for Money in Health Care - The Role of Health Technology Assessment in the European Union. Political Science. WHO - European Observatory on Health Systems and Policies.

Velasco-Garrido, Marcial and Reinhard Busse. 2005. Health Technology Assessment - an introduction to objectives, role of evidence, and structure in Europe. International journal of technology assessment in health care. Vol. 26. April.

WHO Regional Office for Europe. 2010. Portugal Health System - Performance Assessment.

World Health Organization. 2011. Baseline Country Survey on Medical Devices.
World Health Organization. 2011a. Health technology assessment of medical devices - WHO Medical device technical series. Regulation. World Health Organization.

5.

I. van Keulen/ M. Schuijff: The Developing market of neurodevices: regulatory and ethical challenges in the EU

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Scope:	Regulatory challenges for the EU arising from the emerging market for three neurodevices: Deep brain stimulation, EEG neurofeedback and transcranial magnetic stimulation
Keywords:	Neurodevices, European market, regulation, governance

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Neuromodulation – altering the functioning of the brain and the mind by use of magnetic or electronic devices – is an emerging scientific discipline and expanding market as well. Although still a small part of the total medical device market, neurodevices generated a market of USD 4 billion globally in 2010 with an annual growth of 6%. The convergence of information technology (e.g. fast signal processing techniques), nanotechnology (e.g. smaller and better electrodes and sensors) and the neurosciences has resulted in new *engineering* ways to influence the brain more direct – invasive or non-invasive – with devices instead of chemically with psychopharmaceuticals. In comparison to psychopharmacy, electronically influencing the brain (or central nervous system) can be much more precise; at the same time side-effects – especially with invasive devices – can be larger. For industry it is in most cases easier (less time and money consuming) to introduce medical (neuro)devices on the market, although the clinical effects might be the same. Reason for the European Group on Ethics (2005) to recommend (in one of its reports on ICT implants) that at least "*implantable* devices for medical purposes should be regulated in the same way as drugs when the medical goal is the same." But does the current regulatory framework adequately address the safety of the users and harmonizing requirements such as reimbursement?

We looked at three devices for neuromodulation; deep brain stimulation, EEG neurofeedback and transcranial magnetic stimulation. Specifically, we discussed the state of the art of the technologies, their applications and risks. We also examined the market for these technologies as well as the regulatory framework for placing these technologies on the European market.

We found that regulatory issues mostly concern the non-invasive devices. We found both issues with the regulation itself (EEG neurofeedback can be placed on the market as a medical device as well as an ordinary device, thereby bypassing the safety procedures required in the more stringent medical device regulations) as with subjects

that are not regulated within the Directives (such as differences in reimbursement across European countries, no mandatory certified training before someone can operate the devices, and lack of standard operational protocols).

The regulatory framework for the neurodevices studied does not answer all challenges the technologies raise in a satisfactory way. For example, the framework cannot deal with the use of these technologies for enhancement or leisure purposes. Also, some medically used devices are not regulated as such, by specifying a non-medical intended purpose instead of a medical one. Furthermore, the entry to the market has been harmonized, but this still does not mean that the technologies are equally accessible across Europe. Harmonizing the national reimbursement regulations as well could solve this, as well as making it more clear for future developers how big their potential market is and whether or not they should invest in the development of new devices.

The presentation will give an outline of our research, which was done as part of the STOA project 'Making *Perfect* Life' for the European Parliament.

PACITA Conference, Prague

VII. Thematic Session: Foresight and Economics of Technology

Chair: **Attila Havas**

Date: Thursday, March 14th, 2013

Concept of the thematic session

The aim of this session is to explore the issue of technology assessment from the perspective of foresight approach. The session will therefore search for mutual links of foresight and technology assessment. Is it the technology assessment, which provides knowledge base to consequent foresight activities? Or it is foresight, which serves as a tool for a more comprehensive technology assessment? Presentations throughout the session will provide a number of case studies and share experience in utilization of forward-looking activities, methods and tools in specific sectors, contexts and settings. The focus of the presentations will therefore be placed on practical utilization and outputs of the presented projects. The consequent discussions will try to answer the questions stated above: How can forward-looking activities contribute to development of technology assessment methods and vice-versa?

1.

A. Havas/ M. Weber/ D. Schartinger: Exploring the impact of FLA on national innovation systems

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Scope: National innovation systems; STI opolicy-making

Keywords: Forward-Looking Activities (FLAs); policy governance sub-systems (PGS); fit between an FLA approach, the perceived policy needs/ opportunities, and the PGS; impacts of FLA

In spite of several decades of using Forward-Looking Activities (FLAs) in the context of science, technology and innovation (STI) policies, our knowledge of the actual impacts of foresight on national innovation systems is still very limited and based on case-by-case evidence – mainly evaluation reports or case descriptions – rather than systematic comparative analyses. However, it is widely acknowledged that apart from looking forward in substantive terms, an intelligent process design can also contribute to shaping the innovation system for which FLA is being conducted. Ultimately, the purpose of understanding impacts is to contribute to the design of more appropriate and effective FLAs.

One of the reasons for this knowledge gap can be found in the great diversity of FLA in methodological terms. A wide variety of practices has been applied ranging from highly participatory to expert-based and from creativity-driven to evidence-based examples. Further, the "objects" to which FLAs are applied are complex in nature. Indeed, the innovation system (IS) approach paints a quite sophisticated picture of the embedding of R&D and innovation (RTDI) activities in economy and society. Current thinking about STI policies and system performance is also stressing the challenge of anticipation.

For the purpose of investigating impacts of foresight on innovation systems, the conventional actor-centred IS approach shows a number of limitations (e.g. with

regard to the governance cultures). Looking into complementary lines of reasoning for better capturing possible impact chains is thus a potentially fruitful inroad to follow.

Against this background this paper aims at

- Proposing an analytical framework and tentative taxonomies of policy needs in innovation systems, of FLAs to address them, and of policy governance sub-systems within innovation systems to mediate them, as a basis for
- Exploring hypotheses on the likely "fit" (and thus the potential impact) of different types of FLAs with different types of policy governance sub-systems in IS and typical policy needs.
- Illustrating the hypotheses (and thus the framework) by looking ex-post at a number of actual cases of FLAs.

The paper relies on various theoretical building blocks of evolutionary economics of innovation, as well as on political sciences, most notably on the policy governance literature. The conceptual framework covers different types policy needs in IS, but the focus is on developing taxonomies of FLAs, on the hand, and of PGS within innovation systems, on the other. The paper discusses the relationships between the dimensions of each of the two taxonomies individually, i.e. what relations exist between the different dimensions within these taxonomies. It is followed by an analysis of what relations exist across the dimensions of FLAs and PGS. Then the main question is revisited: how the proposed framework and approach could be used for the addressed policy needs, for analysing actual and potential impacts of FLAs and thus for better designing FLAs in the context of a certain PGS. This discussion draws on examples of actual FLAs conducted in different innovation systems.

The combination of a typology of FLAs and a focussed view on national innovation systems in characterising PGSs thus provides us with an analytical framework to systematically compare specific FLAs and their (potential or actual) impacts.

This type of analysis, when applied thoroughly and honestly, can deliver some well-substantiated hypotheses/ insights into the appropriateness of a chosen FLA, that is, a "fit" between a chosen FLA, the perceived policy needs/ opportunities, and the policy governance sub-system. The main hypothesis we put forward is that the closer the fit, the higher/ more favourable impacts of FLAs can be expected (obviously assuming an appropriate quality and methodological rigour in conducting FLAs). Specific hypotheses have also been formulated, and several of them propose a number of guiding principles for the design of FLAs.

Yet, it would be a mistake to presuppose linear (sequential) links among these "elements" of a needed fit, as they interact in several ways:

- First, an often neglected impact of FLAs is that the understanding of the originally targeted policy needs /options would need to be revised, and new policy needs/ options are likely to be identified while conducting an FLA, which may, in turn, shift the character of a next FLA (assuming that the PGS remains rather stable).
- Second, FLAs would impact on the PGS itself, at least in the longer term: a non-participatory FLA would reinforce the "closeness" of a PGS (its reliance on expert-

based approaches), while a participatory FLA would open up a “closed”, hierarchical PGS in a longer run, and with ensuing tensions, of course.

- Finally, analysts and decision-makers also need to ask a broader question when a lack of “fit” between the above three elements is observed: is this a mistake in the design of an FLA, or has it been designed in this way on purpose, for instance with the intention to run it as a transformative FLA?

2.

D.K.R. Robinson/ A. Rip: The challenge of indications of socio-economic impact that address the complexities: insights for TA and future-oriented analyses

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Scope:	Tracing indications of impacts and their dynamics as a key element for TA and foresight
Keywords:	Indications of Impacts, TA, foresight

Given the big promises about socio-economic impacts of nanotechnologies one would expect there are attempts to trace and evaluate them. And indeed, the OECD is moving in this direction, organizing a large meeting with the US National Nanotechnology Initiative on indicators of socio-economic impacts (Washington, DC on March 27-28, 2012). But such attempts are fraught with difficulties, because there is no linear-causal relation between nanotechnology innovation (cf. co-production). Impacts are heterogeneous, distributed across R&D hubs, value chains and in the eventual use, and more often than not it is difficult to disentangle the web of activities and attribute an impact to a single point source. This is a generally recognised issue, but still there is a demand for indicators of unilinear impact. This is the second main difficulty, the need of policy makers and administrators to have indicators, so that decisions can be made on their basis, without having to go into the complexities of the actual developments. We move away from *simplistic indicators* by speaking of *indications* (which could be qualitative, stories of impacts).

On the other hand, we recognize the need to assess current and potential return on investments from funding agencies, venture capitalists and industrial actors. So there is a challenge: how to develop indications which speak to these actors and their purposes, without giving up on the actual complexities. We faced this challenge when we were invited to present during the OECD symposium, and from the reactions we got we conclude that we were fairly successful. In this paper we report our analysis and our proposal for 'bespoke indicators', and offer further reflections.

We start with a constructive criticism: simple economic indicators of impact are an illusion, because impacts are distributed across value chains. We also argue that socio-economic impacts are not nano-specific but domain-specific and implication-specific.

Therefore, indications of impact should recognise that innovation and uptake (therefore impacts of nanotechnologies) are distributed, that the key value added may occur at quite a distance from the laboratory where the technoscientific knowledge originated, and that embedding, and the associated impacts, is where final success and final impact is realized – which is out of the hands of the technology developers (although they can anticipate and augment). Claims about expected socio-economic impact have to be accompanied by assessment of changing business models and evolving value chains + framing conditions (regulation, investment landscape, policy).

There are examples of how to trace innovation, uptake and embedding processes retrospectively (in innovation studies and technology studies). The key further move is to consider expected impacts (the stuff of future-oriented analyses), and such a prospective analysis is possible because there are general patterns in development, uptake and embedding in society. On this basis we have developed the notion of 'endogenous futures' that can be articulated in sociotechnical scenarios.

We refer briefly to some examples, and close the presentation by considering approaches to construct indications of socio-economic impact for nanotechnologies that can inform decisions of actors while doing justice to actual complexities.

3.

M. John/ F. Fritsche: Bibliometrics for technology forecasting and assessment – a preliminary application to human enhancement

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Scope:	Bibliometrics as a method for technology forecasting and the analysis of scientific landscapes.
Keywords:	Bibliometrics, Technology Forecasting, Human Enhancement, Emerging Technologies, Scientific Landscape

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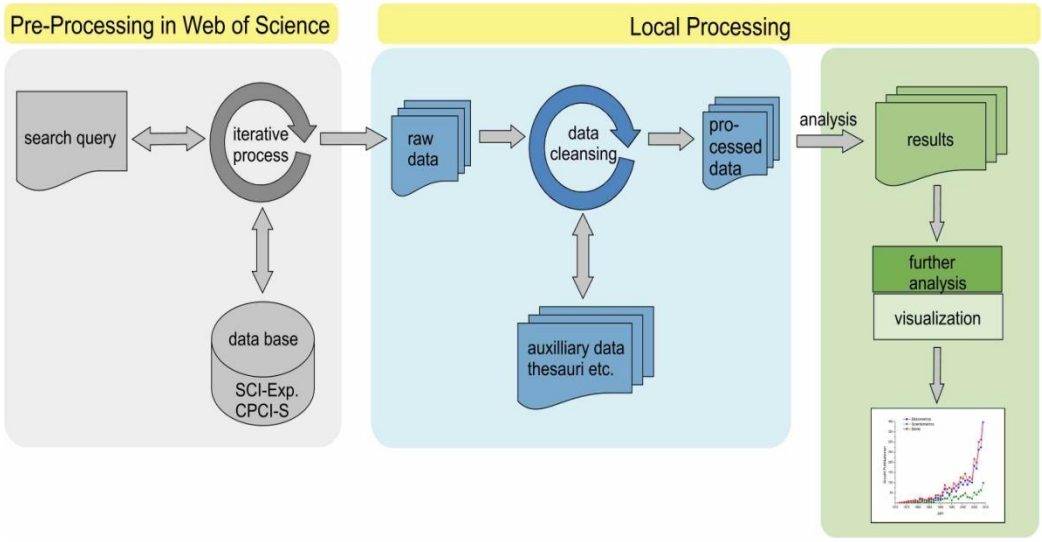
For present-day decision makers not so much a lack but contrarily a plethora of information forms a challenge. Since bibliometric methods offer the chance to structure the growing amount of at least scientific publications, we want to address in this contribution the question, whether such quantitative methods might form a meaningful contribution to the methodological portfolio of technology foresight and technology assessment.

While bibliometric methods have been applied by technology forecasters increasingly often in recent years, they have, to the best of our knowledge, not yet been adopted to problems regarding the assessment of technologies.

Bibliometrics is a collection of quantitative and statistical techniques, which aim to analyze scientific literature. It relies on the bibliographic information of scientific papers stored in an appropriate data base. A prototypical bibliometric workflow comprises three different phases. The first phase covers the elaboration of a search query which aims to delineate the field of interest as accurately as possible. While the second phase deals with the acquisition and cleansing of the bibliometric data, the last phase covers the analysis and visualization of the data.

This method is applied to the analysis of the scientific landscape concerning the research on human enhancement. Furthermore the results of this analysis are compared with those of other scientific themes, namely the research on fullerenes and cold fusion, the latter being a prototypical example of so called pathological science. The problem of constructing an appropriate search query is addressed.



Next different types of bibliometric observations ranging from the publication dynamics to more complex ones like the analysis of cooperation and citation networks are used to characterise the scientific landscape.

It is demonstrated that such bibliometric analyses allow a clear distinction between different types of emerging topics like the research on human enhancement or on fullerene. Furthermore it will be discussed, whether or not it is possible to identify examples of pathological science by means of bibliometric analyses.

The talk will try to demonstrate how bibliometric methods assist researchers and decision makers in gaining insight into the structure of a specific scientific landscape. By lurking into scientific communication it is possible to extract useful information from scientific publications, which go well beyond their respective scientific content. Finally we will discuss if and how these methods might be useful with respect to the specific aspects of technology foresight and technology assessment.

4.

G. Clar/ B. Sautter/ V. Nestle: From shared knowledge to collective action: the "Spitzencluster" MicroTEC Südwest

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Scope:	Great Societal Transitions, New intra- and inter-Societies Cooperation Approaches, Roles and Responsibilities of Science, Industry and Politics
Keywords:	Microsystem-technology-based Solutions addressing Grand Societal Challenges, General Purpose Technologies, Strategic Policy Intelligence, Participative FTA, Multi-Actor Strategy Development, Inter-governance-level Synergies, Horizon 2020, STI Specialization for Competitive Advantage

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In the context of the pressing needs to find viable and acceptable solutions to facilitate and enable "Great Transitions", a participative FTA approach is presented. Combining foresight and science, technology & innovation assessment with international benchmarking and roadmapping activities, it is implemented with two main objectives:

- focus on intelligent and energy-efficient microsystem technology (MST) solutions to facilitate great transitions (using MST as General Purpose Technology esp. for Health Care in an Ageing Society, Resource-efficient Production & Consumption, Energy and Mobility),
- increase strategic capacities of societal actors for evidence-based policy making on STI issues.

The ca. 300 actors of the MicroTEC Südwest (MTS) consortium in Baden-Württemberg, closely linked with neighbouring parts of France and Switzerland, cover the competences along the value chain of miniaturized systems: from basic research e.g. in nano-, micro-, bio-technologies, to the design and production of smart microsystems, and to the integration of these systems in autonomous products. Successful in the German "Spitzencluster" competition they avail of an additional budget of ca. 90 million EUR (50-50 public-private funding), mostly for research projects, but also for a broad spectrum of innovation support measures and their joint Strategy Process 2025.

This strategy process takes on board results of, and links with processes of related projects and networks, e.g. the European Technology Platform EPoSS or the German

national Foresight. It is designed to contribute to raising, structuring and optimizing overall private and public (EU, national, regional) investments. One focus is on pooling forces and jointly tackling common challenges of related regional and sector innovation ecosystems.

Related to the application-oriented fields of the German High-Tech Strategy 2020, and parallel to the implementation of their Spitzencluster R&I projects, the MTS Strategy Panel develops their "Strategy 2025" as a base for a sustainable future cooperation beyond the current funding (ends in mid-2015). At the present stage of the process, agreement has been reached on five R&I-related priority fields for smart-system-based solutions as well as on 'horizontal' activities relating to cross-industry innovation and education & training.

We present our results related to

- the procedures to jointly think and debate futures in order to facilitate and enable longer-term STI investments in the context of the much shorter policy cycles,
- the innovation support measures to ensure optimum impact of the research results, e.g. for system integration, methodological & process competence, speeding-up innovation and supporting start-ups, qualification and recruitment, and international collaboration,
- the prioritisation achieved towards the Cluster Roadmap 2025, and the Roadmaps 2020+ for key application areas with regard to great transitions.

A participative FTA approach - when integrated in a broader Strategic Policy Intelligence (SPI) context and implemented with a view to balance inputs from specialized technology experts as well as policy representatives, current and potential future investors, and regional stakeholders – can better cope with complexity and uncertainty, address conflicting interests, scientific and policy rationales, decrease negative impacts and increase consensus. Thus, a solid base can be developed for commonly pursued, longer-term STI-related goals, and the difficult prioritization processes for financially high-risk STI investments.

5.

P. Warnke/ S. Kimpeler/ C. Bogenstahl/ D. Holtmannspötter/ B. Ohnesorge/ A. Zweck: Foresight in support to mission oriented RTI[3] policy strategies recent experience from Germany

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Scope:	The kinds of knowledge and dialogue needed for decision-making in societies in order to accomplish the great transitions
Keywords:	National foresight, innovation and research policy

The German Ministry of Research and Education (BMBF) has a long tradition in applying technology foresight in order to underpin its strategic processes. Since 2007 "BMBF Foresight" is established in the ministry as a continuous process that: "is carried out cyclically and in several phases: search and analysis, transfer, and preparation of the next cycle."[4] With the advent of the German high-tech strategy[5] and its mission oriented approach the BMBF Foresight is explicitly seeking to explore future missions for research and innovation policy that address the grand challenges of our time or – in the terms of PACITA – underpin the ability of the German innovation system to manage the corresponding "Great Transitions". The current BMBF Foresight methodology differs substantially from previous approaches. In order to complement results from the previous Foresight cycle it adopts a demand-pull perspective and sets out with a strong focus on changes in society and culture.

In order to identify relevant social and cultural developments this Foresight process analyses recent insights from social sciences and humanities and international reports

[3] Research, Technology, Innovation
[4] http://www.bmbf.de/en/18378.php
[5] http://www.bmbf.de/en/6618.php

on global socio-economic developments and conducts interviews and workshops with opinion leaders and key experts. Furthermore the team is interacting with lead users and other people with particular sensitivity to social change and or special needs in different transition arenas such as mobility, food and security through interviews and creative workshops. The Foresight process proceeds in three steps:

1. Inventory: Societal trends with relevance for research and innovation will be identified and evaluated.
2. Updating: The technology-orientated results of Foresight Cycle 1 will be updated, and previously neglected topics will be added.
3. Linking: The demand- and technology-driven perspectives will be linked. "Hotspots" with particular dynamics and high potential for addressing future challenges will be identified as a base for BMBF's demand oriented policy strategy.

We would like to present the German BMBF Foresight in a tandem presentation of BMBF and Foresight team colleagues and introduce the approach, explain the challenges of its implementation and discuss open questions with the audience.

6.

A. Sacio-Szymańska/ A. Mazurkiewicz/ B. Poteralska/ J. Łabędzka: Using corporate foresight results effectively: A case study from Poland

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Scope:	Foresight in public research organizations, foresight implementation
Keywords:	Foresight methodology, technological solutions, technology transfer

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A review of foresight-related literature along with practical experiences in the design and conduct of foresight projects executed at different levels were the basis to formulate the main characteristics of foresight processes tailored to the needs of public research organisations. These include: (1) the bottom-up approach, which takes into account R&D potential of a specific public research organisation (its present R&D portfolio, research infrastructure, academic and industry partners on R&D), (2) the top-down approach, which takes into account R&D priorities set in national innovation and industry development strategies, which are in line with global science and technology trends (3) the rationale to add more quantitative methods in the process, which allow to get more objective, precise, repeatable and reproducible results and thus, better support the strategic planning and decision making processes of a public research organisation (4) the necessity to keep the balance between market pull and technology push and (5) the necessity to address global challenges through R&D.

Prerequisites and requirements for the execution of foresight in public research organisations have been envisaged by a foresight team of the Institute for Sustainable Technologies – National Research Institute (ITeE-PIB), who has been designing the Institute's foresight process, supervising the conduct of the process, introducing the results into the institute's strategic planning, and operational activities and refining the methodology since 2009. At the moment the third iteration of foresight process in the field of safety engineering is about to start at the institute. The paper presents the methodological rationale of the institute's foresight process (lessons learned included) and its main outcome: namely the "Innovative Systems of Technical Support for Sustainable Development of Economy" project funded in the framework of the Innovation Economy Operational Programme (co-funded from the European Regional

Development Fund). The project aims at developing product and process solutions ready to be implemented e.g. in manufacturing industry. The project is divided into 60 research tasks that are realised within 5 subject areas concerning:

- Advanced technologies supporting production and maintenance processes of technical objects,
- Test apparatus and unique technical devices,
- Systems and methods for the rational use of the resources,
- Systems of diagnosis and safe maintenance of technical objects,
- Systems of knowledge transformation, advanced technologies transfer and commercialization of innovative solutions.

The paper presents the interrelation between technological solutions development and activities, which support processes of knowledge creation, transformation and technology transfer.

7.

L. Hebáková/ O. Valenta: National priorities of oriented research, development and innovation in the Czech Republic

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Scope:	RDI priorities, national level
Keywords:	Foresight, RDI, priorities, Czech Republic, societal needs

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National priorities of research and innovation are defined through National Policy of Research, Development and Innovation of the Czech Republic for 2009 – 2015, major RDI policy document at the national level in the Czech Republic. These priorities were previously set up as broad fields of science or industry, covering nearly the whole spectrum of scientific as well as industrial activities. The wide range of the priorities did not allow a targeted financing of public support to priority directions of the RDI. Moreover, these priorities are only very loosely linked to the broader socio-economic priorities and strategic interests of the Czech Republic.

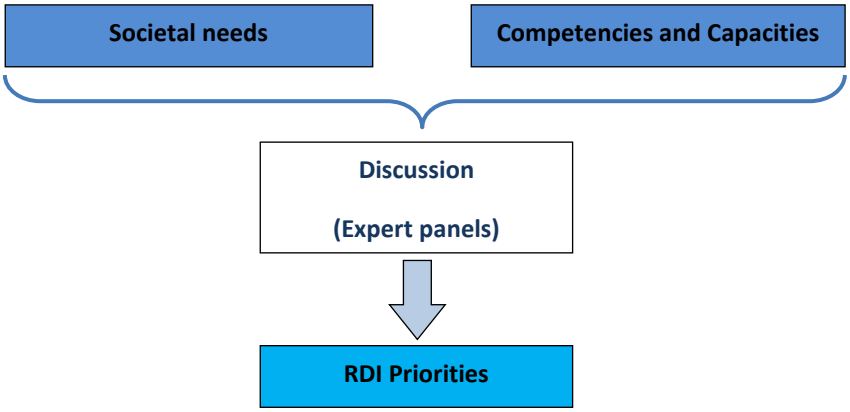
Thus, in 2011 a process started, leading to identification of explicit priorities for research & innovation, which are closely linked to the overall socio-economic goals of broad development of the Czech Republic in terms of social, economic as well as environmental. The executive agency responsible for the process was the RDI Council in cooperation with the Technology Centre ASCR as a supportive methodological and administrative body within this process.

These explicit priorities are officially termed “Priorities of oriented research, development and innovation”, which means that research, development and innovation are directed (oriented) to the areas, which are considered to be of a strategic importance in order to achieve a successful economic, social and environmental development of the Czech Republic. For that reason, the priorities of research and innovation are not defined as certain fields of science or industry. Instead, they are defined as socio-economic and environmental targets (in the horizon of 2030), and only in the second step, target for RDI were identified as one of the means to achieve them. These RDI targets were at the same time identified with the respect to their feasibility as to existing capacities and potential of the Czech RDI in terms of human resources, infrastructure, and excellence as well as to the potential of the Czech industry to absorb the results of RDI activities.

The overall approach to the identification of national priorities of oriented RDI is shown at Picture 1.

Competencies and capacities of Czech RDI were assessed by in-depth analyses of various aspects of Czech RDI, incl. human resources, international cooperation, R&D excellence, absorption capacity, RDI infrastructures etc. The aim of these was to assess the current state of Czech RDI and the findings were consequently used in latter stages of the process.

Pic 1: Approach to the identification of RDI priorities



As to societal needs, the aim was to identify strategic socio-economic targets in the time-horizon of 2030, which would be based on two general criteria: quality of life and sustainable development. Within this step, foresight was used as a tool to anticipate the future likely development of the Czech Republic. In this sense, a normative approach was applied and as a result, a set of most plausible and significant needs, opportunities and challenges was identified. The findings were then grouped into six complex priority areas, which are as follows:

1. Competitive economy based on knowledge
2. Sustainability of energetics and resources
3. Environment for quality life
4. Social and cultural challenges
5. Healthy population
6. Safe society

To each of the priority area, an expert panel was established. Their aim to identify RDI targets so that they contribute to the broader socio-economic and environmental targets defined within each priority area. Additionally, expert panels proposed set of policy measures which would further enable the achievement of the set targets.

The establishment of expert panels as well as the main coordination and management body (Coordination Expert Council) served another purpose; that was the achievement of a broad acceptance of the identified priorities. Altogether almost 120 respected individuals from scientific community, industry as well as state administration participated in this process.

The priorities of oriented research, development and innovations were approved by the Czech government in June 2012 and will be an obligatory document for designing new research, development and innovation programs. It is expected that allocation of financial means on the basis of these priorities will be launched since 2014. Large number of the proposed policy measures is to be included into an updated National Policy of Research, Development and Innovation of the Czech Republic, which will be underway through 2013.

PACITA Conference, Prague

VIII. Thematic Session: Health Care and Ageing Society

Chair: **Michael Decker**

Date: Thursday, March 14th, 2013

Concept of the thematic session

Technology Assessment (TA) on health issues is special in several ways. There is a strong normative aspect in it, simply saying that we want to help people suffering from disease. "Techniques" or "arts" of healing range from drug development to alternative, homeopathic treatments, from care taking to high-tech medicine. Ethical questions are very relevant since we need to permanently reformulate the idea of how we – as modern societies – should treat our sick people in a socially acceptable way.

Ageing is not a disease at all. Strictly speaking, it is the opposite, since you need a certain health constitution to get old at all. However, the number of people reaching older ages is increasing. This trend is accompanied by a falling birth rate in many countries. The first trend alone and even more so in combination with the second one lead to so-called "ageing societies", i.e. societies with an increasing average age of the population. This will most likely result in an increasing demand for (health) care taking in the next decades. Here, various technologies are developed to meet this demand, with the concrete applications ranging from technical support for human care takers to full substitution of individual care taking actions.

This session deals with these challenges from a general perspective of health TA as well as from a more specific angle with respect to ageing societies.

1.

S. van Egmond/ M. Heerings/ I. Geesink: Quantified health in TA perspective

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Scope:	Assessment of quantified health, Citizen science, public communication and TA
Keywords:	Personalised medicine, Big data, Citizen science, Quantified health, TA methods

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Quantified self meets personal health and wellbeing. Small devices enable individuals – healthy or with an illness - to measure all kinds of bodily functions, such as heart rates, sleep patterns, blood sugar levels and menstruation cycles. At the same time more data than ever is stored in large databases, enabled by developments in ICT. The Rathenau Institute is currently investigating these developments, in which personal health is becoming both more tailored and individualised (*personal health*), while at the same time being quantified and increasingly expressed in numbers, statistics and algorithms. We investigate the consequences of these developments for our behaviour and lifestyle, and for the institutional arrangements in policy and the health care sector. We use new ways to understand these trends from a TA perspective.

The focus of our presentation is on novel methods for TA, such as the use of various art forms and audio-visual tools for technology assessment, as part of our research project on quantified health. These methods can be used to reach new and different audiences such as adolescents and young adults. The project focuses on three connected trends. Firstly, the upcoming 'do it yourself' mentality connected to the second trend, the rise of novel technologies for quantifying human bodily functions, such as measuring heartbeat, calorie intake, stress levels, genetic makeup, emotions and behaviour. Secondly, data that can be used by patients to set up their own clinical trials or biobanks, to take control of their own health and wellbeing. Thirdly, the rise of 'big-data' in the clinic. These trends involve a number of ethical, legal and social issues, such as how it will affect our definitions of health and illness, the role of lifestyle in staying healthy or becoming ill, and institutional changes in the health care sector, politics and government. These questions demand reflection, debate and potentially policy change. Methods used in this project include firstly, the publication of a

scientific book that addresses several cases of quantified health, by a commercial publisher to reach larger publics. Secondly, the Rathenau project team collaborates with third parties involved in developing an experience oriented robotic suit that enables people to experience being 'quantified' and which has a connection with social media, and which is also part of a documentary being produced on the topic. Thirdly, the results of Quantified Health and the robotic suit project are presented in an (pop-up) art exhibition on the quantified body. Fourthly, we build an international consortium of research and policy experts in this domain.

These public activities complement the book and debate in which the Rathenau takes the lead. Our presentation focuses on these trends and on the use of public communication methods for technology assessment.

2.

V. Rogalewicz/ K. Kotajná/ V. Šinkorová/ H. Dománková: Comparison of breast cancer treatment and targeted prevention - a CzechHTA comparative cost-effectiveness research

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Scope:	Oncological screening programs in ageing society – effectiveness assessment
Keywords:	HTA; cost-effectiveness analysis; hereditary breast cancer; screening program

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Health Technology Assessment (HTA) comprises a number of methods for assessing effectiveness, appropriateness and cost of health technologies, i.e. drugs, biologics, devices, equipment and supplies, medical and surgical procedures, support systems, and organizational and managerial systems. Medicine has seen revolutionary changes during last 50 years. Thanks to development of modern science and engineering, technological basis of health care has increased without precedence both in knowledge and in investment in facilities, devices and drugs. We got used to the fact that clinicians manage to cure (almost) everything. However, no country in the world is so rich as to satisfy all demands its inhabitants have on the health care system. On the other hand, life expectancy is prolonging and the society is ageing, new technologies are expensive, patients are well informed, our lifestyle brings diseases of civilization, while our demands on quality of life are growing. HTA can inform us, which care is effective from the point of view of the society as a whole. While HTA is widely utilized in many western countries, CzechHTA is one of a few bodies cultivating HTA in the Czech Republic. A lot of analyses are done as student projects. Such an example is the cost-effectiveness study of breast cancer prevention that was carried out together with the Department of Oncology of the General University Hospital in Prague.

Almost a quarter of all tumors in women in the Czech Republic are diagnosed as breast cancer. The hereditary syndrome (BRCA1 and BRCA2 mutations) causes 5–7 % of them. Patients suspected of having this gene alteration undergo DNA testing, and the whole family joins the screening program. These patients will eventually become ill with a high probability (approaching to one as the life expectancy is increasing), but the

screening can detect cancer in earlier stages, and so the treatment is not that expensive and, primarily, the probability of healing is fairly high. The screening program has run only for 10 years in the Czech Republic comprising 105 patients. Out of them, 10 were diagnosed with breast cancer. Although the outcome in these women was better than in the general population, cost per QALY appeared to be much higher for the patients included in the preventive program. One of the reasons might have been the size of the sample. The disease did not manifest in most included women during the 10-year period, although the predicted risk of breast cancer in women with BRCA1/BRCA2 gene mutation is 78 % to 83 % by the age of 70. Due to the lack of real clinical data, it was decided to repeat the calculations using a cohort of patients generated by the Monte Carlo method. A fictional cohort of 331 women (164 with BRCA1 mutation and 167 with BRCA2 mutation) was generated on the grounds of data from medical centers and literature. This fictional cohort was used to estimate average cost of the screening program. Next to that, an economic analysis of breast cancer chemoprevention by tamoxiphen was carried out. The goal was to figure out the short-time risk value threshold, over which a 5-year chemoprevention is cost-effective.

The CEA showed that the screening program is quite ineffective, when cost per QALY was 523 065 CZK for the general population and 788 562 CZK for the patients in the preventive program. However, this result might rather point at ineffective screening programs at regional mammary centers, where many women are included unnecessarily, while other suspected women are not sent to a genetic test to specialized clinics, than speak about ineffectiveness of the preventive program as such. The threshold for chemoprevention appeared to be equal to 2.7 %; if the individual short-time risk value of a woman is higher than this figure, tamoxiphen is recommended to be administered for a 5-year period.

3.

W. Drozenová: Autonomy and Competence in Ageing Society

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Scope: Some aspects of autonomy related to ageing society

Keywords: Autonomy, competence, ageing society

Based on the population development in Europe and in the Czech Republic we speak about "an ageing society". Our effort to prevent problems and provide adequate regulations requires changes in both material and spiritual culture. Innovations required by the multigenerational society largely lie in the field of organization of the society and interpersonal relations, in the field of ethics, legislation, and institutions.

This paper is focused on some aspects of autonomy. Autonomy is one of the main principles of biomedical ethics, as they are proclaimed in the basic works (e.g. Principles of Biomedical Ethics by Tom L. Beauchamp and James F. Childress). Generally speaking, “autonomy” is not a single concept, but rather a complex of issues connected with various philosophical, political and legal ideas. In health care, the quality of autonomy is connected with informed consent. The principle of autonomy is difficult to apply when the competencies are disrupted in particular due to a brain disease, which typically covers mainly the oldest generation (cf. number of people over 85 years affected by brain diseases that cause dementia - in Europe over 24%). Reduction of competencies should be taken into account in matters of law: Decrease or even loss of the independent decision-making ability is one of the arguments against the legalisation of euthanasia.

On the other hand, autonomy together with competence and relatedness establish three basic needs of emotional well-being; in some respect, competence can be viewed as one the aspects of autonomy. Modern society overestimates active life and specifically the capacities related to economic sphere. The support of other aspects of creativity is important for ageing society, especially the “passive” capacity to listen, to understand, to accept the wastage of the previous physical and mental capacities and relate to other persons.

Conclusions: Due to the post-modern cult of the body, youth and efficiency, there is too much emphasis on preservation and development of competencies of seniors, partly suitable for the 3rd age and mostly inadequate for the 4th age. But decrease of some specific competences in old age should not be associated with a decrease of autonomy as a whole.

The concept of autonomy generally accepted in bioethics needs specifications related to the cultural and societal background. Solution of social and legal issues associated with problems of the oldest generation will require greater sensitivity, taking into account fragility and vulnerability, as well as respecting personal dignity of every human being. These requirements can signify certain shift from the classical conception of autonomy in liberalism toward the communitarian perspectives and ethics of care.

4.

E.H.M. Moors: Healthcare innovations in an ageing society

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Scope:	Science, Technology & Innovation Studies, emerging innovations, user producer interactions
Keywords:	Healthcare innovations, uncertainty, flexibility, early diagnostics for Alzheimer's disease, concerted stakeholder interaction

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Today, society is facing various grand challenges. Longer life expectancy and chronic diseases are putting a strain on the capability of healthcare systems to meet the needs of the (ageing) population. Age-related diseases like Alzheimer's disease (AD) will occur more frequently in the near future, nursing care need to be intensified, and a broader, mission-oriented innovation policy is increasingly seen as being critical for effectively meeting these societal challenges. Innovation, however, always has a dual character. New technologies hold promises for economic growth or improving health, but also fears for economic decline or health damages. Innovation in general and healthcare innovations especially, is nowadays increasingly perceived as a co-evolutionary process, an institutional interplay in which many heterogeneous stakeholders interact in complex ways. Interaction between users and producers of healthcare technologies takes place both in laboratory and clinic, and in the wider society, where the application of healthcare technologies not only meets a medical need, but is also accompanied by increased health awareness and growing needs and expectations of citizens, due to diagnostic possibilities.

Heterogeneous stakeholders in the wider society provide feedback about how an emerging diagnostic technology, such as early AD diagnostics, with still a high degree of uncertainty about measuring cognitive functions with biomarkers, technical specifications, and related ethical, social and cultural aspects, matches their needs, preferences and performance criteria. These aspects become articulated in demands and experimental learning between stakeholders in the current diagnostic practice. While stakeholder involvement in such emerging innovation processes might be beneficial, it remains unclear how to organize it in an effective and efficient way. Uncertainty and flexibility – inherent to such emerging technologies - open possibilities for far-reaching stakeholder involvement, but at the same time ask for thorough organization of these interactions in the face of ever-changing technology specifications, demands, and configuration of the social network and their related roles (Rip et al. 2005). This paper aims to systematically explore these interactions

between users and producers of healthcare innovations, in particular regarding early diagnostics for Alzheimer's disease in the Netherlands.

Seven types of user producer interactions are applied as analytical tool, including constructing linkages, broadening, characterizing users, upstream involvement, first user enrolment, feedback, and downstream innovation (Nahuis *et al.*, 2012). The results show that broadening is already fairly advanced in research on early AD diagnostics. Furthermore, researchers could engage various stakeholders (e.g. patients, caregivers) in the informal deliberation of impacts of early AD diagnostics, e.g. by linking up with Alzheimer Cafes. During clinical trials, feedback is obtained from patients on technological performance criteria of early diagnostics. Upstream involvement takes place through encouraging patients to participate in these clinical trials. Furthermore, new linkages between researchers and patients and their care givers are constructed to make the communication of information more effective.

The results show that adequate linkages between users and producers are important for emerging healthcare innovations, such as early Alzheimer's disease diagnostics. Patient organizations, such as Alzheimer Society, play an important intermediary role between users and researchers. Alzheimer Cafes are important places where concerted stakeholder interaction takes place, controversies about early AD diagnostics are articulated, and informal Technology Assessment takes place (Rip, 1986).

Such concerted stakeholder interactions consist of adaptations of current behaviors of the various stakeholders involved in early AD diagnostics to stimulate healthcare innovation and is the outcome of an alignment process, in which shared research agenda building, feedback and broadening processes play an important role.

References

Nahuis, R., E.H.M. Moors, R.E.H.M. Smits (2012). User producer interaction in context. *Technological Forecasting and Social Change*, 79(6), 1121-1134.

Rip, A. (1986). Controversies as informal technology assessment. *Science Communication*, 8(2), 349-371.

Rip, A., T. J. Misa, et al. (1995). *Managing technology in society : the approach of constructive technology assessment.* London, Pinter.

5.

M. Scheermesser/ H. Becker/ M. Früh/ Y. Treusch/ H. Auerbach/ R. Hüppi/ F. Meier: Robotics and Autonomous Devices in Health Care

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Scope:	The interdisciplinary study analyzes the opportunities and risks of robotics in the areas of care, rehabilitation, nursing and therapy, using future scenarios.
Keywords:	Robotic, Health Care, Opportunities, Risks, Future scenarios

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Demographic developments, shortage of skilled personnel and growing economic pressure in the health sector lead to an increased focus on technical solutions in the field of medical care and treatment of people. So far, robots are mainly technology-driven and still in the development and testing phase. An assessment of opportunities and risks, however, has yet to be realized.

The interdisciplinary study shows the current status and macro trends of robotics in healthcare. It assesses opportunities and risks in view of a technically feasible, economically achievable and ethically desirable use of robotics in health care. To determine the current status and trends, a literature review on current developments, prototypes and their use in practice was conducted. Furthermore, by means of focus-group interviews with stakeholders a needs assessment was drawn up. On the basis of the findings three scenarios of possible future developments in the use of robots in health care in 2025 were created.

The field of robotics is characterized by diversity and a different complexity of the devices.
Most of the identified models can be classified into three groups according to their functions:
1. Training aids and aids for movement, for the purpose of mobility and autonomy
2. Devices which complement or facilitate people's life, or which can serve as their physical proxy
3. Devices which accompany and interact with people
Among the opportunities of the use of robots in health care is the assistance they provide for professional and non-professional users, for example family member caregivers. Technical innovation can provide an increase in autonomy and mobility and lead to an improved integration and better quality of life for patients as well as their families. On an institutional level, robotics provides a rationalization potential in the area of organizational and logistic processes. All in all, in addition to assisting health care professionals and at the same time contributing to mitigating the shortage of qualified health care professionals; they would improve the quality of care for patients and people in need of care.

One of the risks is that through the use of robots there would be less personal contact between patients and health professionals. This could have negative effects on the patients' wellbeing and their convalescence and could even lead to isolation. Furthermore, health care professions could become less attractive, which in turn could further increase the shortage of skilled health care professionals. Another risk lies with particularly vulnerable people incapable of giving their informed consent for the use of robots themselves. On an institutional level, there is reason to worry that economic pressure could lead to a favored use of devices, which could be economically advantageous but could be disadvantageous for people concerned. Moreover, due to an almost total lack of benefit-cost analyses dealing with the use of robots in health care, the risk that their use may lead to increased costs cannot be ruled out.

Insufficient regulation for instance in liability law, data protection and ethics is already leading to risks for people dealing with such devices in research, testing and practice. Measures such as the clarification of liability laws and data protection are therefore necessary and cannot be postponed to an indefinite future. Evidently, a proactive and coordinated policy framework is required to minimize the risks of the use of robotics in the health care environment and to allow to fully benefit from the opportunities and advantages it presents.

PACITA conference, Prague

IX. Thematic Session: Assessing Sustainable Mobility

Chairs: **António Brandão Moniz**, **Jens Schippl**

Date: Thursday, March 14th, 2013

Concept of the thematic session

The session on "Assessing Sustainable Mobility" is split into two parts:

1. Potentials of scenarios on future mobility systems for guiding public policy making: It could be argued that the scenario-methodology is recently experiencing a sort of "hype". In particular in the energy and in the transport sector a broad range of scenarios have been produced over the last years. A key question to be addressed is what are the reasons for this "new attractiveness" of scenarios? Further, it will be discussed how scenarios need to be designed and communicated to support policy makers in facing the "great challenges";

2. Examples for concrete approaches or pathways will be illustrated. One focus will be on the question whether electric mobility is a promising pathway towards sustainable mobility. It will be further discussed, if building new infrastructures for intermodal transport could be an additional or an alternative approach. The question on the role of scientific assessments and economical motivation for such decision making will be addressed as well. Further questions are: How companies and national/regional policies are reacting to European definition of strategies on mobility? Are they re-organising their networks and supplier tiers to face new challenges? Or are they behind the design of such strategies? How these strategies are interpreted to the local/regional level.

1.

J. Schippl: Learning from scenarios on eco-efficient transport for Europe

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Scope:	The presentation will briefly illustrate the purpose, the design and the challenges of scenarios on eco-efficient transport futures for Europe.

Keywords:	Mobility, scenarios, eco-effcienct transport, foresight

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In particular for dealing with the future of complex technology-infrastructure systems scenarios are increasingly considered as being a useful tool. Transport systems are such complex systems. They are characterised by a mutual relationship between technical, societal, economical, political, and environmental factors; the term co-evolution is used to describe these interdependencies which are in-deterministic in principle and, thus, difficult to predict. Scenarios are often used to cope with this high degree of uncertainty. In doing so, scenarios can have different functions. At least in theory, the following two can be distinguished:

1. They can help to improve the understanding of possible cause-effect relations in a system. Thus, they help to get a better understanding on the intended and unintended effects of policy intervention and other developments onto the transport system (and beyond). In these cases, it is mainly the output of the scenarios that aims at giving orientation to decision makers.
2. Secondly, scenarios can be used to trigger or structure a debate on certain issues. In these cases, it is rather the process of working with the scenarios that gives support to policy making.

When assessing scenarios, it seems helpful to differentiate whether scenarios or elements of the scenarios are:

- Plausible (is a certain development/scenario technically, economically feasible?)
- Desirable (is the scenario in line with certain values or does it help meeting certain targets?)

Over the last years, a broad range of scenarios on sustainable transport futures for Europe have been designed, providing an integrative perspective on potential developments in the transport sector. They all illustrate that there are pathways to achieving targets such as a reduction in CO2 emissions or reduced consumption of fossil fuels. But they do also illustrate that there are differing views on the feasibility and desirability of the various measures and pathways. An important reason for the variety of opinions surely is that transport is a complex system with many mutual interdependencies between factors in the system and external factors. This leads to a high degree of uncertainty regarding the potential and the exact impacts of interventions in the system. Changes in the transport system are often triggered by technological progress, but there are different views on the potential and impact of certain technologies, such as batteries or automation in car transport. Whether a measure or pathway is considered to be likely or desirable quite often depends on the assumptions on which the calculation of a scenario or an impact assessment is based. Thus, it is important to make these assumptions transparent and understandable.

The presentation briefly describes a STOA projects on eco-efficient transport. In this project, a set of scenarios on eco-efficient transport futures was developed with the purpose to better understand reasons and assumptions of the different assessments of the feasibility and desirability of different pathways or policy measures. The scenarios consist of qualitative storylines that are combined with quantitative calculation. The scenarios were based on the following principles:

- All scenarios assume high – sometimes extremely high – innovation rates and a very high pace of technological change and diffusion of new technologies in society.
- ***Eco-efficient*** *transport* is understood as getting access to a certain activity/purpose (working, shopping, recreation, etc.) with a smaller ecological footprint (see definition in the glossary).
- The three scenarios focus on ***three different basic strategies*** for achieving eco-efficiency:
  - Scenario 1: ***Making transport modes cleaner*** (users/goods use the same modes)
  - Scenario 2: ***Changing the modal split*** (users/goods use different modes)
  - Scenario 3: ***Reducing growth rates in transport demand*** (users/goods have different origins/destinations)

The presentation will draw some conclusions based on the experiences made in the STOA project. It seems as if it was useful to develop such kinds of scenarios in this STOA project, in spite of the broad range in scenarios on European transport futures that do already exist. It also seems as if it was useful to have the qualitative storylines

for triggering a discussion amongst stakeholders. However, it needs to be further discussed to what extent the scenarios need – in spite of all the uncertainties - quantifications via modelling as an output in order to achieve “significant” political impact.

2.

L. Klüver: Sustainable transport and sustainable energy entwined

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Scope:	Sustainable transport in the light of transition to a sustainable energy system
Keywords:	Mobility; Transport; Energy; Sustainability; Modeling

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Transition of transportation to a more sustainable future is often – well, always – analysed without explicit reference to the underlying transition of the energy systems. This results in a series of artifacts, such as battery driven cars with CO_2 emissions from coal plants, or extrapolation of growth in mobility up to scales that a sustainable energy system cannot be expected to be able to feed. These are artifacts, since any real future developments in sustainable energy systems must rest on the demand that energy consumption fits into energy production. Energy conservation and strategic development in the main consumption fields are the tools to make that happen. The project presented was set up to explore if it is possible to make scenarios for a sustainable transport system for Denmark, which fit with scenarios for a 100% sustainable energy system.

The Danish Board of Technology (DBT) in 2006-8 developed the STREAM model, which is able to follow energy streams from energy sources, through energy conversion (with attached efficiencies), through consumption technologies (with attached efficiencies), to energy services. The STREAM model was afterwards used by the "Climate Commission", set up in 2009 by the Danish Government to develop a scenario for a 100% sustainable energy system for Denmark. However, transport in this scenario was not well explored, and in praxis was treated as a black box. The DBT therefore set up a project to study if a 100% sustainable transport system was possible by 2050. The project used the STREAM model, the Climate Commission scenario, and added a transport module. Scenarios were made without expected technology leaps, but with extrapolation of already seen technology development pace.

The project showed that 100% sustainable transport scenarios could be made and that physical planning of towns and cities plays a major role for reaching the goal of sustainability. Further, the project showed that the energy system has to be tweaked to make a sustainable transport system possible: Some transport services will demand biofuel in the future, which puts restrictions on the use of biomass for other purposes. Interestingly, the technology and energy economy in a combined 100% sustainable energy and transport scenario was positive at a scale of 100€/Year/Capita.

3.

S. Moretto: Scenario tools for future generations of high-speed trains: Lessons from Europe

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Scope:	Prospective and analysis methods
Keywords:	Socio-technology scenarios; High-speed trains; Technology decision-making

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In 2010 the European Rail Research Council (ERRAC, 2010) anticipated for rail transport in Europe a shift from technological responses to policy challenges (for a fully interoperable and modern rail-system) to grand societal challenges (meeting environmental targets and end-users rapidly changing mobility patterns). In fact a societal landscape has emerged as a new layer of analysis to prospective exercises.

According to Robinson and Propp (2011) failing to acknowledge potential resulting discontinuities between technocentric visions and the dynamics of societal landscape can have negative consequences in future oriented technologies.

This way, it is the author objective to find-out to which extend rail transport visions and road maps address such rising global phenomenon (impacting both emergent and mature innovations). An analysis was made to pre-selected group-sample of reports.

Theoretical references were found within the growing body of empirical studies on the use of assessment tools in prospecting evolutionary scenarios for high-risk research, focusing on nanotechnology. They emerge from the debate (not always consensual) on reference concepts from authors such as Rip, Robinson and Geels.

The author of this study extrapolates on those same references to the high-speed train, integrating matured innovations of a highly technological content. For coherence of analysis, the author distinguished in time three evolutionary approaches in which the high-speed train product development process has been carried out: Technical (past); Political (present); and Societal (future). In its turn, the author used them to contextualize the object of study.

The contrasted prospective exercise where then classified in technology trajectory layers (or technology journeys, to use Rip *et al.* (1997) terminology): Supra-systemic; Systemic; Regime; Technology niches (close to “niche level” as referred in Geels, 2007). These layers (yet open for discussion) result from the author attempt to converge the

structure outlined in his previous work Moretto *et al.* (forthcoming) and the debate between A. Rip (forthcoming), Robinson (2011) and Geels (2007).

Technical:

Until late 90' the decision on rail-vehicles technology developments was the task of rail-operators. Resources driven, they would make decisions based on past events of vehicle-operation failures, prioritizing it upon the number of repeated incidents. Technology responded to post-operations technical problems, developed on a trial-and-error approach. Share of knowledge was almost inexistent and mostly happened at engineering dedicated platforms, the most known the World Association of Railway (UIC) in Paris.

On a linear technological system, practices similar to what we call today as prospective exercises were held at domestic level to support the political debate on controversial rail infrastructure investments. They were not found on rail-vehicle technologies. For instance, the introduction of the electric motor units (EMUS year 1830') and the first generation of high-speed trains (TGV-PSE year 1981) rather occurred as responses to already registered events such as pollution in the first case or oil crisis in the second.

Policy:

From the late 90' technology decision-making was transferred to the manufacturing industry consequence of the sector reforms imposed by the European White Paper on Transport (COM(2001) 370 final). Project driven and client centric, manufacturers' decisions aimed to adapt rail-vehicles to the new systemic conditions imposed by policy measures of an enlarged, integrated and liberalized rail market.

The new framework pushed for collaborative research and created the conditions for the entry and emergence of new actors. To mitigate market failures in such dynamic and complex innovation system, the industry introduced strategies anticipating policy, emerging sector's regulatory requirements and client operational specifications. Such occurred for example with the second generation of high-speed trains (TGV years 2001 and 2007; ICE3 year 2002) and implementation of European Rail Traffic Management System (ERTMS from year 2004).

It is interesting to notice the revitalization of the referred UIC (which members are rail operators and infrastructure managers) and emergence of the European Rail Industry Association (UNIFE) as knowledge sharing platforms. Which in its turn met to form the European Rail Technology Platform ERRAC in response to the call from the 6th framework work programme for research in 2002.

At this stage it has been found a proliferation of prospective exercises within different technology journey layers. At the supra-systemic layer, of strategic and political actors, prevails foresight, commissioned by European administrations or national parliaments to external bodies. Example STOA (Schippl, 2008). At the systemic-layer, of sector

advisory councils, prevail strategies, visions and road mapping produced by the European railway community. Example ERRAC vision 2050 (ERRAC, 2010). At regime layer, dominated by rail-operators and suppliers, is mainly found forecasting, commissioned by industry or its associations to consultants. Example UNIFE outlook 2020 (BCG 2008). Finally at the technology layer, of train manufacturers and components suppliers and rail operating companies, are found, as previously, market outlooks and forecasting. Example Vossloh (SCI, 2005). The referred reports have in common a techno-centric vision of scenarios, with an exception made to STOA report.

The third generation of high-speed trains (tests of ICE350E year 2006 and AGV360 year 2007) is pioneer, integrating technology results from collaborative research and in addressing the challenges identified by the scenarios, mainly from the regime layer.

Societal:

The global financial crisis, since 2008, is introducing to the high-speed train technology journey the societal-landscape layer, of grand challenges. These challenges are diffuse and a vague pull-force of technology. They contrast with strong pull-force found in the other layers (mainly in system and regime ones).

From the prospective reports studied STOA (2008) stands for addressing emerging societal grand challenges, around which constructs its socio-technical scenarios using participatory methods. Moreover it defines the roots arriving to the same scenarios. But as it happens with the other reports STOA misses establishing the necessary links with other layers, techno-centric, and necessary engagements from the innovation-chain in path creation (reflecting its supra-systemic dimension).

At the present stage of the study it is yet premature to point directions in which way should be constructed and tailored the evolutionary scenario tools for future generations of high-speed trains. That will be only possible at a later stage after interviews with the authors of the studied reports and discussion with peers.

This paper presents the preliminary findings of the study and thus not completed. The author takes PACITA 2013 as an opportunity to discuss with peers and move forward with turning it into a full publishable paper.

References:

BCG Boston Consulting Group (2008) World Rail Market Study. Status quo and outlook 2010. Study Commissioned by the European Rail Industry Association (UNIFE).

Commission of the European Communities (2001) White Paper - European transport policy for 2010: time to decide. COM(2001) 370 final. Brussels, 12.9.2001.

Deuten J.J., Rip A., Jelsma J. (1997) Societal embedding and Product Creation Management. Technology Analysis & Strategic Management, Vol. 9, No.2, 131:148.

European Rail Research Advisory Council (2010) Rail Route 2050: the sustainable backbone of the single European Transport Area. Published by ERRAC Roadmaps.

Geels F. and Schot J. (2007) Typology of sociotechnical transition pathways. Research Policy 36 399–417. Doi 10.1016/j.respol.2007.01.003.

Geels F.W. (2002) Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study Research Policy, Vol. 31, No. 8/9, pp. 1257-1274.

Kulve H. and Rip A. (2011) Constructing Productive Engagement: Pre-engagement tools for emerging technologies. Springer. Sci. Eng. Ethics 17:699-714.

Rip A. (2010) Processes of Entanglement, Chapter in Mélanges, offered to Michel Callon, December.

Rip A., Robinson D. K. R. & Te Kulve H. (2007) Multi-level emergence and stabilization of paths of nanotechnology in different industries/sectors, Free University of Berlin, 17-18 September.

Robinson D. K. R. (2010) Constructive Technology Assessment of Emerging Nanotechnologies: Experiments in Interactions. PhD Manuscript, University of Twente, The Netherlands (forthcoming November 2010).

Robinson D. K. R. (2009) Co-evolutionary scenarios: An application to prospecting futures of the responsible development of nanotechnology. Technological Foresight & Social Change. doi 1.106/j.techfore.2009.07.15.

Robinson D. K. R. and Propp T. (2011) Innovation-Chain+ approach to prospecting technology embedment in society: An Illustration for potential nano-enabled agrifood sector transformations. Fourth International Seville Conference on Future-Oriented Technology Analysis (FTA). Seville 12-13 May 2011.

Robinson D. K. R. and Propp T. (2006) Multi-path mapping as strategic intelligence for reflexive alignment in emerging S&T. Second International Seville Seminar on Future-Oriented Technology Analysis. Seville 28-29 September 2006.

Schippl, J. (2008) The future of the European long distance transport – Scenario Report. European Parliament, Science and Technology Options Assessment (STOA). IP/A/STOA/FWC-2005-28/SC27.

Schot J. and Geels F. (2008) Strategic niche management and sustainable innovation journeys: theory, findings, research agenda and policy. Technology Analysis & Strategic Management Vol. 20, No. 5, September 2008, 537-554.

SCI Verkehr Gmh (2003) Market and investment volumes in railway technology in Central and Eastern Europe. Report produced on behalf of Vossloh AG's.

4.

C. Gaivoto: Hybrid PT modes in the complexity of mobility urban systems: Potentialities and difficulties of adoption

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Scope: Hybrid PT modes are interoperable in different urban transport infrastructures and get the possibility to increase direct travels (door-to-door) and to make better use of public expenditure in urban public transport of high quality and performance. This is happening with tram-train and bhls in urban PT services. The decision-making process wins with this evaluation of intermodal PT systems to "door-to-door" systems and helps to create more sustainable cities

Keywords: Hybrid modes; Tram-Train; Interoperability; Connectivity; TOD

In Europe it has been given particular attention to the interoperability of PT network for urban travel and recent technological innovations of railway and road rolling stock at the level of intermediate capacity[6], opening up the range of supply solutions in complex multimodal urban mobility systems. For purposes of this work, it is appropriate to distinguish two operational concepts of networks within the travel PT system, intermodality and multimodality, understanding that the multimodal solutions[7] (door-to-door services), which promotes greater network connectivity compromising a reduction or cancellation of transfers in commuters travels, reduce the need of interfaces with the savings in time and space; while the intermodal network requires the articulation of various modes in the same displacement, with wasting of transfer time and transfer centers.

These two PT network concepts are connected with compact and sprawl urban systems and the process of technological innovation transport system has been introduced, or through by adding new equipment or the exclusion and reduction use of

[6]The hybrid modes Tram-Train and BHLS allow a differential level of service between regional, suburban and urban supply and better territorial and time coverage, without transfers, taking the advantage of the different types of infrastructure or heavy and light rail or road infrastructure.

[7]Beaucire, Francis, Out.1997, (sic) "Multimodality: - use of multiple modes of transport, but not in the same displacement (in this case we speak of intermodal). Intermodality: - use of multiple modes of transportation during the same displacement (car and metro, for example) ", "The Public Transport and the City", Essentials Milan, Toulouse

others but, whose impacts of these solutions deserve to be, in the public interest, analyzed, integrated and evaluated, for example, where there is more evidence of PT efficiency gains and reinforcements to the urban renewal and sustainable mobility.

The discussion about PT options and optimization of theirs networks, in this context, is a theme which is reinforced in the pivotal events of the last 40 years and whose statement has been made now by examples of good practice and in literature resulting from research or strategic and operational agendas of cities and urban agglomerations. The very concept of complementarities framed in intermodal policies and interoperability promoting multimodality are now cause for a greater understanding of those networks and services in urban PT integration, as there are reactive and proactive governance policies of the common good. Subjecting these PT networks and services to the incremental planning, without prior selection of a strategic and sustainability objectives, you can increase the risk of negative effects on its profitability and in terms of social communities both in terms of various agents intervene directly in the field of passenger transport.

In this situation, the problem is defined by the decision-making process misunderstanding the motives and objectives, the incongruity of certain decisions about public investment in transport infrastructure, particularly, regarding the operating conditions of the urban travel system and then precipitates models of mobility and accessibility incoherent (low demand) and some integrators sustainability objectives.

Therefore, it makes perfect sense that methods include some case studies to reinforce the theory that you can include the sustainability strategy of PT networks, road and rail interoperability, matching each case to its efficiency, more you have to find in the policies of TOD (Transit Oriented Development) with the techniques of 3D's[8] for the local HOD (Human Oriented Development) policy framework, e.g., "Liveable Transportation in Cities." (Vuchic).

The need to evolve a door-to-door perspective into the most of the PT supply services in mobility systems, associating to them the goal of the territory sustainability [9] as stated, it will require to be introduced in the PT networks the question of travel system efficiency and therefore interoperability with optimization of material and human resources, public space, energy and the urban environment, since this policy of offering PT multimodal service.

In the developing of this sustainability strategy for a particular mobility system geography (IT, PT, distance, time, transfers), it is from particular importance to recognize three key factors in any PT network[10]: the conditions of ROW; existing technology and type of service performed (frequency, regularity, punctuality, safety).

[8]Cervero R.and Kara Kockelman, Berkeley University 1997, "Travel Demand and the 3D's: Density, Diversity and Design"

[9]Peter Newman and Jeffrey Kenworthy, Washington DC 2009, "Sustainability and Cities, overcoming automobile dependence", Island Press

[10]Vuchan Vuchic, 1992, cap.2 "Urban Passenger Transportation Modes", in "Public Transportation", George E.Gray and Lester A.Hoel, 2nd edition, Prentice Hall

On the other hand, considering that it is necessary to point out the framework for decision-making process between PT intermodal and PT multimodal networks, the comparative analysis fits the strategy and mobility for a study area (city, metropolitan area), should be evident not only the technological as well as the potential supply characteristics of *hybrid modes* (Tram-Train and BHLS) in the territorial and temporal coverage (direct connections and less transfers) for different mobility segments (distances and travel times).

Generally, we know the importance of transport in sustainable development assume in these urban areas but is particularly important to know the interaction effect of investment in public transport to urban development that varies from city to city or even within the city. In fact, improvement of accessibility caused by the attractiveness of PT system may substantially alter characteristics of occupation and land use either in cities or urban areas or in compact urban areas of cities scattered, depending upon the action of the strong influence of public policies, example, with regard to urban regeneration.

This forces to explain the importance of selecting the transit network that will enable efficient performance to meet answers to the new challenges of urban mobility, knowing that conditions of applicability of the new PT corridors with certain NHD (Net Humans Densities) and research work conducted recently in Barcelona about BHLS network (RetBus)[11] comes partly to confirm this increase in efficiency and in relation to territorial coverage and in relation to direct links.

What will also highlight is that in the both case of compact urban areas, as in dispersed areas, the use of existing infrastructure and new structural extensions in transit networks operated with *hybrid PT modes*, will be applied sustainability criteria in the evaluation and the importance of transparency and public policy-making, in both urban and rural development as they should or are subject to rehabilitation in the process of sustainable development. In this process, the use of geographic information (GIS) - see the works of the Institut d'Aménagement Urbain Région d'Ile de France, IAURIF - have supported a number of decisions to expand the PT networks (RoW A) in tramway mode, tram-train and BHLS, beyond what is now understood as a support TOD policies in the U.S..

In this perspective, these methods of analysis and evaluation to identify these differences through the quantification of data about NHD[12] and the costs associated with each transport system (ex: the Public Account of the Mobility System), since they depend better understanding of the financing of the transport system. In the particular case of Tram-Train, it is important to highlight the paradigm of Karlsruhe that to capture around 40% the demand from IT demonstrating it has been linked to a policy

[11]Estrada, M.; Daganzo, CF and all, 2011 Elsevier, "Design and Implementation of Efficient Transit Networks:Procedure, Case Study and Validity Test"

[12]Levinson, Herbert, 1992, cap 13 "System and Service Planning", Public Transportation, Lester and Hoel, Prentice Hall: see the Figure 13-2 that relates the number of travels/day/personl with the densities of six American cities, observing the tendency of the PT use with the increasing of residential density, supported by the study of Pushkarev, Boris e Zupan, Jeffrey about "Public Transportation and Land Use Policy", a regional planning association book (Bloomington, Ind:Indianna University Press1977, pág.31

of sustainable urban planning, and it is not known any phenomenon of "urban sprawl", but rather, the decisions and policies have been to strengthen the coordination of the development of tram-train network in the regulation of urban growth.

5.

R. Zah/ P. De Haan: Opportunities and Risks of Electric Mobility in Switzerland

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Scope: Future mobility, electric mobility, sustainability assessment

Keywords: Electric mobility, life cycle assessment, sustainability, penetration modeling

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Electric cars are seen as great hope for a sustainable or at least less polluting mobility. Generally, electric cars increase the energy efficiency of travel and reduce dependency on conventional fuels such as petrol and diesel. Thanks to its energy mix, of which a large part comes from hydroelectric power, Switzerland has suitable conditions to generate environmentally friendly energy for electric vehicles. Furthermore, the planned major expansion of renewable energy production may be supported by electric vehicles as a form of local energy storage.

Lower greenhouse gas emissions with efficient vehicles

However, in order to realize the ecological benefits of alternative fuels, many conditions need to be met. The benchmark against which electric cars are measured is becoming even more rigorous as conventional combustion engine vehicles are continually technically refined to make them more efficient and ensure lower CO_2 emissions.

By 2035, a compact car which today uses on average 7.5 liters of petrol per 100 kilometers could be using only 4.8 liters; this corresponds to a reduction of more than one third. The same compact car which runs on electricity could cut its energy use from 24 kWh to 16 kWh per 100 kilometers by 2035 through improvements in auxiliary systems such as heating and battery conditioning. This corresponds to a reduction of around 30 percent in CO_2 emissions.

Shift in environmental pollution from operation of vehicles to their manufacture and disposal

One major reason why the life cycle assessment of electric cars is not substantially better than that of conventional vehicles is due to environmental pollution during the

manufacture of the car: if we take into consideration the entire life cycle, 90 percent of greenhouse gas emissions from battery-powered vehicles are produced during manufacture. This compares with 25 percent for mid-sized cars with combustion engines today, increasing to 40 percent over the longer term.

During operation, environmental pollution depends on how much fuel the vehicle consumes, or in the case of electric cars, the electricity mix. In comparison with other countries, Switzerland has one of the lowest CO_2 producing electricity mixes, based on hydroelectric and nuclear power. Operating an electric car powered by Swiss electricity therefore produces 70 percent fewer greenhouse gas emissions than a comparable combustion engine vehicle. By contrast, if the electric car is charged using the average EU electricity mix, of which 52 percent comes from fossil fuels, the CO_2 reduction in comparison with a conventional car is reduced to 20 percent. Consequently, environmental and energy policy instruments should be increasingly extended to cover the entire vehicle life cycle. Sustainable eMobility is only possible if the resource life cycle is closed.

The role of electric cars in the overall fleet

In order to assess the future impact of electric mobility in Switzerland, the TA-SWISS study links individual cars with the environmental pollution caused by the entire Swiss vehicle fleet. Three scenarios based on the range of possible development paths are applied to model the future expansion of eMobility in Switzerland. Compared with literature values, the study initially expects a rather slow uptake of electric mobility. Based on these scenarios, we can calculate that on average, in 2025 one in ten new cars will run on electricity and in 2035 every second new car will be an electric car.

On the basis of this distribution scenario, we can estimate the expected CO_2 emissions in 2020, 2035 and 2050. In all the scenarios there is an almost identical 10 percent reduction in greenhouse gas emissions from transport by 2020 compared with today, despite a calculated 24 percent increase in mobility. From 2035, there are major variations between the eMobility scenarios: the business- as-usual scenario predicts a 20 percent reduction in greenhouse gases, while the optimistic scenario predicts a 30 percent reduction. The more actively energy policy measures promote energy efficiency for new cars, the more likely it is that eMobility will increase. Electric cars have high energy efficiency and small and mid-sized cars in particular are well suited to running on electricity – thanks to advances in battery technology, which will mean increasingly fewer compromises in future. Accordingly, targeted drive-specific support for electric cars does not seem to be necessary.

New financing models required

In future, the energy efficiency of road vehicles will improve more rapidly than the rate of total mobility. This will mean not only a reduction in CO_2 emissions, but also in income from fuel taxes. Electricity for electric cars is not taxed any higher than «normal» electricity. The higher the rate of eMobility, the greater the pressure to switch to a taxation system based on kilometers travelled will become. The TA-SWISS study recommends also basing this kind of km-based taxation models on primary energy efficiency; this would avoid the risk of such a system change slowing the market

penetration of electric cars. In order to prevent negative feedback effects, an increase in the general cost of mobility is needed to ensure that more environmentally friendly and less expensive vehicles do not result in an increase in the general traffic.

Methods

The TA-SWISS study is based on a range of components. It applies the same underlying assumptions on population growth and increase in mobility as the Energy Perspectives of the Swiss Federal Office of Energy (SFOE). The assumptions on which the various SFOE scenarios are based are adopted as far as possible. The study links this projection with its own calculations on the technical development of various vehicle classes and components performing a consistent bottom-up calculation. Thus it describes and more specifically substantiates the scenarios outlined by the SFOE.

The calculations for market penetration by electric cars take into consideration the potentially limiting factor of production capacity in the automotive industry in the years ahead. From approximately 2020, it will remain to be seen whether the electric cars available are able to prevail over combustion engine cars which are also constantly improving year-on-year. To this end, the Swiss new car market is simulated for each year, in which a million hypothetical households must purchase a new car, choosing between existing conventional and electric car models.

The study also analyses the life cycle of various vehicle categories from small cars to off-roaders, and determines the environmental pollution resulting from each phase. The models applied here were based on the latest, scientifically supported life cycle inventories of Li-ion batteries, and on life cycle assessment methods optimized for electrical mobility.

6.

N. Boavida: Towards an assessment of the Portuguese e-mobility case: The Mobi-E

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In early 2008 the Portuguese government started a working group on electric mobility, aiming to develop infrastructure for street charging of electric vehicles across the country. The project named Mobi-E was officially launched with the settlement of a special cabinet in mid-2009, and its pilot-project ended in June 2011 with the full implementation of 1300 slow charging stations and 50 fast charging stations in places of public access. The project also installed a payment system, which connects personal information and communication technology devices (e.g. tablets, smart phones, etc.), and enables the user to select the most appropriate operation. It also allows the analysis of the user's mobility costs in order to optimize energy consumption.

The research conducted for this work (Boavida 2011) revealed that one group concurred in the elaboration of the Portuguese e-mobility policies, and centred the Mobi-E project on the hardware and software to charge and control the e-car. The group was composed by several companies, and was led by the Inteli group (a think tank associated with the Ministry of Economy), which was in charge of the Mobi-E concept and model. Other companies included CEIIA[13] - a public-funded technology centre who developed an e-car prototype, part of the Inteli group, supported by the Ministry of Economy and in charge of the Mobi-E vehicles; the EDP group - the public energy utility, in charge of the integration with the grid; Siemens, Efacec and Martifer – three technology companies, all dealing with the charging solution; and Critical and Novabase – two information technology (IT) companies, in charge of the IT solution.

[13] Centro de Excelência e Inovação para a Indústria Automóvel

Although the infrastructure for charging electric vehicles was fully built, the project failed to address the expected consumers. In fact, it can be said that far fewer cars than expected could be observed using the charging points in 2012.

Nevertheless, the Mobi-E project produced some impact on knowledge creation in Portugal. First, the project was referred directly[14] in 12 Master thesis, and indirectly[15] in 27 Master thesis. Until now, no PhD thesis was discussed (with such keywords)[16]. Furthermore, some industrial property procedures were disclosed (Gouveia 2010), such as two patents from universities: one related to an electronic differential published in March 2009, by the Engineering Faculty of the University of Porto. The patent uses techniques of control by field guidance with identification of engine parameters, as well as improves the performance and incorporates a method of energy optimization. The other patent was published in April 2009 and granted to Engineering Faculty of the Technical University of Lisbon, consisting of a system to charge batteries of electric vehicles.

Second, there were also some Portuguese companies and inventors working previously to the Mobi-E project with electric vehicles, according to Nuno Gouveia (2010). The author sustained that these actors were working in areas such as cars, vans, an electric bus, moulds for plastic injection and electronics.

Third, there were some research projects concerning electric vehicles, integrated in the MIT-Portugal programme and financed by the Portuguese National Science Foundation[17]. For example, according to Gouveia (2010) the research team of one project worked together with companies in areas such as electric engines, suspension parts, and steering wheels and brakes in a single system called "Motor in Wheel". This research was included in the Mobi-E project, and was led by CEIIA car technology centre and by a similar structure in Galicia named CTAG[18]. The work was subdivided in several components, namely modelling the power control system, laboratory implementation of this system, implementation in a prototype, "hybridization" of the electric vehicle, motor-in-wheel unit project, sustainable composites, smart grids and concepts of flexible project and sustainability analysis. According to the author, the work also involved the building of three prototypes: a control system, a link to connect the vehicle to the internet, and the previously mentioned Motor-in-Wheel. Although information is scarce on outcomes of the research project, several products and materials were expected, as well as impact studies in the electric net, problems and technology solutions, and a study on the sustainability based on the electric car to test different commitments and scenarios of usage. Furthermore, companies such as Efacec, Simoldes, MCG and TMG were involved in each component of the research project, according to Gouveia (2010). In addition, Siemens developed two prototypes of home-charging and energy efficiency in buildings. Moreover, the formerly public

[14] Source: "Mobi-e" in *Repositório Científico de Acesso Aberto de Portugal,* at 11/Jan/2013 and internet, at 11/Fev/2013.

Source: "veículo eléctrico" and "carregamento eléctrico" in *Repositório Científico de Acesso Aberto de Portugal,* at 11/Jan/2013.
Source: "Mobi-e", "veículo eléctrico" and "carregamento eléctrico" in *Repositório Científico de Acesso Aberto de Portugal,* at 11/Jan/2013.

[17] Fundação para a Ciência e Tecnologia

[18] Centro Tecnológico de Automación de Galicia

energy provider EDP offered free charging of batteries between 2009 and 2011. Presently, there are five other energy suppliers of electric mobility in Portugal. At the time of the research project, there was also a promise of Renault-Nissan to build a factory to produce batteries for electric vehicles in Portugal. Now this factory is producing batteries in the United States (Smyrna, TN). However, this Portuguese project was suspended in 2011 and is under re-evaluation[19].

Although information regarding pre-existing communities on electric mobility is still scarce, there are elements to support the idea that there was significant social dynamism around the Portuguese Association of the Electric Vehicle[20]. This association received state funding for dissemination activities since 1999, and was also behind public debate on this issue. However, according to interviews and information collected during the development of this work (Boavida 2011), it appears that this group remained on the fringes of the policy decision centres existent for the Mobi-E project.

At least in terms of public discourse, the Mobi-E project did not initially rely on a planned sustainable transport strategy. In fact, Mobi-E disregarded not only the existing strategies of city councils but also other alternative urban possibilities, such as public transport, car and bike sharing systems, and pedestrian and cycle traffic. Instead, the rhetoric was oriented to an easily convenient idea: the e-car. In fact, public support often arises in public debates from simple persuasive messages, and the simplicity of the central idea of the urban e-car is one good example (Schwedes et al. 2012). To Schwedes et al, the complexity of the transport reality is an unappealing fact in the competitive construction of a hegemonic public discourse. Furthermore, the authors argued that it is still far from clear whether e-cars could be part of a sustainable transport strategy. In the German case, for example, the problem started when e-mobility discourse was pushed away from the discussion on a sustainable transport policy by powerful actors with particular interests, such as the government protected automotive and energy industries. The authors argued that from a policy perspective the e-car is only a small part of the technological innovations, and should include a strategy to change people's transport behaviour.

There are some elements to conclude that users' perceptions were disregarded in Mobi-E project, and might partially explain its failure. In fact, according to Schippl & Puhe (2012, p.36) they play a crucial role regarding the success and failure of transport related innovations. During this research (Boavida 2011), it was not possible to detect any element of inquiry of users' perceptions until March 2010. By then a small quantitative study was carried out for the national energy certification and quality control agency (dataE 2010), regarding individuals' acquisition intentions and the localization of charging points in Portugal.

To conclude, besides some knowledge creation, the Mobi-E project fell short of the expectations. The Mobi-E policy makers' discourse inspired a sense of innovation, sublimity and the hope that technology awe would help solving the problems associated with transport economy and pollution. Behind the rhetoric, however, the Mobi-E project left behind an integration of the e-car in an overarching concept of

[19] DESPACHO N.º 115/2013
[20] http://www.apve.pt/

sustainable mobility, the need to change human behaviour and the dynamics of users' perceptions. Several other significant problems concurred to the lack of consumers' mobilization around the Mobi-E project. Among them was the financial and economic national crisis, the lack of a clear and decisive financial incentive, the deficiency of public communication and debates, as well as the inability to involve key communities with electric mobility. In this context, further research seems necessary to assess the way policy design was conducted and the existing development strategy.

References

Agência Portuguesa do Ambiente, 2006. *Estratégia Nacional De Desenvolvimento Sustentável ENDS 2015*.

Boavida, N., 2011. Decision making processes based on innovation indicators: which implications for technology assessment? *Enterprise and Work Innovation Studies*, (7), pp.33–55.

dataE, 2010. Apresentação dos resultados do estudo de mercado Avaliação do Conceito da Eficiência Mobi-E. *Adene - Agência para a Energia*, p.45.

Gouveia, N., 2010. "Is it easy to be green?" Uma abordagem ao veículo eléctrico. *Instituto Nacional da Propriedade Industrial*.

Schippl, J. & Puhe, M., 2012. *Technology Options in Urban Transport: Changing paradigms and promising innovation pathways*, Brussels: Science and Technology Options Assessment.

Schwedes, O., Kettner, S. & Tiedtke, B., 2012. E-mobility in Germany: White hope for a sustainable development or Fig leaf for particular interests? *Environmental Science & Policy*, pp.1–9.

Links

European Patent Office. http://www.epo.org/searching/free/espacenet.html

Institute Nacional de Patentes e Propriedade Industrial http://www.marcasepatentes.pt

Green Car Reports http://www.allcarselectric.com

Mobi-E. http://www.mobi-e.pt

Nissan Zero Emissions http://www.nissan-zeroemission.com

Plano Tecnológico http://www.planotecnologico.pt

Renault Portugal http://www.renault.pt

PACITA Conference, Prague

X. Thematic Session: Privacy in the Internet World

Chair: **Michael Friedewald**

Date: Thursday, March 14th, 2013

Concept of the thematic session

A universal feature of modern life is the invasion of privacy that occurs every day and in a variety of forms. Invasive surveillance activities are carried out in the name of preventing terrorism and stopping fraud. Crime control has become synonymous with surveillance technologies, information technologies and databases. The boundaries of public and private life have become blurred, and privacy has become compromised in the name of protecting the public. At the same time, users of social networks and Web 2.0 services voluntarily give away their information – supposedly to other users, but whether they know it or not, they are also giving it to companies and whoever is interested in the data freely available on the Web. Google and Facebook's power are being discussed more and more in the media, opening up a discourse about companies and citizens' handling of personal information.

The idea of a right to privacy has been a long-debated issue. For some, privacy protection can only occur through the development of transparent standards; for others, privacy is already an outdated concept. Attempts to ensure privacy protection have focused on the notion of personal data and legal frameworks. More recently, privacy-enhancing technologies have become an important technological advance, although they have not been widely adopted by the online community. It is widely acknowledged that existing legal frameworks fall short in terms of impacting on organisational practices. Thus the question to be

dealt with in this session: how can privacy be protected in the future Internet world and how can the protection keep up with the dynamic technological developments.

1.

S. Strauß/ M. Nentwich: Social network sites, privacy and the blurring boundary between public and private spaces

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Scope:	Privacy implications of social network sites
Keywords:	Social networks, interactions, privacy, surveillance, transformation

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The potential conflicts between social media and the concept of privacy are among the heavily debated issues in the information society. Features that challenge privacy are inherent in the design and diffusion of social network sites (SNS). Despite of their various usage contexts, sharing personal data and information are essential to SNS as every form of social interaction requires a certain amount of information about the parties involved. In line with the social need to communicate, SNS provide a wide range of opportunities for sharing, exchanging, creating content and collaborating with others. Thus, SNS are mainly designed to stimulate interactions and elicit or seduce users to reveal personal information. One the one hand, these novel modes of interactivity and networking mechanisms allow for fostering creativity, community building and collective actions (e.g. in the political sphere). On the other hand, the entailed new dynamics of information flows challenge the concept of privacy in a variety of ways.

The paper explores the implications of SNS on the notions of privacy and informational self-determination by focusing on the diminishing boundaries between public and private spaces. Some major aspects will be shown that foster the increasing conflation between online and (once) offline contexts. This research is based on ongoing project that studies the potential impacts of cloud computing and social network sites, funded by the STOA Panel of the European Parliament. Methods applied include a comprehensive literature review as well as practical tests of different SNS functions and applications.

SNS provide a variety of low-threshold ways to establish, modulate and extent different network-based relations. Usage contexts of SNS range from private purposes (e.g. dating, seeking friends) to professional networking (e.g. job seeking, education, business contacts, science and research). These new modes of interaction and the effects of many-to-many relations also affect the understanding of public and private

contexts. Not least due to the wide range of embedded applications in SNS, personal information and user content can hardly be distinguished in these new environments. Thus, one's control over personal information – in other words: informational self-determination – becomes increasingly undermined. User information, preferences, behavior, activities, social relationships, etc. are made explicitly visible in SNS.

SNS can also be understood as a hatchery for testing new applications and technologies – a trend that is exemplified by the many quickly evolving features, functionalities and modalities, which often entail significant changes in user requirements and challenge privacy preferences without the user's informed consent (e.g. Facebook's obligatory introduction of the "timeline" feature or the myriads of changes in its interface; or the latest, and again heavily debated new feature of the "open graph" fostering personalized search). This makes it not merely challenging for users to customize their profiles but reinforces privacy infringements on a larger scale. The possibility of SNS to map social relations on a global level provides deep insights into one's identity and behavioral patterns. The users' intentions to share information and the way this information is used by the SNS (e.g. behavioral targeting and processing of user data for commercial interests) come into conflict.

These aspects provide further contact points for the potential and effective observers of online activities in the public and the private sector: the large amount of personal information available via SNS is valuable for business models based on behavioral advertising and for predicting new trends; security authorities strengthen their efforts to observe online activities and aim at real-time surveillance to identify suspicious behavior and prevent crimes (such as recent developments in Europe and the US for standardized backdoors in cloud services and virtual applications).

With the increasing coupling of SNS with other applications and technologies, the concept of privacy becomes further strained. Social graphs and social plugins play a crucial role in this regard as they provide additional information on usage patterns also beyond the original SNS environment. SNS are thus diffusing to once separate contexts of application, entailing further loss of informational self-determination. Mobile computing and the significant growth in SNS use via smart phones allow to observe users, e.g. via location tracking; in addition, quickly evolving technologies such as face recognition are being incorporated in SNS and increase the possibility to identify and track users in an unprecedented manner.

These developments induce a transformation of the boundary between public and private as well as online and offline spaces: once separated (online) application contexts merge and also increasingly reach out to once "analog" environments. Given the rapidly growing amount of SNS users (e.g. Facebook has already more than one billion users) these trends entail a wide range of societal impacts and shift privacy concerns to a higher level. To prevent that privacy becomes lost in this conflation, there is a need to reconsider its public value. Privacy might become also a question of explicit decoupling contexts and related spaces.

2.

S. Sevignani/ C. Fuchs: Privacy in the internet: Commodity vs. common good

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Scope:	Political economy of communication, privacy and surveillance studies
Keywords:	Privacy, surveillance, commodification, common good

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By employing a political economy framework, we explore the problem of privacy in relation to computing. The privacy problem can be found on the one hand in dominant practices how personal data is used in the Internet and on the other hand in theoretical concepts of privacy. Therefore steps towards solving the problem of privacy should cover both practical and theoretical efforts. We use material from a qualitative study (N=30; semi-structured interviewing and qualitative content analysis informed by thematic coding) to ground each step of our analysis empirically.

Economic aspects are frequently overlooked in discussions of privacy on the Internet. Surveillance based business models are dominant in the Internet and pose threats to users' privacy. User privacy is not necessarily made obsolete here; but it takes on the form of a commodity. Privacy is then traded between Internet users, Internet service providers, and the advertising industry. Thereby users are exploited and users' interests in democracy, self-determination and autonomy are structurally disrespected. Instances of the commodification of privacy can be found in influential Internet corporations, such as Google and Facebook, newer developments in the video game industry, and user's attitudes towards these corporations.

On an ideological level, privacy is easy to commodify. Dominant notions of privacy stressing subjective, formal control over personal data can be characterised as possessive individualistic. They correspond to the transformation of privacy into a commodity ultimately. In this context instances can be found in influential theoretical traditions to conceptualise privacy, in the terms of use and privacy policies of major players in the Internet economy, and in users' discussions of privacy.

Against these practical and theoretical commodifying processes, we want to explore what privacy that is oriented to the common good may denote.

As the disrespect of privacy and its related values is bound to the dominant business model in the Internet economy, we must ask what practical alternatives to these models could be. Instances that aim at reformation in this context can be found in

ongoing civil society or parliamentary privacy struggles, such as 'Europe vs. Facebook', that address structural economic aspects of privacy threats. Additionally transcending instances can be found in alternative privacy protecting Internet services, such as the social networking site Diaspora. These alternative services are at the same time highly welcomed but rarely used by users.

Alternative practical developments frequently leave intact and make use of the dominant possessive individualistic concepts of privacy. For privacy in the Internet that is oriented on the common good, these concepts are self-contradictory and less helpful. Therefore an alternative notion of privacy is needed. Such a notion of privacy can proceed from newer privacy theories that reject individualism and takes into account trans-subjective and societal aspects. Aside possessive individualistic privacy notions, those aspects can also be found among users. A social concept of privacy must also reject subjective formalism and try to identify who and for what purpose privacy is acclaimed based on an analysis of societal power relations.

3.

L.M. Hilty/ B. Oertel/ M. Wölk: Identifying, tracking and tracing. From geographic space to cyberspace and back

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Scope: Our study discusses the societal implications of localization (or positioning) technologies with regard to surveillance, privacy and security issues.

Keywords: Location Privacy, Positioning Technologies, Navigation Systems, Social Networks, Location-Based Services

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An increasing number of technologies are being used that involve information on the location of objects or persons. In addition to the widely known geolocation by satellite via GPS, today at least 12 more technologies are being used that make it possible to determine the location of devices, and indirectly that of their users. This may happen in real time (tracking) or after a delay depending on the technology (tracing); it may happen with a degree of precision ranging from a few kilometres to a few centimetres, and either with or without the knowledge of the persons affected. The mix of technologies in use today bears greater privacy risks than the relatively manageable RFID technology, which created a public debate some years ago (Oertel et al., 2005).

The TA-SWISS study "Localized and Identified – How Localization Technologies are Changing Our Lives" (Hilty et al., 2012) examined the technologies, applications and Swiss legal framework conditions of localization technologies, including the situation in the EU whenever relevant.

Localization technologies offer many societal opportunities, e.g. for promoting public transportation (easier to find connections and to pay for them), for emergency and rescue operations, for personal security and orientation at unfamiliar locations, for meeting friends and perhaps even for making friends among strangers.

However, as localization technologies become more readily accepted, society is becoming more dependent on them. They are becoming new critical infrastructures the malfunctioning or collapse of which can have far--reaching consequences comparable with a breakdown of the telephone network. Manipulated localization information may have even more serious consequences than a lack of information, because it can misguide vehicles, persons and freight.

It is mainly the combination of two factors which make considerable societal risks develop in addition to the obvious advantages and opportunities afforded by localization technologies. The factors are:

1. *A drop in the voluntary nature of our use of localization technologies:* If a person does not wish to be located even today, she has to do without a mobile phone and many Internet functions, in extreme cases even without electronic access and payment systems – thus becoming excluded from many aspects of personal and professional life.

2. *The increasing amount of personal data in circulation* due to the increasing generation, transmission, storage and processing of localization data: the public or private--sector offices that process such data can combine them into tracking and relationship profiles. Far--reaching profiles of persons and groups can be assembled by combining that with other data, in particular geographic data.

The combination of these two aspects – the drop in the voluntary nature and the increasing amount of data – holds a potential for societal conflict because the difficulties of the individual that exist today in getting her right to informational self-determination respected might later intensify to a critical mass. The lack of transparency in the processing steps used, which are frequently not associated with a person until after the fact, is increasing the risk of personal and data protection violations.

By using a qualitative risk assessment approach developed in an earlier TA-SWISS study (Hilty et al., 2004; Som et al. 2004), the project team identified a number of issues calling for political action.

Conclusion

Need for political action has been identified in the following areas:

- For the technical surveillance of people in dependency relationships, especially employees, persons needing protection and children;
- In Child Protection Measures pertaining to the participation of adolescents in social networks with a localization function;
- In defending the informational self-determination of the individual vis-à-vis the state and private-sector enterprises; this is a matter of maintaining control over one's own data and avoiding the thoughtless surrendering of basic rights;
- In limiting the retention of localization data, because in many cases it can be associated with persons after the fact, possibly jeopardizing their rights to privacy ("right to be forgotten");

- As regards the permissibility of the Terms of Service (ToS) used by the providers of software packages and services with localization functions, some of which violate current law;
- Taking seriously the model function of government offices in implementing data protection principles, whenever they use localization technologies to perform their own duties more efficiently;
- To recognize the security of localization systems as a new critical infrastructure and to protect the populace against those forms of cyber-criminality that are facilitated by localization technologies.

From this list, a set of recommendations was derived.

The *general recommendations* aim to develop further the legal framework: There is an urgent need for introducing more efficient ways to sanction violations in the data protection rules intended to effectively prevent the misuse of personally identifiable data (in particular, the localization data of persons). Furthermore, measures are needed to improve the enforcement of data protection principles in the international context. Localization systems are developing into critical infrastructures for the Swiss population and must therefore be protected from malfunctions, breakdown or destruction. Many people have difficulty understanding the operation of software products and services that process localization data; this inability makes a certification necessary, so that software products become more reliable and transparent. The widely discussed "right to be forgotten" for personal data is of special importance in the case of localization data; therefore a legal anchoring of this right should be investigated thoroughly. Empirical social science research is needed so that the real handling of localization technologies in everyday life and the social development dynamics of sharing relations and dependencies can be better understood. Such an understanding is the basis for effective regulation.

In addition to the general recommendations that aim to establish legal guideposts for the on-going development and use of localization technologies in compliance with basic law, we next articulate *special recommendations* for more specific areas: improving the public's understanding of the Terms of Service of social networks; directions and a clearer regulation of the permissibility of localization at one's place of work; integration of the topic of localization in measures to promote the media literacy of adolescents; the introduction of effective ways to establish the legal age of users of Internet services with localization functions; the accession of Switzerland to the Council of Europe Convention on the Protection of Children from Sexual Exploitation and Abuse; exercising the model function that governments have in the application of localization technologies; bringing the use of crowd sourcing (cooperation of many volunteers) in road traffic into compliance with data protection principles; a uniform regulation of video localization; the extension of the principle of the so-called Robinson List ("don't send me any advertising") to digital media, especially location-based marketing.

References

Hilty, L. M.; Oertel, B.; Wölk, M.; Pärli, K.: Lokalisiert und Identifiziert. Wie Ortungstechnologien unser
Leben verändern. vdf Verlag, ETH Zürich 2012

Hilty, L. M.; Som C.; Köhler A. R.: Assessing the Human, Social and Environmental Risks of Pervasive
Computing. Human and Ecological Risk Assessment, 10 (5) 2004, 853-874

Oertel, B.; Wölk, M.; Hilty, L. M.; Köhler, A.: Security Aspects and Prospective Applications of RFID
systems. Bundesamt für Sicherheit in der Informationstechnik, Bonn, 2005

Som, C.; Hilty, L. M.; Ruddy, T.: The Precautionary Principle in the Information Society. Human and
Ecological Risk Assessment, 10 (5) 2004, 787-799

4.

P. Schütz/ M. Friedewald: Privacy by design for biometric authentication solutions

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Scope:	Privacy by design within the technological project MARS (Mobile Authentication via Retina Scanner)
Keywords:	Biometrics, retina scanner, privacy by design, authentication, identification

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MARS (Mobile Authentication via Retina Scanner) is a civilian security research project funded by the German Federal Ministry for Education and Research BMBF. One of the central goals is to prepare the grounds for a retina scanner technology used in a civilian context allowing authentication and identification of individuals with increased security but in a privacy- and user-friendly way. In a mid to long-term perspective, applications of that technology are intended to be integrated into smartphones, tablets or other mobile devices. In order to explore and outline practical problems in privacy, data protection, discrimination and user-friendliness, we have developed scenarios in which the retina scanner is used for mobile online-banking transactions and verification purposes of security guards.

Based on the scenarios, a comprehensive legal analysis with special focus on the conflicts of the collection and processing of retina data with current and upcoming data protection law has been carried out. Moreover, a medical analysis of surplus information that can be deduced from the collected retina data, used for the biometric authentication templates, is being conducted. Since high-resolution retina pictures have the potential to reveal highly sensitive health information comprising hints to medical anomalies or illnesses such as diabetes and hypertension, there is the risk of function creep of the retina scanner technology that has to be address as early as possible in the development process, i.e. in the design phase of the actual hard- and software.

Although the MARS project particularly aims at a biometric authentication technology that from the user's perspective takes privacy and convenience into serious consideration, the combination between a tangible technological development and an abstract (and still experimental) TA method such as a Privacy Impact Assessment (PIA) poses enormous challenges on both sides, the engineers' and social scientists'. Beyond the mere technical realization of the retina scanner, acceptance research suggests that

simplicity, transparency, practicality and convenience as well as a tangible security benefit for the user must be aimed at, as well, when designing a new civil security technology that should prevail on the future market. However, it has to be closely watched and remains a balancing act that privacy by design and PIA approaches are merely used to give additional legitimacy to the developed product.

5.

J. Pridmore: Personal data ecosystems and our “digital exhaust”: User centric services as a reformulation of privacy

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Scope:	Personal data and Privacy, User control and standardization
Keywords:	User centricity, Privacy, Informational Self-Determination, Digital Profiles

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The development of coalitions of companies and service providers and the push to standardize interoperable networks of information sharing and use are intended to allow for extensive user control of personal data. Though privacy is not the primary motivation for the development of these ‘personal data ecosystems’, the focus on user control does refer back to privacy, reformulating the ‘problem of privacy’ as a one that stems from the inability of users to be responsible for their own data. This has driven the development of particular protocols and standards intended to allow organizations to provide simplified solutions that work across various platforms. These are forms of ‘identity management systems’ that seek to empower and enable consumers to reveal and conceal the information they want to in the context of their choices serves to maximize user control and therefore ensure a particular conception of personal privacy. All traces of user activities remain under her control, so that the ‘digital exhaust’ produced from daily activities are seen as assets from which the user can profit.

User centric identity management systems such as are promoted by organizations such as the Personal Data Ecosystem Consortium are advantageous in many respects. The development of open standards ensures data portability and interoperability, key features of new European data protection legislation. It also is intended to allow individual users access to the value of their own data and more fully allow for informational self-determination. Given the increasing reliance on digital profiles and as social media, digital communication and mobile computing have become ubiquitous, personal control over data will only continue to grow in importance. However, this individualistic approach reinforces the conception of all data as a commodity and it relies upon an implicit trust in systems of identification that are largely hidden from the user’s view. In addition, this may ignore the negotiated ways in which people make use of their own information, personal privacy and varieties of services choices. It is also unclear what effect these proposals might have on significant players in new and social media, from Google, Facebook, Twitter and Microsoft, to mobile phone companies and internet service providers.

Efforts to make the use and exploitation of digital information more user centric simultaneously relies upon and reformulates conceptions of privacy. It is posed against a particular problem perceived to exist in contemporary information practices, that of consumers not having the opportunity to gain from the use of their own personal information. This translates the use of personal information not only into an issue of personal control, but also commodifies this information in new ways, creating potential problematic relations to privacy. As we assess developments in new technological practices, the focus on informational self-determination in these particular practices need to be weighed carefully in terms of their advantages and their disadvantages.

PACITA Conference, Prague

XI. Thematic Session: Social Media

Chair: **Michael Nentwich**

Date: Thursday, March 14th, 2013

Concept of the thematic session

In this session we shall explore, from a technology assessment perspective, the opportunities and impacts of recent salient developments in the Internet. While our main focus will be on the so-called social media like social network sites, and microblogging services, we will also touch upon Google. The contributions to this session have complementary perspectives on how the current and forthcoming web architecture is shaped and is or may be shaping society, behaviour, academia, and politics.

Mirroring the session's theme we aim at stirring parallel Twitter coverage (comments, questions) enabling also virtual participation. The hashtag for the overall conference, and this session in particular, is #PaciTA13.

1.

J. Simon: Social Media as a topic and a resource for TA

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Scope: Social Media as a Topic and a Resource for TA, E-Participation, Crowd-Sourced Policy Advice, New Roles & Methods for TA

Keywords: Social media, e-participation, data mining, crowd-sourced policy advise

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With my contribution regarding the dual role of social media as both as a topic and potential resource for TA, I will address several of the main subject areas outlined for the PACITA conference. In particular, I will focus on "(t)he kinds of knowledge and dialogue needed for decision-making in societies in order to accomplish the great transitions as well as "novel methods, such as the use of various art forms, to reach different types of actors and target groups" in order to address "changes to societal relationships through ICT".[21]

In my presentation, I will briefly introduce four case studies:

1) The *Onlife Initiative* of the European Commission (DG CONNECT) as an example of an expert-based initiative providing policy advice regarding the societal impact of ICT and regarding societal expectations towards policy making.[22]
2) The *Futurium* as a project also initiated by DG CONNECT to harvest the wisdom of the crowds for the bottom-up creation of future visions, trends and policy ideas.[23]
3) *Avaaz*, the world's largest online campaigning community for change using social media to bring "people-powered politics to decision-making on any issue of public concern".[24]
4) Finally, I will indicate recent lines of research directed at using social media for decision-making in politics by analyzing crowd-sourced content through data mining and related computational techniques.

[21] These quotes are taken from the main subject areas outlined for the PACITA conference, cf. http://pacita.strast.cz/en/conference/programme (last date of access 18.1.2013)
[22] https://ec.europa.eu/digital-agenda/en/onlife-initiative (last date of access 18.1.2013)
[23] http://ec.europa.eu/digital-agenda/futurium/ (last date of access 18.1.2013)
[24] http://avaaz.org (last date of access 18.1.2013)

All these initiatives take place beyond the boundaries of classical TA. Yet by exploiting or addressing social media, they tackle core issues of TA, such as participation or the provision of policy advice. It may therefore be feared that these developments could endanger the status of TA by accomplishing tasks and offerings competencies considered core *TA tasks and competencies*.

Several strategies may therefore be advisable regarding the relationship between TA and social media. With respect to the use of social media as a *resource* for TA it may be necessary to form alliances and collaborate with experts on big data analyses and to learn from them and develop novel TA methodologies harvesting distributed data and crowd-sourced content. However, given TA's expertise in participation, another task for TA consists in making sure that *e*-participation it not reduced to mere data mining. For true e-*participation* it is not enough that crowd-sourced content provided by distributed agents is processed and made available to decision makers. We need to make sure that citizens have a voice which they can raise, they must be supported and empowered to truly participate, not merely to have their digital traces being processed. Here TA can learn from successful projects such as Avaar.org. Finally, social media is and remains also a *topic* of TA by asking questions regarding the role of social media for society.

2.

J. Timmer/ F. Brom: The precoded web and the way it shapes our behaviour

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Scope:	Internet, persuasive technology, digital autonomy
Keywords:	ICT, persuasive technology, interface design, personalization, online service providers

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We keep in touch with our friends using Facebook, find romance with the help of dating sites, use online voting aid applications to know whom to vote for, and if we have other questions we just ask Google. In many of our day-to-day decisions we use online software to aid us. These web based services take a lot of work out of our hands, but at the same time have a strong influence on our choices and behaviour. The way our web searches, social contacts, and dating efforts are mediated by these services is far from neutral. Online service providers have their own commercial goals, and our communication and choices are often times structured along these goals. Building on research by authors like B.J. Fogg discussing computers as persuasive technology, we investigate how the algorithms and interface design of web services like search engines, dating sites and social networks influence and steer the behaviour of their users.

In the design of online services choices about the options and information we get, and those we don't get, have been made for us. This makes communicating and finding information quick and easy, but also limits and influences us. Taking the business models of different services as a starting point we found interesting examples of how these site design choices are motivated by commercial interests: Social network sites, employing strategies to increase communication and activity over the network to gain more valuable personal data. Dating sites, programming fake profiles to promote their paid memberships. And even e-health sites incorporating product related queries in their health questionnaires.

An important trend in the way choices are being pre-configured is that more and more content is becoming personalized. What we get to see is based on what we've clicked before. Facebook and Google use personalization extensively to filter our huge amounts of search results and social network updates, down to what they think is relevant. The development of Facebook and Google proved to be extra interesting as

both sites are repositioning themselves as 'identity providers': the central account that is used to access all our online services, and the profile used to filter and personalize our information diet. This puts them in a central position where massive quantities of data on our online behaviour can be collected, and where our view on the online world is determined by the filtering choices of the personalization algorithms.

The web is becoming increasingly pre-coded to our personal desires. The vast sea of information that is found on the internet is being filtered down to a selection of information that matches our personal profiles and supposed desires. This personalization helps us in finding the information we are looking for, but it also denies us from alternative choices and sources of information. Applied on a large scale by important information providers like Google and Facebook this limits our online autonomy and puts us at risk for algorithmic narrow-mindedness. To regain control and autonomy transparency is needed into how information is being selected for us and how our profiles are being collected and put to use. We need the ability to opt out of a personalised media diet when we desire, and have to realize that online services are not neutral platforms. The web is a place of huge opportunity for entertainment and personal development, but a critical perspective on how information and options have been coded and designed, is vital to appreciate online content appropriately, and to make our own choices instead of the choices designed for us.

3.

R. König: The Googlization of academia: Scientific content between search engine optimization and personalization

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Scope:	Sociology of (scientific) knowledge, internet research
Keywords:	Search engines, algorithms, scholarly communication, public understanding of science

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Facebook has recently introduced a new feature called “Graph Search”. CEO Mark Zuckerberg stressed that it is not to be confused with Google, as it does not search the entire web but only Facebook´s “graph” of connected users (Hatmaker 2013). Nevertheless, Facebook also includes results from Bing, Google´s competing web search engine by Microsoft. No matter if this feature will be a success, it represents a trend: Search becomes more personal and social network sites become more searchable. Google has tried to establish their own social network site (Google+), apparently in order to get access to the valuable social connections made through such services. Both strategies aim at keeping users on their site, thereby extending their positions as central platforms dominating the internet. Already today, Google and Facebook appear “too big to fail”. It is a battle between only a few giants who can compete with the power and infrastructure of the scale accommodated by these companies. Their underlying philosophies are technically inscribed and enforced through algorithms and interfaces which ultimately define the users´ ability to interact. The new currency of information is Google´s “link economy” and Facebook´s “like economy” (Gerlitz/Helmond 2011) – even beyond these platforms.

The private sector has reacted quickly. Today, there are rarely any commercial websites which do not go through search engine optimization, a marketing method which aims at achieving high search engine rankings by modifying online content in a way that meets the criteria of crawlers and algorithms. Since user studies clearly and repeatedly have shown that search engine users mostly follow the first links in the results, these links are considered crucial for the visibility of a company and its products. At the same time, more and more businesses hire social media experts and some even make use of questionable methods such as buying “friends” or “likes”.

But not only the private sector is concerned about its online visibility. More and more, academia is adapting to the new reality. For example, Beel et al. (2010) have suggested

performing “academic search engine optimization” for scholarly articles to give them a better position in academic search engines like Google Scholar. Their suggestions reach from providing correct metadata (e.g. names, publishing dates etc.) to a strategic selection of keywords, titles and even publishers. We may regard this as an indicator for the “Googlization” (Vaidhyanathan 2011) of academia. But of course, this development goes beyond the ranking of scholarly articles in specialized search engines. Academics retrieve all kinds of information through search engines (not limited to those with an academic focus): They look up technical terms, conference programs, colleagues and pretty much everything that matters in their daily routines. At the same time, search engines also provide direct access to scientists and scientific content for people outside of the academic realm. Therefore, the public understanding of science is increasingly mediated through search engines and their algorithmic indicators for relevance. Needless to say, the relevance of an economy of links and likes is not necessarily the same as the relevance determined by scientific experts.

The talk will present some empiric cases illustrating how scientific content is re-ordered in this environment. It will address a number of critical questions such as: Can, should or must academia adjust to this new reality of information politics? What are the problems related to methods like academic search engine optimization and how else could this problem be tackled? What kind of social dynamics are triggered by the (potential) re-ordering of information hierarchies? How will trends like personalizing search engines and adding social features (e.g. content based on personal networks) impact academia?

While some might welcome this development as another step towards a democratization of science, one could argue that it allows for manipulation and opens academia´s gates for pseudoscience and commercial interests, potentially leading to undesired activities like green washing, underplaying risks of drugs and technologies etc. But which possibilities do academics have to directly interfere here? Google ultimately defines the relevance of scientific content in their search engines, not academics. Given the wide usage of Google services inside and outside of academia, it might be justified to speak of an algorithmic shift in information dissemination. Of course, this shift is not limited to Google but includes many more platforms which apply algorithms to organize information. More and more, these algorithms decide over the relevance of scholars and their texts. Evidently, it is still humans who have to assess the actual scientific relevance of publications. But algorithms may ultimately provide or deny visibility. Academics will have to deal with these new mechanisms of inclusion and exclusion. Search engine optimization is one answer to this algorithmic shift but given the vulnerability to manipulation, it is debatable whether it is desirable.

References

Beel, J., Gipp, B. und Wilde, E., 2010, Academic Search Engine Optimization (ASEO): Optimizing Scholarly Literature for Google Scholar and Co., Journal of Scholarly Publishing 42(2), 176-190.

Gerlitz, C. und Helmond, A., 2011, Hit, Link, Like and Share. Organizing the social and the fabric of the web in a Like economy, DMI mini-conference, University of Amsterdam <http://www.annehelmond.nl/wordpress/wp-content/uploads//2011/04/GerlitzHelmond-HitLinkLikeShare.pdf>.

Hatmaker, T., 2013, Facebook Debuts Graph Search, A Natural Language Powered Social Search Engine, readwrite.com, January 15 <http://readwrite.com/2013/01/15/facebook-graph-search>.

Vaidhyanathan, S., 2011, The Googlization of Everything. And Why We Should Worry, Berkeley/Los Angeles: University of California Press.

4.

J. Visser: Policy making and science – through Twitter the twain shall meet

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Scope:	Influencing Policy Using Social Media and Science
Keywords:	Social media, policy making, public affairs, evidence based policy

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Scientific research and policy making are a difficult match. People from very different worlds do try to speak each other's language, but they each have their own jargon. And researchers' time paths are very different to those of politicians. Social media can be an effective tool for bypassing these issues.

One important dilemma is the precision with which researchers work: when they want to make scientifically sound statements, they are bound by the precision of the definitions they work with. Being a good scientist who speaks the truth is at par with providing information to politicians, who use different definitions. Another dilemma is the timing of scientific research, which may take years to produce valid and reliable results, versus the timing of politics, where current affairs in the media are on the agenda. That agenda often changes faster than researchers can provide answers. Meanwhile, third parties are trying to influence politicians – people who have a political agenda. And who play the game by different rules and with different types of information.

So how can scientists and politicians be in effective direct contact more? In this presentation, the dilemmas above will be explored. Examples of how both scientists and politicians use social media will be used to show how they make those media work for them – and how those means can help practitioners of technology assessment as well.

PACITA Conference, Prague

XII. Thematic Session: Participatory Methods

Chair: **Robby Berloznik**

Date: Thursday, March 14th, 2013

Concept of the thematic session

Participatory Technology Assessment is generally been recognized as standing at the forefront of the development of participatory methods. The question is if this will stay that way. Together with TA more and more research areas such as science and technology studies, innovation studies, action research are using, developing and promoting participatory methods. Together with a societal trend in which participation is seen as being valuable to complement the traditional democratic decision-making procedure, one can say that TA has not got the monopoly any more in participatory methods development. Therefore is it important to see and discuss new developments in this field. This Thematic Session on Participatory Methods will create the opportunity for those who reflect on new methods, those who develop such methods and those who apply methods to present and discuss findings and experiences with colleagues and an interested public.

1.

A. Bogner/ H. Torgersen: The paradox of participation in new and emerging technologies

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Scope:	Framing a debate over emerging technologies, problems of project-shaped participation, contextualizing a virtual technology
Keywords:	Discursive frames, emerging technologies, upstream engagement, project-shaped participation, synthetic biology

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New and emerging technologies play an important role in the innovation agenda. At times, they met a sceptical public, which gave rise to normative demands for giving them a say. This is reflected in the STS literature, highlighting the necessity of empowerment and of democratising technology policy. In recent times, the introduction of new technologies goes along with an increasingly rich offer of participatory and dialogue events, aiming at providing an opportunity for both spreading the message of the new technology and discussing its potential implication. At the same time, science and technology development increasingly gets entangled (technoscience). Participatory and dialogue events therefore focus on 'upstream' technology development. As a consequence, issues to be discussed in participatory events get highly abstract and practical applications become hypothetical at best.

Due to the complexity and detachment from everyday-life lay people are not very keen to engage in such issues. Despite ample opportunity, few actually get involved. Participatory procedures increasingly get experimental and project-shaped – they become as "virtual" as the technologies they refer to.

Due to the abstractness or virtuality of emerging technologies public participation has to be organised "from the outside". Participation, in other words, takes often the form of a project. This means:

- Public dialogues and engagement procedures are initiated and organised by professional participation specialists, often from the field of STS.
- This participation often takes the form of a research project funded by a third party (external funding agencies).
- Citizen participation takes place largely without reference to real public controversies, to individual concerns.

Due to the lack of public interest there is the need to contextualise an abstract issue, i.e. to make it interesting and debatable to lay audiences. In other words, such upstream debate needs a dominant frame that determines which arguments are legitimate and which issues are relevant.

Taking the example of synthetic biology (SB) we show that in order to contextualise the new technology such frames tend to be based on previous debates over other (then) novel technologies. So far, three technologies have provided frames for discussing SB: (green) biotechnology, nanotechnology and information technology. Each comes with particular analogies, perceptions on what is important, expectations and fears.

The fate of SB might depend on which pattern will prevail and convey its frames to an emerging public debate on SB. The consequences for a possible debate and for the prospects of participation of adopting one or the other frame should not be underestimated and might even influence the technoscientific development. SB thus may serve as a test-bed to study processes of framing the debate on new and emerging technologies.

2.

S.R. Davies: Technology assessment in a deliberative society: Informal public engagement as science policy

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Scope:	Novel methods; Types of knowledge and dialogue required for great transitions; Approaches needed for TA
Keywords:	Participation; Deliberation; Public Engagement; Art

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New and emerging technologies present new challenges for society. As developments in nanotechnology, neuroscience, synthetic biology, biotechnology, ICT, and energy systems progress, they re-order taken-for-granted patterns of both daily life and science policy and regulation. We live in a moment of transition, in which – we are told – technology will disrupt the texture of society (e.g. Roco and Bainbridge 2003). We need, then, not only new technologies but also new social techniques for assessing these technologies – tools which can explore complex, uncertain developments through innovative methods (Davies et al 2010). In this paper I argue that such techniques and tools can be developed not only by making use of the traditional lineage and formats of technology assessment, but by looking beyond, to informal modes of public engagement with science. In so doing I suggest that we should move beyond a model of deliberation as process-oriented to one in which it is pervasive, informal and continual – one in which the emphasis is on the *deliberative society* rather than the deliberative *event* (Brown 2009; Parkinson 2006).

I start by outlining recent work in STS on public deliberation and engagement with science and technology, noting some of the critiques that have been levelled at the many deliberative processes which have sought to enable public assessment of technologies such as nanotechnology or synthetic biology (see, for instance, Delgado et al 2011; Irwin and Hagendijk 2006). Within this literature it has proved difficult to move beyond what we might describe as the consensus conference as implicit model: a perspective in which technology assessment is a one-off event which should ideally influence policy in some way, and within which diverse actors exchange reasoned arguments. Using literature from political theory, I suggest that participatory democracy can be better understood as being enacted through multiple, diverse 'deliberative moments'. For Parkinson (2006), for instance, deliberative democracy is distributed – stretched across a network that may encompass activism, formal policy making, and the use of deliberative micro-publics. Each node will have its weak points

– its infelicities as a democratic or deliberative form – but, taken together, robust outcomes can be reached.

If we take the deliberative society as our starting point, our imagination of technology assessment can be radically altered to incorporate not only formal, policy-oriented processes but features of civil society and private life such as activist engagements (protests, charitable events, fundraising, advisory roles), artistic interventions (science and technology-related art, music, theatre, dance or film), leisure activities (museum visits, popular science, hacking and making, informal dialogue events) and even science PR (advertising, university open days, lobbying). Rather than technology assessment of any one issue comprising a single event, or even a series of events, we can envisage an ecosystem of participation, in which science policy draws upon a wide range of activities and deliberative moments. As I close I reflect upon what this will mean for practice: how can practitioners of TA and foresight methods draw on societal capacities for deliberation so as to make use of these existing events, activities, practices and meanings?

3.

B. Seewald/ K. Kimpel/ M. Schraudner: Discover markets - participatory methods for integrating user experience

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Scope: The talk is going to provide a comprehensive overview of the methodology developed so far, to introduce the original workshops that are part of that methodology, and to present two health-care-related subprojects.

Keywords: Knowledge transfer, diversity, collaborative design, collaborative ideation, user experience

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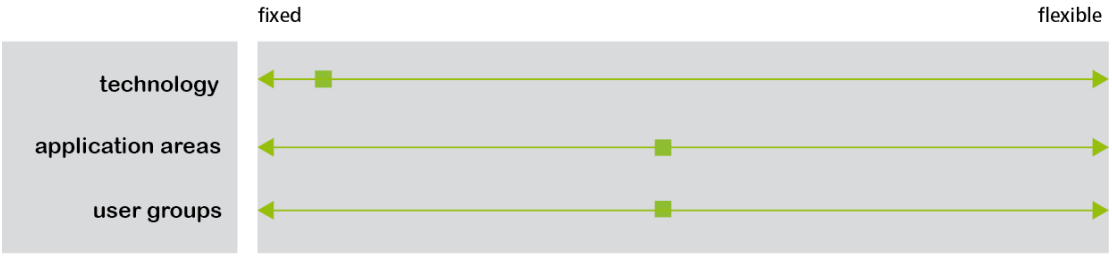
Public acceptance is vital to innovation. By matching technological advances to societal developments, by conforming to the preferences of prospective users, and by recognising a plethora of potential applications early in the innovation process, we can discover and capture new markets.

Fraunhofer's Discover Markets pursues an original methodology that fosters collaborative ideation and thereby promotes the integration of user experience into all stages of research and development. Since the beginning of the project in 2010, the interdisciplinary team has developed, tested, and refined a range of suitable methods. Methods that were established to facilitate the co-ideation process now compose a modular toolbox.

In the proposed talk, we intend, inter alia, to provide a comprehensive overview of the methodology developed so far, to introduce the original workshops that are part of that methodology, and to present two health-care-related subprojects. These projects have different levels of flexibility on three axes: the technologies under development, their potential application areas, and prospective user groups. We intend to illustrate how these levels can affect the choice of collaboration formats. Short descriptions of the projects and of the chosen formats follow.

Project 1 – CareJack

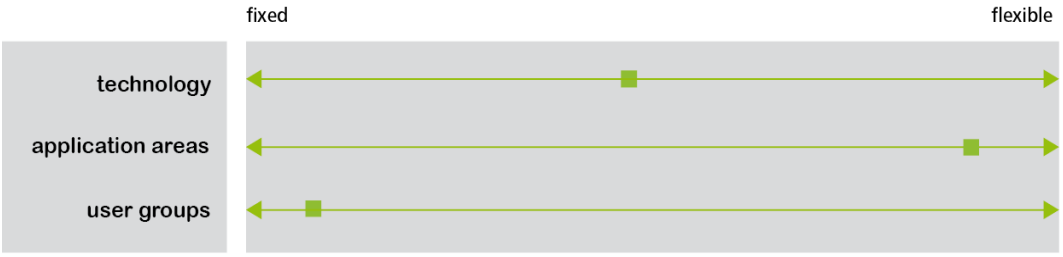
A group of scientists, designers, engineers, physical therapists, and professional caregivers is designing an orthesis that will be easy to attach and equally suitable for inpatient, outpatient, and at home care including physical rehabilitation. The therapists and caregivers work in a variety of settings including private residences and a range of health care facilities; their diverse input thereby delivers a variety of professional perspectives. The following figure demonstrates the levels of flexibility and the chosen workshop design.



→ **Workshop design:** **Objective: to identify potential applications and prospective user groups**
Timing: before applying for a grant
Methods: demand analysis and demand visualisation (e.g. "story-telling", prototyping)

Project 2 – Akrobatik@home

A group of scientists, designers, engineers, professional caregivers, physical therapists, and congenitally handicapped non-specialists is working on a web-connected home device that can provide a fitness programme for people with very limited mobility. The programme will enable the users to exercise alone, online in a group, and/or under a supervision of a professional physical therapist. The following figure demonstrates the levels of flexibility and the chosen workshop design.



→ **Workshop design:** **Objective: to identify potential applications, to estimate the demand, to develop initial approaches, and to evaluate their technical feasibility in order to finally determine the specifics of the technology**
Timing: throughout the entire project
Method: collaborative creation (e.g. "story-telling", prototyping)

4.

K. Kimpel/ M.K. Luge/ M. Rehberg/ M. Schraudner: Shaping the future - participatory methodology at the intersection of design and technology

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Scope: The talk is going to show opportunities at the intersection of design and technology in developing an original participatory methodology.

Keywords: Participatory foresight, novel methods, design thinking, design prototypes, enabling spaces

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The need for *transformative innovation* (STEWARD 2012) reveals the growing necessity of orienting technological advances toward the preferences of prospective end-users, which in turn emphasizes the core value of engaging the latter in *consumption-oriented socio-technical networks*. Utilizing a collective interdisciplinary perspective, these networks are characterized by an outcome-oriented approach to problem-solving (GIBBONS et al. 1994) and by synthetic knowledge creation as opposed to analytical knowledge creation, i.e. the production of know-how as opposed to the production of know-what (MOODYSSON et al. 2008). Due to this orientation toward application, collaborative ideational processes require new methods that can enable both laypersons, as "experts in everyday life", and decision-makers from research, business, and political organizations to interact on equal terms. By expanding the boundaries of "traditional" research and development to include laypersons, such methods provide an effective innovation tool, indispensable in a knowledge-centric society.

Existing methods of participatory innovation, however, still appear to be in the initial stages of development (BOON et al. 2011; WARNKE et al. 2008). Against that background, actor network theory (CALLON 1986; LATOUR 1986) provides a promising approach. In particular, the object-centric methods from design research that utilizes

design provotypes (MOGENSEN 1992) and *enabling spaces*[25] (PESCHL 2007; PESCHL & WILTSCHNIG 2008) supplement the "traditional" methods of verbal articulation with a variety of new interaction formats. The co-ideational process can be realized through the joint creation and exploration of objects; this enhances access to *implicit knowledge* (POLANYI 1966) and fosters its transformation into haptic symbols. The preferences of potential users can thereby be articulated and made available for discussions early in the innovation process.

Fraunhofer's *Shaping Future*, funded by the German Ministry of Research and Education, draws from these approaches in order to develop an original participatory methodology. Motivated by the principles of collaborative ideation and remaining mindful of the *dilemmas of participation* (HELM 2007), the interdisciplinary team engages non-specialists[26] in their exploration of the following questions:

- Which methods, formats, and settings will enable and encourage laypersons to participate in the innovation process?
- How will these methods and formats function in these settings?

References

BOON, W.P.C.; MOORS, E.H.M.; KUHLMANN, S.; SMITS, R.E.H.M. (2011): Demand articulations in emerging technologies. Intermediary user organisations as co-producers? In: Research Policy 40, pp. 242-252.

CALLON, M. (1986): The sociology of an actor-network: The case of the electric vehicle. In: Mapping the dynamics of science and technology, ed. Michel Callon, John Law and Arie Rip, pp 19–34. London: Macmillan Press.

GIBBONS, M.; LIMOGES, C.; NOWOTNY, H.; SCHWARTZMAN, S. (1994): The New Production of Knowledge- The dynamics of research and science in contemporary societies. London/Thousand Oaks/Neu-Dehli: Sage Publications.

HELM, VAN DER R. (2007): Ten insolvable dilemmas of participation and why foresight has to deal with them. In: Foresight 9 (3), pp. 3-17.

LATOUR, B. (1986): The powers of association. In Power, action and belief. A new sociology of knowledge?, ed. John Law, 264–80. Sociological Review monograph 32. London: Routledge & Kegan Paul.

MOGENSEN, P. (1992): Towards a Provotyping Approach in Systems Development. In: Scandinavian Journal of Information Systems 4, pp 31-53.

MOODYSSON, J., COENEN, L., ASHEIM, B. (2008): Explaining spatial patterns of Innovation: analytical and synthetic modes of knowledge creation in the medicon valley life science cluster. Environment and Planning A 40 (5), pp 1040–1056.

[25] *Enabling spaces* are transformable along a number of both physical and psychic dimensions such as social, cognitive, and emotional.
[26] So far, 150 laypersons have participated in the project.

PESCHL, M.F. (2007): Enabling Spaces -- epistemologische Grundlagen der Ermöglichung von Innovation und knowledge creation in N. Gronau (Ed.), Professionelles Wissensmanagement. Erfahrungen und Visionen. Berlin, pp. 362–372.

PESCHL, M.F.; WILTSCHNIG, S. (2008): Emergente Innovation und Enabling Spaces. In: Lucke, U. et al. (Ed.): Proceedings der Tagungen Mensch & Computer 2008.

POLANYI, M. (1966): The tacit dimension. University of Michigan, USA: Anchor Books.

STEWARD, F. (2012): Transformative innovation policy to meet the challenge of climate change: sociotechnical networks aligned with consumption and end-use as new transition arenas for a low-carbon society or green economy. In: Technology Analysis & Strategic Management 24, pp 331-343.

WARNKE, P.; WEBER, M.; LEITNER, K.-H. (2008): Transition pathways towards user-centric innovation. In: International Journal of Innovation Management 12 (3), pp. 489-510.

PACITA Conference, Prague

XIII. Thematic Session: Energy Transition

Chair: **Reinhard Grünwald**

Date: Friday, March 15th, 2013

Concept of the thematic session

A fierce public and political debate is going on in a number of countries about the question how the way we use energy could be made more sustainable. In order to achieve the internationally agreed 2°C-goal to limit climate change, the industrialised countries have to reduce energy related greenhouse gas emissions by at least 80 % by 2050. To accomplish this, the electricity sector has to become essentially carbon-neutral. Because the energy sector is vital for the creation of economic wealth and is very special in terms of its technological and economic framing, actor constellations ("old" vs. "new") as well as societal perceptions and acceptance, it poses tremendous challenges for technology assessment.

In this session we will look at the issue of "energy transition" from three different angles: The first is a systems perspective: how are views of the long-term development of the energy system created (e.g. visions, scenarios, projections and prognoses) and how can they be made productive in terms of present-day decisions. Secondly, the development is not going on "all by itself", but it is governed by a number of actors in economy and politics as well as relevant interest groups and the society at large. Their different perceptions, motives, interests and possibilities to influence decisions open up the field of "transition governance" that certainly deserves the attention of TA. The third perspective is the one directly from the "machine room", discussing what concrete instruments and measures can be applied to steer the development in the desired direction and which technologies are developed and implemented in order to achieve this.

1.

M. Ornetzeder/ P. Wächter/ H. Rohracher: Transition pathways to a sustainable energy future in Austria: Socio-technical scenarios and structural challenges

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Scope:	Foresight looking activity
Keywords:	Energy system; Socio-technical scenarios; Stakeholder involvement; Foresight; Backcasting

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Reducing greenhouse gases by 80 percent, as demanded by the IPCC, is one of the great long-term challenges faced by our societies today and will doubtlessly require transformative changes to current energy regimes. Large-scale system transitions such as the one envisaged for the global energy system in the next 30-40 years can only be realized through complex processes of change involving global, regional, national, and local levels.

The presentation is based on the national project E-Trans 2050 which mainly aimed to contribute to long-term transformations of the Austrian energy system by focusing on 'key action fields'. Key action fields are structural issues of policy and social action that are likely to be decisive for the future development trajectory chosen. In particular, we tried to identify cross-cutting fields and new problem framings that need to be dealt with as a precondition for a transition towards a more sustainable energy system. The approach in the project was intended to complement existing quantitative modelling efforts. From the outset, the focus was on necessary changes of institutions, social practices, and cultural norms rather than on the precise mapping of technical potentials and desired outcomes. E-Trans 2050 started in 2009 as one of several scenario-building projects within the new research programme of 'New Energy 2020', which supports research and development activities aiming at a long-term transformation of the Austrian energy system. E-Trans 2050 contributed to the programme by identifying socio-economic constellations that are central to the further transformation of the energy system.

System innovations require for profound change regarding the reconfiguration of technologies, institutions (e.g. regulation; informal norms such as professional cultures and cognitive paradigms), and social practices (e.g. use patterns, lifestyles), as well as cultural norms and values. The active political and social shaping of such transformations depends on the development of shared visions about possible 'future scenarios' of the energy system and on the continuous adaptation of strategies and action in order to move the energy system in the desired direction. Common learning processes and shared visions are all the more important because actors in the energy field increasingly expect the energy system to be exposed to fundamental destabilisation and change.

In the presentation we report on socio-technical scenario analysis to contribute ideas for the transformative change of the current Austrian energy system over the long term and to identify some of the particular policy measures, as well as structural changes and broader shifts in perspective that would be necessary to deal with such challenges.

In a first step, framework scenarios were elaborated to describe different potential socio-economic contexts and other external influences shaping the further development of the energy system. Within two consecutive stakeholder workshops three scenarios were defined: an "ecological modernisation" scenario involving incremental system optimization, a "break-down" scenario causing catastrophic socio-economic consequences, and a scenario involving a "radical change" towards a sustainable energy system in Austria 2050. In a second step, three fields of action were identified and further analysed using an interactive backcasting approach.

Based on the results of the backcasting exercise dealing with energy and spatial organisation, we conclude the following short-term consequences for energy policy measures. Firstly, it has become clear that better coordination of energy policy, spatial planning, and land-use regulation issues is needed in general. This would require the establishment and/or improvement of integrated planning structures at the national and regional levels, the redesign of building subsidy schemes, the closer adjustment of land development plans to energy efficiency and sustainability criteria, and the fostering of increased cooperation across municipal and county lines in the future. Secondly, it seems to be necessary to rebuild regional structures in a way that matches available resources to the existing demand for energy services as closely as possible. Thirdly, it is important to develop and implement sustainable settlement showcases. Radical new settlement models that combine new social and organisational structures with the latest energy technology and transport infrastructure are not yet available in Austria.

In the presentation we discuss our experiences with the socio-technical scenario process and introduce selected findings. In particular, we identify examples of some critical issues and opportunities within one of the identified cross-cutting fields and examine their various implications for energy policy.

2.

B. Droste-Franke: Energy storage and other options for balancing demand and supply as key technologies for the transition of the electricity system assessed with an interdisciplinary project group

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Scope:	Technology assessment, transition of energy system, integration of renewable energies
Keywords:	Interdisciplinary project group, balancing technologies, energy storage, network extension, demand side management

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The Europäische Akademie is concerned with the scientific analysis and assessment of scientific and technological advances with respect to consequences for society and the environment. The aim of its work is to examine societally relevant aspects based on independent scientific expertise from appropriate disciplines. The “interdisciplinary project group” is the core methodological tool of the Akademie, usually consisting of five to ten established experts of the field from specifically relevant disciplines and a project co-ordinator from the Akademie. First, disciplinary contributions are elaborated, before these are combined and condensed to conjoint recommendations. The results are finally published under common authorship. Beside frequent meetings, the work of the group is usually accompanied with two workshops to which further selected experts are invited to discuss the working programme and preliminary results.

The general approach of the Akademie project groups is outlined, before the work and the results of a project group concentrating on a central aspect of energy system transition – how to deal with options for balancing supply and demand applied to realise a reliable electricity system at a high share of renewable energy used – is discussed in more detail.

In the project in focus, acknowledged scientists from the areas of engineering science, energy economics, theoretical economics, political science, legal science, and environmental science were engaged. Starting from first disciplinary analyses, a general methodological approach for the project was derived. Beside rough energy system analyses, analyses of framework conditions were carried out. The focus is set on the discussion of the different approaches chosen and the final results. This includes particularly the estimation of balancing capacity required, the categorization of technological options, and the assessment of environmental and resource effects with respect to a future energy system around 2050. These investigations are complemented by the presentation of results from the analysis of legal, economic and

political framework conditions and of common recommendations on how to handle foreseeable options by configuring framework conditions in an adequate way.

Following the methodology of interdisciplinary project groups, a good overview about the technological options like energy storage, demand side management, and network extension for balancing demand and supply of electricity in future energy systems can be given. Furthermore, starting points for measures which could be implemented immediately to set the course of the system transition already today into the right direction and to monitor the progress continuously are provided.

3.

J. Schippl: Users, customers, citizens and the general public in the Germany energy transition: The Helmholtz-Alliance ENERGY-TRANS as an example

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Scope: The presentation will highlight the need for a better understanding of the dynamics at the interfaces between technology and society for a successful governance of energy transitions. By using the example of the Helmholtz-Alliance ENERGY-TRANS, it will be illustrated how corresponding research in context of the German energy transition is carried through.

Keywords: Energy transition, socio-technical system, demand side, interdisciplinary research,

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Germany decided to transform its energy system in a relatively short period which includes an accelerated phase-out from nuclear power, a rapid expansion of renewable energies as well as an ambitious increase in energy efficiency. A broad range of visions and concepts exist which outline potential future designs of such a transformed energy system as well as pathways on how to get there. In general such future oriented studies concentrate on the technical requirements for rebuilding the energy system. However, energy systems are not only a mixture of technologies and infrastructures; they are socio-technical system. A transition of the system is not limited to technologies but also the interfaces between technologies and society will change; the relationship between societal actors and the technologies will have to be transformed as well. Some changes along these interfaces are already emerging others are anticipated in visions on future energy systems. Examples are:

- Ideas linked to the concepts of “Smart Grids” or “Smart Homes” in general encompass an adaptation of load profiles to the energy supply. More flexibility in demand patterns of the consumers will be needed to achieve such a shift of loads (e.g. usage of washing machines in off-peak hours).
- New business models enable energy suppliers to control small power plans which are located in the private buildings of the customers;
- When it comes to the implementation of new power lines or to the installation of new wind turbines the directly affected public often reacts with fears and protest;
- In the mobility sector, new propulsion technologies, such as battery electric vehicles, will change the established routines of its users;

- Also in the industrial and commercial sector changes might occur in terms of new business models, new regulations or decentralised supply structures.

The examples listed above illustrate well that the "public" is affected by or involved in the energy transition in different roles or functions: amongst others as users, as customers, as citizens or as a part of the general public. In scientific and public debates there usually is the focus on either one of these roles or the demand-side and the public are addressed in a very general and unspecific way. In this presentation it is argued that a clearer and more systematic differentiation between theses roles is needed for understanding the relevance of the demand side for successful energy transitions. This will be done by making reference to a large research project, the Helmholtz Alliance ENERGY-TRANS. This alliance was established in 2011 in Germany to look at the transition of the energy system with particular focus on the demand side and on the interfaces described above. For doing, an explicit interdisciplinary design is needed in research activities.

It will be shown that understanding the energy system as a socio-technical system reveals a broad range of uncertainties and missing knowledge in relation to potential dynamics in the energy transition. In particular a clearer and more detailed understanding of societal prerequisites and implications of the energy transition is needed for governing the German energy transition. ENERGY-TRANS aims at making a contribution for closing this gap.

At the same time, the ENERGY-TRANS analysis on the complex interplay between societal and technological developments illustrates well that the German "Energiewende" cannot be governed by a relatively fixed and detailed plan. The Energiewende is a long-term project; the developments in a socio-technical system are far too complex to be covered by a sort of "master plan". Governing the Energiewende needs political learning "en route". It will be crucial to find the ideal path between flexibility at the one hand and, at the other hand, the reliability and stability needed for longer-term oriented planning/investments.

4.

G. Fuchs: The Governance of energy transitions: The role of TA and advocacy coalitions

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Scope:	Governance of Energy Transitions, Role of Technology Assessment
Keywords:	Governance of energy transitions, technology assessment, advocacy coalitions sector, carbon capture and storage, photovoltaics

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The proposed paper will analyze four cases of energy transitions in three nations. The four cases are strongly related to the attempt to eliminate or reduce the threatening effects of electricity generating technologies for the environment, especially global warming. In all cases expert commissions, scientific reports etc. have played an important role in coining decision making processes. The four cases are: Carbon Capture Storage (CCS) technology development in Norway and Germany, Photovoltaics (PV) technology development in Japan and Germany. The paper will analyze the role of TA and expert influence as well as different modes of coordination of the actions of incumbent and challenger actors in the specific courses of development.

The "success" of a technology development seems to depend on a variety of factors among which the specific characteristics of a technology are only one. In a highly stylized way it can be said, that the success of CCS in Norway builds on a broad support coalition ranging from the industrial incumbent actors to the green NGOs with a strong supportive role of the state. The apparent failure of CCS in Germany is related to the lack of a broad support coalition that would move beyond the realms of the incumbent actors in industry and administration. The development of Photovoltaics in Germany was driven forward by challenger actors which in the late nineties were able to overcome the resistance of incumbent actors in industry and administration with the help of a change in the political composition in the Federal Government and the building of a new, wide ranging support coalition. With another change in government in 2010 and a faltering support coalition the development of PV in Germany seems to be stalling. PV development in Japan was in contrast to Germany advanced by the incumbent actors in industry and politics, but was more oriented toward exporting the technology than to build up a strong home market. The deployment of PV in Japan in spite of the availability of technology and world class know how is rather limited.

The two potential success stories show features of a combination of top down and bottom up elements of coordination in order to achieve change. The top down

examples fail to achieve substantial changes, because of either effective resistance by the incumbent actors and a missing mobilization of challenger actors (PV in Japan) or because an effective coordination of the activities of incumbent actors faces effective resistance from bottom up which strangles the further development.

The paper will attempt a systematic comparison of the four cases and relate the changes in governance to the structures of the sectoral systems of innovation and will determine the role of embedded expertise.

5.

H. Shiroyama/ J. Fujino/ S. Kajiki: Transition governance of energy system in Japan after Fukushima – local experiments, national strategy and possible role of technology assessment

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Scope: Linking of local experiments and national strategy for energy transition

Keywords: Energy policy in Japan after Fukushima, Feed in Tariff, smart grid, national transmission line, coordination of local and national policies

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After East Japan great earthquake disaster and Fukushima accident in March 2011, increasing the ratio of renewable energy dramatically and promoting efficiency of energy use using smart grid is imperative regardless uncertain future of nuclear energy in Japan. Even before Fukushima accident, several local experiments were undertaken. Besides local experiments, central government also introduces new policies facilitating renewable energy. For example, Law on FIT (Feed in Tariff) system was enacted recently. This paper tries to analyze the methods and strategies for transition governance in Japan based on case studies focusing on energy and related systems, especially focusing on interaction between local experiments and national strategies.

At the local level, various experiments have been conducted. Environment model city program asks cities to achieve low carbon societies for which the central government set national target of 60-80% GHG reduction by 2050. Although there are several interesting institutional and process level experiments carried out under this program – the mayor of Kyoto city asked the environmental bureau to guide the design of local policies, and Yokohama city created an integrated office for global warming – local governments face the difficulty of coordinating among other sections and stakeholders.

Smart community program mainly focuses on the technological feasibility to realize low carbon societies by applying technological innovations at the district scale. It consists of initiatives such as diffusion of renewable energy, joint and efficient use of

electricity and heat among different consumers, energy storage to adjust energy supply and demand, dynamic pricing to ask behavior changes using smart meters, and others. This experience tells us that such community scale initiatives make big impact when they have the backing of business groups.

In 2009 Democratic Party of Japan took office and began to plan Future City program to solve not only energy and environment problems but super-aging, international competitiveness in city scale. Thereafter East Japan Earthquake and nuclear power accidents enhanced the priority of this program. This initiative stresses on the necessity of inter-sectoral project management and knowledge platform.

At the national level, Japan has unique problems. Though Japan has a population of over 100 million, it is an island country and must deal with power supply risks such as blackouts by oneself, because grid is not connected with other countries.

According to the survey by Ministry of Economy, Trade and Industry (METI), Ministry of the Environment, wind power generation and photovoltaic power generation have a large introduction potential in Japan. Areas such as Tohoku and Hokkaido away from consuming area have a large potential of wind power generation. For dealing with such a supply-demand gap, transmission linking northern part to central part has to be strengthened. As well as setting of the clear introduction target, a framework to share the cost of facilities necessary for adjustment of power supply and a rule to coordinate various stakeholders are needed for mass introduction. Introduction potential of photovoltaic power generation spreads over, however there is a problem that who should built branch lines to transmit from run-down fields to transmission line.

Experience in Japan so far shows the several challenges for energy transition, for which national - local coordination measures are indispensable.

1) Local governments face lack of resources (human resource, finance, technology). Lesson we learnt especially after East Japan Earthquake is that it is difficult for local governments to facilitate prompt and dynamic actions for revitalization. For example, even though Fukushima prefecture declared its goal to create a society without nuclear power, there is not enough coordination among several initiatives for renewable energy by different sections. Local initiatives are good for diversity of experiment but national mechanism for supporting local capacity is necessary.

2) National regulation sometimes makes advanced experiments difficult. Toyota-city creates new housing zone to realize smart community living. However current regulations (such as Radiowave Act, Electric Appliance Act) do not allow residents to turn on any electrical devices inside house thorough advanced wireless ICT systems. Yokohama-city has greater difficulty because they are carrying out similar experiments in existing housing zones. National regulatory reform need to be conducted responding local experiments.

3) In Japan, the ten privately-owned major electric power companies have supplied electricity from power generation to distribution to the consumers in their respective service area, and however, many new companies at the local level enter into this business particularly photovoltaic power generation after

introduction FIT in July, 2012. Because these new entrants at the local are not responsible for supplying electricity unlike former ten companies, securing of electric stability and quality are important problems for central local coordination.

For facilitating energy transition in Japan, comprehensive TA involving various heterogeneous stakeholders for identifying various issues such as above linking local and national level, depending on each transition scenario, need to be conducted for visualizing whole policy agenda.

6.

M. Knapp/ S. Wenzel/ I. Gehrke: Innovations for a sustainable biomass utilization in the Upper Rhine Region

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Scope:	Multidisciplinary approach analyzing biomass sources, scenarios and impacts, creating a regional actors' guide for sustainable utilization of biomass
Keywords:	Biomass potentials, alternative pathways, bio-energy planning tool, roadmap for decision makers, sustainable regional biomass strategy

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Biomass is a renewable resource that can be used to produce heat, electricity, transport fuels and a range of chemicals and materials, whose future demand is estimated to grow substantially. In particular, bio-energy is an important option in the transition process towards a more sustainable energy supply, with benefits in terms of greenhouse gas emissions, security and rural development. However, the significant increase in biomass utilization will present substantial sustainability challenges, in particular as it may rely on energy crops. The production of these crops raises questions as for e.g. mono-cropping, land consumption and land use change, land competition with food crops and competition for the use of the generated biomass. Accordingly, besides the technical challenges, biomass utilization implies considerable environmental and social impacts, leading to distrust and rejection of biomass projects by various interests groups. As benefits and negative impacts depend very much on the type of biomass resource and its management, avoiding or mitigating these impacts is crucial to the future of the biomass utilization on a regional scale.

In order to cope with these challenges, an innovative comprehensive problem oriented TA approach is presented, taking into account the whole supply chain, diverging use options, innovations in biomass systems, regulatory and industry framework conditions, but also the local specific environmental and social conditions, to find the most sustainable way of biomass utilization. Therefore, a tri-national multidisciplinary collaboration bringing together knowledge of all major research institutions in the border region Upper Rhine Valley (situated in France, Germany and Switzerland) has

been set up, integrating stakeholders from politics and industry and thus intending to give an important stimulus to environmental policy and innovation. The main focus of innovative biomass use concepts is to give sustainable solutions fostering and improving the regional biomass use as a renewable energy source and/or raw material along the supply chain respecting the land use competition as well as economic, social and technological constraints. These requirements are tackled by providing scientific expertise from academic partners in all three countries unifying the specific knowledge of economists, engineers, physicists, forestry scientists, biologists, chemists and sociologists. Existing data from various sources are combined to build up a comprehensive and harmonized bio-energy planning tool.

With this interdisciplinary concept for the first time a harmonized method for the transnational estimation of existing and future biomass potentials is to be developed at regional scale. This opens the chances to generate new applications and options for both innovative and sustainable technologies and to validate them in a multidisciplinary way. In addition, the approach also contributes to solving social, scientific and political problems raised by recent significant increases in biomass utilization for energy and material uses. Possible environmental, economic and societal impacts of different transition pathways are to be assessed in a scientific way and a scenario-based roadmap to support decision-making of policy makers, industry, other stakeholders and the general public is to be developed. Combining region-specific innovative biomass solutions and best practices this applied TA approach in conclusion will allow defining the necessary steps to implement a knowledge-based sustainable biomass strategy within the transition of the Upper Rhine Region’s energy system.

7.

M. Effenberger/ H. Bachmaier: "Energiewende" – estimating the contribution of agricultural biogas plants to more sustainable electricity supply ("energy turnaround") in Bavaria

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Keywords: Electricity supply, renewable, biogas, greenhouse gases

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For the Free State of Bavaria with its high share of nuclear and renewable energy sources the average specific GHG emissions of electricity production are around 110 CO_2-eq. kWh_{el}^{-1}. With the legislated phasing-out of nuclear energy by 2022, between 3 and 4 GW of guaranteed generation capacity are needed to substitute the decommissioning of nuclear power plants in Bavaria. It is discussed whether a part of the required conventional generation capacity could be supplied by either central natural gas fired power plants or distributed combined heat-and-power generation from biogas (or fossil fuels).

By the end of 2011, there were an estimated 2,730 biogas plants registered in Bavaria with a total installed electrical generation capacity of 674 MW. Given the low system emissions in Bavaria as mentioned above, it is a very important issue how GHG emissions from electricity production will develop with the proposed transition of the supply system.

This paper aims to analyze the potential effect of substituting conventional centralized power stations with a large number of distributed co-generation plants (biogas or fossil fuel driven) on specific GHG emissions of electricity production.

The analysis is based on the assumption that biogas or fossil fuel fired co-generation units (CGU) could be operated during time intervals when the electricity feed-in from wind and solar power plants cannot meet the demand.

First, the potential of upgrading existing biogas plants for part-time feed-in was evaluated on the basis of structural data. Second, the range of specific GHG emissions from electricity production for the respective alternatives of biogas / fossil fuel fired CGU is estimated based on own case studies and literature data. Third, in comparison with characteristic figures of GHG intensity of conventional electricity production,

possible critical limits for the configuration of CGU are determined in order to achieve an overall reduction of GHG emissions from electricity supply in Bavaria.

While the refitting of biogas plants for part-time feed-in is technically feasible, it has hardly been realized. The reasons are that for existing biogas installations the current compensation scheme does not provide sufficient incentives and poses administrative obstacles for refitting. The same applies to distributed CGU based on fossil fuels. The assessment of possible GHG savings should make for a more comprehensive economic assessment of the proposed transition of electricity supply.

It appears that the greatest challenge for effective decision-making and implementation of the “energy turnaround” is to achieve an agreement between many stakeholders with diverse interests.

PACITA Conference, Prague

XIV. Thematic Session: Sustainable Development and Consumption

Chair: **Zoya Damianova**

Date: Friday, March 15th, 2013

Concept of the thematic session

The „Sustainable Development and Consumption“ session will focus on multiple aspects and challenges related to the sustainable development of the society which means meeting human needs while preserving the environment. Different approaches and novel/emerging technologies in areas such as water treatment, renewable energy sources, sustainable agriculture or food safety will be presented. One of the important aspects that will be discussed in the session is communication of new solutions to the general public as well as the public acceptance and policy support to the new technologies.

1.

J. Lemm/ U. Rübsam/ G. Seide/ T. Gries: Clean Water – energy for our everyday life

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Scope: Sustainability, Water as Energy, TA, Society

Keywords: Water, Energy, Sustainability, agriculture, industrial process, water economy, membrane technology, fiber nonwoven composites, innovation in filter technology

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The target of a research project at the Institut für Textiltechnik (ITA) of the RWTH Aachen University is to realize an innovative leap within filter technology, by designing a composite structure made of melt electrospun and spunbund nonwovens.

As a product of our everyday life clean water forms the most precious and endangered good in the world. At present, over 900 million people have no access to clean water. The reasons therefore are for example a rising world population, migration and globalization [1]. For the next years one of the major challenges in sanitary environmental engineering will be to establish a successful approach to solve this problem.

Water with the right quality is not only required for the human population or agriculture (e.g.) irrigation but also for industrial processes. Within the industry there is a need for a sustainable sufficient water of specified quality [2]. But technical advancement, agricultural and industrial trends also have a large influence on the worldwide water economy and lead to an increase in water consumption. For example, in the last 50 years the worldwide abstraction of subterranean water tripled. Furthermore, there is a rise in water pollution, due to increasing water consumption and industrialization [2]. Another aspect is the climate change, which aggravates the problem even more and gave rise to a new level of discussion amongst experts all over the world.

The UNESCO declares that in the future it will be even more difficult to ensure a sufficient supply of clean water for everybody. Thus, it is important to explore and use new technologies to meet the demand for clean water. One technology that offers possible solutions to overcome water shortage is the membrane technology. Presently, this technology is successfully used for different types of water and industrial processes, due to its versatility. The use of membranes can furthermore guarantee hygienic clean water, which is a considerable improvement in comparison to the conventional water purification methods.

However, high investment and operating costs presently limit the application and circulation of this beneficial technology. Deficits of conventional membrane technology are considerable manufacturing costs and high energy consumption during the application. Membrane substitutes made of fine fiber nonwoven composites (figure 1) could contribute to overcome these problems. These composites are intended to reduce the production costs by abdicating expensive solvents. Using solvents implies further process steps for recycling and security of the employee. Furthermore, nonwovens with fine fibers show good filtration properties. The open structure leads to a reduced flow resistance [3], which results in lower pressure difference and therefore reduced operating costs. Additionally, pore sizes can be adjusted by choosing the diameter and arrangement of the fibres.
To reduce the operating costs the fouling of the membrane substitute has to be prevented as currently 50 % of the energy for wastewater treatment is used for the prevention of fouling. The positive effects of nonwovens can be used in two ways. Generally, the structure and the surface of the nonwoven fabric determine how fast pores will be blocked [4]. In addition to that, the membrane substitute consists of different nonwoven layers so that particles will settle at the surface where they can be easily removed from the flow. [5]. In contrast, conventional membranes exhibit a symmetric structure where particle settle inside the structure [4].

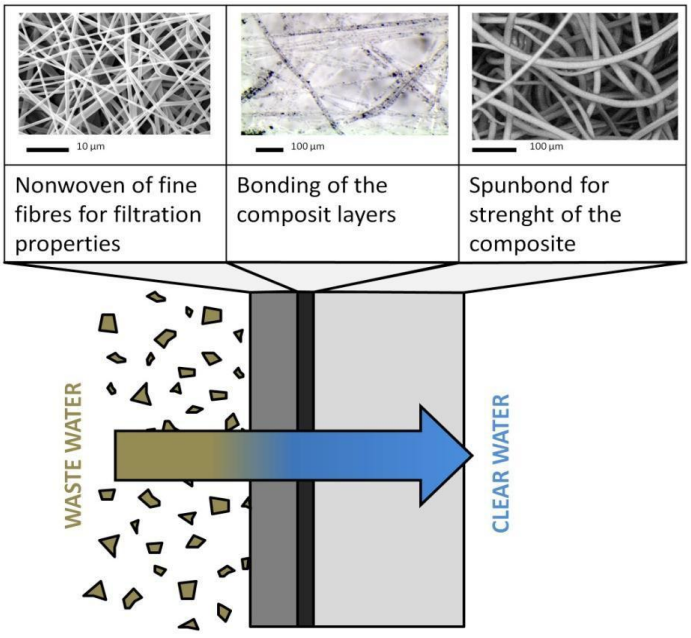

Figure 1: Structure of the membrane substitute

The target of current research at the Institut für Textiltechnik (ITA) of the RWTH Aachen University is to realize an innovative leap within filter technology, by designing a composite structure made of melt electrospun and spunbund nonwovens. Furthermore, the research aims towards the development of a user-oriented, less risky and more environmental friendly filter technique. One aspect is therefore the dialogue with the society about the acceptance of new developments. An active participation of addressees creates transparence and a feeling of participation. That is important because an improved water quality is with of the influence on topics like hygiene and health a socially relevant issue.

[1] ZDF Artikel “Wasser wird knapper und kostbarer”
http://www.zdf.de/ZDF/zdfportal/web/heute-Nachrichten/4672/6604554/44849a/Wasser-wird-knapper-und-kostbarer.html
Zugriffsdatum 27.06.2012

[2] WWAP (World Water Assessment Programme)
The United Nations World Water Development Report 4: Managing Water under Uncertainty and Risk (2012). Paris, UNESCO.

[3] Gopal, R., Kaur, S., Ma, Z., Chan, C., Ramakrishna, S., Matsuura, T.
Electrospun nanofibrous filtration membraneJournal of Membrane Science 281, 2006, S. 581-586

[4] Melin, T., Rautenbach, R.
Grundlagen der Modul- und Anlagenauslegung
3. aktualisierte und erweiterte Auflage
Berlin, Heidelberg: New York Springer Verlag, 2007

[5] Greiner, A., Wendorff, J.H.
Elektrospinnen: eine faszinierende Methode zur Präparation ultradünner Fasern
Angewandte Chemie 2007, 119, 5770 – 5805
Weinheim: Wiley-VCH Verlag GmbH & Co. KGaA, 2007

The target of current research at the Institut für Textiltechnik (ITA) of the RWTH Aachen University is to realize an innovative leap within filter technology, by designing a composite structure made of melt electrospun and spunbund nonwovens. Furthermore, the research aims towards the development of a user-oriented, less risky and more environmental friendly filter technique. One aspect is therefore the dialogue with the society about the acceptance of new developments.

2.

D. Siswartonová/ M. Rice: Using BEAUTY to achieve true sustainability

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Scope:	To trigger curiosity & awareness of the need for fundamental transformation towards sustainability through art & playful ways
Keywords:	Playful methods, cultural transition, self-sufficiency, sustainability

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"Study nature; love nature; stay close to nature. It will never fail you".

Frank Lloyd Wright

"We need to develop all of our senses; know that everything is connected; study the art of science and the science of art".

Leonardo Da Vinci

Nature uses Beauty as a powerful force to create deep ecological sustainability. All life seeks to express beauty as a property of efficiency of form and function. Beauty is the force that generates true sustainability at every level. When we perceive beauty we feel better, healthier and happier. When we work consciously with it in the design and building of our world, we create spaces, objects, processes and environments that offer us a more integrated and holistic living system that we can honestly call Home. Beauty calls us and leads us to a whole new way of seeing things which informs and totally transforms our thinking. Beauty needs to be included and integrated into the creative process of all new technology.

This new thinking, fueled with biological awareness, will help us develop new technologies which can enhance our quality of life and the lives of all living beings on this beautiful planet. What is needed now is the ability to communicate this successfully and powerfully to the widest possible audience; in order for this seed of knowing to become the new personal and collective wisdom. That is the universal language of Beauty.

As biological organisms, we are already hard and soft wired to perceive and be attracted to beauty; and as such this process of re-educating ourselves need not necessarily be a difficult one. In order to truly **assess** any new technology we need to be able to full **access** it. Accessing anything is a question of perception; which is a product of our full body sensitivity and our ability to process the information we

receive accurately. The optimisation of this process requires a more artistic and playful approach; so that the whole human potential is involved, not just the intellect. By balancing and working with both of our primary essences – the masculine and feminine, the left and right hemispheres we effectively bridge the gap between Science and Art, which offers us a whole new country to explore in terms of what we create, and how we use it. This is vital if we are to leverage this potential fully, and indeed playfully.

We need to trigger natural curiosity and foster deep enthusiasm in the service of true sustainability. So any situation, problem or opportunity can be approached and solved with an open heart, a clear head and a strong body. We believe that embracing beauty as a fundamental design imperative will produce public policy directives and industry initiatives which will reflect this growing understanding of how we can all create from a place of togetherness rather than the illusion of separateness.

The key to sustainable success is to consider everything we do as a creative act, and to embrace this reality with a playful spirit. For too long we have ignored this natural ability to make beauty as something secondary, or something that we may try to do in our 'spare time'. Now is the time to work with nature – not against. We must co-create with her with full responsibility and activate and develop our skills to the benefit of all.

This presentation will introduce the principles of designing consciously with beauty, highlight the many benefits of doing so, and give many examples, especially in the area of renewable technology. We will introduce the possibility of how by changing the way we see the world, changes the world itself. We can turn the biology of belief into the soul of creation.

NANO ENERGIES ltd.

Operates since 2007 and is demonstrating excellent results using new higher mathematics equations to assess fluctuations of energy from renewable sources in the transmission grid to introduce a relative stability. As the first company in the Czech Republic it started to deal exclusively with electricity from renewable sources, focused on small & individual producers. No manipulative sales methods to attract customers, no hidden fees. The company currently trades 70% of the spot markets. The aim of NANO is complete energy independence for the clients within 10 years.

BioArchitecture

BioArchitecture is an award winning architectural design studio established in 1998 and run by Michael Rice; specialising in designing and building structures, buildings and spaces which create, support and enhance life and living systems. Based on the pure principles of how Nature uses harmonic shapes and geometric relationships to create sustainable environments, this studio represents a unique approach to manifesting your home dream.

3.

E. Bongert/ S. Albrecht: Towards a great transition of Food & Health care: Rethinking the key role of sustainable agricultures for healthy societies

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Scope: Sustainable Agriculture is the cornerstone for every sustainable development

Keywords: Agriculture, Sustainability, Global Assessments, Science, Paradigm shift

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Global food systems are since decades in turmoil and structural imbalance. More than one billion human beings are suffering malnutrition, hunger and a corresponding plethora of diseases, which especially for mothers and toddlers often are deadly. Simultaneously one billion people are adipose and many more are on the heavy side – again with corresponding diseases. Both situations are emerging from various roots. But there is a connecting thread: cultivation, harvest, processing and consumption of food and foodstuffs. In industrialized countries those economic sectors, which are for every society indispensable, to date represent a marginal position if Gross Domestic Product (GDP) is used as measure. But this perspective is a far-reaching conjecture.

Food security is a *conditio sine qua non* for an active and healthy life. The German philosopher Ludwig Feuerbach coined in the year 1850 the phrase: “Human beings are in essence what they are eating.” The inextricable context of food cultivation, nutrition and health can be seen inter alia in following aspects:

- Unhealthy diets are evidently main causes for chronic syndromes like cardiovascular diseases, strokes, diabetes, and cancer which count for the lions share in global fatalities.
- Migration from rural areas and urbanization are accompanied by akinetic life styles, which amplify negative impacts of unsound diets.
- 15% of global diseases result from malnutrition.
- Poor people ingest too little micronutrients by increasing monocultural farming of only very few plant varieties (rice, maize, wheat) resulting in decreasing diversity of food preparation.
- More than half of all global occupational fatalities occur in agriculture, mainly by tractors, machines, agrochemicals, zoonoses, and poisonous or allergenic substances.

Industrialization of agricultures and food processing as practised in some parts of the world result in some paradoxes:

- Yield increases by intensification (of animal production as well as plant production) often come along with massive environmental damages especially concerning soil fertility, biological diversity, freshwater, and changes in climate systems.
- Increasing outputs especially in OECD countries lead to repeated decline in world market prices (so called 'pork cycle') and disturbances of the development of strong and lively endogen agricultural and food markets in many not industrialized countries.
- Mechanisation and rationalization in farming and food processing are contributing to increasing unemployment in rural areas and migration to metropolitan areas.
- The global capacities and economic power of vertical integrated agro-food-retailer corporations belittle the bargaining position and income of small producers and cooperatives.
- The recently established political economy of fuels from biomass, foremost by acts and regulations in the US and EU, institutes a new global cycle of subsidies with negative impacts for family farming, food security, access to land for poor families, and natural resources and ecosystems.

Our paper reflects successes of technology and other assessments so far in conceptual as well as political regard and deduces some proposals for conceptual and paradigmatic advancement of TA as well as for an increase of its political-societal effectiveness.

4.

P. Vergragt: Technology assessment and sustainable consumption

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Scope:	A systemic approach to a transition to sustainable consumption
Keywords:	Consumption, system, transition, technology, life styles

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Technology Assessment has developed from foresight and assessment studies to a field which addresses major societal challenges; and studying the roles that coproduction of science, technology, and society could play to address those issues. Hence the strong emphasis on clients, governance issues, and decision makers. It has thus close connections with transition studies; which also address incumbent socio-technical regimes like housing, agrifood, mobility, energy systems, and health care; and how to change these regimes towards more sustainable ones.

Among those incumbent regimes the macroregime of the final consumption and consumerist culture is often neglected or not seriously taken into account.

In the emerging field of sustainable consumption research, such as practiced in the SCORAI network (www.scorai.org) , the emphasis is not only on the individual consumer and how to incentivize her to consume more sustainably; but also on grassroots innovations and alternative lifestyles including collaborative consumption; happiness and wellbeing research; challenging the economic growth paradigm and developing alternative economic models and indicators; challenging consumerist cultures across the globe, and the creation of alternatives; challenging inequities and their impact on increasing consumption needs; and new forms of empowerment through localized production rather than passive consumption.

This emerging and still somewhat incoherent field shows some overlaps with various fields like ecological economics; industrial ecology; wellbeing research; social psychology; innovation studies and STS; and socio-technical transitions studies, as well as with sociological approaches like theories of practice. In this paper I will mainly focus on the role of technologies in this emergent field. In general, technologies are often seen as silver bullets to solve societal problems like, for instance, climate change. However, population increase, increase in affluence, and spreading of consumerist culture and unsustainable consumption systems across the globe, especially to China and India, will easily offset most of those technological solutions. The question thus becomes if and how technologies could play a role in empowering consumers to address overconsumption; and to facilitate the systemic changes necessary for a transition to a more sustainable consumption and production system.

The paper will collect some examples of technologies that could help facilitate such a transition; notably communication and information technologies and social network technologies. The bigger question is if and how technologies could be consciously designed to empower consumers to change towards more sustainable life styles. At the moment of writing this question is still wide open. In this sense this paper will be a discussion paper; in addition to putting the subject of sustainable consumption on the research agenda of Technology Assessment.

Some references:

Philip J. Vergragt and Halina Szejnwald Brown, 2012 The challenge of energy retrofitting the residential housing stock: grassroots innovations and socio-technical system change in Worcester, MA, Technology Analysis & Strategic Management 24 (4) 407–420

Cohen, M., Brown, H., & Vergragt, P. 2010. Individual consumption and systemic societal transformation: introduction to the special issue. Sustainability: Science, Practice, & Policy 6(2):6-12. http://sspp.proquest.com/archives/vol6iss2/introduction.cohen.html .

Halina S. Brown, Philip J. Vergragt, Maurie Cohen 2013. Setting the stage: Three theoretical perspectives illustrated by the case of Passive House, chapter 1 of Maurie Cohen, Philip J. Vergragt, Halina S. Brown (eds.) Innovations in Sustainable Consumption: New Economics, Socio-Technical Transitions, and Social Practices, Edward Elgar, to be published, 2013. https://www.e-elgar.com/bookentry_main.lasso?currency=US&id=14746

5.

J. Schmidl/ K. Schilcher: Central European stakeholders propose clear priorities for further development of bioenergy-markets

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Scope:	Energy Transition
Keywords:	Bioenergy, Central Europe, heat market, stakeholder-survey

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Between November 2009 and September 2010, a survey among bioenergy-stakeholders was carried out in eight Central European countries (Austria, Czech Republic, Germany, Hungary, Italy, Poland, Slovak Republic, and Slovenia) in the framework of the Central Europe project „Fostering the sustainable usage of renewable energy sources in Central Europe – putting biomass into action", project-acronym "4biomass", see www.4biomass.eu. A questionnaire was developed by the German project partner FNR (Fachagentur Nachwachsende Rohstoffe, www.fnr.de), translated into the respective national languages by the members of the 4biomass project-team, and placed online.

Biomass-stakeholders from eight Central European countries (Austria, Czech Republic, Germany, Hungary, Italy, Poland, Slovak Republic, and Slovenia) were invited to express their respective opinion and assessment concerning the current and future development of bioenergy in Europe. The 1,221 experts who filled in the electronic questionnaire, or at least parts of it, responded to a list of aligned questions.

The questions of the survey concerned:

- framework conditions of bioenergy,
- the national biomass action plans (nBAP),
- measures and instruments for the support of bioenergy,
- prospects and most favourable markets of bioenergy deployment and
- the role of bioenergy in relation to the other renewable energy sources

The stakeholders´ rating of national biomass action plans targets and of the success rates of the countries in reaching these targets show that they endorse the nBAP´s targets, but remain skeptical about reaching them. Results of the survey reveal notable differences between national- and professional origin of the experts. Especially in Italy and Slovenia there are large differences between highly valued targets of BAPs and lowly rated probabilities of success. The more international the level of operation of the respondents (national, EU, international), the higher is their mistrust in reaching the goals, whereas experts engaged on a local or regional level are quite confident to reach the goals.

The most noteworthy result of the survey concerns the preferred direction of further development of biomass-markets in the Central European region. According to the stakeholders, biomass for heat will have to most significantly contribute to reach the goals of nBAPs. This clear message keeps its significance throughout all participating countries and with respect to all sectors of stakeholders analyzed, it remains furthermore applicable if biomass is compared to the other renewable energy sources like wind and hydro.

Asked for the most favorable instruments for support of market introduction, the stakeholders seem to trust in the already well-established mechanisms like feed-in tariffs (for electricity) and support of investments (for heat). On the other side, there seems to be little trust in new regimes like voluntary schemes and premium tariffs.

A second group of questions referring to specific national legislations and features has been evaluated separately, the particular national reports can be found on the 4biomass-website (www.4biomass.at).

Despite all differences in the perception of national policies and efforts with respect to the further development of renewable energy systems in the Central European States (Austria, Czech Republic, Germany, Hungary, Italy, Poland, Slovak Republic, and Slovenia), one signal remains constant if bioenergy-stakeholders are being asked: they favor and recommend the most traditional and relatively easy-to-develop market of heat from Bioenergy. This can be both, small scale systems for single houses, and district heating systems – also existing ones, where biomass-boilers would replace existing fossil-fuel fired boilers.

The project “4Biomass” has been implemented through the CENTRAL EUROPE Programme co-financed by the ERDF and the Austrian Ministry of Agriculture, Forestry, Environment and Water Management.

6.

F. Sehnal/ O. Habuštová/ Z. Svobodová: Assessment of the environmental impact of genetically modified crops

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Scope:	Role of genetic modifications in solving pressing problems of agriculture
Keywords:	GM, biotech crops, maize, environmental impact, sustainable agriculture

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Human population has surpassed 6 billion and continues to expand at a rate 80 million per year, imposing increasing demands on agricultural production that is expected to produce more food of good quality and also satisfy the needs of bio-energy industry, all this in spite of the current decrease of arable land acreage. Increase of yield is the only solution of this problem. It has traditionally been achieved by selection of randomly mutated plants but new suitable mutations are already difficult to find. In addition, many unidentified genes are probably affected in the mutants and we know nothing about possible consequences of such changes for the over-all crop quality. Fortunately, modern breeding techniques target specific genes that are either endogenous to the plant or introduced into it from another organism. Plants containing a foreign gene are called genetically modified (GM).

The era of practical exploitation of GM crops began in 1996 when a maize resistant to the European corn borer, Ostrinia nubilalis, *and a glyphosate-tolerant soybean were commercialized in USA. A variety of GM crops, mainly soya, maize, cotton, and canola, have spread rapidly worldwide: a 94-fold increase in hectarage from 1.7 million hectares in 1996 to 160 million hectares in 2011 makes GM crops the fastest adopted crop technology in the history of modern agriculture (James 2011). The rapid and widespread adoption of GM crops testifies to the economic advantages of this technology. Europe is the only region resisting the boom of GM crops deployment due to the complexity and cost of the environmental risk assessment procedures needed for the permit to cultivate GM crops.*

A decade ago we decided to examine possible environmental effects of GM crops. We conceded that GM crops resistant to insect pests could endanger some beneficial insects and thereby upset ecological balance. We therefore examined communities of arthropods in fields planted with GM maize cultivars MON810 and MON88017 that are directed against insects. Their insecticidal activities are due to the expression of *Cry* genes that were introduced to plants from the soil bacterium *Bacillus thuringiensis* (spores of this bacterium are widely used in the biological control of some insect pests in both standard and ecological agriculture).

We followed arthropods in 0.5 ha plots set in a large field. Each treatment (GM maize, parental non-GM cultivar, insecticide treatment) was applied to the same 5 plots in 3 consecutive years. GM maize MON810 expressed Cry1Ab that provided full protection against caterpillars of the European corn borer, *Ostrinia nubilalis*. The maize MON88017 expressed Cry3Bb1 toxin and therefore partly resisted attack by the larvae and beetles of the western corn rootworm, *Diabrotica virgifera virgifera*. MON88017 also tolerates the herbicide glyphosate that kills non-GM plants by inhibiting their vital enzyme EPSPS. The tolerance was achieved by introducing into plants the CP4 EPSPS gene from *Agrobacterium tumefaciens*. The product of this gene is functionally identical with EPSPS but it is glyphosate-insensitive. The tolerance to glyphosate allows farmers to reduce the number of herbicide treatments (in case of maize mostly from two to one) and to use glyphosate-based universal herbicides that are rapidly degraded in the soil.

We collected insects dwelling on plants (aphids, thrips, *Orius* bugs, lady birds, lacewings etc.) and on the soil surface (ground and row beetles, spiders), identified them to species level and counted. We found considerable fluctuations in species composition and abundance in dependence of the plot position and weather pattern in the respective year but not in relation to the genetic modification.

Our data show that GM technology has no effect on the community of examined arthropods. This is in agreement with similar studies of other authors – the fear of damaging environmental effects of the GM crops is not justified.

PACITA Conference, Prague

XV. Thematic Session: Emerging Technologies

Chair: **Christopher Coenen**

Date: Friday, March 15th, 2013

Concept of the thematic session

In the 'Emerging Technologies' session, the results of empirical research and conceptual reflections on a variety of emerging fields of science and technology will be presented, including outcomes of research projects at EU and national levels. The presentations will cover emerging technologies in such areas as synthetic biology, security, food, mining, nanotechnology, human whole genome sequencing, neurodevices and biocybernetic adaptation. Shared challenges of technology assessment activities on emerging technologies will be discussed by the presenters and other participants in the session.

1.

M. Bonfanti/ J. C. Burbiel/ S. Goymann/ E. Mordini/ R. Schietke: Holistic technology assessment in security: The ethical dimensions of critical and emerging technologies

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Scope: Ethical assessment of future technology options in security

Keywords: European research policy, ethics, security, emerging technologies

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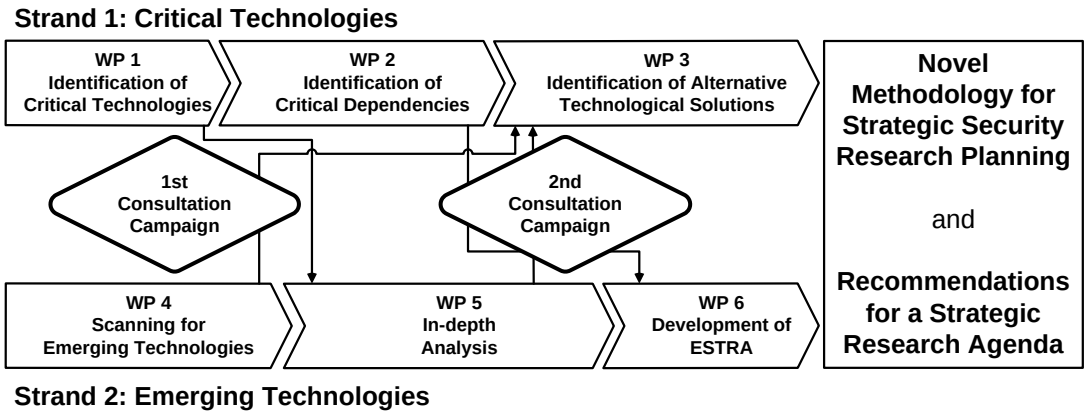
The FP7-cofunded research project "Evaluation of critical and emerging technologies for the elaboration of a security research agenda" (ETCETERA, October 2011 to September 2013) aims at providing policy makers with reliable information for security research planning in HORIZON 2020, both to close short-term technology gaps and to



exploit long-term positive effects of future technologies.

To address these two temporally separated issues, the project is divided into two research strands (see figure). In Strand 1 “Critical Technologies”, an analysis of technologies that are essential for European security has been performed, with a special focus on technologies that may not be supplied by European providers alone (“Critical Dependencies”). Strand 2 “Emerging Technologies” provides answers to the question how technological developments in the next 15 to 20 years may be used to improve European security. Both strands are closely accompanied by work on ethical aspects, as decisions about research funding should take into consideration all possible implications of novel technologies on society.

The talk will be given as a PowerPoint-supported conversation between representatives of the Coordinator (Fraunhofer INT) and of CSSC, the ethics experts within the ETCETERA consortium. It will focus on opportunities and challenges of integrating ethical (and fundamental rights) discourse in security research projects. As a start, the problematic distinction between security and “perceived security” will be discussed. This distinction is partly misleading as the very notion of security implies people’s perception as the word “security” means “to feel safe” (literally from Latin, securus “without care, safe, free from care”). Indeed there is a deep difference between risk management (which implies an objective assessment of risks and their probability) and security (which implies the feeling to be protected). In the talk we will present some framework questions to be used by researchers and developers to identify main ethical issues or implications that are likely to be generated by the development of new technologies with security implications. We will then try to demonstrate how anticipatory thinking on such issues may help to mitigate potential negative effects, where possible by technological design.

The talk will highlight that security is consequently a societal activity and the ethical discourse is strictly inherent to any security related activity, technological research included.

The research leading to the results to be presented has received funding from the European Union Seventh Framework Programme under grant agreement n° 261512.

2.

B. Wepner/ G. Huppertz: Identification of emerging technologies with security implications: Experience and results from the ETCETERA project

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Scope:	Scanning for emerging technologies with security implications in time frame 2020 to 2030 by using three different technology scanning methods
Keywords:	Technology foresight, Methodology, Emerging technologies, Security

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The EU FP7 project ETCETERA aims at identifying Critical and Emerging Technologies relevant to security in the European context. The results will lead to recommendations for a European Security Research Agenda that deals with upcoming technological opportunities and threats, to alleviate the critical dependencies on technologies for member states and to provide alternative technological solutions. In work package WP4 “Scanning for Emerging Technologies with Security Implications” emerging technologies were scanned for their security implications in 10 to 20 years’ time.

Different methods to identify emerging technologies were performed in a parallel fashion by three research institutions: Isdefe (Spain), AIT (Austria) and Fraunhofer INT (Germany). A comparative analysis of the results of the three methods was performed. Based on this comparative analysis, ideas were explored to derive a novel method for this kind of technology scanning, using the best properties of the different methods.

From all three partners involved a list with technologies were identified with only few overlaps in the results. Since the focus of the foresight activity of Isdefe and Fraunhofer INT lies on technological development potentially leading to future capabilities or applications in about ten to twenty years, the strength of these approaches is the distinct sensitivity of the experts involved to detect possible security aspects of identified technology developments at an early stage.

Using bibliometric analysis on the other hand with the very general search term “security” a broad, non-partisan overview of the topic was gained by AIT. Alongside

with technical topics and issues, cross sectional (social and psychological related topics) and environmental themes were identified.

Thus new trends and issues for future demands outside the focus of experts are taken into account. Also stakeholders, scientific experts and important organizations engaged in a certain technology can be identified in a back cast view that furthermore can reveal Hype-Cycle developments of certain technology topics.
Altogether more than 120 emerging technologies from 13 technology areas have been identified, 70 of which were rated as having significant impact in security.

The general approach in this project was to search for emerging technologies and prioritise the results from the three different scanning methods applied by three research organisations.

To combine the strengths of the scanning approaches it is proposed to weave them together, e.g. in a three step modus using bibliometric analysis for a widespread overview on main topics, then assigning experts in the relevant areas for a detailed desk top research based on the foregoing results, and finally confirming the findings by a focused bibliometric analysis with more precise and concrete search terms.
For the prioritisation process the WBAM method was applied to assess the identified technologies and proved to be a very useful and objective tool. However, the process depends on some parameters that always need to be taken into account when interpreting the results.

Table: Example of a resulting list based on a prioritisation process using the WBAM method.

Rank	Emerging Technology	Security Relevance	Ethical Consideration	Market Potential	Application Potential
1	Homomorphic Encryption	6	4	3	3
2	Post-Quantum Cryptography	6	3	3	3
3	Power System Security	6	3	3	3
4	Effective Water Ressources Management	6	3	3	0
5	Terahertz (Imaging and Substance Identification)	6	2	1	3
6	Quantum Cryptography	6	2	-1	3

The research leading to the results to be presented has received funding from the European Union Seventh Framework Programme under grant agreement n° 261512. We acknowledge the contributions of all partners and colleagues in ETCETERA WP4.

3.

J. Allison/ D. Broun/ J. Lacey/ S. Jones: The Rise of new manufacturing: Transitioning skills and technologies into the future

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Scope: Transitioning manufacturing businesses - changing technologies/processes, new cultures, emerging markets in regional and peripheral economies, and implications for skill development and workforce planning.

Keywords: Manufacturing, skills, transitioning industries, emergent technologies

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Manufacturing plays a critical role in every advanced economy in the world today. The sector contributes to the biggest spend on applied research and innovation in these economies and it is a key driver for productivity improvements, contributing to the largest share of world trade and driving export earnings. However, many manufacturing businesses, particularly in regional economies, face the significant challenge of recruiting a suitably skilled workforce to keep up with the demands of a now globally competitive market.

As a small island state in Australia, Tasmania's manufacturing sector is small by global standards. However it is significant as it is home to a large global mining equipment manufacturer and an associated cluster of small componentry firms, all linked through a common supply chain network. Our investigations suggest that these regional manufacturing firms are moving through a series of five key transitions. These transitions imply a shift in both technologies and skills. We argue the importance of understanding these transitions to adequately work with the cluster to develop relevant workforce planning and skills development strategies into the future.

The *first transition* reflects the changing focus from low value to high value-added manufacturing. The importance of manufacturing to advanced economies has now been recognised, particularly since the global financial crisis. In Europe, the countries that have best navigated the GFC and the Euro Crisis have been those countries with well established high value-added export oriented manufacturing industries (i.e. Austria, Denmark, Finland, Germany, Netherlands, Switzerland and Sweden). This transition is clearly underway in the north west of Tasmania in the shift to the production of low volume, high value, large scale mining equipment. The flow-on effect is a requirement for consistency and quality in the components supplied. This is demanding more sophisticated equipment and advanced skills.

The *second transition* has been the shift in the mindset and perceptions about manufacturing. No longer equated with the dirty, smoke stack producing factories and unskilled labour of the past, new manufacturing is high-tech and focused on zero waste. In this we are seeing a transition from the 'black arts' to a new green manufacturing future, but this also requires an understanding of the transferability of skills from 'old industries' to 'new ways of working', and what it takes to do this well.

The *third transition* involves the 'game changing' shifts that are now transforming manufacturing. These are the step changes in the materials, processes, products and most especially in the technologies used in manufacturing. In particular, the technologies gaining most attention in this space include additive manufacturing, assistive automation, advanced design and smart information systems. The adoption of these new technologies presents critical social questions as manufacturing transforms not only our environmental and economic landscapes but also the way we interface with these new technologies, and in the new skills that are increasingly required in line with these new innovations and practices.

The *fourth transition* has been in the closing of the gap between manufacturing and manufacturing services such that there is no longer a clear distinction between the secondary and tertiary services associated with manufacturing. Smarter ways of working have embedded a range of valuable new business services among the outputs of this changing sector which, as is illustrated in the paper, is a valuable new opportunity for manufacturing firms located in regions.

Finally, the *fifth transition* reflects a series of relationships in transition around manufacturing. This is taking the form of new partnerships between industry, universities and R&D institutions to broker new knowledge solutions. It also reveals how the mutuality of these new forms of engagement are driving new opportunities for the transitions taking place in manufacturing and also how these transitions are being shaped and driven through new modes of dialogue.

In this paper, we explore how these transitions play out in a case study based on a recent government funded research project in regional Australia which focused on process manufacturing in the food and mining sectors, with state, national and global linkages. We find, for example, the national and international impact of these changes in the regional manufacturing sector have the potential to leverage Australia's current resources boom beyond the export of raw minerals to provide significant value-added mining technologies and services. We also find that the place based context of north west Tasmania (e.g. a long trades history, a ,'can do' attitude and localised know-how culture) afford the manufacturing cluster additional opportunties to value-add and leverage services to gain competitive advantage. Mobilising these opportunties prompts, in turn, a rethinking about approaches to education and training.

By working closely with the manufacturing sector, this research leverages local know-how to identify the skills, training, pathways and partnerships that will underpin the future success of new manufacturing in the region. This project also brings together the regional manufacturing sector with the higher education sector and Australia's national science and technology organisation to understand the implications of these 'game changing' approaches for productivity and skills education and training for the region, and beyond. Our findings not only speak to the role of technology assessment in understanding some of the social implications of the rise of new manufacturing, but also outline a model for the new collaborative partnerships and dialogues that will shape these solutions into the future.

4.

M. Steinfeldt: Precautionary design of new nanomaterials

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Scope: Nanotechnology

Keywords: Precautionary principle, nanomaterial, design, technology assessment

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The development of nanotechnology especially of next generation nanotechnology is still in an early phase of development. Here we have the Collingridge dilemma between design options and the availability of reliable impact knowledge (Collingridge 1980). On the one side is a great uncertainty and lack of knowledge at an early stage in the product development cycle of nanomaterials and impacts cannot be easily predicted. On the other side control or change is difficult when the technology has become entrenched.

As long as results from toxicological assessments are not sufficiently accurate to warrant special legal regulation of nanomaterials, their handling should be guided by a precautionary approach. Established Risk Regulation and Risk Governance Framework (IRCG 2006) are not enough for the implementation of precautionary principle. There is a need for a preliminary assessment and for a rational implementation of the 'precautionary principle' based on sound scientific data and knowledge indicating justifiable concern.

In this contribution, the focus is placed on the developed comprehensive approach for the precautionary design and for improved recyclability of engineered nanomaterials. This approach is derived from several qualitative and semi-qualitative approaches to risk assessment and to criticality of materials, and is supplemented with environmental impact categories of Life Cycle Assessment.

Categories and aspects	Data quality	Source
Precautionary risk aspects		
Decision tree of risk categorization	Qualitative	German SRU to precautionary strategies for managing nanomaterials (SRU 2011)

Potential exposure of humans	Semi-quantitative	Swiss precautionary matrix for synthetic nanomaterials (BAG/BAFU 2011)
Potential input into the environment	Semi-quantitative	Swiss precautionary matrix for synthetic nanomaterials (BAG/BAFU 2011)
Potential of accident	Semi-quantitative	German ÖI Sustainability check (ÖI 2011), orientation on Swiss precautionary matrix
Ressource aspects		
Criticality	Qualitative, Semi-quantitative	EU concept of criticality (EC 2010)
Recycling capability / tendency to dissipation	Qualitative	In orientation on German ÖI Sustainability check
Abiotic ressource requirement	Quantitative	LCA methodology (DIN EN ISO 14040 2006)
Other LCA impact categories		
Energy requirement	Quantitative	LCA methodology (DIN EN ISO 14040 2006)
Global warming potential	Quantitative	LCA methodology (DIN EN ISO 14040 2006)
Tox. potenzial, but not nanospecific	Quantitative	LCA methodology (DIN EN ISO 14040 2006)
Ecotox. potenzial, but not nanospecific	Quantitative	LCA methodology (DIN EN ISO 14040 2006)

Table 1: Approach for the precautionary design and for improved recyclability of engineered nanomaterials

Our approach as well as first assessment results concerning four nanomaterials (nanocellulose, MWCNT, nano TiO2, and nano ZnO) and associated products in the project NanoSustain will be presented.

References

BAG/BAFU (Federal Office of Public Health FOPH and Federal Office for the Environment FOEN) (2011a). Precautionary Matrix for Synthetic Nanomaterials, Version 2.1.

Collingridge, D (1980). The Social Control of Technology. St. Martin's Press. New York.

DIN EN ISO 14040 (2006). Umweltmanagement - Ökobilanz - Prinzipien und allgemeine Anforderungen. (Environmental management - Life cycle assessment – Principles and framework), Berlin. (in german).

European Commission (2010). Critical raw materials for the EU. Report of the Ad-hoc Working Group on defining critical raw materials; Brussels.

Möller, M et al (2012). Analysis and Strategic Management of Nanoproducts with Regard to their Sustainability Potential - Nano-Sustainability Check. UBA-Texte Nr. 36/2012, Dessau-Roßlau.

OECD Environment Directorate (2010). OECD Forum on Global Environment focusing on Sustainable Materials. Materials Case Study 1: Critical Metals and Mobile Devices; Working Document; Paris.

Öko-Institut (2011). Nano-NachhaltigkeitsCheck (Sustainability check for nanoproducts). Freiburg.

SRU (German Advisory Council on the Environment) (2011). Precautionary Strategies for managing nanomaterials. Berlin.

5.

B. Giese/ S. Königstein/ C. Pade/ H. Wigger/ A. von Gleich: Assessing and influencing an emerging technology – the case of synthetic biology

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Scope:	'Research assessment', providing early orientation for funding and precautionary regulations, enabling sustainable paths for the development of Synthetic Biology.
Keywords:	‚Synthetic biology', paradigms, methodology, ‚new functionalities', hazards

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Synthetic biology (SB) is a rapidly emerging research field of biology with ambitious claims. The highest potential for sustainable contributions and for minimizing hazards is achieved, if societal interventions influence innovation processes as early as possible. The project SynBioTA – a technology assessment of synthetic biology – tries to take this chance and therefore represents rather research assessment. Thus, assessment is confronted with the need to change its analytical focus from applications to the technology itself and the new functionalities.

Our analysis concentrates on underlying paradigms, applied methods, models and experiments of SB as well as on their possible technical, social and ecological implications.

We identified three paradigmatic elements, which constitute the field of SB:

a) the chemical paradigm,

b) the informatics paradigm (with a systems-level perspective) and

c) the genetic paradigm.

These elements apply the methodological triad of 'deconstruction', 're-design' or 're-programming' and 'recombining'. The leading idea, characteristic of all constructive

approaches in the subfields of SB, is the claim for new possibilities to combine elements of biological systems.

Although the application of engineering principles is a major claim since the advent of SB, in practice rational design and evolutionary principles are not as opposing as it seems. It became clear that even in the future a combination of both approaches will be found and needed when intricacies of rationally designed structures (or mechanisms) are optimized.

Regarding new or improved functionalities it turned out that approaches, which have evolved during recent years in SB, are rather based on a reduction of complexity. Current top-down strategies therefore try to eliminate inherent characteristics of living matter like noise, complexity, instability and evolution. But it remains questionable, whether the full range of probable functionalities offered by biological entities can be obtained by this reductionist strategy.

In terms of hazardous potentials two elementary processes of living organisms could be responsible for a variety of negative outcomes: on the one hand the ability for self-replication and on the other hand exchange and evolution on the genetic level. Consequently, application oriented technological development paths in SB have to avoid the manifestation of each of these capabilities. Cell-free approaches, missing a bio-physical boundary or microreactors, containing only a limited amount of biomolecular equipment and thus excluding self-reproduction would provide direct control and regulation and simultaneously minimize the hazardous potential.

The main part of current approaches in SB still contributes to basic research. As such they belong to the scientific cognitive process and should therefore remain independent of any third party claim. However, when technological developments in science shift their focus on applications, societal needs have to be considered, which can be divided into two groups:

a) qualitatively new or improved functionalities for sustainability goals and

b) minimization of hazardous side effects.

These requirements could best be achieved in cell-free approaches and microreactors that are unable to replicate.

The extended claims of manipulation and creation in SB, which lead to increasingly ‘unnatural’ organisms, question the regulatory approach for genetic engineering. Here the precautionary principle should be central for new specific regulations.

6.

H. König/ C. Coenen/ D. Frank/ R. Heil: Science, technology and the state: The quest for knowledge-based governance in synthetic biology

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Scope:	Project results in policy-making, knowledge and dialogue needed for decision-making in societies
Keywords:	Synthetic biology, evidence mapping, benefit and risk dimensions, pluralistic policy input, hurdles to efficient policy output

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New biological systems and organisms designed to satisfy human needs are among the aims of synthetic biology, an emerging field that may be described as an engineering approach to life. It has been predicted that synthetic biology applications will offer great benefits by making possible new drugs, renewable chemicals or clean energy, all of which may contribute to a new revolutionary bioeconomy. However, they have also given rise to concerns about new safety/security, environmental and socio-economic risks, and about ethical and other philosophical issues regarding the nature of life – provoking an increasingly polarized debate.

Against this backdrop, we have sought to identify conditions and potential schemes for governance in synthetic biology that may contribute to knowledge-based policy-making. Working towards this goal, we have performed evidence mapping of the potential social benefits and risks of synthetic biology, encompassing environmental, health, safety, security and socioeconomic aspects. Our data suggest that benefits and risks depend on issues linked to different layers. Thus general issues associated with application schemes (e.g. effects on biodiversity or food security due to large-scale biomass production) can be distinguished from threats more specifically associated with synthetic biology approaches, namely biosecurity issues related to the easier creation of new pathogens by genome-synthesis techniques; and from issues concerning biosafety risk assessment caused by extensively genetically modified or (putative) entirely “synthetic” future organisms. Furthermore, these issues need to be seen in the light of synthetic biology’s likely global impact, the low predictability of the exact nature of future innovations/approaches from an emerging field and the rapid

proliferation of knowledge and equipment (that is likely to be impossible to control). We propose that curbing negative consequences on a global scale may require products or applications to be subjected to broadly applicable and effective environmental, socioeconomic and ethical international standards that are largely independent of the exact nature of the underlying technical approach, and that future biosafety assessment may need case-by-case testing. Furthermore, the issue of knowledge and equipment proliferation (and control) illustrates the additional need for shared responsibility and awareness-raising among all actors.

Given these different layers of benefits and risks, we argue that policy makers need to be informed by the most pluralistic expertise and perspectives available, including knowledge from civil society. Even if the conditions could be created under which to obtain appropriate pluralistic input of this type, however, we propose that this would not suffice: recent developments in the relations between science, technology development and the state (or its regulatory institutions) have the potential to undermine efficient knowledge-based policy output and legitimacy. These developments may drive inefficient policies or regulations and prevent the emergence of the innovation and safety/security cultures required to responsibly govern potential transformations linked to synthetic biology and other emerging technologies.

7.

R. van Est/ D. Stemerding: Making *Perfect* Life: Bio-engineering (in) the 21st century

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Scope:	European governance, bio-engineering, NBIC convergence
Keywords:	NBIC convergence, governance, bio-engineering, trans-technological

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STOA project Making *Perfect* Life

The main goals of the STOA project 'Making *Perfect* Life: Bio-engineering (in) the 21st Century' were:

- To identify major trends in 21st-century bio-engineering, and related societal and political challenges, thus fulfilling the function of early warning of long-term-policy challenges
- To discuss specific developments to alert politicians that near-term policy challenges and regulatory questions are already imminent.

To achieve these aims, the project took a trans-technological perspective by describing four fields of bio-engineering: engineering of the human body, the brain, intelligent artefacts and living artefacts.

The study was commissioned by the Science and Technology Options Asssement (STOA) unit of the European Parmliament and it was delivered by the Rathenau Insititute based on STOA requitements.

Two bio-engineering megatrends

In this century we see the emergence of a *new engineering approach to life*, which is shaped by NBIC-convergence. Convergence implies the increasing interaction between the biological and physical sciences and can be described in terms of two megatrends: 'biology becoming technology' and 'technology becoming biology'. Both megatrends point to a future in which 'life' is conceived of as a phenomenon that can be controlled and constructed. In many respects this future is uncertain and speculative. Still, our study revealed that all four fields of 21st-century bio-engineering are shaped by these two megatrends, which together constitute a new engineering approach to life.

As biology and engineering become increasingly intertwined, new questions and concerns will fuel already long-standing bioethical debates in society. Partly such debates are stimulated by highly speculative long-term visions. Already today, however, bio-engineering raises a variety of ethical, legal and social issues which may challenge current regulatory practices. To identify these challenges we studied: whole genome sequencing, neuromodulation, biocybernetic adaptation and synthetic biology.

The case studies strongly indicate that bio-engineering in the 21st century will pose a variety of regulatory challenges to European politics and policymakers. An important question for policymakers is to what extent current regulatory practices are able to adequately respond to the shifting and emerging sociotechnical practices that we have identified. There is already a patchwork of regulatory practices in place in the different fields of bio-engineering. Depending on the sociotechnical practice under consideration, these existing regulatory frameworks were found to be partly adequate, partly under pressure and partly inadequate.

Conclusions and policy recommendations: The need for bioethics and biopolitics

In order to cope with the governance challenges of bio-engineering in the 21st century, European policymaking needs a comprehensive strategy involving both *bioethics* and *biopolitics*. European policymakers need to acknowledge that future bioethical debates will no longer be solely guided by the life sciences, but more broadly by NBIC convergence. The European Commission actively stimulates R&D projects and research on ethical, legal and social issues (ELSI) in all four fields of bio-engineering. However, across the different bio-engineering fields there is a clear disparity in the extent of institutionalized attention paid to the governance of ELSI. Besides bioethics also biopolitics is required, that is, the *political regulation* of shifting and newly emerging sociotechnical practices in society.

PACITA Conference, Prague

XVI. Thematic Session: Integrated Assessments of Emerging Science

Chair: **Frans Brom**

Date: Friday, March 15th, 2013

Concept of the thematic session

For this workshop, we would like to open up a debate on the needs of further integration of methodology in assessments of emerging science and technologies, the role of such integration in Parliamentary Technology Assessment, and the concrete make-up of an integrative framework. In the workshop we will first present a summary of the assessment status in the fields of the project case studies, and then present our ideas about a useful integrated assessment framework for further developing a holistic and consistent basis for good technology governance. We believe that the PACITA conference provides an invaluable opportunity for discussing our findings with fellow practitioners and researchers.

E.-M. Forsberg/ R. Nielsen/ N. Heyen/ A.-C. Hoes: Integrated assessments of emerging science and technologies

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Keywords: Different assessment traditions, integrated assessment framework, nano food, synthetic biology, biofuels, cloud computing

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In times of great scientific and technological transitions there is a need for a systematic assessment of technologies, with regard to economic, social and environmental sustainability, human, animal and environmental safety, ethical issues, and consumer acceptance. Besides Parliamentary Technology Assessment (PTA) other relevant assessments are sustainability assessments, impact assessments, risk assessments, ethical assessments and consumer studies. Each of these kinds of assessments includes heterogeneous practices and methods, and can as such be labelled areas of practice, rather than be regarded as distinct assessment methods.

EST-Frame is a European research project (funded by the 7th framework programme, Science-in-Society) focusing on determining the need for more integrated assessment frameworks for assessing emerging science and technologies (see www.estframe.net). The work includes studying how emerging science and technologies currently are assessed, focusing on four case studies (nano food, synthetic biology, biofuels and cloud computing). The EST-Frame project is also a meta-methodological research effort to develop an integrated assessment framework that will support assessors in designing assessment projects in varying contexts. The aim is to create a framework that will provide guidance on situation appreciation, methodological choices and process design related to achieving the desired assessment impact.

In this session, at first a summary of the assessment status in the fields of the project case studies is given, then some initial ideas about a useful integrated assessment framework for further developing a holistic and consistent basis for good technology governance will be presented, and finally an extensive general discussion based on the two papers is intended.

Paper 1: The current assessment situation with regard to nanotechnology, synthetic biology, biofuels and cloud computing

Anne-Charlotte Hoes and Nils Heyen

In this contribution we will present the work from the four case studies, showing how such emerging technologies currently are assessed. The case studies include in-depth studies of the assessment situation in one country (respectively, the Netherlands, Germany, the UK and Denmark), as well as at the European level. They describe the national and EU context of the assessments, including the important policy discussions, governance initiatives and public concerns. We will present an overview of the relevant assessments and an analysis of the relations between them, discuss the varying policy impact of the assessments and describe uncovered assessment needs.

Paper 2: Developing an adaptive framework for integrative assessment of emerging science and technologies

Rasmus Øjvind Nielsen and Ellen-Marie Forsberg

The presentation will take its point of departure in the assumption that science and technologies emerge in complex societal situations and create different political challenges. Consequently, assessments to support STI policy must make situation-specific choices of methodology and assessment design related to specific impact goals. By adopting an interactive understanding of the relationship between assessment methodology and the political situation which the assessment project feeds into, a pragmatic dimension opens up regarding the question of integrative methods in assessment of emerging science and technologies.

Different traditions already exist (e.g. impact assessment, technology assessment, risk assessment, ethical assessment, foresight, and sustainability assessment) which each in their own way seek to facilitate interdisciplinary assessment of emerging science and technologies. These different traditions, however, exist in different institutional ecosystems and do not necessarily benefit from the otherwise obvious benefits of methodological cross-fertilization. In EST-Frame we therefore wish to develop an adaptive approach based on the concrete situation as the privileged ground for such mutual learning. This involves opening up institutional silos and allow for a common reflection on situational description, methodological choices and process design.

PACITA Conference, Prague

XVII. Thematic Session: Ethical Aspects of TA

Chair: **Frans Brom**

Date: Friday, March 15th, 2013

Concept of the thematic session

Which ethical dilemmas are evident in selecting technologies? This session dares a tour d'horizon of ethical expertise and TA and focuses on ethical questions in selecting health technologies, on autonomous machines tested as agents or robots, on conditions for gaining acceptance of technological development and on social sustainability.

1.

M. Siebzehner: Ethical dilemmas in selecting health care technologies in Israel

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Scope: The ethical dilemmas in selecting Health Care Technologies during the decision making process of inclusion proposed technologies in the National List of Health Services of the National Health Insurance Law in Israel.

Keywords: Ethical dilemmas, health technologies, priority setting, Health Insurance Law

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The Israeli National Health Insurance Law, enacted in 1995, determines a national list of health services (NLHS) to which all citizens are entitled. In order to maintain the high standard of medical care provided by the Israeli healthcare system, as expressed by long life expectancy and low infant mortality, the NLHS should be updated periodically. The NLHS can be updated only by allocation of funds from the Ministry of Finance. The rapid development of medical technologies together with the limited resources available in the healthcare system makes priority setting inevitable.

In 1998, a systematic process to adopt new medical technologies within the NLHS, was initiated. The Decision making process for choosing the inclusion of health technologies into the NLHS is based on the recommendations of a National Public Advisory Committee which integrates not only the clinical and economical aspects, but social and ethical values. Members of the committee include representatives of government officials, health professionals, economists, and of the public amongst others an ethicist and a rabbi.

E**thical Dilemmas in Selecting Health Care Technologies in Israel**

Decision makers strive to improve the quality of life and welfare of the population, but at the same time they confront the dilemma of balancing health benefits with a shortage of resources, therefore, rationing is required.

The prioritization of health technologies confront many ethical dilemmas that the decision makers and the society in Israel are facing throughout the years, such as: what should be given priority? – costly medications for relatively few people or inexpensive ones for many?

Israel offers a unique example of implementing a methodology of health technology assessment (HTA), combined with a priority setting process debated within a National Public Advisory Committee forum, which takes into account cultural and moral values. After years of experience, this process is considered by many health policy analysts in Israel and abroad, to be a breakthrough on an international scale.

This presentation will include some features of the National Health Insurance Law, an original model for HTA, the process of updating the NLHS, finalizing with the ethical dilemmas in decision-making regarding the selection of the health technologies.

2.

O. Bendel: Towards a machine ethics

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Scope: Machine ethics

Keywords: Machine ethics, information ethics, ethics, normative models, autonomous machines

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There is an increasing use of autonomous machines such as agents, chatbots, algorithmic trading computers, robots of different stripes and unmanned ground or air vehicles. They populate the modern world like legendary figures and artificial creatures in Greek mythology – with the main difference being that they are real in the narrow sense of the word. Some are only partially autonomous (acting under human command) while others are completely autonomous within their area of action.

A genuinely autonomous machine should be able to act in a moral way, able to make decisions that are good for humans, animals and the environment. But what does it mean for machines to behave morally? Should they learn moral rules? Should they evaluate the consequences of their acts? Or should they become a virtuous character, following Aristotle? How is it possible to implement the classical normative models of ethics and is there a need for new ones?

In this paper the young field of machine ethics is explored. The main question is if it is possible to implement morality into autonomous machines. The answer is based on literature analysis and personal considerations and derivatives.

Firstly, the concept and the classification of machine ethics are clarified with respect to the circumstance that it is not an established discipline. On the one hand, machine ethics can be subsumed under information ethics (including computer and net ethics) and technical ethics. On the other hand, it may be seen as a counterpart of human ethics, in that the autonomous system is a subject of morality.

Secondly, new literature on the field is reviewed, focusing on a book about machine ethics, which was edited by Michael and Susan Leigh Anderson, two leading experts from the United States.

Thirdly, the main topics of machine ethics are described; it is distinguished between different kinds of systems and situations in which they act, and present strategies of the industry are outlined.

Fourthly, the paper tries to answer the question if and how it is possible to implement the classical normative models of ethics and which models should be preferred. Seven important normative approaches are described and estimated relating to their suitability for machine processing. Then the focus shifts to duty-based ethics, ethics of responsibility and virtue ethics that seem to be serious candidates. With a short technical analysis it can be shown that they fit to machine processing, apart from some limitations. The most promising approach may be the combination of the selected normative models. It is not only similar in the "normal" human ethics, but also an opportunity to balance out weaknesses of the autonomous machines and to allow them alternatives. In addition, other methods like orientation on reference persons and social media evaluation could be used.

The research field is, despite contributions of robot ethics since the 90s, full of challenges and difficulties. In this respect, the paper is work in progress and merely a small piece in the big puzzle of machine ethics. It is aimed at ethicists and experts of technology assessment as well as at KI experts and computer scientists. The author is skeptical about the possibility of implementing a moral code in a machine in a satisfactory manner. Moreover, the requirements of machine processing could be different from system to system (and even from situation to situation). But there will be a substantial interest from industry and military that would like to bring their solutions in the market respectively in the areas of conflict, and, in a different sense, of philosophy to solve some of the central questions. To say it from the philosophical point of view: Machine ethics will be the touchstone of ethics in general.

3.

P. Machleidt: Technology assessment as applied ethics of technology in the Czech Republic

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Scope: In the Czech Republic it is possible to follow up not only the established and appreciated tradition in the philosophy of technology but also considerable experience with the study of social assumptions and consequences in development of science and technology - TA. Mainly legislative sphere is the natural addressee of these initiatives in the Czech Republic. Nevertheless, demand for advisory services in the field of evaluation or formation of technology with regard to social aims in the Czech Republic grows only gradually and this process requires certainly an active stimulation. Here is a great opportunity for the project PACITA (Parliaments and Civil Society in Technology Assessment).

Keywords: Philosophy of technology, TA implementation process, applied ethics of technology

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Both in the past as well as at present, activities with elements of social assessment of technology have got in the Czech Republic unignorable ethical background and motivation. It is interesting that for instance assumptions and assessment of the social consequences of the use of nuclear energy, as well as use of new biotechnologies are very close to the current conception of social technology assessment, including an emphasis put on participation of stakeholders in discourse and on significant normative (value) side of the issue - TA acts here as an aspect of applied ethics in technology.

For the time being, TA in the Czech Republic still remains without specialized institutional background and its development compared with potential possibilities is still undersized. Great emphasis is placed on technology ethics. There is a wide range of TA activities with elements of social assessment of technology but most visible are especially those with high and unmistakable ethical dimensions.

TA development in the Czech Republic is aimed to monitoring or active mediation of discussions among stakeholders of the TA process. Confrontation of thoughts associated with the search for consensus is characteristic of the present stage of TA in the Czech Republic - scientific information here is no longer crucial. Also the role of an

expert is being changed - his position is no longer exclusive, but more or less symmetrical with the role of the user.

TA implementation process in the Czech Republic proves that the concept of TA is still highly topical. It may yet take various forms - such as ethics of technology - depending on emphasis currently placed by society on the various sources and components of TA. It turns out that the original idea presented by Emilio Q. Daddario in 1967 constantly returns and shows its continued viability.

Technology assessment in the Czech Republic will be evidently always connected with innovation policy. This is an essential factor, legitimising evaluation in terms of TA – the innovation policy is often focused solely on economic factors, while social assessment techniques in the form of TA, analyses technology innovations and makes their selection based on their sociable values that far exceed the economic sphere.

An important role for TA in the Czech Republic is to create conditions for gaining public acceptance of technological development. If the Czech Republic wants succeed in the future, it has to create an environment that is "friendly" to technologies. It is quite evident, that countries whose public will be open to new technologies will have a significant advantage over others – namely in the days when the development of the society will depend on the pace of innovation and innovative dynamics.

Many of the ethics issues in technology are linked with the interface of science and ethics, environmental ethics and/or medical ethics. There is also a structural interface for TA and ethics, politics and ethics, economics ethics and business ethics. Applied ethics of technology, together with an analysis of the human factor in the sphere of risks, emphasizing of the importance of public awareness and monitoring of "vulnerability" of technologies (i.e. research of the sufficient "robustness" of technological systems), indicate the future orientation of TA development in the Czech Republic.

4.

M. Opielka: Ethical dimensions of TA and social sustainability: The case of participation in social and health policy

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Scope:	Concept of Social Sustainability / Participation as central element within TA /Ethical dimension and conflicts
Keywords:	Social Sustainability / Participation / Ethics / Social Policy / Health Policy

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Background & Context: Starting point of the paper is the urging need to enhance the role of social and health policies in the field of TA. A normative reason for this case can be seen in the politics of sustainability which needs improvement in order not to endanger its practical goals e.g. the so called “Energiewende”. Social and health programs are conceptualized as emerging markets especially regarding the demographic development. However, the social techniques used e.g. for prevention, insurance, or long-term care replicate techniques from the technical fields in the narrow sense. There exists doubt whether this replication leads to ethical unsoundness, hinders politics of sustainability, and should be transformed into a more socially sustainable program. The context of this reflection is the TA support for several German parliaments as well as a set of futures studies.

Content & Findings: The most important method to raise the ethical impact in social and health policies is to organize the participation of all relevant stakeholders within the decision making processes. The bureaucratic structure of most programs and the corporatist lobby structure hinder the participation esp. of the weak users and badly organized interests. However, from the field of futures studies one can derive expertise in the field, e.g. Delphi Studies, Horizon Scanning, and other instruments combine research and development, and allow the consultants of public policies to integrate the view of otherwise marginalized interests to become represented and articulated within the political system. The discussion in the paper follows actual ethical controversies esp. transplantation medicine and autonomy in the case of dementia under AAL.

Conclusion: Participation and discourse orientation are discussed as problem solving strategy for ethical dilemmas in the field of social and health policy and TA processes therein.

PACITA Conference, Prague

XVIII. Thematic Session: Participation: Practical Cases

Chair: **Walter Peissl**

Date: Friday, March 15th, 2013

Concept of the thematic session

Participation is seen as an important instrument and therefore gains increasing influence in TA. After having discussed theoretical and methodological issues related to participatory TA in session XII, this session is devoted to exchange of practical experiences made during PTA projects. Projects from across Europe and from different technological and political domains will be presented. In order to learn from the experiences made, plenty of time will be devoted to compare and discuss the common grounds and differences.

1.

P. Stankiewicz: Governing energy transitions in post-communist countries. The case of Polish Nuclear energy development programme

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Scope: Change of institutional settings in TA systems in post-communist countries

Keywords: Participatory Technology Assessment, nuclear energy, institutional systems of Technology Assessment, feasibility of participatory approach

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According to the Polish government's agenda, the first nuclear power plant in Poland will have been constructed before the year 2025. The preparation for the initiative has already started and a public debate on nuclear energy has begun to unfold. In order to deal with public opinion and possible resistance to the development of Polish nuclear power industry, the government is running a wide information & education campaign, which is heavily based on above-the-line marketing and PR techniques as well as on the 'deficit model' of communication with the public.

The case of nuclear energy development in Poland gives the opportunity to pose a question about the desired technology assessment system for post-communist countries. What should be the best (and what does it mean 'the best' in this context?) approaches, methods, tools, institutional solutions and structures of technology assessment?

The main problem of those countries is the lack of experience with governing areas of great technological transition in a democratic, participative or deliberative manner. Therefore, the styles of decision making are very much expert-based, technocratic and top-down. The development of nuclear energy can be seen as an ultimate test for the current approach to technology governance, highlighting its strengths and weaknesses. At the same time the situation may open a 'window of opportunity' for emergence of new styles of technology assessment. The goal of this presentation will be to show the main characteristics of the Polish governance system of transition towards nuclear energy.

If we stick to the rough divide of technocratic and participative decision-making styles in technology development, we can observe that the participative approach is more and more popular, although mainly in the declarations and vocabulary used by the decision makers. Such words as 'debate', 'discussion', 'dialogue', sometimes even 'participation' became quite common. While they seem to construct the framework of nuclear energy development policy, the practice behind the framework still reminds more of the well-known technocratic way of public communication, where a debate is only a way to get public acceptance for the decision which already has been taken.

As a result, in Polish technology assessment approach we can observe a very interesting mixture of a declared openness to public debate and stakeholders' engagement with a business as usual in the practice, where the crucial decision are taken in experts circles close to the government.

At the same time demands for more participatory and transparent approach are raised almost exclusively by the green movements, what only strengthens the divide between proponents and opponents of nuclear energy, whereas the participatory approach is associated more and more with green activists. It makes it difficult to accept new modes of technology assessment as a broad, legitimate way of decision making in technology sector.

The ambitious and far reaching plans of nuclear energy sector development might be an opportunity for a change from the dominating, conventional technology assessment approach in Poland towards a more democratic and participative approach. However, there are still many obstacles, rooted in the lack of institutional experience with alternative approaches and the general way of perceiving technology development as a purely expert issue.

2.

J. Hahn/ S. Seitz: What can TA learn from 'the People'? A case study of the German citizens' dialogues on future technologies

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Scope:	Large participatory TA processes, transdisciplinary knowledge, normative frameworks of citizens
Keywords:	Participatory TA, citizens' dialogues, energy transition, high-tech medicine, demographic change

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The project "Bürgerdialoge" ("Citizens' Dialogues") initiated by the German Federal Ministry of Education and Research aims to incorporate the perspectives of citizens regarding future technologies. In the aftermath of Fukushima, Germany's highly discussed withdrawal from nuclear energy and the accompanied fundamental changes and transitions in energy production were subjects of the first round of eight regional dialogues (with about 100 participants each), which took place from July to November of 2011. Citizens were invited to discuss and develop approaches to solve energy questions formulated by the ministry regarding energy efficiency, renewable energy, energy grids and bridging technologies. In a second round the citizens' dialogues took on the topic of high-tech medicine, with focuses on telemedicine, neuronal implants, as well as palliative medicine and intensive care, again given beforehand by the ministry. For each of these three topics, two regional dialogues took place. A total of six regional dialogues were conducted from September to October of 2011. In fall of 2012 a new dialogue round on demographic change focusing on the work world, education and lifelong learning and social aspects with a total of six regional events started.

Generally, the format of the dialogues can be described the following way: In a first discussion-round the citizens' concerns and expectations are documented and a second round is made up of developing approaches and possible polices for dealing with and solving the issues articulated. The goal of each regional dialogue is to put together a report which is then given to a representative of the ministry. During a two-daylong summit concluding the regional dialogues, participants are able to write a final summarizing report, which is officially passed on to the federal minister. The entire process is accompanied by an advisory board made up of representatives of research, science, the economy, civil society as well as participating citizens themselves. Additionally, an Internet platform offers the possibility of online participation.

A first interpretative analysis of the dialogues shows several overarching themes for both the energy and high-tech medicine dialogues that differ substantially from the topics 'assigned' by the ministry. Citizens' recommendations from the energy dialogues were concerned with the decentralization of energy production, which was seen as a possibility to strengthen regional participation of citizens and municipalities helping them become more independent from large energy companies and to develop local energy plans. Further, participants stated that the political framework in form of taxes, research funds and new laws was an important tool to encourage energy efficiency, the development of new technologies and education of the public. Overall, offering advice and guidance to citizens was seen as a main job of the government. The necessity of large investments in research for the improvement and development of technologies and economic aspects regarding the importance of supporting the enlargement of highly qualified people were also discussed.

During the high-tech medicine dialogues the three different topic areas given beforehand by the ministry characterized many discussions. Recommendations, concerns or interests differed between the dialogues for example on neuronal implants or palliative medicine and intensive care. Yet, similar to the energy dialogues, certain overarching themes can also be distinguished. Data privacy, informed self-determination, equality regarding the access of new technologies as well as assistance and human care in connection to the role of technology were all main themes of all dialogues.

Apart from the first contextual findings, the dialogues also offer an interesting format for TA. Compared to other participation approaches (such as focus groups), they give a relatively large number of citizens the opportunity to take on an active role in the societal discussion on new technologies, but also the framing of possible policy decisions. Further, the dialogues have a qualitative level; going beyond, for example referendums, and enabling an understanding of citizens' narratives regarding new technologies. Yet, it can be assumed that the strong focus on consensus-reaching during the citizens' dialogues and the fixed thematic framework given by the ministry constrained the outcome to a certain degree, which would have to be examined further.

Still, by providing insights into normative frameworks, values and interests of citizens (understood as 'experts for the everyday`) formats like these dialogues can support a certain 'sensitivity' of TA researchers and respectively decision makers regarding issues important to the public and potentially integrating these into wider policy-making. Public engagement goes beyond simply assessing citizens' perceptions or hopes and fears. It includes creating new forms of participation that influence the development of policies in certain ways (ideally decided upon beforehand), which of course is not an easy task. This is grounded in the understanding that new technological developments are shaped socially, they don't just occur linearly in a separate sphere, which also shows in the different expectations of actors regarding the outcome and impact of formats such as the citizens' dialogues. The participants themselves want to be taken seriously regarding their recommendations and assessments. The actors from the political (i.e. ministerial) and scientific side often don't regard citizens as 'fit' to answer highly complex questions and are unsure what the participants' role is, which results in difficulties when transferring the results into political and professional fields and

coordinating these with actual policy decisions. It remains to be seen to which extent and in which form the suggestions, ideas and concerns articulated in the citizens' dialogues will actually influence political, economic and social decision makers, thus having some kind of impact and becoming more than mere engagement 'exercises'.

Nevertheless, including the public (i.e. social groups, stakeholders, affected citizens or laypeople) in the process of assessing and evaluating (future) technologies is an integral part of TA. The argument could be made that through participation different kinds of (transdiciplinary) knowledge can become part of the assessment process. During the citizens' dialogues it could be observed that citizens often apply complex technological developments to their own specific social background and context. The incorporation of this can enable a transdiciplinary approach to include the 'dialogue of many' for more networked and inter-related knowledge regarding TA.

3.

S. Gram: Local participation in climate change adaptation

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Scope:	Climate change adaptation
Keywords:	Scenario workshop, citizen summit

From 2009 to 2011 stakeholders, citizens, decision-makers and experts were involved in the planning and discussion of climate change adaptation in a number of European cities around the Baltic Sea. The Danish Board of Technology (DBT) was part of the process of testing and implementing new participatory decision-making procedures throughout the Baltic Sea Region. These initiatives were part of the BaltCICA project from 2009 to 2012 under the EU Baltic Sea Region Programme.

In a future with a warmer climate municipalities and cities along the European coasts are being threatened both by rising sea levels and storm surges and by more and heavier precipitation in the hinterland.

Areas with houses and summer cottages, farm land, protected nature areas, infrastructure and much more are increasingly at risk of being flooded. To address this situation municipalities are forced to incorporate climate change adaptation in their long-term development plans.

This long-term planning is partly technical (dikes, pumps, building regulations, drainage systems etc.) and partly political regarding which areas should be protected, economic constraints, priorities between different areas etc. Decisions about where to protect and where to phase out current land use and for example turn agricultural areas into wetlands are politically sensitive and therefore require a thorough debate involving large parts of the public who through this dialogue take responsibility for the decisions taken.

The BaltCICA project tried out a range of different deliberative methods such as different forms of scenario workshops, citizen summit, and expert and politician consultations.

This presentation will go into detail about one of the BaltCICA cases, Kalundborg Municipality, in which several dialogue methods were used in combination to involve a lot of the local citizens and stakeholders in the decision-making process leading up to the drafting of a climate adaptation strategy for the municipality of Kalundborg.

As part of this participatory process DBT and Kalundborg Municipality organized a scenario workshop in the autumn of 2009 with stakeholders working together to form visions for local climate change adaptation based on different climate scenarios. These visions helped give inspiration and direction to the themes discussed at a subsequent citizen summit where hundreds of citizens voted on alternative developing plans for their municipality taken into account conflicting interests like nature, farming, summer cottages, local economy etc.

As a result of the BaltCICA project, the need for long-term climate change adaptation planning and priorities rather than ad hoc solutions is now more widely recognized among the politicians, stakeholders and citizens, and the municipality is more ready to make priorities now that they have a mandate from the public.

4.

M. Sotoudeh/ W. Peissl: CIVISTI method for future studies with strong participative elements

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Scope:	Integration of different knowledge for reflexive governance
Keywords:	Long-term planning, sustainable development, forward-looking activities, citizen participation

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Long-term planning with a time-horizon exceeding 20 to 30 years is an important element of sustainable development. At the same time economic actors apply flexible policies and use short-term planning to ensure profit. Environmental and social problems also may sometimes call for short-term solutions in order to save systems in acute danger. This creates a paradoxical situation: the respective society needs to define long-term targets for its infrastructure and achieve systematic changes in pursuing those, but the necessary short-term actions might not be in line with such long-term goals. If this apparent paradox is not solved through an appropriate governance method, it might lead to conflicts between different policy goals. The concept of reflexive governance for transition management [1] tries to solve this apparent paradox and combines a number of short-term planning processes in a stage-wise and reflexive way to create a more comprehensive and innovative process of long-term planning for a sustainable development. In this contribution we introduce and discuss the CIVISTI method as a reflexive instrument for integrating different types of knowledge and creating a bridge between short- and long-term planning. The method is designed for identifying future-visions based on peoples' hopes and fears and integrating them as an input to dialogues between actors and to identify different future expectations.

Forward-looking activities and identification of goals set by the society are a fix element at each stage of reflexive governance. The main challenge is how to integrate different knowledge types such as citizens' visions and experts' recommendations into long-term planning in order to support the decision-making process. The CIVISTI method, an innovative forward-looking approach, addresses this challenge through a well-designed combination of consultation and reflection steps. The CIVISTI method has been developed during the EU-project on Citizen Visions on Science, Technology and Innovation (CIVISTI 2008-2011). All visions and recommendations are available on www.civisti.org).

One of the main functions of the CIVISTI method is the translation of implicit knowledge on emotions, fears and hopes related to the future to explicit knowledge on needs for scientific research. At ITA the CIVISTI method has been analyzed since 2011 according to the integration of results in the decision-making process at local and national levels [2]. Results of explorative interviews show different views about the impact of this innovative participatory method. The interviewees mentioned inter alia that scientific community, administration, and media have different selection mechanisms of results and need different levels of information. Main factors identified for improvement of integration of results are optimized timing between different phases of consultation and reflection, thematic focus, integration of local policy especially for discussion of tensions between short- and long-term projects as well as new strategies for validation of the qualitative results.

CIVISTI method provides a systematic and citizens oriented assessment of relevant issues for the future scientific research and technological development. The method is valuable for generation of knowledge and identification of values, since it identifies implicit knowledge on future hopes and fears, which can be discussed by experts and stakeholder; integrate this knowledge with corresponding stakeholders' and expert's recommendations and generates new knowledge on research needs that will be evaluated by all involved citizens. While the qualitative character of knowledge generation in CIVISTI has been well developed, there is a need for research and optimization of the integration of results into the decision-making process.

In this light ITA will apply the CIVISTI method in a new project for identification of citizens' visions on Autonomous and Ambient Assisted Living (AAL) in Vienna. To improve the validation process, results of the qualitative part of CIVISTI will be presented to a broader public debate and evaluated with an on-line tool. A close cooperation with the city administration and interested groups at the city level should improve the consideration of short- and long-term issues and integration of results into the long-term development and city planning.

Selected references

[1] Voß, J.-P., Bauknecht, D., Kemp, R. (2006). Reflexive Governance for sustainable Development. Edinburgh, Edward Elgar.

[2] Sotoudeh, M.; Peissl, W.; Gudowsky, N.; Jacobi, A. (2011) CIVISTI method for futures studies with strong participative elements. ITA-manu:script 11_03. http://epub.oeaw.ac.at/ita/ita-manuscript/ita_11_03.pdf

Parallel events

PACITA Conference, Prague

I. Parallel event: Civil Society Organisations in Research Governance

Chair: **Ivelina Fedulova**

Date: Thursday, March 14th, 2013

Concept of the parallel session

This round of talks and discussions will bring interested researchers, Civil Society Organizations (CSOs) and experienced scientists of CSO participation in research together.

There is a general expectation that the involvement of CSOs results in consumer friendly technologies, harmonized political debates or the improvement of legitimacy for policy decisions. Early suggestions or even interventions in science could contribute to the production of outcomes that are regarded as socially responsible. However, the empirical reality of CSO participation in research is almost unknown and also well-defined theoretical framings are missing. The presentations, talks and reports in the panel react to these deficits. They stimulate a critical discussion about the conditions, pitfalls and limits of CSO participation in research projects. Therefore the panel includes theoretical explanations, some empirical results but focuses on story telling elements from CSOs and scientists who have had experience in participatory projects. Presentations and discussions focus on setting up guidelines supporting the participation of CSOs in research projects. Following the sessions, all participants are welcome to continue their discussions online.

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II. Parallel event: Politicians and Researchers – Respective Views on Joint Projects

Chair: **David Cope**

Date: Thursday, March 14th, 2013

Concept of the parallel session

The idea of the politicians and researchers session is to focus on the policy advice aspect of TA by combining the perspectives of the TA practitioner with those of the clients. Selected TA projects will be presented from two perspectives: the involved researcher/project manager as well as the "client", i.e. the policy maker (Member of Parliament, representative of ministry or other public authority). The session is meant to discuss () the project process, the respective perspectives and the communication between the project management side on the one hand and the user on the other hand. Questions / aspects to be dealt with include:

- Scoping process: relevant issues (seen from the policy making and the project management perspective)
- Being comprehensive vs. pragmatic (What should be done and what can be done)
- Time schedule: Thorough analysis vs. meeting the policy making agenda
- Opening up to the wider attentive public
- Developing options for policy making (supporting policy making without intervening)
- Facts vs. values (How to be unbiased)
- Feeding results into the policy making process (What is the message and how to get it through?)

The session panellists are the following:

Germany:

- René Röspel, Biologist, Member of the German Bundestag since 1998
- Prof. Dr. Armin Grunwald, Philosopher and Physicist, Director of TAB (Office of Technology Assessment at the German Bundestag) and of ITAS (Institute for Technology Assessment and Systems Analysis, Karlsruhe Institute of Technology)

Denmark:

- Søren Mark Jensen, Head of Division, Danish Nature Agency, Danish Ministry of Environment
- Bjørn Bedsted, Project Manager, Danish Board of Technology (DBT)

The Netherlands:

- Dr. Jacqueline B. de Jong (Strategic Advisor, Strategy Development Department, Ministry of Security and Justice
- Prof. Dr. Frans W.A. Brom (Head of Technology Assessment Rathenau Instituut)

Finland:

- Päivi Lipponen, Dr. of Education Sciences, MP, Chair of the Committee for the Future
- Harri Jaskari, MP, Committee for the Future + Elina Kuusisto, Dr. of Education, University of Helsinki/Faculty of Education Sciences
- Paula Tiihonen, Dr. of Administrative Sciences

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III. Parallel event: TA Meets Young Talents

Chairs: **Pierre Delvenne**, **Jan Romportl**, **Lenka Hebáková**

Date: Thursday, March 14th, 2013

Concept of the parallel session

The event is co-financed by the project "Interdisciplinary Partnership for Artificial Intelligence" (MOAINet).

It is a round table session, which offers students, (post)graduates, researchers and practitioners from different disciplines the opportunity to discuss how they can learn from Technology Assessment activities and from each other.

Science, technology and society co-evolve at an increased speed. Activities that provide knowledge-based support for innovation governance and policy-design have to adapt to globalised economy, risk-aversive society, and information-overloaded policy-makers etcetera. Technology Assessment of today is not and should not be Technology Assessment from 1980s or 1990s. Rather, it needs as much input from TA like activities as possible: foresights studies, science communication, ethical-legal-societal implication studies, risk assessment, transition management, science & technology studies, etc. All deliver disciplinary expertise but often lack time and means to share results and visions or to collaborate across disciplinary boundaries.

The topic chosen for the round table discussion is robotics for society. This topic has significant techno-scientific challenges and societal expectations and concerns. The audience is students, doctoral and postdoctoral researchers that will phrase reflections, questions or suggestions based on:

- the interests/background of the addressee (somebody from government, industry, academia, TA community)
- their own field of education/expertise (foresights studies, science communication, ethical-legal-societal implication studies, risk assessment, transition management, science & technology studies,…)

1.

F. Lucivero: Regulating emerging robotic technologies in Europe: Robotics facing law and ethics

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Scope: Robotics and society

Keywords: Robots, ethics, law, regulation, society

RoboLaw is a FP7 funded project whose aim is to investigate the ways in which emerging technologies in the field of (bio-) robotics (e.g. bionics, neural interfaces and nanotechnologies) have a bearing on the content, meaning and setting of the law. The project researches the ways in which regulation may be affected by, and even in need of adjustment in light of, advances in robotics, with a special focus on human enhancement. The interrelations between technical, legal and moral norms in this field are studied, in order to define what could be the best balance between them, and to promote a technically feasible, yet also ethically and legally sound basis for future robotics developments. Uncovering ethical values embedded into robotics technologies, and ethical consequences arising from their use, is another key element of this research. The most important outcome of the RoboLaw project will consist of a "White Paper on Regulating Robotics", containing regulatory guidelines for the European Commission, in order to establish of a solid framework of 'robolaw' in Europe. (http://www.robolaw.eu)

2.

M. des-Neiges Ruffo: Why autonomous UAVs will lose the war

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Scope:	Ethics, war, autonomous technology, unexpected reaction
Keywords:	Consequences, technology without human supervision

This abstract seeks to answer the question if the use of autonomous UAVs without human supervising or presence on the battlefield is contrary to the success of the war.

From the Paleolithic spear-thrower, the crossbow and the canon until today's UAVs (unmanned air vehicles) man hasn't but endeavoured to increase the range of its weapons. The greater the firing range the more one hopes to escape the enemy's riposte. Today's UAV Predators are piloted from Arkansas. They participate in contact actions in Afghanistan, a.o. In increasing the distance between the operators and the battlefield one hopes to reduce the number of casualties in one's ranks. To reduce risks even more and gain in efficiency, why should the UAVs not become autonomous? Would deployment of autonomous UAVs make the western myth of zero casualties possible? Even if they can help win battles, can autonomous UAVs lose the war? Some points could raise doubts about the UAV's ability to lead alone and efficiently the war to its reasonable term: peace.

Obedience, uncertainty and unpredictability

Are autonomous combat UAVs adapted to the context of asymmetric wars, to terrorist actions, to guerrilla warfare? Would an element of surprise not be more important on a UAV, admittedly autonomous but obeying a determined programme, than on an officer able to improvise on the spot?

And what if the success of a mission would require disobeying part of the orders implemented in the UAV's programme? Would it not be more beneficial that a human officer be present to take this kind of decision? Blind obedience is not always a virtue, as Lord Fisher summarized when speaking about Admiral Jellicoe having missed the opportunity to destroy the German fleet at the battle of Jutland in 1916: "he has all Nelson's qualities but one: he doesn't know how to disobey[27]".

Robots, however could disobey, but this is not necessarily better. Most of the time they obey blindly as the good robots they are. However, this kind of obedience can

[27] Cited by C. de GAULLE in *le fil de l'épée*, 1932, Perrin, Mémorables, 2010, p 8.

raise doubts in the case of autonomous UAVs. The press reported in 2009 that a MQ-9 Reaper out of control near the Afghanistan border had to be shot down by a fighter plane. The safety process imposing the UAV to return to the basis in case of loss of signals from the operator didn't go off.

Taking this case into account it seems useful to keep some operational human beings as fast reaction forces to face technological vagaries. The example just referred to, related to a tele-operated UAV, but how determine in an autonomous robot what behaviour belongs to his legitimate liberty of action, which would be unpredictable, and what would be erroneous behaviours?

The unpredictability of complex systems, associated to their risks for errors and the unpredictability of the environment would impose, for reasons of security and safety, that a human being be constantly present in the loop or have the possibility to intervene in the loop under his supervision. In absence of this, fratricidal firing or firing on innocent civilians by autonomous UAVs could occur. This would have consequences on public opinion and on the population's reception.

If a robot is supposed to blindly obey it is assumed that the totality of his programming has been fixed upstream. The major drawback is thus the need to determine beforehand types of behaviours, admittedly varying more or less, but nevertheless always predetermined. Programmers have to envisage all scenarios, and all desirable answers of a programme. This is only possible in a limited framework with full knowledge and control of all variables, as in the automated assembly line in a factory.

But war is not a closed field: the unexpected is the rule. This truth is known since Euripides who wrote that "the expected will not be achieved and to the unexpected a God opens the path". Clausewitz developed a theory for the notion of "friction" in the war (and still today for our contemporaries for which « shit happens »). Even a posteriori, it is often difficult to determine which decision would have been the best one on the battlefield. How then to pretend to determine it a priori?

The programmer faces a contradiction: he must programme a robot in a general way whilst this robot will be operated in the most uncertain situations. A totally autonomous robot, i.e. totally programmed upstream is at risk of being vulnerable to the unexpected with the risk never to "stick" to the reality, always diverging from the abstract plans. At least, its robustness seems to be weak without human supervision.

An answer is technically possible but not necessarily ideal either. Thinkers as Ronald Arkin propose to equip these systems with software based on a utilitarian concept of ethics. A calculation and a scale setting the number of civilians in the vicinity would determine if the robot shoots or not. One could wonder if one and only one civilian killed in the middle of rebels is not already a civilian too much.

This is a reduction of reality. General Vincent Desportes, in his book of 2007 Décider dans l'incertitude (Deciding in uncertainty) is opposed to this kind of reasoning as according to him, "a military decision will never be the product of a mathematical calculation: the decision will always require intuition and the capability to grasp the essence of a situation at a glance synthesizing a lot of circumstances[28]". This would mean that the essence of situations cannot but escape to autonomous robots.

[28] V. DEPORTES, *Décider dans l'incertitude,* Economica, stratégies & Doctrines, 2007, p 78

If one has to combat uncertainty, the art of war teaches to play with it too. The secret of success lies sometimes in the proverb "fortune favours the brave", well understood by the Special Forces of which certain regiments have as motto « Who Dares Wins ». One should be able to seize the opportunities. But, can one programme a robot to be daring? How making him recognizing what could be an opportunity? And if one leaves this room for manoeuvre to the robot, the problem of unpredictability would raise again. If one cannot predict his action, nor determine if she is due to the good functioning of his programme or to an error, can one have confidence, and to what extent?

A serviceman deserves the confidence of his superiors and subordinates because he participates in a common culture which was taught to him. Is it possible to "programme" this culture in a robot in order to steer his future decisions? The answer lies with the developers.

Strategic interest and side effects

Can these technological objects help to "win the battle of the hearts and the minds of the people" as recommended for Afghanistan by General McChrystal? Would they be able to "feel" the local population's reactions efficiently and delicately? Or would they not more probably self provoke hostility even more than a soldier in uniform who still remains a fellow creature? Would one once be able to win a war or maintain peace without setting a (human) foot in the country? Would one once be able to conclude a sustainable peace with those who had to struggle against robots and not against conventional opponents? What kind of respect would there be towards the nation and culture of a hidden opponent?

The Pakistani reactions following American strikes using tele-operated UAVs show the size of the possible local protest actions against autonomous UAVs. David Rode, the American journalist kidnapped by the Talibans in 2008 and detained more than 7 months in North and South Waziristan, gives us an inside account: « Our Afghan and Pakistani Taliban guards despised the drones and disparaged them as a cowardly way for America to wage war. The 2009 surge in drone attacks in Pakistan prompted our guards to hate Obama even more than they hated Bush[29]". One would wonder if this type of technology, far from making war "more rational", does not provoke the adversary to be more aggressive. Rhode reported that following one of the UAV strikes, "one of our guards suggested I be taken to the site of the attack and ritually beheaded[30]" by way of retaliation.

If the autonomous UAVs would participate in the increase of power, would they for all that make war shorter? Ardant du Picq in 1860 and Richard Holmes in 1985 demonstrated that men have a tendency to voluntarily miss a human target. Led by automated UAVs, war would probably be more efficiently bloody, and thus more violent. Peter W. Singer, author of Wired for War, reports that a Navy sniper qualified the Forster-Miller SWORD model as "nasty" for its shooting precision. Faced with said efficiency, the opponent will most probably choose a "guerilla" type of action and a

[29] David RHODE, "the Drone War", Reuters magazine http://www.reuters.com/article/2012/01/26/us-davos-reutersmagazine-dronewar-idUSTRE80P19R20120126 (dernière consultation 11/10/12)
[30] idem

war of nerves. And thus, would this type of weapon not risk to prolong war, because more latent and less frontal, rather than shorten it?

The exclusive use of autonomous UAVs is not an absolute solution to conflicts. Its efficiency can have another paradoxical effect on their duration. Rhode reports that « Exaggerated Taliban claims of civilian deaths are widely believed by the Pakistanis, who see the strikes as a flagrant violation of the United States' purported support for human rights. Analysts believe that killing a senior militant in a drone strike is a tactical victory but a loss over the long term because it weakens public support for an American-backed crackdown on militancy in Pakistan, which many analysts think is essential[31] ».

It is a truth that the French General Benoît Royal repeats in his work L'éthique du soldat français (Ethics of the French soldier): "There is more to gain to be an example than to be violent[32]". If one cannot be exemplary in the use of technology, one can dread that making UAVs autonomous amounts to be violent.

As a UAV is based on more exhaustive information, one can expect that it takes better decisions than an officer. A UAV is supposed to process more information in a more limited time than a human being, and this, without tiredness, without anger nor fright. On this point it is doubtful that the machine could collect the totality of available data. In this sense absolute exhaustiveness is impossible and a total loss of time. Clausewitz said that "waiting to be totally informed to take a decision is choosing the manoeuvre a posteriori, the one which leaves the enemy with the total freedom of action". And even if the robot would have at its disposal the most complete information, would this not imply that one forgets that rather than be based on the whole of the available information, any decision making process requires distinguishing the non-essentials from the essentials? This ability is fundamental in the carrying out of a command: how should this be taught to a robot? Similarly, how teach a robot to identify itself a target without blunder? (If human errors are accepted with difficulty, how would be those of the machine?). In matters of intelligence and consequent decision making, "certainty is quite more a matter of comprehension than of data[33]", according to Desportes. Technology, even autonomous, has its limits.

The ill effects of technology are numerous. Let's mention amongst others the increase of speed whilst immediacy of response does not ascertain its quality. It might be justified to keep time for a deeper analysis of the situation. The drawback of working with speeds of the kind "just-in-time" is that it presents a strong vulnerability to the unexpected. It would be an error to think that the warfare daze disappears with speed. Or also the problem of the economy of the financial powers: whilst the western nations support important development (and purchase) costs of new technologies Irakian computer hackers could make use of the videos of the American UAVs using a software programme worth 26 dollars,…etc. Desportes stresses that far from being an absolute advantage, technology would in reality have an "equalizing" power, the opponent being able to take advantage of the flaws and weaknesses of technology, knowing how to protect himself from its assets. If thus the use of machines brings us

[31] idem
[32] B. ROYAL, *La conviction d'humanité. L'éthique du soldat français*, Economica, 2008, p95.

[33] V. DEPORTES, *Décider dans l'incertitude,* Economica, stratégies & Doctrines, 2007, p75.

back in enemy's reach, only the human element remains to be able to make the difference. In this perspective, suppressing the human element in favour of the UAVs does not seem sound.

The last adverse effect is perhaps still to be feared. Could this technology threaten our internal security? Even if until now it only appeared in fiction, let us hope that reality will not catch up with it. Daniel Suarez based his thriller Kill decision on the possibility of "anonymous" UAV strikes. It would be unfortunate that these technologies would have delivered the means to make us vulnerable within our own borders. Even if this scenario still belongs to the fiction, the possibility to buy a Parrot UAV for some hundreds euro or to easily develop one's own model sets us thinking.

Thinking that we will control the uncertainty itself because we will control the behaviour of robots is an illusion. At war one commands but one cannot pretend to control. Napoleon, whose strategic intelligence is known, commanded down to the detail if he was not confronted to uncertainty. He then gave free hand to his marshals giving them very simple objectives. He left them free to analyze and act. He took back the lead when uncertainty reduced.

Be it the warfare daze, the persistence of uncertainty, the "friction" due to time constraint, the population's reaction … there are unchanging principles that even the great technological revolution cannot erase. The risk would be to forget their existence, fascinated that we are by the novelty and the prospects of its advancement whilst disowning human experience. If robotics can be a vehicle for future, one should not keep it separate from a concrete cooperation with the human element. The success of war, i.e. peace, could be at this price…

PACITA Conference, Prague

IV. Parallel event: Author Meets Critics – with Joy Zhang, Ole Döring and Aditya Bharadwaj

Chair: **Linda Nierling**

Date: Thursday, March 14th, 2013

Concept of the parallel session

This Session will be dedicated to the book "Cosmopolitanization of Science" by Joy Zhang. The book was chosen as it is felt to be an important contribution from the field of technology assessment to the topics of technology governance and global bioethics.

Based on site visits to 22 key research teams in China, as well as interviews with ethicists and Ministry of Health officials, this book investigates how, over the last decade, Chinese stakeholders have developed a cosmopolitan sensibility in comprehending and responding to ethical and regulatory concerns with influence from both within and outside their national boundaries. It elucidates the structural and administrative particularities the stem cell scientists are confronted with and it charts the transformation of Chinese science from an image of the 'Wild East' to a responsible player in the international stem cell community. This book demonstrates the feasibility, and implications, of a less advantaged country in influencing global research trends and provides a powerful corrective to existing cosmopolitan frameworks which are established mainly on Western data sources. It contributes both to the empirical social study of science and to current theoretical debates on cosmopolitanization.

Based on the book, two critics (Aditya Bharadwaj, Ole Döring) will discuss and provide further viewpoints on the issue with regard to empirical research, bioethics, cosmopolitisation and changes in technology governance.

PACITA Conference, Prague

Poster session

1.

M. Arentshorst / T. de Cock Buning /J. Broerse: Future visions of medical neuroimaging: dealing with polarities

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Scope: Responsible innovation of neuroimaging in health care

Keywords: Responsible innovation, Neuroimaging, CTA, Visions, Participation

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Innovations in the neurosciences are increasingly shaping and impacting people's lives. Neuroimaging technologies, such as functional Magnetic Resonance Imaging (fMRI), Magneto-encephalography (MEG) and Positron Emission Tomography (PET), have a large share in this by making it possible to image and study the function, connectivity and biochemistry of the brain non-invasively. Technical experts and scientists expect that future advances in neuroimaging technologies, such as increased resolution and improved options for data-analysis, will probably lead to more understanding of the brain and its disorders. This is expected to result in the development of improved diagnosis and treatment options. Above all, neuroimaging technologies could contribute to novel options for prevention, which are absent at the moment (Arentshorst et al., forthcoming).

The research presented here is part of a project which aims to steer innovations in medical neuroimaging in an early phase of development towards more socially responsible directions. To this end a specific operationalization of a CTA approach, the Interactive Learning and Action (ILA) approach (Broerse and Bunders 2000) is combined with vision assessment (Grin and Grunwald 2000). With this combination, ideas, objections, demands, desires and future visions of both scientific and societal

stakeholders are, in an early phase of the innovation process, inventoried, analyzed and re-shaped towards more commonly shared desirable directions of medical neuroimaging.

By means of in depth semi-structured interviews, visions workshops and focus group mediated discussions, desirable and undesirable future visions of scientist, technologists, user groups (for example neurologists, psychiatrists), policy makers, patients and citizens are inventoried and the similarities and differences are explored and further analyzed. Technical and medical neuroimaging experts, for example, show a focus on improved diagnosis, treatment and preventive options. Concerns articulated relate to general health discussions (for example privacy) and applications outside the domain of health care (for example enhancement). Dutch citizens regard applications in the field of diagnosis and treatment as mostly desirable. However, options for prevention, especially those focusing on predispositions, were considered as non-desirable unless they are applied under strict conditions.

The poster will visualize a variety of such contrasts among stakeholders that portray the complexity of interests and ideas in society regarding medical neuroimaging innovations.

References

Arentshorst, M.E., de Cock Buning, Tj., and Broerse, J.E.W. Towards socially responsible neuroimaging applications in health care: guiding visions of scientists and technology developers. Accepted for publication in: Responsible Innovation, Volume 1: Innovative Solutions for Global Issues (forthcoming). Eds: van den Hoven, J., Koops B.J., Romijn H., Swierstra T., and Doorn N. Dordrecht: Springer.

Broerse, J.E.W., Bunders, JFG. (2000) Requirements for biotechnology development: the necessity for an interactive an participatory innovation process. International Journal for Biotechnology 2(4): 275-296.

Grin, J., Grunwald, A. (eds). (2000) Vision assessment: shaping technology in 21st century society; owards a repertoire for technology assessment. Berlin: Springer

2.

G. Banse: Technology assessment and culture – an old or a new relationship?

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Scope: Relationships between TA and Culture

Keywords: Culture, Cultural connectivity Technology Assessment, Patterns of using

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For some time it can be observed a so called “cultural turn” in the humanities (but not in TA?!). “Culture” is a fuzzy term. But in this relationship it means “patterns of” (perception, behavior, communication, selection, consumption, production …). These “patterns” are mostly different in different groups of persons, regions, countries a.o. It shows that these patterns influence interactions between men and technology, f.e. in relationship to safety or innovation (safety/security culture, innovation culture). The intercultural communication gives many examples for it. But there is a relevance of culture for TA too: It begins with the selection of TA topics and goes up to acceptance of specific technological solutions, includes preferences and evaluation criteria as well as their hierarchy. There are only some discussions of this relationship in the last years. But I think with processes of globalization it will be increasingly important.

3.

M. Baumann: A constructive technology assessment of stationary energy storage systems: A prospective life cycle analysis with the focus on electrochemical storage systems

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Scope:	Energy Storage, Energy System, Constructive Technology Assessment
Keywords:	Energy Storage, Renewable energies, Multi Criteria, Life Cycle Assessment

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Environmental concerns over the use of fossil fuels and their resource constraints have increased the interest in generating electric energy from renewable energy sources (RES). A main problem of technologies (wind or solar power) is that they are not constant and reliable sources of power. This results in an increased demand of energy storage technologies. Related stake holders show a big interest in the technical, economic and ecologic aspects of energy storage systems. A Constructive technology Assessment (CTA) can help to minimize mismatches, wrong investments, possible social conflicts, and environmental impacts of new electrochemical energy storage technologies in an early development stage [3]. It is insufficient to exclusively look at the operation phase to assess a technology like energy storage systems [2]. Such an approach can lead to misleading interpretations and can furthermore disregard social or ecological impact factors over the whole life cycle. Therefore different energy storage technologies have to be evaluated in a prospective manner with a fully integrated sustainability and life cycle approach to form a base for decision making [4, 7].

The aim of the presented PhD Thesis is to make an economic, technological and ecological comparison of (electrochemical) Energy storage technologies based on a life cycle sustainability Analysis (LCSA) and multi criteria Analysis (or evaluation) (MCA) and to develop a suitable LCSA-MCA model through a new combined highly interdisciplinary approach in combination with a stakeholder mapping and involvement.

The technical characterization enables to identify application fields and technical properties. The parallel carried out stakeholder mapping helps to identify related actors (end users, grid operators etc.) and forms an integral part of all assessed dimensions. The LCSA approach involves all life cycle dimensions and helps to achieve

robust results by aggregation [7] of an Environmental Life Cycle Assessment, LCA-type Life Cycle Costing (LCC) and Social Life Cycle Assessment SLCA.

The LCC will be based on different fields of application and battery parameters, using the net present value and annuitant method. The LCA (ISO 14040), will be done in a streamlined way. A main problem of a stream lined LCA is to identify the areas which can be omitted without affecting the results to a certain degree [1]. A probabilistic approach will be used to handle uncertainties and to assure the deterministic approach of the LCC and LCA. The identification or measurement of societal factors or impacts by an SLCA of energy issues is difficult due to a missing approved theory. The evaluation could be carried out based on factors identified by [5]. Finally a proper evaluation scale has to be found for comparison and choice of electrochemical energy storage technologies [6]. This is planned to be done with a multi-criteria decision analysis or evaluation.

Proposed Results

The results of the specific dimensions could be as followed:

A. Technical: Identification different application fields

B. Economical (LCC): Costs of storage €/kWh

C. Stakeholders & Policy: Identification of related actors and Policies

D. Environmental (SLCA): Different impact factors (KEA, GWP)

E. Societal (S-LCA?): Identification of relevant impacts on society

F. Multi criteria analysis: Evaluation and comparison

The final result is to assist the future development of electrochemical energy storage technologies in terms of a constructive Technology Assessment.

References

[1] Hochschorner, E.; Finnveden, G;, „Evaluation of Two Simplified Life Cycle Assessment Methods“, International Journal of LCA, Bd. 3, Nr. 8, S. 119–128, 2003.

[2] Grunwald A., Rationale Technikfolgenbeurteilung: Konzepte und methodische Grundlagen, Bd. Berlin-Heidelberg: Springer, 1999.

[3] Schot J. und Rip A., „The past and future of constructive technology assessment“, Technological Forecasting and Social Change, Bd. 54, Nr. 2–3, S. 251–268, Feb. 1997.

[4] Musango J. K. and Brent A. C., „A conceptual framework for energy technology sustainability assessment“, Energy for Sustainable Development, Bd. 15, Nr. 1, S. 84–91, März 2011.

[5] Gallego Carrera, D.; Mack, A. (2009): Quantification of social indicators for the assessment of energy system related effects. In: Stuttgart contributions to risk and sustainability research, 12.

[6] Oberschmidt J., „Multikriterielle Bewertung von Technologien zur Bereitstellung von Strom und Wärme“, Universität Göttingen, Göttingen, 2010.

[7] Finkbeiner, M.; Schau, E.; Lehmann, A.; Traverso, M.;, „Towards Life Cycle Sustainability Assessment“, Sustainability, Nr. 2, S. 3309–3322, 2010.

4.

A. Chulok: S&T priorities for transition: A case from Russian S&T foresight 2030

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Keywords: Foresight, technology forecasting, S&T priorities, policy measures

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Over the last years, we have seen increasing activity of federal and regional authorities in innovation and industrial policy in Russia. This activity has led to a series of projects at different levels concerned with the long-term development of the Russian economy (Strategy 2020, etc.). Among them national S&T Foresight 2030 (2011-2013) is one of the anchor projects. The key objectives of the study are to: identify key drivers and trends for the Russian economy, identify the most critical technologies, elaborate scenarios for key sectors and S&T fields, develop policy recommendations at the federal and regional levels, identify research priorities, build expert networks around universities and research organisations, create technology roadmaps for S&T fields and key sectors. Its methodology involves the synthesis of a theoretical approach to the examination with the empirical test of the hypotheses. Average number of methods used – 10 (including bibliometrics, different models, surveys, panels), number of experts involved – 3000 (including members of National Academy of Science, international experts (UNIDO, OECD, UNIMAN, IPTS)).

For 7 S&T areas (nano, energy, ICT, bio, medicine, transport, rational use of nature) the following group of results were obtained: global trends, grand challenges, windows of opportunities (app. 25-30 for each area); new markets and niches (app. 10-15 for each area); innovation products and services (app. 3-5 for each market); perspective technologies and R&D field (50 thematic groups. more than 1000 items for all areas); assessment of Russia vis-à-vis world leaders; recommendations for S&T and innovation policy.

Rapid changes in the global socio-economic context, changing technological paradigms and sources of added value lead to the need of searching for the new agenda for S&T and innovation policy. Global challenges and Grand responses for them can be one milestone whereas national forecasting system can be another. Russia's experience and results of S&T Foresight 2030 can be useful in this field to develop common view on future vision of S&T development, «fine turning» of policy instruments for better efficiency and using them for technological modernization and Great Transitions.

5.

G. Gano: A Distributed, collaborative 21st Century approach to technology assessment: From concept to practice

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Poster:	**A Distributed, Collaborative 21st Century Approach to Technology Assessment: From Concept to Practice**
Scope:	Participatory technology assessment in the United States
Keywords:	Participatory technology assessment (pTA), network, United States

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From 1972 to 1995 the United States institutionalized TA practice by creating the Office of Technology Assessment (OTA) to provide expert scientific and technical information to Congress, before defunding the office in 1995. Parliamentary TA agencies in Europe adapted OTA's expert model to include broader citizen participation, or pTA. European pTA methods have been tested and proven in the U.S. at least sixteen times by university-based groups and independent non-profit organizations, but a program for pTA that has support among policymakers has yet to emerge since the demise of OTA.

This poster summarizes recent efforts to pilot a distributed, collaborative 21st century approach to pTA in the United States. Constituted independently of the government, Expert and Citizen Assessment of Science and Technology (ECAST) launched at the Woodrow Wilson Center for International Scholars in 2010, where Loka Institute founder Richard Sclove presented his report *Reinventing Technology Assessment: A 21st Century Model.*

The ECAST model integrates citizen participation, deliberation, expertise and assessment into government policy making, management, research, development, informal education and dissemination at the national and international levels. This approach connects independent, non-partisan and non-profit organizations into a nationwide network. Valuable partners include universities, science museums, non-partisan policy research institutions and other non-partisan, non-profit organizations that have capabilities pertinent to expert TA and pTA. An institutional network model has the flexibility to organize technology assessments not only for Congress but also for the executive branch and can incorporate fostering societal debate and discussion, as well as broad public education and outreach, into its mission.

ECAST's largest project since its formation is the U.S. coordination of World Wide Views on Biodiversity, a global citizen consultation on biodiversity policy that took place at 34 sites around the world on September 15, 2012, hosted by the Danish Board of Technology. The United States conducted the Sept 15 meeting at four sites and convened an expert panel to develop a fifth session around the question of whether as non-signatories to the Convention on Biodiversity, the United States should formalize a national strategy for biodiversity preservation. Founding ECAST partners include the Woodrow Wilson Center for International Scholars; Arizona State University; the Museum of Science, Boston; the Loka Institute and Science Cheerleader.

The most promising *outcomes* of the WWViews project in terms of ECAST's development are:

1) The insights it generated about the informed and considered views of ordinary citizens around the world on practical policy issues; previously there was little comparable information for such views on biodiversity

2) The positive reception at the Convention on Biodiversity

3) The engagement (although nascent) of citizens in addition to those who participated directly

4) The mobilization of ECAST core members and significant contributions by experts, including a the panel that helped tp shape a US National Question

There are three main *challenges* for pTA in the United States:

1) The media has little interest in biodiversity except when high stakes controversies (such as developing an undisturbed landscape) erupt. Yet policy makers are unlikely to heed citizen views from deliberations in the absence of a wider public awareness of them.

2) Sustained engagement is critical, but most professionals in the informal science education community lack the particular skills required for designing and conducting programs for this engagement.

3) Research on WWViews to date has been organized informally and somewhat independently. Data on issues like the political orientation of participants or the dynamics of table conversations are thus missing for most sites, which limits project managers' ability to understand strengths and weaknesses and the options for addressing the latter.

Further information about Expert and Citizen Assessment of Science and Technology (ECAST) activities can be found at *https://ecastnetwork.wordpress.com/*

The report, **Technology Assessment and Public Participation: From TA to pTA** authored by Richard Worthington[2], Darlene Cavalier[4], Mahmud Farooque[1], Gretchen

Gano[1&5], Henry Geddes[5], Steven Sander[2], David Sittenfeld[3], David Tomblin[6] is available online at *https://ecastnetwork.wordpress.com/2013/01/29/ecast-from-ta-to-pta-report-available-online/*

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6.

L. Hempel/ T. Schaaf/ L. Ostermeier/ D. Vedder: Towards a multi-dimensional security technology impact assessment: Security, trust, efficiency, freedom infringements

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Scope:	Security Impact Assessment
Keywords:	Security Impact Assessment; Security; Trust; Efficiency; Privacy

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Security technologies turn out to be part of the fabric of everyday life. They are only one part of the many technologies that are entering the everyday life of the citizens. Security Technologies for detection, identification and surveillance are constantly enhanced, improved and widely diffused throughout all areas of life. The assessment of such technologies does mostly not go beyond the perspective of security, meaning a purely functionality orientated evaluation. Societal dimensions and impacts of those technology options are thus neglected, despite their increasing importance. The EU-funded project Security Impact Assessment Measure (SIAM) follows the approach that the societal dimensions of security technologies are not limited to security and freedom infringements, but also have a trust dimension that is depicted by emotions, experience and knowledge of a scrutinized. But SIAM also incorporates the security and efficiency dimensions which base on a more traditional economical assessment of technologies.

SIAM conducted and analyzed numerous in-depth interviews with actors that are participating in assessment processes of security technologies at two large airports and two large public transport systems in Germany, Italy, Israel and the United Kingdom. The assumption behind the study was that a technology is not given, but rather the result of many in process assessment activities of different actors during the acquisition process (Rip, A. and Schot, J. 2002). The overall objective of the study was to develop an assessment model in order to assess the societal dimensions of security technologies. Three characteristics for each actor´s role in the assessment process and security technology type were analysed: concepts, assessment criteria, and attributes. The basic assumption structuring the relation between roles and technologies on the

one hand and concepts, assessment criteria, attributes on the other hand is that while all actors' objectives could be represented by the same concepts, they will use different assessment criteria and attributes to operationalise them. In order to structure and systematise the different assessment perspectives of actors, we categorized the assessment criteria of the participating actors into four major assessment perspectives encompassing the societal dimension of security technology assessments: Security, Trust, Efficiency and Freedom Infringements (STEFi).

The first dimension is Security. It entails a set of interrelating concepts including risk, vulnerability, deviance, resilience and order. Trust, the second dimension, relates to both trustworthiness and to the way people perceive and experience security measures and technologies. This will be specified in relation to what people trust: the technical reliability, the actual safety it provides, the level of confidence they have and the trust they have that such measures respect their rights and freedoms. The third dimension is labelled Efficiency. Taking the specific processes of a site into account it focuses on efficiency and combines it with economic considerations. The last dimension is Freedom Infringements. Usually seven types of Freedoms are identified: Bodily integrity, Equal treatment and non-discrimination; Freedom of movement; Freedom of unlawful detention; Presumption of innocence; Fair and due trial; Privacy and data protection.

The main purpose of SIAM is to develop an assessment tool which will provide guidance to its users when they are assessing security measures and technologies. Based on a multi-dimensional assessment model, the SIAM tool ensures that beside security and efficiency, also freedom infringement and trust issues are fully considered in the decision making process. However, the goal is not to give answers and ready-made solutions to the users of the assessment support system, but to provide them with questions based on the assessment criteria of the STEFi dimensions. The guidance of the SIAM tool will help to identify relevant actors and to achieve an understanding about the involved actor perspectives and their assessment criteria in established environments.

7.

M. Puhe: Will integrated ticketing meet its expectations?

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Scope: Impact of e-ticketing on transport and tourism

Keywords: Integrated Ticketing, Urban Tourism, Transport, NFC

Both the transport sector and the tourism sector are subject to a transformation that is being caused by Information and Communication Technology (ICT). ICT is an enabling and integrative technology in nearly all areas of daily life, also affecting urban transport and tourism. E-services are rising in importance in urban tourism (e.g. interactive maps, location based services etc.). This changes the way users search for information and for the tourism industry e-services provide innovative branding and marketing opportunities. In transport, ICT helps to better organize transport flows. This affects the way people use the transport system, policy making and priority setting. Especially the public transport sector profits from ICT in various ways. An important strategy to overcome the imbalance in the mode share of individual transport compared to collective transport is the development of an integrated multimodal transport system. However, most often the different transport modes still operate separately; users of the system notice this in form of different fare structures, service information and sales channels, which make a combination of different transport modes complicated. The challenge for future transport policy is thus to form a single multimodal transportation system that doesn't separate between transport modes, but enables users to choose the most suitable means of transport for each trip. ICT is believed to be an enabling technology to do so but it is yet not clear which impacts it can really have.

The overarching idea of a multimodal transportation system is to combine all modes on a single ticket. Integrated ticketing schemes aim at facilitating the combination of modes and the transfer between them. Moreover, e-ticketing could be extended to major entertainment and touristic sites and thus facilitate access to major points of interest within cities, making e-ticketing also interesting for travellers. They are being discussed since the 1990s and there seems to be a considerable potential for intermodal transport and tourism related e-services within Europe. However, while technologies are already available and ready to meet multi-function requirements, such schemes often do not reach implementation in spite of the positive expectations towards the positive effects of integrated ticketing on sustainable transport. Regardless of some pilot projects, e-ticketing has not yet been implemented on a wider scale in Europe. Obviously decision-making processes take longer than innovation cycles. A large number of stakeholders, with partly diverging interests, are involved in the implementation process: financial services and mobile phone providers, telecommunications operators, public transport authorities, and the tourism sector.

Obviously there is a need for organisational, management and governance changes to make such systems come true.

Research will be carried out in the context of a project for the Science and Technology Options Assessment (STOA) Panel of the European parliament from 2013. The poster will put the main focus on how integrated ticketing solutions can contribute to a transition towards a more sustainable transport system. Applying the methodological toolset of TA, the project will improve knowledge about impacts on operators, end users and administrations. The poster will outline expectations and assumptions connected to integrated ticketing solutions as well as on the potentials of TA to support policy making in this field.

8.

M. Reichenbach/ J. Schippl: Assessing the future competitiveness of the European transport sector

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Scope:	Assessing the effect of future challenges, demand drivers and upcoming innovations on the competitiveness of the European transport sector.
Keywords:	Sustainable mobility, competitiveness, R&D strategies, foresight

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Due to the economic crisis and the accelerated globalisation, the terms of innovation and competitiveness are increasingly gaining importance in public debate as well as in R&D Strategies. In the transport sector, policy documents and strategies until recently mainly focused on a transition towards sustainable mobility. Within the goal of increasing sustainability of the transport system, the great importance of an advanced transport infrastructure for the economic growth and for the wealth of European societies is mentioned frequently. In the meantime, however, the competitiveness of the transport sector itself has become an issue, as it is expressed by the title of the recent White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system".

Against this background, the challenge of aligning competitiveness with the claim for sustainable development is emerging and is also of relevance for TA related agendas. The poster addresses this issue by taking the FP 7 project FUTRE[34] as an example, which is carried out in cooperation by five partners[35]. Main objective of the project is to assess the effect of future challenges, demand drivers and upcoming innovations on the competitiveness of the European transport sector.

Within the project, ITAS will explicitly focus on the link between the two aims of sustainability and competitiveness. The poster will indicate how the project will make

[34] FUture prospects on TRansport evolution and innovation challenges for the competitiveness of Europe

[35] Hellenic Institute of Transport – Centre for Research and Technology Hellas (project coordinator) / TIS.PT Consultores em Transportes, Inovação e Sistemas, S.A. / Fraunhofer Institute for Systems and Innovation Research / Joint Research Centre – Institute for Prospective Technological Studies / ITAS

use of experiences from TA to overcome the methodological challenges linked to the complex tasks of doing prospective research on the mutual relationship between sustainability and competitiveness in transport related transitions. FUTRE explicitly aims at providing policy relevant outcomes which can be translated into strategic options for future transport-related research agendas.

The project will go beyond classical foresight procedures and will not only prospectively analyse the development of new technologies. Instead, FUTRE will put particular effort on assessing potential systemic effects of radical innovations in the transport system. By assessing their potential to change core characteristics of the transport system and their potential to influence market structures, the project will be able to provide profound analysis of the future of transport. This will be done closely together with an analysis of global challenges and demand drivers in the European transport sector. In doing so, potential technological developments will be checked for their compatibility with societal trends and changing demand patterns, enabling further specification of the mutual interrelationship between competitiveness and sustainability.

The poster will address the potentials and limits of TA when incorporating future competitiveness as a factor of development and when taking the co-evolution of supply and demand into explicit consideration.

9.

A. Sacio-Szymańska: Innovativeness in times of economic downturn - a comparative analysis of selected economies

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Scope:	Factors determining innovativeness and competitiveness of economies
	Financial crisis impact on countries' economic performance
	Economic power shift from West to East
Keywords:	International rankings, innovativeness, competitiveness, strengths, weaknesses

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Recent years have brought remarkable socio-economic challenges. World crisis in the financial and banking sectors have resulted in the worsening of macroeconomic situation of many countries as shown by the level of public finance deficit, the level of national saving, the inflation rate, currency value or state tax levels. The crisis in financial sector has spread to other sectors of economies, such as: the employment market, the consumption market, the real-estate and commodity markets. It resulted in the decrease of innovativeness and competitiveness levels of many countries in international rankings.

In particular, the negative effects of global economic crisis have affected the American economy, which so far has been a world leader in developing and commercializing ground-breaking technological solutions contributing to the strengthening the overall performance of the economy. Whereas currently, the US has been losing its position as a global leader in innovation for the benefit of such countries as: Switzerland, Sweden, Singapore, Finland.

In Europe the crisis has induced economic perturbations in Greece, Italy, Spain or Portugal, which negatively affected international competitiveness position of the other eurozone economies; particularly: France, Germany and Great Britain.

On the other hand a group of leading emerging economies should be mentioned, which despite the world economic crisis, has continued growing dynamically in economic terms. The leading, among the so-called BRICS countries, is Chinese economy. According to Goldman Sachs analyses by 2040 China will have been the biggest world economy (with India, Brazil and Russia occupying the 3rd, 4th and 6th positions respectively).

In the face of the unfolding economic power shift from West to East, it is justified to evaluate innovative and competitive position of countries by:

- identifying and analysing key factors, which support innovativeness of economies,
- identifying strengths and weaknesses of economies.

The above mentioned analyses are conducted with the use of factors, which constitute the following methodologies:

- Global Innovation Index (GII) developed by INSEAD,
- Global Competitiveness Index (GII) developed by World Economic Forum,
- Knowledge Assessment Methodology (KAM) developed by World Bank.

Finally, a set of factors proposed by the author supplements the analyses performed with the use of the international indexes. These include among others:

- comparative analysis of key national R&D priorities, high-tech industries and sectors of highest expenditures on innovation by countries,
- analysis of trends in the area of public sector innovation support measures by countries,
- analysis of entrepreneurship activity by countries.

Countries, that are the subject of the analyses include: Switzerland, Sweden, United States, Germany, Netherlands, Great Britain, France, China, India, Russia, Czech Republic and Poland.

10.

S.B. Seitz/ J. Jahnel/ T. Fleischer: *NanoSafety* - risk governance of manufactured nanoparticles - challenges of substance regulation under scientific uncertainty

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Scope:	Governance of emerging technologies
Keywords:	Nanoparticle, nanotechnology, definition, risk assessment, measures for governance

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Manufactured particulate nanomaterials (MPN) are expected to be a major opportunity for the economic and sustainable development of many countries. Due to nanosize (app. 1 - 100 nm) these materials exhibit completely new or improved properties compared to larger particles of the same material, which makes MPNs attractive for the industry for applications in various branches.

Thus, a wide range of MPN-containing products are on the market and many more are under development. While on the one hand nanoproducts promise innovation and sustainability, on the other hand the concern rises that the new properties of the MPNs within them bear also new environmental, health and safety (EHS) risks, which was even confirmed by some toxicological studies. However, there are still the great uncertainties regarding the actual health and environmental effects of MPNs as well as numerous methodological challenges to established risk assessment procedures (including definitions, analytics, exposure, life cycle and hazard assessments, etc.). At the same time, precautionary regulatory action with regard to MPN is demanded by a number of stakeholders and parts of the general public. Regulation under uncertainty raises the fundamental political question: “How lawmakers should regulate risk in the face of such uncertainty?”

To address this question in regard to scientific policy advice in the frame of technology assessment, we discuss three main challenges that have to be approached in this context: (1) The limitations that research on potential EHS risks of MNPs is currently facing plus the consequences for risk assessment and how to handle this. (2) The lack of a harmonized and generally accepted definition and delimitation of MPNs for

regulatory purpose. (3) The intricacy to identify and finally choose suitable regulatory means and/or options of parliamentary action.

11.

H. Wancura/ F. Montignac/ C. Mazzucchi/ M. Spirig/ J. Bana e Costa/ A. Nowak: Evidence based technology policy making using an integrated technology assessment and monitoring tool

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Scope: Integrated Technology Assessment Methodology and Tool

Keywords: Technology Assessment, Methodology, Tool, Multi-criteria decisions, Expert Judgment

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Policy actors are getting increasingly involved in technology programmes be it due to top-down activities to promote socially desirable solutions or as partners in public-private partnerships to jointly develop new technologies with significant concentration of efforts. However, policy actors are faced with a number of challenges, such as (i) asymmetry of information vis-à-vis other stakeholders, (ii) stakeholders which are potentially primarily interested in the receipt of public funds an environment not conducive to solving the asymmetry problem or (iii) multi-stakeholder environment with conflicting interests, to name just a few important ones. Designing the technology roadmap which shall be used for the definition and the controlling of scientific achievements clearly poses a challenge.

The FCH-JU is such a major European Joint Technology Initiative, mobilizing almost 1 billion Euros for accelerating innovation in Fuel Cell and Hydrogen technologies. Recognizing the challenges above it has requested the development of a suitable TA framework and tool.

The TEMONAS project has developed an innovative integrated solution combining the required methodology and structure with advanced database technology to support a variety of functions among them *inter alia* (i) documentation and definition of state-of-the-art as strting point for program design, (ii) objective target formulation, (iii) project and programme progress tracking, (iv) overall technology progress monitoring and (v) comparison on both multi-technology and multi-national level.

The tool comprises data entry with advanced features dealing with data consistency and accuracy, data validation and authorization workflow processes, data query, selection and presentation. In addition, it enables the aggregation of multi-criteria performance using the MACBETH methodology and has a separate function for structured expert input.

Its approach is multi-dimensional, i.e. TA can be done for a multitude of technologies or solutions in a variety of grouped metrics, such as technology, economical, and safety&health related ones, but also allows a more holistic evaluation by including social, policy or environmental metrics, which can subsequently be used for comprehensive analysis of options.

An integrated methodology and IT based tool for managing complex TA tasks has been developed using the initiative of the FCH-JU a major European Technology Initiative. This tool reflects the needs of a variety of stakeholders in technology programme management and is now available to interested third parties.