Sustainability Transitions Research Network | STRN

Newsletter 6, December, 2012

This is the sixth newsletter from the steering group of the Sustainability Transitions Research Network. The newsletter is divided into the following sections:

- Words from the Chairman
- Network news
- Event announcement
- Event reviews
- New research projects
- Publications

We welcome all members to submit news items for the next newsletter. You can use the website www.transitionsnetwork.org (submit projects, output or news), or send a message to sustainabilitytransitions@gmail.com. The advantage of using the website for submission is that the information also becomes available online.

The STRN steering group

Words from the Chairman

Dear transition research colleagues,

Transition research seems to be exploding in the last half year. As this newsletter shows, transition research is winning prizes for producing high-quality interdisciplinary research, three international conferences on the topic are in preparation, various international workshops have been organized, many calls for papers for special issues are issued, and the OECD is organizing a workshop on 'system innovation' as kick-off to a 1.5 year project which may further disseminate the idea across the world. Two special issues on sustainability transitions have just appeared, in *Energy Policy* and *Sustainability Science*, which suggests that the field is moving into other areas and mainstream sustainability journals. The list of publications is also longer than usual, which indicates that we are publishing more interesting papers and/or have easier access to journals (perhaps because editors recognize the importance of the topic). There are also various new projects, including a £5 million research centre for SPRU (together with Oxford and Manchester) on transitions and energy demand reduction.

We sometimes read and discuss about diffusion, institutionalization, and up-scaling of innovations. Seeing transition research as a (niche)innovation in the wider academic research field (dominated by disciplinary 'regimes'), it is very interesting to now experience how our community and ideas are diffusing and becoming institutionalized, with large incumbents (e.g. OECD) taking an interest. As discussed by in the previous newsletter, it is important for the field to deal with the tension between standardization (convergence on a 'dominant design' may be necessary for diffusion) and the continuous generation of novelty (the field also needs diversity, new ideas, new methods, new applications to not become stale and predictable). I am confident that our community is able to navigate this dilemma, because the workshops, conference, new papers and new research projects reported in this

newsletter highlight the wealth of new ideas and approaches. I want to thank STRN-members for their contributions to this newsletter, and wish you all a good festive period.
Frank Geels, Chairman of STRN (frank.geels@mbs.ac.uk)

Network News

Any news related to ongoing activities of STRN

Prize for special issue on Sustainability Transitions (in Research Policy)
The European Association for the Study of Science and Technology (EASST) has given the Freeman Award to a special issue on Sustainability Transitions (Research Policy 41 (2012) 955 – 1047), which was edited by Jochen Markard, Rob Raven and Bernhard Truffer. The Freeman Award is for a publication which is a significant collective contribution to the interaction of science and technology studies with the study of innovation. The laudatio gave the following reason for awarding the prize to this special issue:

"It is a collection of high quality publications which successfully shapes an emerging broad research area around sociotechnical transitions. The process involved a thorough and very 'collegial' collaboration between editors and with authors. The papers draw explicitly on STS approaches such as actor network theory, controversies, narratives, relational processes, sociotechnical systems and reflexive policy. These contribute to an enriched understanding of innovation in sustainability transitions."

In my view, this prize is important for three reasons. First, it signals recognition from a professional academic body (EASST) that sustainability transitions forms an important and interesting area of research. Second, it underlines that one of the strengths of the transitions community is its multi-disciplinarily and co-evolutionary style of working. We successfully mobilize insights from various disciplines to understand multi-faceted topics. Third, it gives praise to the special issue editors for putting together this wide-ranging special issue, which explicitly aims to widen the transitions debate beyond the normal frameworks. I, too, want to congratulate the editors for their work on this high-quality special issue and for winning this well-deserved prize.
Frank Geels (frank.geels@mbs.ac.uk)

Green Talent Award 2012 for Dr. Joni Jupesta's research on sustainability transitions
Dr. Joni Jupesta received the Green Talent Award from the German Federal Ministry of Education and Research (BMBF) for his research in Sustainability Transitions in Indonesia. Using multiple methodology approaches range from system dynamics, systems innovation and system governance, Joni analyzes transitions from several sectors in Indonesia and provides suggestions on how the sustainability transitions could be achieved in the context of emerging economies such as Indonesia. Currently a JSPS-UNU Postdoctoral Fellow at the United Nations University-Institute of Advanced Studies (UNU-IAS) and a Visiting Scholar at The National Graduate Institute for Policy Studies (GRIPS) in Japan, Dr. Jupesta contributes to policy briefs on green growth, climate change governance, and poverty alleviation in Indonesia, which draws on his multidisciplinary research across the forestry, agriculture and energy sectors. While he is pushing to phase out oil subsidies, accelerate the implementation of green technologies (biofuel, geothermal, etc.) and upgrade the skills and capabilities of workers, he emphasizes the importance of a broader perspective. "In order for green growth to be inclusive and equitable, development policies must integrate society, economy and environment," says Jupesta. "True sustainability will require institutional and social innovation as well as technological innovation."
Further information: http://www.greentalents.de/1000.php

New issue of *Environmental Innovation and Societal Transitions* (EIST), Volume 5, December 2012.

http://www.sciencedirect.com/science/journal/22104224

Volume 5 of EIST just appeared. It contains five articles and two book reviews:

Elzen, B., Van Mierlo, B., and Leeuwis, C., 2012, 'Anchoring of innovations: Assessing Dutch efforts to harvest energy from glasshouses', *Environmental Innovation and Societal Transitions*, 5, 1-18

David J.C. Hawkey, 2012, 'District heating in the UK: A Technological Innovation Systems analysis', *Environmental Innovation and Societal Transitions*, 5, 1-32

Nils Johansson, Joakim Krook, Mats Eklund, 2012, 'Transforming dumps into gold mines. Experiences from Swedish case studies', *Environmental Innovation and Societal Transitions*, 5, 33-48

Jacobsson, R., and S. Jacobsson (2012). The emerging funding gap for the European energy sector – will the financial sector deliver? *Environmental Innovation and Societal Transitions*, 5, 49-59

Chun Xia, Claudia Pahl-Wostl, 2012, 'Understanding the development of flood management in the middle Yangtze River', *Environmental Innovation and Societal Transitions*, 5, 60-75

Daianu, D., 2012, H.W. Sinn, The Green Paradox – A Supply Side Approach to Global Warming (2012) The MIT Press,Cambridge, *Environmental Innovation and Societal Transitions*, 5, 76-78

Köhler, J., 2012, F.W. Geels, R. Kemp, G. Dudley, G. Lyons,Editors, ,Automobility in Transition? A Socio-Technical Analysis of Sustainable Transport (2011) Routledge, *Environmental Innovation and Societal Transitions*, 5, 70-80

The next issue of EIST will be a special issue on the theme of "Economic crisis and sustainability transition". Four other special issues are being prepared, namely on "Global diffusion of environmental innovations", "Models of innovation, society and complexity", "Transitions through a lens of urban water" and "Electrification of the car". If you are interested to submit to these, please go to the website of EIST to find a description of the respective aims and deadlines.

Jeroen van den Bergh, Editor-in-Chief **jeroen.bergh@uab.es**

Event announcements

Calls for upcoming relevant events such as workshops and conferences

4th International Conference on Sustainability Transitions (4-IST), June 19-21, 2013 Zurich, Switzerland [DEADLINE 31 JANUARY 2013]

The 4-IST conference will be held at the premises of ETH in Zurich, June 19-21, 2013. Sustainable transitions of socio-technical systems have received increasing attention in recent years and there is a growing international community of scholars from a range of different disciplines working in this promising field. The conference will be a platform to present latest research, exchange ideas and strengthen networks. Furthermore, it aims at presenting promising avenues for future research and socio-political challenges associated with sustainability transitions. Featured topics include "sustainability and management studies", "geography of transitions" and "sustainability in the wake of current economic crises". Zurich is Switzerland's largest city, beautifully located at the shores of Lake Zurich close to the Swiss Alps. Zurich sets great store by sustainability and was one of the first cities in the world to include the ideas and aims of the 2000-Watt society in the city's constitution.

Scholars who wish to present their research at the conference must upload an extended abstract through the conference website (www.ist13.ch) no later than **January 31, 2013**, starting January 1st. Only novel and previously unpublished research is eligible for presentation.For more information see the conference website.

Organizing committee: Bernhard Truffer, Eawag; Jochen Markard, ETH; Lea Fünfschilling, Eawag; Christian Binz, Eawag. Contact: info@ist13.ch

Organizing committee: Bernhard Truffer, Eawag; Jochen Markard, ETH; Lea Fuenfschilling, Eawag; Christian Binz, Eawag. Deadline for Abstracts: January 31, 2013. Contact: info@ist13.ch, www.ist13.ch.

Second International Conference on: 'Sustainable Business and transitions for Sustainable Development', 20-22 June, 2013, Opole, Poland

On 20-22 June 2013, the second International Conference on Sustainable Business and transitions for Sustainable Development - Multilevel Governance and Strategic Approaches towards Sustainable (Product) Innovation, will be held in Opole (Poland). Sustainability issues have become so common in many fields of socio-, political- and economic life, that it is often forgotten that it requires new approaches, and a change in rules guiding human activity, ways of thinking and governance structures. There exists the need to understand the interactions in institutional change between socio-economic systems, technology, product innovation and a transition path towards more sustainable production structures. Scholars wishing to give a presentation at the conference are kindly asked to submit an abstract of their paper in advance. Please register and submit the abstract not later than **31 January 2013.** For more information see website http://www.ees.uni.opole.pl/conferences.html

International conference on: 'Energy Systems in Transition: Inter- and Transdisciplinary Contributions', 9-11 October, Karlsruhe, Germany

The energy transformations in Germany and in many other countries worldwide include the rapid expansion of renewable energy sources, an ambitious increase in energy efficiency and, at least in Germany and several other countries, an accelerated phase-out of nuclear energy. This transformation is not only a technical but also a societal challenge. The conference aims to address a broad variety of interconnected topics and create room for presenting an interdisciplinary portfolio of approaches and research findings. Conceptual as well as empirical studies from different disciplinary backgrounds, and in particular interdisciplinary contributions are highly welcomed. We explicitly invite analyses from various countries as comparative studies facilitate mutual learning processes.

The presenters of papers and posters are encouraged to address the following topics:

1. Concepts, scenarios or modelling approaches with an integrative perspective on energy transitions taking explicit account of the interface between technology, economic development and social changes;
2. Criteria/indicators for assessing the sustainability of energy transitions as well as tensions/conflicts between different dimensions of sustainability related to the environmental and societal implications as well as the economic performance (including approaches such as the "lead markets" concept);
3. Governance of energy innovations with a particular focus on path dependencies or path creation; contributions might also address the motivations, strategies, or expectations of different actors in the energy system;
4. The role of subnational governance levels (including regional/local energy independence or even autarky) for enabling or facilitating energy transitions. In this context, technical, political and behavioural aspects of cooperative governance structures and processes are of special interest; aspects of decentralisation might be addressed as well;
5. Determinants of individual and group-related behaviour with respect to energy consumption of households and industry and instruments to influence this behaviour (incentives, coordination, communication); this might include new insights into rebound phenomena or on side effects of monetary incentives;
6. Potentials and limits of public/stakeholder participation in formal or informal planning procedures with respect to energy-related infrastructure projects;
7. Challenges and approaches for communicating complex and uncertain research results to a wider policy and public audience;

8. Scientific concepts and methods, governance approaches, regulations or policy packages with an explicit focus on “risks and uncertainties”. In this context, also the tension between flexibility and stability in long-term infrastructure planning might be addressed.

We invite scholars to submit abstracts (English language only) of maximum 500 words, which clearly address one or more of the topic areas outlined above. Please indicate these topics on the front page of your abstract. Abstracts should not only list what subjects will be addressed but also the key messages of the paper. Please send your abstract via e-mail to jens.schippl@kit.edu

Deadline: The deadline for submitting abstracts is **Thursday, 14 February 2013**. Authors will be informed by the beginning of April 2013 whether their abstracts have been accepted. The conference is organised in the context of the Helmholtz Alliance ENERGY-TRANS. Spokespersons of the Alliance are Prof. Dr. Armin Grunwald, Institute for Technology Assessment and Systems Analysis (ITAS), KIT; Prof. Dr. Ortwin Renn, ZIRIUS - Research Center for Interdisciplinary Risk and Innovation Studies, University of Stuttgart
For more information see the conference Website: www.energy-trans.de/conference-2013.

Summerschool on "Innovation and Research Policies for a Sustainable Transition"
The Network of Research on Innovation (http://rri.univ-littoral.fr/) organises a summerschool (28-31 August 2013). The conference focuses on innovation, system of innovation, co-evolution of technology and society, and sustainability transitions. It takes place at the University of Technologies of Belfort-Montbéliard (France).
For more information contact: Fabienne.Picard Fabienne.Picard@utbm.fr)

Call for papers for special issue on “Transitions through a Lens of Urban Water”
We invite contributions to a special issue in *Environmental Innovation and Societal Transitions* on transitions from an urban water perspective. The urban water sector seems to have ideal characteristics to be a model system for transitions studies. Urban water systems combine ecological, technological and social aspects that independently have the interest of the transitions research community. Moreover, the water sectors in different cities provide rich examples of systems in various phases of transitions. One of the aims of the special issue is to provide a comprehensive overview of the state of the art of the scholarship on urban water transitions. We would like to invite authors to contribute papers that address key questions from transitions studies with insights from urban water research. Specifically, but certainly not exclusively, we are interested in contributions addressing urban water transitions from the perspectives of:

- Actor dynamics and understanding agency
- The role and dynamics of institutional change
- Modelling approaches to understand transition processes

Important dates:

December 10th, 2012	Submission of abstracts, extended abstracts or full drafts to the guest editors (fjalar.dehaan@monash.edu)
December 20th, 2012	Notification of acceptance
February 26th, 2013	Submission of full papers/manuscripts to EIST journal

Guest Editorial Team: Dr. Fjalar de Haan (Monash Water For Livability, Monash University, Melbourne, Australia); Dr. Ir. Niki Frantzeskaki (Dutch Research Institute For Transitions, Erasmus University Rotterdam, The Netherlands); Briony Ferguson (Monash Water For Livability, Monash University, Melbourne, Australia); Professor Rebekah Brown (Monash Water For Livability, Monash University, Melbourne, Australia)

Call for papers for special issue on “Electrification of the car: will the momentum last?”
We invite potential contributions to a special issue in *Environmental Innovation and Societal Transitions* on the current, highly visible development of electric mobility. After more than hundred years of incremental innovations, the automotive industry finds itself in a period of

acceleration. Under pressure of increasingly stringent regulations, a number of more radical innovations have found their way to the market. The most eye-catching development is the electrification of the car: from the mildest of hybrids and plug-in hybrids to all-electric vehicles.
Demonstration programs are currently set up and recharging infrastructure is expanding. These activities reflect the momentum in both the industry and policy circles. However, to what extent these developments will actually result in commercially viable products is still an open question. Next to the automotive industry, other stakeholders need to move along to continue the build-up of the necessary infrastructure and supportive network. Furthermore, competing alternative fuels such as biofuels and natural gas can impede the developments in electric mobility.
Now is a good moment to reflect on the activities related to the electrification of the car. Are we witnessing the start of a new paradigm in mobility or will this turn out to be just another hype that ends in disillusion? Reflecting on the current developments, we see several interesting topics for inclusion in a special issue: industrial dynamics, firm level strategies, diffusion dynamics, demand side mechanisms, policy issues, and expectations about the technology.
Abstracts of potential contributions (1 page maximum) can be submitted until February 1st to the editors of the special issue (Jacco Farla and Sjoerd Bakker). Full papers can be submitted before 1st of April 2013 through the journal's website. Papers will be submitted to a normal review procedure. Publication is foreseen early 2014.

Special Issue in Journal of Industrial Ecology: Greening Growing Giants
Industrial Ecology reaching out beyond the core industrial countries: A special issue on Greening Growing Giants (eds. S.Hashimoto, M.Fischer-Kowalski, S. Suh und X.Bai) searches for another more sustainable development pathway for countries that now contain the majority of the world population, and will soon dominate the world economy.
For more information: http://onlinelibrary.wiley.com/doi/10.1111/jiec.2012.16.issue-4/issuetoc

Event Reviews

Review of events interesting to the STRN community

Sustainability Transitions Workshop at SPRU, University of Sussex
Sussex Energy Group based at SPRU, University of Sussex, welcomed a group of researchers from Finland to a two-day Sustainability Transitions Workshop on 15-16th November 2012. The event was organised by PhD Student Mari Martiskainen from the University of Sussex, Professor Raimo Lovio from Aalto University and Dr Tuula Teräväinen from Helsinki University. A total of 34 researchers attended the workshop. Dr Adrian Smith from SPRU and Professor Raimo Lovio from Aalto University opened the workshop by introducing sustainability transitions research in SPRU and in Finland respectively. The workshop included thirteen presentations, including a session on the politics of low carbon transitions, the role of users and intermediary organisations in transitions, and more technology focused sessions on transport, nuclear energy, carbon capture and storage and solar PV. There was also a PhD poster-session, giving nine PhD students a chance to showcase their work. Professor Per Mickwitz, Research Director of the Finnish Environment Institute, finished the workshop by giving a presentation as part of the SPRU Friday Seminar series. Prof Mickwitz's presentation *Greening the Economy: The case of Finnish Energy* highlighted that there is little consensus in Finland about what is meant by concepts such as the green economy and green growth, and what would be the best policy measures to help their creation. Key outcome from the workshop was that there are several linkages and common interests between researchers in SPRU and the Finnish institutions, especially in areas such as research topics, methods and how sustainability transitions and energy

research is being approached in the two countries. Conversations were active during the workshop and dinner, indicating that further collaboration is likely to take place.
For further information, please contact **Mari Martiskainen** (m.martiskainen@sussex.ac.uk).

OECD workshop and project on systems innovation
Frank Geels, Fred Steward and Adrian Smith were amongst the participants to a workshop on Systems Innovation (12 December 2012), organized by the OECD Working Group on Innovation and Technology Policy (TIP). The TIP-unit, which has been very influential in disseminating the concept of 'systems of innovation', is now addressing the topics of 'grand societal challenges' and system innovation. The workshop call says that: "the complexity of the grand challenges calls for new thinking on the future of innovation policy. Systems innovation (SI) presents an interesting avenue of policy research for the TIP. Systems innovation postulates that innovation in complex systems (e.g. such energy systems, public health systems) requires system-wide changes in both social (values, behavior, attitudes) and technical (infrastructure, technology, tools, production processes) policy (regulations, incentives) dimensions and, most importantly, in the relations between the different stakeholders. System innovation (SI) can thus be defined as a set of public policy interventions that can shift a system to a new more sustainable path through innovation."

It is very encouraging for STRN that major organisations such as the OECD are now beginning to engage with the transitions agenda. The TIP-unit will engage in a 1½ year research project, which entails interactions with STRN-members, and dissemination activities to wider stakeholders. So, hopefully we can report more on this in the future.
Frank Geels (frank.geels@mbs.ac.uk)

International workshop on: Electrification of the car: will the momentum last?"
An international workshop on the electric vehicle was organized by Sjoerd Bakker from Delft University of Technology and Jacco Farla from Utrecht University on November 29th. In this one-day workshop, 15 presentations reflected on the current momentum in the development of the electric vehicle and its infrastructure. The presentations related to strategic choices made by suppliers, prospective analyses of the demand side, and how policies aim at influencing both. The workshop showed that a lot is happening indeed, but it also showed that there is quite some hesitance among automakers and prospective consumers, and that EVs are still treated as one of many options. Policy that affects both sides will be necessary for at least a decade in order to make the current momentum last.
A special issue on this topic is planned with the journal Environmental Innovation and Societal Transitions; see above.
Jacco Farla Farla (J.C.M.Farla@uu.nl)

New research projects

Information about ongoing research activities such as the start of new research projects

£5 million Research Centre on Innovation and Energy Demand (SPRU)
SPRU, in collaboration with the Transport Studies Unit in Oxford and Manchester University, has won a £5 million research grant from the EPSRC/ESRC. The research centre focuses on transitions, and will develop an interdisciplinary understanding of the emergence, diffusion and impact of different types of low-energy innovations and use this understanding to inform the future development of UK energy and climate policies. Low-energy innovations could be new technologies, organisational arrangements and/or modes of behaviour that are expected to improve energy efficiency and/or reduce energy demand. This is one of five research centres in the area of Energy End Use Demand (EUED) that will be sponsored over the next five years. Jim Watson was Principal Investigator on the proposal, supported by Steve Sorrell and Frank Geels as Co-Investigators.
For more information contact Frank Geels (frank.geels@mbs.ac.uk)

Network Interventions by Private Partners for Responsible Innovation
The Knowledge, Technology and Innovation group of Wageningen University will start a new 2-year research project funded in the Responsible Innovation programme of the Netherlands Organisation for Scientific Research (NWO). It was developed and will be carried out in close cooperation with the Agricultural Economics Research Institute (LEI).
We will study the social learning processes of the two initiatives Market Driven Greenhouse Sector (STAP) and Sustainable Dairy Chain (DZK) that take the lead to align innovation with the concerns of citizens, consumers as well as to ensure economic viability. In this project, we regard social learning as collectively developing solutions to tackle challenges encountered on trajectories of 'transitions in the making'. This process will be supported while studying it, with the methodology Reflexive Monitoring in Action. We aim to further conceptualise how innovating actors give meaning to the institutional setting and its boundaries while changing it. We also expect to develop concrete tools to aid actors to address and interact with perceived outsiders about their initiative without closing down prematurely.
For more information, contact Barbara van Mierlo: Barbara.vanMierlo@wur.nl

New research program: Informational Governance
Wageningen University and the connected research Institutes Alterra and Agricultural Economic Institute started a new strategic research program called Informational Governance. At the crossroad of two major developments – the emerging Information Age and shifts in modes of governance – informational governance has been identified as a major new topic of research. Informational governance refers to the idea that information (and informational processes, technologies, institutions and resources linked to it) is fundamentally restructuring processes, institutions and practices of governance, making them essentially different from conventional modes of governance. Information processes now start to become constituting and transformative factors in governance, instead of just an enabling condition for formulating and implementing state policies. This counts especially in contexts where governance transcends the nation-state and becomes international/global, or is being decentralized to self-governing local communities. Scientific information plays an important role, but is often blended with information from practitioners and local experts.
The research program, running from 2012-2016, considers this new mode of sustainability governance within two domains of science: agricultural production chains, and environmental sustainability. The 13 projects (including 6 PhD projects) address 4 topics: contested information, information processes across spatial scales, information processes in adaptive governance of landscapes and the role of social media. More information can be obtained from the program coordinators paul.opdam@wur.nl and katrien.termeer@wur.nl

The Technological Innovation System for Energy Efficiency in the Built Environment
In January 2012 a new research project on the technological innovation system (TIS) for energy efficiency in the built environment started at the Norwegian Institute for Urban and Regional Research, Norway. This three-year project is part of the strategic institute research program on Challenges for Governance and Planning in Cities and Municipalities. The project focuses on innovation processes and the emergence of a TIS related to energy efficiency in buildings and in the built environment in Norway, with particular focus on i) the characteristics of the emerging TIS in terms of structural and functional dimensions and motors of innovation; and ii) the role of the most innovative building projects in this systems emergence. The project studies projects and processes in large urban contexts with a main focus on the Oslo region in order to produce relevant knowledge for how Norwegian cities and urban regions can better deal with climate change challenges and thereby strengthen their capacities and resilience (urban capability) and prepare for transition to a post-carbon future. For more information contact Ove Langeland (NIBR), ove.langeland@nibr.no.

New project: Sustainable Farm Systems
The way Western agriculture faced challenges of maintaining soil fertility, landscape shaping, and nutrient transfer changed considerably over three centuries. In the transition from traditional to industrial agriculture, production and profits expanded but ecosystem functions degraded, threatening long-term sustainability. The move from traditional to industrial agriculture in the 19th and 20th centuries was a major transformation. Researchers will investigate the drivers of that transition, explore why it began at different times in different places, and consider why the manufacturing sector industrialized decades earlier than the agricultural sector. The project Sustainable farm systems: long term socio-ecological metabolism in western agriculture integrates scholars from across a broad range of disciplines from Canada, the USA, Cuba, Colombia, Spain and Austria. It draws upon multiple case studies of historical farm communities in Europe, North America and Latin America will create a common database of agricultural systems over the past 300 years. The research program employs "socio-ecological metabolism" methods, an approach that views farms as ecosystems and measures flows of energy and soil nutrients through the landscape. This project's overarching goal is to understand the biophysical choices and trade-offs available to farmers and the options that are possible for long-term sustainability.
Contact: fridolin.krausmann@aau.at
For more information: http://www.usask.ca/research/news/read.php?id=1075&newsid=1

Publications

Announcement of new publications such as article, PhD theses and books

PhD thesis: Jörg Musiolik 2012: Innovation system-building: on the role of actors, networks and resources - The case of stationary fuel cells in Germany,
On October 22nd 2012 Jörg Musiolik (Cirus/Eawag) successfully defended his PhD thesis (supervised by Jochen Markard and Marko Hekkert) at Utrecht University. The thesis focuses on actors and resources and their role in the build-up of technological innovation systems. He analyzed how system builders (firms, associations) created and shaped technological standards, lobbied for public support programs, set up commonly available training modules, shaped value chains and increased public awareness in the field of fuel cells. These new structures were conceptualized as system resources as they represent assets that are of strategic value for firms interested in the novel technology. The case shows that system builders have developed most system resources with the help of formal networks in which they coordinated their efforts (collective action).
For further information, please contact: joerg.musiolik@swtr.admin.ch

Special section 'Past and Prospective Energy Transitions: Insights from History', *Energy Policy* 2012, Vol. 50

Fouquet, R. and Pearson, P.J.G., 2012, 'Past and prospective energy transitions: Insights from history', *Energy Policy*, 50, 1-7

Grubler, A., 2012, 'Energy transitions research: Insights and cautionary tales', *Energy Policy*, 50, 8-16

Allen, R.C., 2012, 'Backward into the future: The shift to coal and implications for the next energy transition', *Energy Policy*, 50, 17-23

Madureira, N.L., 2012, 'The iron industry energy transition', *Energy Policy*, 50, 24-34

Turnheim, B. and Geels, F.W., 2012, 'Regime destabilisation as the flipside of energy transitions: Lessons from the history of the British coal industry (1913-1997)', *Energy Policy*, 50, 35-49

Rubio, M.d.M. and Folchi, M., 2012, 'Will small energy consumers be faster in transition? Evidence from the early shift from coal to oil in Latin America', *Energy Policy*, 50, 50-61

Fouquet, R., 2012, 'Trends in income and price elasticities of transport demand (1850–2010)', *Energy Policy*, 50, 62-71

Rutter, P. and Keirstead, J., 2012, 'A brief history and the possible future of urban energy systems', *Energy Policy*, 50, 72-80

Wilson, C., 2012, 'Up-scaling, formative phases, and learning in the historical diffusion of energy technologies', *Energy Policy*, 50, 81-94

Bennett, S.J., 2012, 'Using past transitions to inform scenarios for the future of renewable raw materials in the UK', *Energy Policy*, 50, 95-108

Rühl, C., Appleby, P., Fennema, J., Naumov, A., and Schaffer, M., 2012, 'Economic development and the demand for energy: A historical perspective on the next 20 years', *Energy Policy*, 50, 109-116

Pearson, P.J.G. and Foxon, T.,J. 2012, 'A low carbon industrial revolution? Insights and challenges from past technological and economic transformations', *Energy Policy*, 50, 117-127

Pollitt, M.G., 2012, 'The role of policy in energy transitions: Lessons from the energy liberalisation era', *Energy Policy*, 50, 128-137

Fouquet, R., 2012, 'The demand for environmental quality in driving transitions to low-polluting energy sources', *Energy Policy*, 50, 138-149

Special issue 'Socio-technological transitions towards sustainable energy and climate stabilization', *Sustainability Science*, Vol. 7, No. 2

Frans Berkhout, Peter Marcotullio and Tatsuya Hanaoka, 2012, 'Understanding energy transitions: editorial', *Sustainability Science*, 7(2), 109-11

Tatsuya Hanaoka and Mikiko Kainuma, 2012, 'Low-carbon transitions in world regions: comparison of technological mitigation potential and costs in 2020 and 2030 through bottom-up analyses', *Sustainability Science*, 7(2), 117-137

Osamu Akashi and Tatsuya Hanaoka, 2012, 'Technological feasibility and costs of achieving a 50 % reduction of global GHG emissions by 2050: mid- and long-term perspectives', *Sustainability Science*, 7(2), 139-156

Keigo Akimoto, Fuminori Sano, Takashi Homma, Kenichi Wada and Miyuki Nagashima*, et al.*, 2012, 'Comparison of marginal abatement cost curves for 2020 and 2030: longer perspectives for effective global GHG emission reductions', *Sustainability Science*, 7(2), 157-168

Fabian Wagner, Markus Amann, Jens Borken-Kleefeld, Janusz Cofala and Lena Höglund-Isaksson*, et al.*, 2012, 'Sectoral marginal abatement cost curves: implications for mitigation pledges and air pollution co-benefits for Annex I countries', *Sustainability Science*, 7(2), 169-184

Aki Suwa and Joni Jupesta, 2012, Policy innovation for technology diffusion: a case-study of Japanese renewable energy public support programs, *Sustainability Science*, 7(2), 185-197

Suyash Jolly, Rob Raven and Henny Romijn, 2012, Upscaling of business model experiments in off-grid PV solar energy in India, *Sustainability Science*, 7(2), 199-212

Stephen M. McCauley and Jennie C. Stephens, 2012, Green energy clusters and socio-technical transitions: analysis of a sustainable energy cluster for regional economic development in Central Massachusetts, USA, *Sustainability Science*, 7(2), 213-225

I. H. Rehman, Abhishek Kar, Anupama Arora, Ramchandra Pal and Lokendra Singh*, et al.*, 2012, Distribution of improved cook stoves: analysis of field experiments using strategic niche management theory, *Sustainability Science*, 7(2), 227-235

Zeeda Fatimah Mohamad, Noorshahzila Idris and Zuffri Mamat, 2012, Role of religious communities in enhancing transition experiments: a localised strategy for sustainable solid waste management in Malaysia, *Sustainability Science*, 7(2), 237-251

Wells, P. and Nieuwenhuis, P., 2012, 'Transition failure: Understanding continuity in the automotive industry', *Technological Forecasting and Social Change*, 79(9), 1681-1692

This paper argues that there is a powerful tendency in forecasting of socio-technical change to focus on the causes and consequences of change at the cost of greater understanding of

the reasons for and significance of continuity. Taking the case of the global automotive industry, the paper therefore analyses the evidence for systemic continuity in technologies, economic structures, cultural positioning and embedded social function through the lens of transition theory and the multi-level perspective. It is concluded that the observable processes are as much about enduring technologies and social practices as they are about systemic change. That is, the industry has shown resistance to change notwithstanding the apparent imperatives for radical action or the multitude of attempts via socio-technical experimentation to nurture strategic niches. At a theoretical level, it is concluded that greater attention must be paid to understanding how change can be nullified. Moreover, theoretical expectations of systemic change need a greater emphasis on the way in which technological transition as a process may mean that many existing practices and structures are retained more or less intact rather than entirely replaced by new practices and structures. The future research agenda needs therefore to understand more fully how embedded practices and technological change inter-relate in specific concrete conditions.

Van der Meulen, V., Van der Steen, M., Stevens, C.V., and Van Huylenbroeck, G., 2012, Industry expectations regarding the transition toward a biobased economy, *Biofuels, Bioproducts and Biorefining*, 6(4), 453-464

The transition from a fossil-input-based economy toward a bio-based economy is not an easy process. Although policy-makers in the European Union (EU) advocate this transition, still most companies and economies in the EU rely on fossil fuels for the production of materials and goods. However, the transition will not only depend on policy but will also involve all stakeholders: consumers, firms, and supporting policy with industry playing a major role. This paper focuses on the perceptions and expectations of industry regarding a possible transition toward a bio-based economy. Based on the multilevel perspective emphasized in transition theory, the opinions of Flemish captains of industry active in the bio-based sector are analyzed. The case of Flanders is taken because it is a good example of a small European economy relying heavily on imported fossil inputs. Based on the views of the captains of industry combined with the multilevel transition perspective, we argue that the transition toward a bio-based economy follows a typical sequence of pathways starting with a transformation pathway and evolving toward a technological substitution or de-and re-alignment pathway. This theoretical transition perspective helps to define which issues related to market development, technology, research, science, and policy, can influence the transition toward a bio-based economy which helps to describe some future directions for Flanders as well as other European regions.

Le Masson, P., Weil, B., Hatchuel, A., and Cogez, P., 2012, 'Why they are *not* locked in waiting games? Unlocking rules and the ecology of concepts in the semiconductor industry', *Technology Analysis & Strategic Management*, 24(6), 617-630

In a multi-level perspective, regimes can be clearly described as long as they remain stable. To understand how regimes and niches interact during transition, the article contrasts two models of regimes in transition(s). The classical model of evolutionary niches suggests misalignments between rules and competition between niches. Transition management, technological innovation systems and works on transition pathways suggest a second model based on 'unlocking rules', which support collective work on a structured set of emerging technologies. The latter model is illustrated with a case study on the International Technology Roadmap for Semiconductors (ITRS).

Yuan, J., Xu, Y. and Hu, Z., 2012, 'Delivering power system transition in China', *Energy Policy*, 50, 751-772

This paper studies the transition to low carbon power systems in China. The methodology is built on the newly developed multi-level perspective (MLP) transitions, as well as literature on innovation systems. Three lines of thought on the transition process are integrated to probe the possible transition pathways in China's power sector. Five transition pathways,

namely reproduction, transformation, substitution, reconfiguration, de-alignment/re-alignment and reconfiguration, with their possible technology options are presented. The requirements for a smart grid in the socio-technical transition process are addressed within the MLP framework. The paper goes further to propose an interactive framework for low carbon transition management in China. Representative technology options are appraised by employing innovation theory to demonstrate the logic of policy design within the framework. The work presented in this paper will be useful in informing policy-makers and other stakeholders in China and it may prove to be a valuable reference for other countries in energy transition management.

Hassink, J., Grin, J.,Grin, Hulsink, W., 2012, 'Multifunctional Agriculture Meets Health Care: Applying the Multi-Level Transition Sciences Perspective to Care Farming in the Netherlands', *Sociologica Ruralis*, forthcoming

Care farming is a promising example of multifunctional agriculture: it is an innovation at the crossroads of the agricultural and healthcare sectors. Our objective is to develop a framework for understanding the success of initiatives in this field. We link empirical data with the multi-level perspective from the transition sciences and extend this perspective with insights from the literature on entrepreneurship, alliance management and organisational attributes. This framework allows us to explain the success of the three major types of initiatives: (1) individual care farms; (2) regional foundations of care farmers; and (3) care institutions collaborating with groups of farmers at a regional level. We propose that the main factors responsible for the success of initiatives are the commitment and competences of the entrepreneur, the creation of alliances, the quality of the new regional organisations and the implementation of the care farm services in care organisations. The relative importance of the factors varies between the different types of initiatives and local and regional levels.

Switzer, A., Bertolini, L. & Grin, J., 2013, Transitions of Mobility Systems in Urban Regions: A Heuristic Framework, *Journal of Environmental Policy and Planning*, forthcoming

This article examines the possible contributions that transition studies can make to better understand the problems that hinder attempts to deliver co-ordination between transport and land-use planning and better integration between modes of transport in urban regions. Recent publications focus on barriers of co-ordination between transport and land-use and methods to overcome them. Obdurate cultural, social and institutional structures are the dominant obstacles for change. For this reason, transition studies are considered to conceptualise the mobility system. In the paper, key theories in transition studies are first considered. Following this, the ways in which these concepts can be used to characterise the system of transport and land-use planning are explored; it is demonstrated that the system and the challenges facing it can be better understood by using these concepts. This has resulted in a conceptual model for the development of the mobility system. A focus group session in the Noordvleugel region of the Randstad in the Netherlands has been used to test the usability of this model in practice, gauge the participants' reactions to it and to supplement it, if necessary. By combining insights about how to conceptualise change in socio-technical systems and more specific knowledge about transport land-use planning, this paper gives new insight into how a transition towards better co-ordination between transport and land-use planning and the transport network could occur, as well as how it could be hindered. It also provides interesting indications of research options examining cases where such transitions have taken place or been attempted.

Nakamura, H., Kajikawa, Y., and Suzuki, S., 2012, 'Multi-level perspectives with technology readiness measure for aviation innovation', *Sustainability Science*, forthcoming

Sustainability science requires the development of a theoretical framework to understand, analyze, and design innovation to solve social, economic, and environmental issues. This paper extends the framework of multi-level perspectives (MLP) by introducing a technology

readiness level (TRL), and analyzes the innovation of the advanced turboprop (ATP) engine in the aviation industry, also known as a propfan or an open rotor engine, which is one of the most promising engine innovations expected to mitigate climate change. The concept of TRL was introduced to explain the mechanisms of ATP failure in the late 1980s as well as the transition of the geared turbofan (GTF). In this paper, we discuss whyATPandGTFfaced different fates although both were developed under the same landscape in the aviation industry. We also discuss the different roles of the sociotechnical regime, such as uneven and dynamic opportunity windows, technological readiness, niche stock, institutional support of export products, and the risk of a 'launch' customer, at different TRLs. As illustrated in this paper, MLP with TRL is expected to facilitate future interdisciplinary collaboration between social scientists and engineers, and also transdisciplinary expertise between academia and practitioners by supporting analysis and design of the industry's transition toward a more environmentally friendly regime as well as its effective management.

Essletzbichler, J.., 2012, Renewable energy technologies and path creation: A multi-scalar approach to energy transition in the UK, *European Planning Studies*, 20(5), 791-816

This paper examines the potential contribution of UK regions for developing and deploying renewable energy technologies to achieve the government target of obtaining 20% of its energy from renewable sources by 2020. The paper argues for a multi-scalar approach to energy transition theory and policy. National-scale processes and policies need to be complemented by regional and local policies in order to discover and incorporate meso-level sources of renewable energy, recognize that niche or path creation is a geographically localized process and mobilize heterogeneous, local actors around common "regional energy visions" to improve implementation of renewable energy projects. After critically reviewing the main theoretical approach to energy transitions, the multi-level perspective, the paper employs patent data to describe the comparative position of UK regions in the renewable energy sector and examines the success of Danish, German and Spanish regions resulting from strong government intervention at the national level supplemented by region-specific strategies. A number of policy strengths and shortcomings are identified in the evolutionary trajectory of the UK energy system including weak technology push and policy pull factors. Finally, the paper reviews existing regional renewable energy policy and speculates on the potential impact of recent changes in spatial and energy policies on the ability to deploy and develop renewable energy sources in the UK.

Daphne Ngar-yin Mah, Johannes Marinus van der Vleuten, Jasper Chi-man Ip, Peter Ronald Hills, 2012, 'Governing the transition of socio-technical systems: A case study of the development of smart grids in Korea', *Energy Policy*, 45, 133-141

This paper examines the motivations, processes and outcomes of the development of smart grids in South Korea through the perspectives of governance and innovation systems. Drawing on desktop research and semi-structured interviews, this paper has two major findings. First, the development of smart grids in Korea has been shaped by various factors including macroeconomic policy, the role of the government, and experimentation. The complex interactions between these factors at the landscape, regime and niche levels has impacted on the development of smart grids. Second, while Korea's government-led approach has its strengths in driving change, it has also exposed weaknesses in the country's ability to mobilise the private sector and consumer participation. Major obstacles including partial electricity market reform and public distrust exist. A systemic perspective is needed for policy in order to accommodate the changes required for smart grid development. Regulatory reforms, particularly price-setting mechanisms, and consumer engagement are priority areas for policy change.

Kwon, T.-H., 2012, 'Strategic niche management of alternative fuel vehicles: A system dynamics model of the policy effect', *Technological Forecasting and Social Change*, 79(9), 1672-1680

Using a system dynamics model, this study investigates the market barriers to increasing the market share of alternative fuel vehicles (AFVs) and possible policy options to overcome them, in particular strategic niche management (SNM). The model assumes that the operating costs of AFVs, including fuel supply and vehicle maintenance costs, have a positive feedback relationship with the scale of overall car stocks sold. System dynamics modelling is a useful approach to model a feedback effect like this situation. According to the simulation results, if there is a strong network effect on vehicle operating costs, it is difficult to achieve the shift to alternative fuel vehicles, even in the long term, without policy intervention. Although SNM alone may not be enough to sustain the rise of the market share of AFVs with a strong network effect, SNM seems to be very effective in strengthening the policy effect of financial incentives. A relatively small budget devoted to SNM can result in a substantial difference in AFV market share. However, the effectiveness of SNM also depends on the magnitude of the network effect. SNM is more effective when applied to AFVs with a strong network effect.

Markusson, N., Kern, F., Watson, J., Araposthathis, S., Chalmers, H., Ghaleigh, N., Hepstonstall, P., Pearson, P., Rossati, D. and Russell, S., 2012, A socio-technical framework for assessing the viability of carbon capture and storage technology, *Technological Forecasting and Social Change*, 79(5), 903-918

Carbon capture and storage (CCS) is seen as a key technology to tackle climate change. The principal idea of CCS is to remove carbon from the flue gases arising from burning fuels for electricity generation or industrial applications and to store the carbon in geological formations to prevent it from entering the atmosphere. Policy makers in several countries are supportive of the technology, but a number of uncertainties hamper its further development and deployment. The paper makes three related contributions to the literatures on socio-technical systems and technology assessment: 1) It systematically develops an interdisciplinary framework to assess the main uncertainties of CCS innovation. These include technical, economic, financial, political and societal issues. 2) It identifies important linkages between these uncertainties. 3) It develops qualitative and quantitative indicators for assessing these uncertainties. This framework aims to help decision making on CCS by private and public actors and is designed to be applicable to a wider range of low carbon technologies. The paper is based on a systematic review of the social science literature on CCS and on insights from innovation studies, as well as on interviews about assessment of new technologies with experts from a range of organisations and sectors.

O'Brien, K., 2012, 'Global environmental change II: From adaptation to deliberate transformation', *Progress in Human Geography*, 36(5), 667-676

This progress report considers the need for developing a critical body of research on deliberate transformation as a response to global environmental change. Although there is a rapidly growing literature on adaptation to environmental change, including both incremental and transformational adaptation, this often focuses on accommodating change, rather than contesting it and creating alternatives. Given increasing calls from scientists and activists for transformative actions to avoid dangerous changes in the earth system, and the likelihood that 'urgent' solutions will be imposed by various interests, many new and important questions are emerging about individual and collective capacities to deliberately transform systems and structures in a manner that is both ethical and sustainable. This presents a transformative challenge to global change science itself that calls for new approaches to transdisciplinary research.

Seyfang, G. and Haxeltine, A., 2012, 'Growing grassroots innovations: Exploring the role of community-based initiatives in governing sustainable energy transitions', *Environment and Planning C*, 30(3), 381-400

The challenges of sustainable development (and climate change and peak oil, in particular) demand system-wide transformations in sociotechnical systems of provision. An academic literature around coevolutionary innovation for sustainability has recently emerged as an

attempt to understand the dynamics and directions of such sociotechnical transformations, which are termed 'sustainability transitions'. This literature has previously focused on market-based technological innovations. Here we apply it to a new context of civil-society-based social innovation and examine the role of community-based initiatives in a transition to a low-carbon sustainable economy in the UK. We present new empirical research from a study of the UK's Transition Towns movement (a 'grassroots innovation') and assess its attempts to grow and influence wider societal sociotechnical systems. By applying strategic niche management theory to this civil society context, we deliver theoretically informed practical recommendations for this movement to diffuse beyond its niche: to foster deeper engagement with resourceful regime actors; to manage expectations more realistically by delivering tangible opportunities for action and participation; and to embrace a community-based, action-oriented model of social change (in preference to a cognitive theory of behaviour change). Furthermore, our study indicates areas where theory can be refined to better explain the growth and broader impacts of grassroots innovations-namely, through a fuller appreciation of the importance of internal niche processes, by understanding the important role of identity and group formation, and by resolving how social practices change in grassroots innovations.

Grünewald, P.H., Cockerill, T.T., Contestabile, M., Pearson, P.J.G. 2012, 'The socio-technical transition of distributed electricity storage into future networks – system value and stakeholder views', *Energy Policy*, 50, 449-457

Whole system models for the GB electricity system suggest that distributed electricity storage has the potential to significantly reduce the system integration cost for future system scenarios. From a policy perspective, this poses the question why this value should not be realised within existing market structures. Opinion among stakeholders is divided. Some believe that storage deployment constitutes a 'special case' in need of policy support. Others insist that markets can provide the necessary platform to negotiate contracts, which reward storage operators for the range of services they could provide. This paper seeks to inform this debate with a process of stakeholder engagement using a perspective informed by socio-technical transition literatures. This approach allows the identification of tensions among actors in the electricity system and of possibilities for co-evolution in the deployment of storage technologies during a transition towards a low carbon electricity system. It also draws attention to policy-related challenges of technology lock-in and path dependency resulting from poor alignment of incumbent regimes with the requirements for distributed electricity storage.

Pinkse, J., Bohnsack, R. & Kolk, A. (forthcoming). The role of public and private protection in disruptive innovation: The automotive industry and the emergence of low-emission vehicles. *Journal of Product Innovation Management*, forthcoming

In the automotive industry the need to move towards more sustainable trajectories of innovation has received much attention. Car manufacturers have started to develop lower-emission alternatives for the internal combustion engine, particularly electric, hybrid and fuel-cell vehicles. They face the challenge, however, of how to make a potentially disruptive, systemic, and societally embedded technology such as a low-emission vehicle attractive to mainstream customers. While literature has suggested that companies can empower the initial stages of disruptive innovation by creating protected spaces themselves and/or by taking advantage of such spaces created by public actors, the specific role of these different types of protection levers – private and/or public – has remained unclear. This article therefore investigates to what extent and how private and public protection levers affect firm-level strategies to increase the attractiveness of disruptive and systemic innovations to mainstream customers. This is explored empirically through a multiple case study of the emergence of low-emission vehicles within three car manufacturers – Daimler, General Motors and Toyota – in the context of European, Japanese and US policies. The empirical analysis is conducted on a dataset consisting of more than 9,000 articles from two trade

magazines, a car magazine and a financial newspaper for the period of 1997 to 2010. As main findings, the article identifies regulation, tax incentives, and public-private partnerships as the public protection levers that impose or stimulate 'new' performance metrics such as fuel economy and vehicle emissions. It also finds that resource allocation, niche occupation and collaboration-integration act as the main private protection levers. Besides, two protection levers emerge from the data that are rather prominent in this context: the use of regulation imposing large-scale commercialization of low-emission vehicles and dumping of products in the market below cost price. The article concludes with two different protection trajectories – a public protection trajectory and a private protection trajectory – which explain how car manufacturers leverage the various protection levers to deal with disruptive technology. The main implication of the two trajectories is that while the public protection trajectory stalled due to the systemic, socially embedded technological impediments of electric vehicles and fuel-cell vehicles, the private protection trajectory picked up the remains of the public protection trajectory and has gained momentum, continuing until today.

Kim Davis, Thomas Mazzuchi, Shahram Sarkani, 2012, 'Architecting technology transitions: A sustainability-oriented sociotechnical approach', *Systems Engineering*, forthcoming

Achieving sustainability involves complex processes of technology, people, institutions, and the environment. The sustainability challenge requires a combination of social, political, and technological efforts. This paper discusses processes for technological change in order to meet the sustainability challenge. These complex processes are found to be a suitable application for systems engineering and for systems architecture in particular. Based on a thorough review of the literature, an architecture framework is developed to support management of portfolios of sustainable technology projects. This architecture framework is validated through a case study process, providing enhancements and lessons learned. The full architecture framework construct and associated proposed implementation approaches are presented, demonstrating the need for and applicability of such systems engineering approaches to achieve sustainability. Lessons learned from case studies and development of representative architectures are also described

Erlinghagen, S., Markard, J., '2012, Smart grids and the transformation of the electricity sector: ICT firms as potential catalysts for sectoral change', Energy Policy 51, 895–906.

The sustainability challenges associated with increasing demand and generation of electricity require a far-reaching transformation of the energy system. Smart grid technologies are expected to play a major role in such sectoral transformation. While a growing body of literature is concerned with the dynamics and particularities of sectoral transformation, most contributions have focused on exogenous shocks or new technological developments as drivers of change. This paper complements the existing perspectives by exploring the role of actors as catalysts for transformation. Within the field of smart grid, we study the transformative influence of ICT firms on the energy sector in Europe. More specifically, we analyze actor participation in 450 European smart grid projects between 2000 and 2011 as well as acquisitions in the field. We find that incumbent firms from the ICT sector have gained influence and drive transformation through the creation of variety, in terms of technology, business models and value chains. As a strategic reaction, electricity sector incumbents have recently acquired many start-ups specialized in ICT technology and thus expanded their competence base. We conclude that entrants from another sector can be important catalysts for sectoral transformation and should be analyzed more systematically in transition studies.

Underwood, Sarah; Blundel, Richard; Lyon, Fergus and Schaefer, Anja eds. (2012). ***Social and Sustainable Enterprise: Changing the Nature of Business.*** **Contemporary Issues in Entrepreneurship Research, Volume 2. Bradford, UK: Emerald.**

With current environmental, social and financial challenges facing society and the economy, there has been a rapid growth in interest in the role of social and sustainable enterprise. Accordingly, as government, industry and communities seek to find alternative ways to deliver product and services. This new book draws together contemporary research contributions that seek to critically explore a range of issues in the specific context of social enterprise, sustainable entrepreneurship and social responsibility. Collectively, the chapters in this volume consider the challenges facing social enterprises globally, their environmental impact and the difficulties for policy makers in their efforts to tackle complex international environmental problems. It includes a chapter by STRN colleagues, Kishna, Negro, Alkemade and Hekkert (Utrecht), who examine the strategies adopted by entrepreneurs in the Dutch horticulture sector as they develop radical innovations.