

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

- Words from the Chairman
- Environmental Innovation and Societal Transitions
- Network news
- Event announcement
- 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,

The 5th International Sustainability Transitions (IST) conference is approaching rapidly (August 27-29, Utrecht) and I am looking forward to seeing many of you again, and listening to exciting talks about new empirical research, conceptual ideas and methodologies. It is clear that the transitions field has further diversified in the last year in terms of mobilizing insights from the wider social sciences (e.g. institutional logics, corporate political strategy, discourse theory, business models, issue lifecycles, grassroots innovation, geography) and exploring new methodologies (e.g. modelling, combined quantitative time-series, event chain analysis). We have also diversified in terms of publication outlets, with papers being published in an increasingly broad range of journals (also this newsletter includes papers in new journals such as *Climate Policy*; *Health Policy*; *Energy Research and Social Science*; *Local Environment*; *International Journal of Water*; *Journal of Integral Theory and Practice*; *Theory, Culture & Society*). These are signs of a healthy academic community which is open to other ideas, and whose ideas are being picked up in other fields. I am sure the Utrecht conference will further reinforce and deepen this trend.

Other good news is that the Routledge series on sustainability transitions is selling very well. Volume 1 (Grin *et al.* 2010) has sold more than 2500 copies and will now be published as paperback. The other volumes on domain-oriented transitions (in mobility, energy, agro-food) are also selling well (about 500-800 copies) and attracting positive attention. There is also a handbook in the making, to be published by Springer, which signals efforts towards codification. The *Handbook on Sustainability Transition and Sustainable Peace*, edited by Hans Günter Brauch, Úrsula Oswald Spring, John Grin, and Jürgen Scheffran, will contain several chapters that aim to take stock of academic developments in the transitions-field in the last 10 years.

The topic of sustainability transitions is also entering mainstream disciplines such as business & management. A recent editorial in a top journal (*Academy of Management Journal*, 2014, Vol. 57, No. 3) calls on organization scholars to engage more with the important topic of climate change and transitions. Notably, the editorial suggests this also entails re-engaging with big-picture topics such as “societal shifts”, “mobilizing, organizing and coordinating large-scale changes”, “shifts in cultural or institutional values or logics”, “rethinking our understanding of innovation and technology development and diffusion”, “how we live and work”. Although the editorial does not mention STRN-related work, it is gratifying to see that the kinds of topics we have been addressing for your years are increasingly entering the academic mainstream. It also provides new opportunities for us in terms of publication and intellectual engagement.

There are also further indications of wider socio-political impact, reported in this newsletter. The SPRU-based Centre on Innovation and Energy Demand attracted much attention from a wide range of stakeholders at its launch event in Westminster (London), where system transitions and the MLP were discussed in the context of an energy efficiency revolution. And a Norwegian project by one of the world’s largest shipping companies and a sustainability-oriented think tank is using transitions theory/MLP to guide its thinking about global opportunities related to sustainable development.

As the publications section of this newsletter indicates, papers on sustainability transitions are coming hard and fast. I hope you will appreciate the new titles, as well as the various other news items, e.g. new EIST-articles, update on STRN-membership, event reviews and new projects. I wish you all a good summer break and hope to see many of you at the fifth IST-conference in Utrecht.

Reference: Grin, J., Rotmans, J., Schot, J., Geels, F.W. and Loorbach, D., 2010, *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change*, Routledge

Frank Geels, Chairman of STRN (frank.geels@mbs.ac.uk)

Environmental Innovation and Societal Transitions

Volume 11 of *Environmental Innovation and Societal Transitions* appeared earlier this month. It contains regular articles and a special section on “Innovation and complexity”.

The regular articles and two other contributions are:

- Pioneer countries in the transition to alternative transport fuels: Comparison of ethanol programmes and policies in Brazil, Malawi and Sweden, by Francis X. Johnson and Semida Silveira.
- Zero emission housing: Policy development in Australia and comparisons with the EU, UK, USA and California, by Trivess Moore, Ralph Horne and John Morrissey
- The double hermeneutic of sustainability transitions (a viewpoint), by René Audet
- Enough is Enough: Building a Sustainable Economy in a World of Finite Resources, R. Dietz, D. O’Neill. Berrett-Koehler/Routledge, San Francisco/London (2013), book review by Christian Kerschner

The special section on “Innovation and complexity” contains the following contributions:

- Complexity science and sustainability transitions, by Claes Andersson
- Thresholds models of technological transitions, by Paolo Zeppini, Koen Frenken and Roland Kupers
- Niche construction, innovation and complexity, by Kevin N. Laland, Neeltje Boogert and Cara Evans
- UK natural gas system integration in the making, 1960–2010: Complexity, transitional uncertainties and uncertain transitions, by Stathis Arapostathis, Peter J.G. Pearson and Timothy J. Foxon

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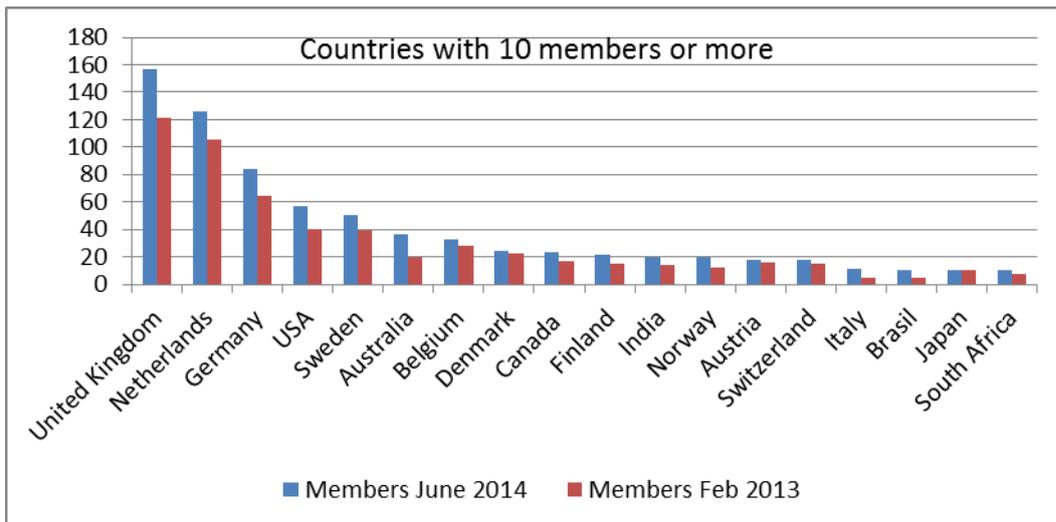
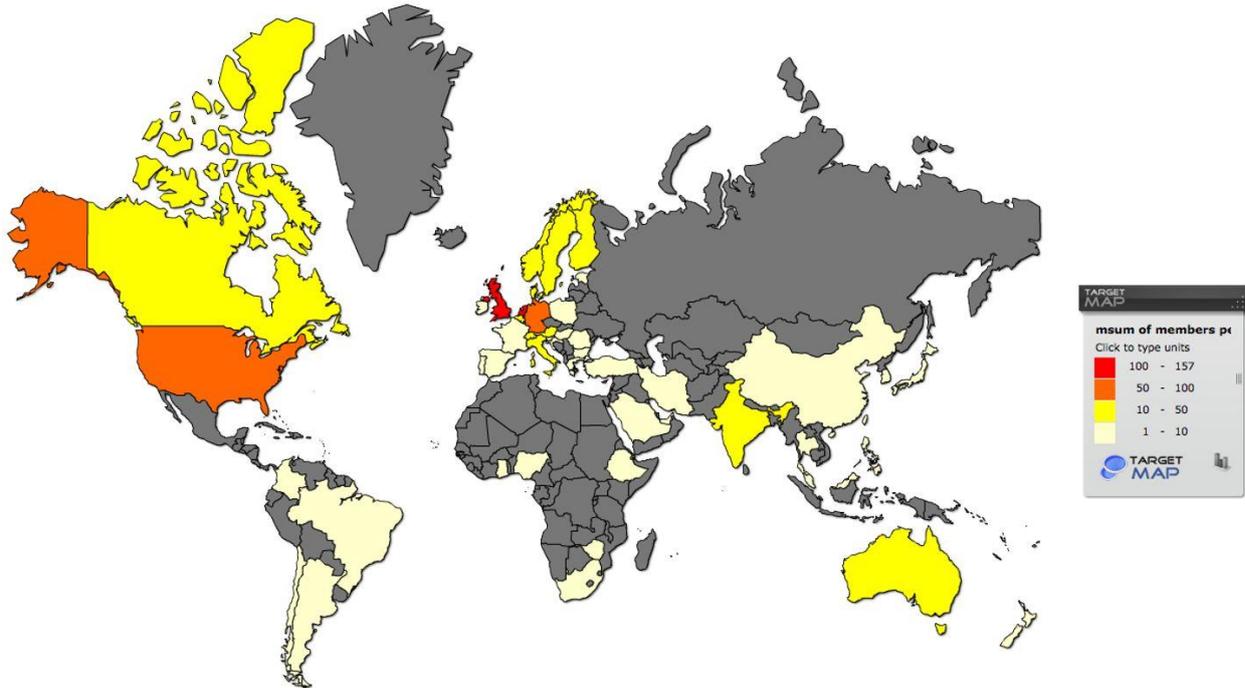
Jeroen van den Bergh, Editor-in-Chief [jeroen.bergh@uab.es]

Network News

Any news related to ongoing activities of STRN

STRN now has more than 800 members!

Since the launch of the Sustainability Transitions Research Network in the summer of 2010 the number of members has been increasing rapidly. In October 2010 STRN accepted its 200th member, in October 2011 its 400th member, in Feb 2013 its 600th member. At the moment of writing (June 2014) STRN has welcomed more than 800 members. About half of the members originate from the UK (19%), the Netherlands (15%), Germany (10%) and the USA (7%).



Three quarter of the members originate from Europe. Notably, growth numbers are most impressive for regions outside Europe and the USA. South America’s member increase is 600% (from 2 to 14), Africa increases with 70% (from 10 to 17) and Australia with 65% (from 26 to 43). Membership in the USA (40%), Europe (31%) and Asia (31%) is also still growing.



Contact: Rob Raven (r.p.j.m.raven@tue.nl)

STRN members in editorial board of *Research Policy*

Three STRN-members have recently taken up new editorial roles at the journal *Research Policy* (where many influential transition papers have been published): Anna Bergek has become associate editor; Koen Frenken and Bernard Truffer have become advisory editors (joining Rene Kemp and Frans Berkhout, who already fulfil that role).

Second-prize for best paper at EU-SPRI conference

Magda Smink (Utrecht University) has won the second prize in the EU-SPRI early career paper prize competition (18-20 June, 2014, Manchester). Magda won the prize for a paper titled 'How mismatching institutional logics frustrate sustainability transitions'. The paper was co-authored with Simona O. Negro and Marko P. Hekkert.

Event announcements

Calls for upcoming relevant events such as workshops and conferences

Event Reviews

Review of events interesting to the STRN community

Launch meeting of the Centre on Innovation and Energy Demand (CIED)

On June 12, 2014, the CIED (based at SPRU, but also with researchers from Oxford and Manchester) had its official launch meeting at the joint All Party Parliamentary Climate Change Group in Westminster, London. The topic of the event was the question: Can the UK achieve an energy efficiency revolution? Speakers from CIED (Steve Sorrell and Frank Geels) used to this question to make a plea for a transitions approach, arguing that current UK energy efficiency policies are progressing too slowly to bring about major reductions in energy demand. They identified two main weaknesses in current policies: 1) too much focus on individual technologies and piecemeal solutions (e.g. energy efficient boilers, insulation) and too little attention for system changes (e.g. district heating, light-rail systems, whole-house retrofit), 2) too much reliance on economic theories (prices, subsidies, information) and too little use of insights from transition studies, innovation theory and institutional theory. The message was well-received by other high-level plenary speakers from the Department of Energy Climate Change (Clive Maxwell), Energy Savings Trust (Andy Deacon), and a

member of Parliament (Alan Whitehead). The event was attended by more than 80 people, who actively engaged in subsequent discussions. Hopefully this event will have contributed to the dissemination of transitions thinking into the center of UK policymaking (which is not easy given its general neo-liberal leanings). More information about CIED can be found at: <http://cied.ac.uk/>.

Frank Geels (frank.geels@mbs.ac.uk)

Two sustainability experiments appraisal workshops (India and Thailand)

Eindhoven University of Technology (Netherlands), together with the Institute for Environmental Studies (Netherlands), Jadavpur University (India) and Chiang Mai University (Thailand) recently organized two stakeholder workshops in Kolkata (November 2013) and Chiang Mai (May 2014). The workshops are part of an ongoing research project (funded by the Dutch science foundation NWO) on applying and adapting transitions theory to rapidly emerging Asian economies, with a particular focus on the concept of 'sustainability experiments'. Before the workshops, major efforts have gone into constructing a database of experiments with sustainable urban mobility and photovoltaic electricity generation in India and Thailand. The final database includes hundreds of solar PV and urban mobility experiments. The database, next to gathering basic information about these local initiatives, was also used to trace their transnational, networked character and to demonstrate emerging innovation trajectories in each country and empirical domain. To appraise rather than assume if and how these trajectories are sustainable (and according to whom) we used an online platform for Multi-Criteria Mapping (MCM) in both workshops. We were glad that Robert Cervero (Berkeley University), James Murphy (Clarke University), Andy Stirling (SPRU) and Fred Steward (PSI) joined us during the workshops and contributed their experiences to the discussions. Both stakeholder workshops play a crucial role in the WOTRO program, which is now entering its final year. The workshops have clearly demonstrated the diverse views on and uncertainties in the appraisal of sustainability of emerging innovation niches in India and Thailand. For instance, whilst not being the core in political and policy attention, walking and cycling innovations in urban areas scored high in comparison with, for instance, electric vehicles and alternative fuels. The appraisal of solar photovoltaic electricity experiments demonstrated that even within a single technological field substantial uncertainty exists in terms of their sustainability appraisal. The WOTRO team is currently working on producing several outputs to disseminate the results of the workshop including systematic analysis of the criteria, uncertainties and scores articulated by the stakeholders and analysis of the transnational linkages in sustainability experiments in Thailand and India.

For more information, contact Rob Raven (r.p.j.m.raven@tue.nl), Anna Wieczorek (A.J.Wieczorek@tue.nl) or Bipashyee Ghosh (b.ghosh@student.tue.nl)

Workshop on 'Innovation and Access to Technologies for Sustainable Development: A Global Systems Perspective' at the Weatherhead Center for International Affairs, April 24-25, 2014 in Cambridge, Massachusetts, USA

This one-day workshop was convened by the Sustainability Science Program (in cooperation with the Science Technology and Public Policy program) at Harvard Kennedy School of Government. A diverse group of scholars from many countries and organizations explored how the technological innovation needed for sustainable development can be promoted. The workshop focused on the idea that while the literature has focused on technology in terms of sectoral, national, or sub-national innovation systems, taking a global systems perspective on the innovation process provides important insights for several key reasons. First, the increasingly global movement of ideas, goods, services, and people means that the costs of investments into innovation may be separated from the benefits, suggesting that international institutions are required to ensure sufficient investment. Second, transnational non-state actors, such as private multinational firms, global civil society networks and voluntary regulatory systems are playing crucial roles in innovation for sustainable development that may allow for learning across technologies. Third, the rapid global flow of

information and knowledge suggests that innovation occurs at increasingly dispersed scales. And fourth, meeting the needs of a global population requires innovations that differ significantly from those established nationally in the industrialized countries.

Fudan Tyndall Centre Hosts Second Biennial Conference of the Global Research Forum on Sustainable Production and Consumption (June 8-11, 2014, Shanghai)

The Fudan Tyndall Centre, a joint initiative of the UK's Tyndall Centre for Climate Change Research, and the Research Institute for Global Environmental Change at Fudan University in Shanghai hosted the Second Biennial Conference of the Global Research Forum on Sustainable Production and Consumption (GRF-SPaC) on June 8–11 under the theme “Global Transitions to Sustainable Production and Consumption Systems.” The conference brought together more than 100 scholars and practitioners, representing 23 countries and all five continents, to consider the latest research in the field and connect with Chinese colleagues who have become increasingly active in drawing attention to the risks inherent in current domestic consumption and production trends. The event featured four keynote presentations (by John Ashton, Ashish Kothari, Bill Rees, and Dajian Zhu), two panel discussions, more than thirty parallel sessions, and a world café reflection session. The conference began with opening remarks by Fudan University Vice Presidents Lin Shang-li and Feng Xiao-yuan, Philip Vergragt (co-founder of the Global Research Forum on Sustainable Production and Consumption), and Trevor Davies (co-director of the Fudan Tyndall Centre). The focused parallel sessions covered both the width and depth of the conference theme, including presentations on the development of eco-cities in China and elsewhere, the creation of sustainable agro-food systems, the modeling of household energy use, the design of low-carbon innovations, and the facilitation of sustainable lifestyles. Other sessions considered business perspectives on sustainable consumption (and production), sustainable mobility, and carbon labeling. A particular emphasis on practitioner engagement was evident in presentations by leaders of sustainable consumption-related projects undertaken in China and Malaysia with financial support from the European Union-funded SWITCH Asia Network Facility. Another interesting series of sessions was devoted to food-waste recycling programs in large cities with special attention centered on community-based initiatives in Shanghai. Co-chairs of the conference were Maurie Cohen (New Jersey Institute of Technology), Philip Vergragt (Tellus Institute and Clark University), Leonie Dendler (University of Manchester), Lin Shang-li (Fudan University), Trevor Davies (Fudan Tyndall Centre and University of East Anglia), Chen Shiyi (Fudan University), and Ren Yuan (Fudan University). For further information on the Global Research Forum on Sustainable Production and Consumption and its current and future activities, please visit <http://grf-spc.weebly.com>.

New research projects

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

CONSENSUS HomeLabs research 2014-2015

Our HomeLab study comprises a key part of Phase II of CONSENSUS research. Focusing on two areas of study, household food and water consumption, HomeLabs extends findings from our previous collaborative backcasting research that developed future scenarios and transition plans for sustainable personal washing and eating practices.

As part of HomeLabs, we are continuing to work with cross-sectoral partners from industry, public and the non-governmental sectors, to test and evaluate innovative devices, regulatory interventions and educational concepts co-designed in our earlier backcasting study. In the HomeLab experiments, we will implement a combination of these interventions within households, carrying out ethnographic evaluation of people's experiences. A key focus of CONSENSUS to date has been on 'social practice' theories of behaviour change for sustainable living. HomeLabs will maintain this theme, evaluating whether and how the

interventions shape and adjust people's everyday personal washing and eating practices. This will make theoretical and practical contributions to the field of practice-oriented sustainable behaviour change. HomeLabs will also result in recommendations for our partners for new policies, business developments, educational tools and collaborative initiatives aimed at influencing consumption practices. This page will be updated with findings as the project progresses.

For more information please contact: Anna Davies <DAVIESA@tcd.ie>

Global Opportunity Report uses the MLP as analytical framework

DNV GL (one of the world's largest shipping companies based in Norway) and Monday Morning (a sustainability-oriented think tank based in Oslo) have started a 3-year project called the Global Opportunity Report, which aims to change the sustainability discourse from focusing on problems and challenges towards seeing opportunities for change. Together with the advisory board (of which I am part), they have identified five 'risk areas' (energy transition, vulnerable food & water supply, extreme weather events, unsustainable urbanization, and waste) for which they will explore possible solutions and opportunities. This exploration will be done with stakeholders at eight workshops in world-cities (e.g. San Francisco, London, Johannesburg, Shanghai). The solutions/opportunities will then be further explored via a global survey of policymakers, business leaders, and civil society organisations. The results will be collected in the Global Opportunity Report, which will be presented to high-level decision makers (e.g. at the Davos World Economic Forum). The project takes the multi-level perspective (MLP) as its guiding analytical framework, which thus represents a crossover from academia to real-world actors.

More information from Frank Geels (frank.geels@mbs.ac.uk) or Morten Jastrup (mja@mm.dk), director of Monday Morning.

Enabling the transition to a bio-economy: innovation system dynamics and policy

The research project focuses on the question "what promotes and hinders transition pathways to the development and deployment of integrated biorefineries in Sweden?" Contributing to the literature on sustainability transitions, the project examines the role of incumbent and emergent industries, policy regulations, and regional context in a transition to biorefineries and biofuels. By comparing Swedish and international biorefineries, this will provide a thorough examination of the constraining factors and development perspectives for integrated biorefineries in Sweden, which will assist stakeholders involved in the current effort to limit the use of fossil fuels and support economic and social development around the bioeconomy. The project is funded by the Swedish Energy Agency and will be carried out in the period 2014-2016. Project partners are CIRCLE, the International Institute for Environmental Economics (IIEE) at Lund University and the Technical Research Institute of Sweden (SP). For more information, please contact the project coordinator

Lars.Coenen@circle.lu.se

Governance of Urban Sustainability Transitions: Advancing the role of living labs

European cities face a pressing challenge – how can they provide economic prosperity and social cohesion while achieving environmental sustainability? In response, new collaborations are emerging in the form of 'living labs' – sites devised to design, test and learn from social and technical innovation in real time. Our aim is to examine, inform and advance the governance of sustainability transitions through urban living labs (ULL). ULL are proliferating rapidly across Europe as a means through which public and private actors are testing innovations in buildings, transport and energy systems. Yet despite the experimentation taking place on the ground, we lack systematic learning across urban and national contexts about their impacts and effectiveness. We have limited knowledge on how good practice can be scaled up to achieve the transformative change required. This project will bring together leading European partners to create a systematic framework for evaluating the design, practices and processes of ULL to enable the comparative analysis of their potential and limits. This knowledge will be co-produced with policy-makers and

practitioners across Europe, with the explicit intention of providing new insights into the governance of urban sustainability and improving the design and implementation of ULL in order to realise their potential. The project is funded by Joint Programming Initiative Urban Europe and will be carried out in the period 2014-2017. Project partners are Lund University, Durham University, DRIFT and Joanneum Research. For more information please contact the project coordinator **Kes.Mccormick@iiee.lu.se**.

LETS2050 Final Program Report: Governing Transitions towards Low Carbon Energy and Transport Systems

The 4-year multi-disciplinary Swedish research program LETS ended in 2013. A report in English that sums up the overall and key findings is now available at <http://www.lth.se/lets2050/english/>

Near zero emissions by 2050 in industrialised countries, required for staying below the two-degree target, is a challenging but also liberating thought. Future studies show that low carbon transitions are possible from an energy resource and technology point of view, as well as economically feasible. However, governance and institutional aspects are often overlooked in future studies. The multidisciplinary LETS research program studied the societal and institutional changes implied by a climate transition to near zero carbon emissions and how such a transition can be governed. Multiple and sometimes conflicting goals must be balanced in broad and coherent policy strategies, e.g., for sustainable transport, greening industry and sustainable cities. Governance approaches should include long-term innovation and industrial development policies, mechanisms for transparency and monitoring, reconsideration of administrative structures, and the establishment of new pathways and long term lock-in situations that satisfy the need for stability and clear direction in industry's investment decisions.

Authors: Nilsson L.J., Kronsell A., Wendle B., Hansson J., Khan J., Andersson F.N.G., Pettersson F., Ericsson K., Johansson H., Pålsson H.

Publications

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

PhD thesis: Caetano Penna, *The co-evolution of societal issues, technologies and industry regimes: Three case studies of the American automobile industry*, SPRU, University of Sussex (supervisor: Frank Geels)

On June 6th, 2014, Caetano Penna successfully defended his thesis for the DPhil in Science & Technology Policy Studies at SPRU (University of Sussex). The thesis contributes to closing a gap in the field of science, technology and innovation policy research: despite many theoretical advances, we still do not know why some urgent societal issues (or 'challenges') remain unaddressed, notwithstanding the technological advances that could potentially address them. In particular, radical technological innovations – innovations that depart from the established technological trajectory – would offer greatest potential to address societal challenges. While the source of radical innovations is often new entrepreneurial firms, *established* firms are likely to play an important role in developing them because of the vast resources and complementary assets they possess. Incumbents however, face few immediate incentives to develop radical innovations in response to societal challenges. The thesis thus explores the analytical puzzle of how, when, and why industries change (or not) their strategies (in particular, their technological strategy) in order to address a societal problem. It develops a new analytical perspective – the Dialectical Issue Life-Cycle (DILC) model – that combines insights from issue life-cycle and issue *attention* cycle theories (from the Business & Society field), with the so-called 'Triple Embeddedness Framework' (Geels, 2014) and concepts from business strategies, innovation management, corporate political strategies, and technology policy. Using qualitative and quantitative research methods in an original way, the thesis applies the DILC

model to three case studies on how the American automobile industry responded to various societal problems (local air pollution, auto and highway safety, and climate change). By explaining how incumbent industry actors respond to societal challenges, the thesis ultimately contributes to the practical policy debate of how incumbents can be stimulated to develop radical innovations that help address societal challenges.

More information from: Caetano Penna (C.Penna@sussex.ac.uk)

Geels, F.W., 2014, 'Regime resistance against low-carbon energy transitions: Introducing politics and power in the multi-level perspective', *Theory, Culture & Society*; forthcoming, available online

While most studies of low-carbon transitions focus on green niche-innovations, this paper shifts attention to the resistance by incumbent regime actors to fundamental change. Drawing on insights from political economy, the paper introduces politics and power into the multi-level perspective. Instrumental, discursive, material and institutional forms of power and resistance are distinguished and illustrated with examples from the UK electricity system. The paper concludes that the resistance and resilience coal, gas and nuclear production regimes currently negates the benefits from increasing renewables deployment. It further suggests that policymakers and many transition-scholars have too high hopes that 'green' innovation will be sufficient to bring about low-carbon transitions. Future agendas in research and policy should therefore pay much more attention to the destabilisation and decline of existing fossil fuel regimes.

O'Neill, K and Gibbs, D., 2014, Towards a sustainable economy? Socio-technical transitions in the green building sector, *Local Environment*, forthcoming

Making the transition to a green economy is a major policy driver in the UK and other countries. Entrepreneurs are suggested as being at the forefront of this transition and as a driving force for sustainability. These "green entrepreneurs" may represent a new type of entrepreneurial behaviour combining economic, environmental and social aims. In this paper, we present empirical work conducted with green entrepreneurs in the UK green building sector. Buildings have significant impacts on the environment, both in terms of materials and post-construction energy demands. Drawing on sustainability transitions theory, we examine the role of green entrepreneurs in affecting change and suggest that green building niches are less consensual than previously theorised. In theorising green entrepreneurs, we also point to the need to consider them within wider networks of activity rather than as lone actors and the implications this has for policy.

Gibbs, D. and O'Neill, K., 2014, Rethinking socio-technical transitions and green entrepreneurship: The potential for transformative change in the green building sector, *Environment and Planning A*, 46, 1088-1107

This paper explores the development of green entrepreneurship and its potential role in transformative change towards a green economy. It achieves this through a study of the green building sector in England and Wales, based on qualitative empirical data from fifty-five semistructured interviews with businesses in the green building sector and with support organisations, including banks, financial sources, and business advice and support. The paper both critiques and synthesises two bodies of literature— entrepreneurial research and sociotechnical transitions theories, specifically the multilevel perspective (MLP)—to better understand the role of green entrepreneurs in facilitating a shift towards a green economy. This analysis embeds green entrepreneurs in a wider system of actors, rather than reifying the lone entrepreneurial hero, in order to explore how green entrepreneurs facilitate sustainability transitions. The paper challenges the notion that green entrepreneurs are an unproblematic category. We discovered that individuals move between 'green' and 'conventional' business, evolving over time, such that this is a fluid and blurred, rather than static, state. Moreover, while the green economy and the green building sector are often referred to as coherent sectors, with agreed and consistent practices, our evidence suggests

that they are far from agreed, that business models vary, and that there are significant contradictions *within* so-called green building practices. The paper contributes to the development of sociotechnical transitions theory and suggests that the MLP needs to incorporate complexity and multiplicity within niches, that niches may be inherently conflictual rather than consensual, and that the concept of 'protection' for niches is problematic.

Morrissey, J.E., Miroso, M. and Abbott, M., 2014, Identifying transition capacity for agri-food regimes: Application of the Multi-level Perspective for strategic mapping, *Journal of Environmental Policy and Planning*, forthcoming

In this paper, agri-food systems are discussed in the context of a set of socio-technical transitions principles, with a focus on energy, materials and practice elements that have the potential to promote sustainable outcomes across the system. This paper aims to develop an integrated approach for regime analysis, informed by emerging knowledge on socio-technical transitions. The application of the multi-level perspective (MLP) as a heuristic framework to structure descriptions of the multi-dimensional transition contexts of contemporary agri-food regimes is explored. To do this, the paper aims to elaborate the MLP by proposing an integrated means through which complex transition dynamics can be mapped across: (a) energy and material flows and (b) social practices which shape, direct and determine these energy and material flows. This approach is labelled strategic regime mapping (SRM). The paper forwards insights from the development of SRM and discusses the role of strategic mapping of key points across the regime. By combining insight on the conceptualization of dynamic and globally interconnected socio-technical systems with specific observations on contemporary agri-food systems, the paper provides insight into the mapping of transition capacity across agri-food systems, as well as highlighting the significant challenges associated with such an undertaking.

Horne, R. and Dalton, T., 2014, Transition to low carbon? An analysis of socio-technical change in housing renovation, *Urban Studies*, forthcoming

Across the westernised world, concerns about climate change and resource scarcity point to the need for widescale changes in housing renovation. Through the exploration of social interactions of eco-renovation businesses on the ground, the paper presents evidence for the emergence of an 'eco-renovation niche' consisting of both traditional and new types of housing industry businesses. However, this niche is not clearly bounded, stable or homogenous, and so generalised ideas about how it may grow in scale or size are problematic. Niche participants typically wish to stay small. Also, complex household relations are involved, and hands-on experimentation is a feature of the industry participants. For policy purposes, this suggests a need to focus on strategic intermediaries in industry and professional associations, licensing bodies and regulators, who could in turn support programmes that more adequately recognise the modus operandi of the industry, households and civil society organisations.

Horne, R., Maller, C. and Dalton, T. 2014, Low carbon, water-efficient house retrofits: an emergent niche?, *Building Research & Information*, 42(4), 4, 539-548

Rising carbon and water footprints of housing present a significant policy challenge across the Westernized world, and this has led to a growing range of government policies and programmes designed to promote greater residential energy and water efficiency. An analysis of low carbon/energy renovations is presented based on interviews with homeowner renovators and project managers in Australia. The renovators included self-declared 'green renovators' and other, more typical 'general' renovators. The project managers included a range of builders, designers, coordinators and retrofitters who provided specialized low carbon/water renovation services. Using the idea of niches and multilayer perspective (MLP), the analysis reveals both the limits to government initiatives promoting low carbon/water renovations and the importance of aspirations and relations in the low carbon/water housing renovation niche. The use of deep enquiry using semi-structured

interviews reveals a detailed picture of these relations that cross the 'supply' and 'demand' sides of housing renovation. These relations reveal interdependence and tensions that profoundly shape low carbon/water renovations. Such relations should be explicitly accounted for in the design of government programmes and regulations.

Bolton, R. and Foxon, T.J., 2014, Infrastructure transformation as a socio-technical process: Implications for the governance of energy distribution networks in the UK, *Technological Forecasting and Social Change*, in press

This paper seeks to uncover and examine the complex set of governance challenges associated with transforming energy distribution networks, which play a key enabling role in a low carbon energy transition. We argue that, although the importance of such infrastructure networks to sustainability and low carbon transitions in the energy, water and mobility sectors is clear, there is relatively little understanding of the social and institutional dimension of these systems and appropriate governance strategies for their transformation. This may be because the prevalent model of infrastructure governance in the energy and other sectors has prioritised short term time horizons and static efficiencies. In this paper we draw on the social shaping of technology literature to develop a broader understanding of infrastructure change as a dynamic socio-technical process. The empirical focus of the paper is on the development of more flexible and sustainable energy distribution systems as key enablers for the UK's low carbon transition. Focusing on electricity and heat networks we identify a range of governance challenges along different phases of the 'infrastructure lifecycle', and we draw lessons for the development of governance frameworks for the transformation of energy infrastructure more generally.

Taylor, P.G., Bolton, R., Stone, D. and Upham, P., 2013, Developing pathways for energy storage in the UK using a co-evolutionary framework, *Energy Policy*, 63, 230-243

A number of recent techno-economic studies have shown that energy storage could offer significant benefits to a low-carbon UK energy system as it faces increased challenges in matching supply and demand. However, the majority of this work has not investigated the real-world issues affecting the widespread deployment of storage. This paper is designed to address this gap by drawing on the systems innovation and socio-technical transitions literature to identify some of the most important contextual factors which are likely to influence storage deployment. Specifically it uses a coevolutionary framework to examine how changes in ecosystems, user practices, business strategies, institutions and technologies are creating a new selection environment and potentially opening up the energy system to new variations of storage for both electricity and heat. The analysis shows how these different dimensions of the energy regime can coevolve in mutually reinforcing ways to create alternative pathways for the energy system which in turn have different flexibility requirements and imply different roles for storage technologies. Using this framework three pathways are developed – user led, decentralised and centralised – which illustrate potential long-term trajectories for energy storage technologies in a low-carbon energy system.

Zhang, S., Andrews-Speed, P. And Ji, M., 2014, The erratic path of the low-carbon transition in China: Evolution of solar PV policy, *Energy Policy*, 67, 903-912

The last twenty years have seen the growth of both solar PV manufacturing capacity and deployment in China, yet this growth has followed a very erratic path. This study applies the concept of socio-technical regime to identify factors which have made this path so erratic. We examine four stages in China's solar PV policy from mid-1990s to 2013 and show that each is characterized by different combinations of policy program. These changes in government policy and in the resultant trajectory of the solar PV sector are attributed to three main sets of variables. The most important of these are events which shape the wider policy priorities of China's government. Secondary factors include the government's poor management of the policy interaction between the domestic solar PV manufacturing industry

and the deployment of solar PV across the country, as well as policy learning within government. The general lesson from this study is that the development path of a single element of a national strategy for the low-carbon transition is likely to be erratic, subject as it is to a range of political and economic forces, and to experimentation and learning.

Riddel, D., 2013, Bring on the r/evolution: Integral theory and the challenges of social transformation and sustainability, *Journal of Integral Theory and Practice*, 8(3-4), 126-145

In order to avoid overshoot of critical planetary boundaries, collective and purposeful social transformation is needed on a scale unprecedented in human history. In Part 1, this article describes and critiques applications of Integral Theory to sustainability and social change, highlighting overstated claims about the role interior development plays in effecting social change. Integral Theory is also missing lenses necessary for understanding the pathways to social transformation, including multi-domain concepts, micro-meso-macro scales, process lenses to illuminate cross-quadrant dynamics, and depictions of the embeddedness of actors and the strategies they pursue. Wilber's outline of an integral social theory of transformation is then presented as a resource to more effectively analyze social change processes. In Part 2, the sociological concepts of agency, structure, and institutions are introduced as important building blocks in any theory of social transformation. Next, three middle-range theories of transformative change are reviewed for their contributions in understanding multi-level and dynamic processes of change, along with the strategies actors can pursue to aid systems transformation. Future directions for research and practice are then identified.

Fam, D., Mitchell, C. Abeysuriya, K. and Lopes, A.M., 2014, Emergence of decentralised water and sanitation systems in Melbourne, Australia, *International Journal of Water*, 8(2), 149-165

In Melbourne, Australia, a shift is occurring in the approach to wastewater management. With increased pressure from landscape drivers such as population growth, urbanisation, and over a decade of extended drought conditions, a new model of wastewater management is being explored by Melbourne's metropolitan water utilities in the development of their latest Metropolitan Sewerage Strategy (MSS). With input from key industry leaders and a broad range of stakeholders a collaborative 'vision' of sustainable sewerage services to Melbourne over a 50 year timeframe was developed with decentralised systems emerging as a key, long-term component of service delivery. Drawing on the multi-level perspective (MLP), we investigate the interrelated and reinforcing factors that have driven this shift in perception toward decentralised systems and serious consideration of alternative socio-technical configurations of wastewater management in Melbourne's future planning strategy. We then explore the process in which cross disciplinary participants from industry, government and civil society articulated their vision of a long term sustainable sanitation future for Melbourne.

Hoes, A.-C. and Regeer, B.J. (2014), Adoption of novelties in a normative diverse society: exploring the Agropark case study, *Journal of Environmental Policy and Planning*, forthcoming

Implementation efforts of novelties such as new land use facilities frequently involve controversy; even when adoption is expected to result in a more sustainable practice. This article analyses the overlaps of the discursive spheres of the project participants and the stakeholder groups of a proposed novel farm. This will shed light on the work involved when governing for the adoption of novelties. The analysis reveals that reframing and redesigning of the novelty are needed for social embedding. Through functional and conceptual alignment activities, the proposed novelty is aligned more to the perceptions and needs of diverse stakeholder groups.

Bakker, S., Maat, K. and Van Wee, B., 2014, Stakeholders interests, expectations, and strategies regarding the development and implementation of electric vehicles: The case of the Netherlands, *Transportation Research Part A*, 66, 52-64

In this paper, we study the strategies of the most relevant stakeholders with regard to the development and commercialization of electric vehicles (EVs) and their recharging infrastructure. Building on the perspective of socio-technical transitions, we relate the strategies of stakeholders to their current and future interests, as well as to their expectations with regard to EVs. Our analysis is based on a series of 38 semi-structured interviews with representatives of a variety of stakeholders in the Netherlands. EVs pose both opportunities and threats to various stakeholders. They therefore participate in the development of the emerging EV system, primarily in order to learn about the potential positive and negative impacts of these systems on their interests and, ultimately, to be able to grasp the opportunities and mitigate the threats. In other words, the expectations, interests, and resulting strategies of stakeholders relate to and depend upon the specific configuration of the emerging socio-technical system for electric mobility. We identify six potential conflicts of interest: the division of tasks within a public recharging infrastructure; the allocation of charging spots; the ways in which charging behavior can be influenced; the role of fast-charging, technical standards for charging equipment; and supportive policies for full-electric and plug-in hybrid vehicles. In general, the stakeholders do not seem overly concerned about either short-term returns on investments or long-term negative impacts. In this regard, the early phase of the transition can be understood as a relatively carefree phase. In order to continue the development of the emerging EV system and to keep it on the right track, however, for the foreseeable future, supportive policies will be necessary in order to provide a stable and reliable basis for further market expansion.

Araújo, K., 2014, The emerging field of energy transitions: Progress, challenges, and opportunities, *Energy Research & Social Science*, 1, Pages 112–121

Energy transitions are an unmistakable part of today's public discourse. Whether shaped by fuel price fluctuation, environmental and security concerns, aspects of technology change, or goals to improve energy access, attention regularly turns to ways in which to improve energy pathways. Yet what is understood about energy system change is still emerging. This article explores the evolving field of energy transitions with an aim to connect and enlarge the scholarship. Definitions and examples of energy transitions are discussed, together with core ideas on trade-offs, urgency, and innovation. Global developments in energy and related mega-trends are then reviewed to highlight areas of analytical significance. Key information sources and suppliers are examined next. The article concludes with ideas about opportunities for further research.

Moss, T., Becker, S. and Naumann, 2014, Whose energy transition is it, anyway? Organisation and ownership of the *Energiewende* in villages, cities and regions, *Local Environment*, forthcoming

As one of the most ambitious national energy transition initiatives worldwide, the German *Energiewende* is attracting a huge amount of attention globally in both policy and research circles. The paper explores the implementation of Germany's energy transition through the lens of organisation and ownership in urban and regional contexts. Following a summary of the principal institutional challenges of the *Energiewende* at local and regional levels the paper develops a novel way of conceptualising the institutional to urban and regional energy transitions in terms of agency and power, ideas and discourse, and commons and ownership. This analytical heuristic is applied to a two-tier empirical study of the Berlin–Brandenburg region. The first tier involves a survey of the organisational landscape of energy infrastructures and services in cities, towns and villages in Brandenburg. The second tier comprises a case study of current, competing initiatives for (re-)gaining ownership of the power grid and utility in Berlin. The paper draws conclusions on the diverse and dynamic organisational responses to the *Energiewende* at the local level, what these tell us about

urban and regional energy governance and how they are inspired by – or in opposition to – new forms of collective ownership resonant of recent debates on reclaiming the commons. It concludes with observations on how relational approaches to institutional research and the notion of the commons can guide and inspire future research on socio-technical transitions in general, and urban energy transitions in particular.

Spickermann, A., Grienitz, V. and Von der Gracht, H., 2014, Heading towards a multimodal city of the future? Multi-stakeholder scenarios for urban mobility, *Technological Forecasting & Social Change*, forthcoming

In redesigning city infrastructure to become sustainable and future-oriented, critical city subsystems, such as the urban mobility system, present a serious challenge. In order to avoid regime stalemates and path dependency, substantial changes to the urban mobility systems are required to limit economic, ecological, population and institutional constraints. We argue that the socio-technical system of multimodal mobility has the potential to solve some of today's urban mobility challenges. Multimodal mobility combines both private and public transport modes, thereby capitalizing on the benefits of various systems. Realizing that mobility systems are non-monolithic and transitions require interdisciplinary analyses, we adopt a multi-level perspective with actors across different fields. This paper aims to guide cities in developing a long-term future vision of urban mobility systems in Germany while drawing on considerations of transition theory. Our comprehensive approach, conceptualized through a strategic issue management framework, draws on empirical evidence from three parallel Delphi studies and several focus group workshops to present strategic implications to firms, public authorities, and customers. Among others, the strategy agenda for stakeholders must coordinate efforts to utilize system strengths, advance intelligent transport systems, diversify the portfolio of public and private financing, change business models, and create a renaissance of civil participation.

Lutz, J., 2013, Do local food networks foster socio-ecological transitions towards food sovereignty? Learning from real place experiences, *Sustainability*, 5, 4778-4796

Drawing on transition theory, we conceptualize local food networks as innovations that initially function and develop in local niches within a given food regime. As niche-innovations local food networks induce socio-ecological changes on the local level and they have the potential to foster wider transformations of the dominant food regime. Many local food networks adopt the concept of food sovereignty as a kind of "leitmotif". At the core of this concept lies the question of how to create an agro-food system that, (i) allows for democratic participation and civic engagement in food production, and (ii) sets up new relationships that avoid social inequity and the exploitation of both humans and nature. In this paper we shed light on how the Austrian local food network "SpeiseLokal" addresses the challenge of operationalizing the concept of food sovereignty. The case study captures the strategies which local food networks embark on and depicts the difficulties they encounter. The paper aims to identify critical points of intersection that either strengthen or constrain local food networks from becoming established, operating, and up-scaling in the ways they wish; that is, in accordance with the principles and aims of food sovereignty, while avoiding a later assimilation into the dominant food regime.

Beers, Hermans, Veldkamp & Hinssen (2014) "Social learning inside and outside transition projects: Playing free jazz for a heavy metal audience" *NJAS Wageningen Journal of Life Sciences* 69, 5-13.

According to transition science, system innovation requires experimentation and social learning to explore the potential of innovations for sustainable development. However, the transition science literature does not elaborate much on the learning processes involved. Senge's Field of Change provides a more detailed approach to the role of learning and action in innovation. We linked the Field of Change to transition management literature in order to explore social learning in an agricultural innovation experiment in the Netherlands called the 'New Mixed Farm'. Our findings show that the project partners focussed primarily

on the level of action and did not learn about (the values prevalent in) their environment. Our analysis suggests that social learning about a project's environment should be organised specifically to avert the risk of a project ignoring its environment. Furthermore, the relevance of social learning in relation to societal context is shown: an innovation experiment that does not or cannot learn about its environment is unable to respond to mounting societal pressures and therefore prone to failure. Finally, the results show that the Field of Change can be related to transition theory in order to provide a more detailed approach to learning in system innovation.

Furlong, K., 2014, STS beyond the “modern infrastructure ideal”: Extending theory by engaging with infrastructure challenges in the South, *Technology in Society*, 38, 139-147

With few exceptions, STS theories of infrastructure stability and change have not been applied to circumstances in the South. Developed in post-War Europe, these theories are often applied in ways that lack transferability to situations where infrastructure conditions are precarious and hybrid. This article seeks to broaden these theories by relating them to infrastructure challenges common to the South, drawing in particular on prevalent issues in water supply. Such engagement helps to identify shortcomings in these theories, to push their paradigms further, and to raise new questions related to infrastructure configuration, stability, and transition. As such, the study of sociotechnical systems across a range of contexts can be enriched. In particular, this article extends theory by placing coexistence among sociotechnical systems, as opposed to the universality of a single dominant infrastructure network, at the center of enquiry. Recognizing coexistence is important because it enables one to decouple key concepts in STS from the presumption of universalized and uniform networks, enabling them to become relevant for the South. Examples discussed in this essay include stability or “momentum” and transitions.

Castán Broto, V., Glendinning, S., Dewberry, E., Walsh, C., Powell, M., 2014, What can we learn about transitions for sustainability from infrastructure shocks?, *Technological Forecasting and Social Change*, 84, 186-19

This paper explores the potential for learning from infrastructure shocks to develop strategic visions of infrastructure. The paper departs from theories of systems innovation, which understand infrastructure transitions as socio-technical re-configurations over long periods of time. The paper presents a complementary hypothesis to those theories about the possibility to catalyze systems change during or as a result of infrastructure shocks. According to this hypothesis, this change is possible because shocks enable higher order learning about infrastructure, which is learning involving a critical evaluation of existing principles and their suitability to complex situations. The hypothesis is examined empirically by studying the association between different types of infrastructure shock and different types of learning that emerge from those shocks using a meta-analysis of published work on infrastructure shocks. The analysis suggests that while there is considerable evidence of social learning from shocks, the context in which they occur will influence whether or not this is higher order learning. Further research is needed to develop feasible and practical ways to maximize the learning opportunities emerging from infrastructure shocks towards a transition to sustainable and resilient infrastructure.

Dijk, M., 2014, A socio–technical perspective on the electrification of the automobile: niche and regime interaction, *International Journal of Automotive Technology and Management*, 14(2), 158-171

[this ‘paper has won second prize in the 2013 Young Author Competition of the *Int. Journal of Automotive Technology and Management*/Gerpisa network’]

This paper offers a socio-technical perspective on how the introduction of various alternatives to the internal combustion engine, especially the full-electric vehicle, influences the established propulsion technology (ICE). This perspective helps to move beyond the well-known incremental vs. radical innovation dichotomy - usually referring to product

innovation- and maps out the socio-technical dimension of market evolution. We offer a conceptual contribution by proposing a hypothesis for how a disruptive innovation, depicted as socio-technical niche, interacts with the established technology, the socio-technical regime (i.e., what it will do to the regime). We offer a preliminary discussion of this niche interaction hypothesis for the current momentum of the full-electric vehicle. We find various types of niche interactions between alternative engine technologies over the last 20 years, some competitive and some symbiotic in character, in the context of a significant 'sailing ship effect' around internal combustion technology.

Eppecht, N., von Wirth, T., Stünzi, C. and Blumer, Y.B., 2014, Anticipating transitions beyond the current mobility regimes: How acceptability matters, *Futures*, 60, 30-40

Today's car-based transportation systems require a transition towards sustainability. This is particularly the case in suburban areas, where the cost for introducing a new transportation system are high due to the low population density, while the negative externalities of the current mobility regime—such as health costs and congestions—are increasing rapidly. Based on expert interviews with car manufacturers, transportation authorities, environmental groups, and scientists we identify two visionary characteristics of future, more sustainable transportation systems: automated driving and sharing. Using these two characteristics, we apply the scenario-axes technique to develop four mobility scenarios for a suburban context that range from business-as-usual to a radical and sustainable one. When evaluating these with ten criteria that measure a scenario's performance from a user perspective, the radical scenario performs worst since it does not meet individualistic user requirements. Our findings suggest that lock-ins of users' expectations act as barriers for the diffusion of novel transportation systems. These barriers cannot be overcome by technological innovations and regulation alone. Hence, we call for innovative arenas, wherein technology and user acceptability could co-evolve.

Porter, N., Claassen, M. and Timmermans, J., 2014, Transition experiments in Amsterdam: Conceptual and empirical analysis of two transition experiments in the WATERgraafsmeer program, *Technological Forecasting and Social Change*, forthcoming

In the wake of a rapidly changing world, cities need to cope with global threats and opportunities, and changing societal demands regarding living standards in cities. These are urgent issues for mega cities in the global South, and are becoming increasingly relevant for the more consolidated cities in the North. In the Watergraafsmeer area, a low-lying urban polder area in the eastern part of Amsterdam, water issues are a salient problem and are perceived as persistent by citizens, businesses, and the municipal and water management authorities alike. Therefore, under the flag of the WATERgraafsmeer (WGM) program, municipal and water management authorities and local partners adopted transition management as a governance approach to change. In transition management, experimenting is a vital activity. The present research analyzed the WGM program and the Eenhoorn redevelopment project in the Watergraafsmeer as transition experiments. The research used recently developed management guidelines for transition experiments as an evaluative framework for the systematic analysis of project documentation and written communication. The analysis shows that the WGM program functions well as a transition experiment, and that the limited transition potential of the Eenhoorn project is strengthened by its incorporation in the WGM program. Furthermore, we conclude that the management guidelines for transition experiments do not incorporate interaction processes between projects and program, and do not pay attention to technology and engineering.

Moallemi, E.A., Ahamdi, A., Afrazeh, A., Bagheri Moghaddam, N., 2014, Understanding systemic analysis in the governance of sustainability transition in renewable energies: The case of fuel cell technology in Iran, *Renewable & Sustainable Energy Reviews*, 33, 305 - 315

Considering the complex and evolutionary process of renewable energy development, it is imperative to have a framework for its governance. The governance of transition toward renewable energies can be divided conceptually into two phases, namely systemic analysis and policy making. This paper focuses on identifying different methodological steps in the systemic analysis phase. These steps provide requisite inputs for the second phase, policy making, by attaining a concrete understanding of the current status. In the first step, the boundaries of the transition process are defined by specifying the unit of analysis and identifying the system's components and relations. In the second step, and in order to have a big picture of the system's transformation, the dynamism of technological development is mapped through time. In the third step, an approach for analyzing and policy making of sustainability transition is chosen by comparing various approaches and selecting the most fitted one. All of these methodological steps are finally applied in the case of the Iran fuel cell technology development program to show the practicality of the proposed conceptual framework in a real case problem and to provide some insights for practitioners.

Sovacool, B.K. and Brossmann, B., 2014, The rhetorical fantasy of energy transitions: Implications for energy policy and analysis, *Technology Analysis & Strategic Management*, forthcoming

This article explores the rhetoric of four energy transitions. It begins by summarising research on the intersection of fantasy, technology and the sociology of expectation. It then looks at how ideas of progress, modernity, cheapness, abundance and hope influence the way society perceives new energy technologies, causing them to overestimate benefits and underestimate challenges. Our rhetorical analysis finds in case studies of steam engines, gasoline automobiles, hydroelectric dams and nuclear reactors that newly 'discovered' sources of energy or newly invented technologies are always assumed to provide infinitely abundant energy and to have the potential to create positive utopian changes in society. We conclude by noting the salient implications of these rhetorical themes for energy planners, analysts and scholars.

Hunt, M. and de Laurentis, C., 2014, Sustainable regeneration: a guiding vision towards low-carbon transition?, *Local Environment: The International Journal of Justice and Sustainability*, forthcoming

While the concept of sustainable development brings together concepts of economic, environmental and social sustainability, much has been said regarding inherent tensions between them. Conflicts between economic and environmental objectives, in particular, have been noted as restraining efforts to instigate transitions to environmental sustainability, with growth ambitions limiting environmental policy to "win-win" cases. This paper argues that they can also play complementary roles in managing transitions by creating inclusive visions for rallying actors and resources. This is explored by looking at a case of sustainable regeneration in Wales, UK. Using as a case study the Arbed scheme, an area-based project established in 2009 to retrofit housing stock for energy efficiency, this paper shows how the scheme explicitly addresses economic, environmental and social aspects of sustainability; and, in particular, how sustainable development aims constituted a guiding vision that supported the formation of actor and resource networks necessary for large-scale retrofitting.

Stirling, A., 2014, Transforming power: Social science and the politics of energy choices, *Energy Research and Social Science*, 1, 83-95

This paper addresses key implications in momentous current global energy choices – both for social science and for society. Energy can be over-used as a lens for viewing social processes. But it is nonetheless of profound importance. Understanding possible 'sustainable energy' transformations requires attention to many tricky issues in social theory: around agency and structure and the interplay of power, contingency and practice. These factors are as much shaping of the knowledges and normativities supposedly driving transformation, as they are shaped by them. So, ideas and hopes about possible pathways

for change – as well as notions of ‘the transition’ itself – can be deeply constituted by incumbent interests. The paper addresses these dynamics by considering contending forms of transformation centring on renewable energy, nuclear power and climate geoengineering. Several challenges are identified for social science. These apply especially where there are aims to help enable more democratic exercise of social agency. They enjoin responsibilities to ‘open up’ (rather than ‘close down’), active political spaces for critical contention over alternative pathways. If due attention is to be given to marginalised interests, then a reflexive view must be taken of transformation. The paper ends with a series of concrete political lessons.

Davies, A.R., 2014, Co-creating sustainable eating futures: technology, ICT and citizen-consumer ambivalence, *Futures*, forthcoming

The early 21st century has seen a plethora of future-oriented roadmaps and foresight exercises focused on increasing food supply, often with the aid of advances in technology, in order to feed a growing global population under conditions of uncertain climate change. As such, they provide important, but only partial, pictures of how we might eat more sustainably. The complex politics underlying food production and distribution as well as factors that shape the highly uneven practices of food consumption are often obscured. Equally, and in the face of ongoing conflicts that suggest otherwise, supply-side analyses frequently assume that technological advances will play a relatively uncontested role in food futures. Drawing on insights from a participatory backcasting process that adopted a practice orientation within an overarching transitions framework, this paper adds two related dimensions to the productivist paradigm in urban food futures research. First, it places eating practices at the heart of food futures debates and second, it provides a critical reflection on consumer–citizen perceptions of the role for technology, and in particular ICT, in shaping those eating practices. Ultimately, it is argued that technological advances in production alone are unlikely to generate the significant transformations required to construct more sustainable urban future food landscapes.

Gabaldón-Estevan, D., Criado, E., Monfort, E., 2014, The green factor in European manufacturing: A case study of the Spanish ceramic tile industry, *Journal of Cleaner Production*, 70(1), 242-250

This paper analyses how environmental issues have affected and are continuing to affect the evolution of European manufacturing industries based on the example of the Spanish Ceramic Tile Industry (SCTI). The Ceramic Tile Industry (CTI) in Europe became very competitive and innovative in the early 1990s, with the Italian and the Spanish sectors, which are cluster-based, becoming world leaders. However, since 2008, this leadership position is being eroded. We provide an in depth analysis of the SCTI focusing on the influence of new European environmental regulations. The CTI has a major impact on the environment and has been the focus of environmental regulations. We also consider the innovation system and socioeconomic effects of the industry. In order to analyse the relationship between the environmental issues and innovation the empirical part of the paper builds on research on SCTI, including the industry value chain, and the innovation system and how it functions. We take account of the views of industry experts on the SCTI innovation system, its environmental impact and the constraints on the sector. Current research at the local level suggests that the environmental impacts of the industry are outweighed by its huge contribution to socioeconomic wellbeing. The transition from national environmental legal frameworks towards EU-wide regulation has had a clear effect on both the strategic goals and the management of the industry and the new regulation combined with a more complex international economic scenario is jeopardizing European manufacturing industries. This applies especially to traditional industries. The case study demonstrates that the capacity of the SCTI to adapt to new scenarios will be vital for its future survival and success.

Burch, S., Shaw, A., Dale, A. and Robinson, J., 2014, Triggering transformative change: a development path approach to climate change response in communities, *Climate Policy*, forthcoming

While climate change action plans are becoming more common, it is still unclear whether communities have the capacity, tools, and targets in place to trigger the transformative levels of change required to build fundamentally low-carbon, resilient, healthy communities. Evidence increasingly supports the finding that this transformation is not triggered by climate policy alone, but rather is shaped by a broad array of decisions and practices that are rooted in underlying patterns of development. Even so, these findings have rarely penetrated the domain of practice, which often remains squarely focused on a relatively narrow set of climate specific policies. This article builds a conceptual framework for understanding the dynamics of community-level development path transformations that may both dramatically reduce GHG emissions and significantly enhance community resilience. This framework illuminates eight critical enablers of innovation on climate change, each of which is illustrated by compelling examples of community-level experimentation on climate change across the province of British Columbia, Canada. It is concluded that community-based climate (or sustainability) policy might be more likely to trigger development path shifts if it employs a longer time horizon, recognition of adaptability and feedbacks, integrated decision making, and systems thinking.

Cramer, H., Dewulf, G. and Voordijk, H., 2014, The barriers to govern long-term care innovations: The paradoxical role of subsidies in a transition program, *Health Policy*, 116(1), 71-83

This study deals with the governance of a transition program (2007-2011) that tried to radically change a fragmented, supply-driven long-term care system into an integrated, demand-driven system to deal with an aging population. The transition program was subsidized by the healthcare ministry and enabled 26 projects throughout the Netherlands. The idea was to first experiment with innovative long-term care practices outside the system and then to scale-up these innovations to change the system. However, previous research does not highlight examples of long-term care innovations that scaled-up. Hence, the goal is to explore the barriers to govern the scaling-up of the long-term care innovations. The barriers were identified by participating in the program and interviewing ministry, program and project actors. The core barrier was the lack of commitment to the empowerment. It resulted from the subsidy focus of the projects and the lack of protection of the innovations, and from conflicts of interests and power struggles on the ministry-level. A transition program requires more than providing a subsidy. Policymakers have to learn from innovations outside the system in order to change it. Simultaneously, projects should not be entirely subsidized, otherwise there are no incentives to scale-up the innovations.

Hoppmann, J., Huenteler, J., and Girod, B., 2014, Compulsive policy-making—The evolution of the German feed-in tariff system for solar photovoltaic power, *Research Policy*, forthcoming

In recent years, policy approaches that build upon the notion of innovation systems have enjoyed increasing attention in science, technology and innovation policy. But while the usefulness of systemic thinking in policy-making has been demonstrated in a large number of empirical settings, we still lack a detailed understanding of the dynamics at play when policy makers address systemic problems. In this paper, we show how complex interdependencies and the uncertain nature of technological change shape the process of targeted policy interventions in socio-technical systems. Toward this end we analyzed the evolution of the German feed-in tariff (FIT) system for solar photovoltaic power, a highly effective and widely copied policy instrument targeted at fostering the diffusion and development of renewable energy technologies. We find that the policy has been subject to a considerable amount of changes, many of which are the result of policy makers addressing specific system issues and bottlenecks. Interestingly, however, often these issues themselves were driven by unforeseen technological developments induced by previous

policy interventions. We argue that the pattern of policy serving as both a solution to and a driver of technological bottlenecks shows strong similarities with what Rosenberg (1969) called 'compulsive sequences' in the development of technical systems. By shedding more light on how the characteristics of socio-technical systems affect policy interventions, our framework represents a first step toward more closely integrating the literature on innovation systems with the work on policy learning.

Van Gameren, V., Ruwet, C. and Bauler, T., 2014, Towards a governance of sustainable consumption transitions: how institutional factors influence emerging local food systems in Belgium, *Local Environment: The International Journal of Justice and Sustainability*, forthcoming

System innovations and transitions in the realm of sustainable consumption policies will seldom emerge automatically from the present socio-political and socio-technical contexts. This paper explores a set of perspectives related to the governance of transitions and develops their application to the relatively unexplored governance of sustainable *consumption* transitions. Empirical material stems from an extensive case study which analyses a food consumption niche in the form of collectively organised local food systems (LFS) in Belgium. More specifically, we analyse and discuss the institutional contexts and socio-political configurations within which the investigated system innovation cases are embedded. The results explore the role of governmental interplay in fostering innovative consumption practices for a transition towards a more sustainable, autonomous, citizen-based, LFS.

Ceschin, F., 2014, *Sustainable Product-Service Systems: Between Strategic Design and Transition Studies*, Springer

This book investigates the potential contribution that a strategic design approach can make to stimulating and supporting the societal embedding of sustainable PSSs (product-service systems). A new strategic design role thus emerges; a role in which the ideation and development of sustainable PSS concepts is coupled with the designing of appropriate transition paths (sequence of socio-technical experiments) to gradually incubate, introduce and diffuse these concepts. The book also outlines the new design approach and capabilities needed by strategic designers, project managers and consultants to operate at such a strategic level. On a more operational point of view, the work presents a practical "how to do" design process and associated guidelines to support practitioners in designing and managing the societal embedding process of sustainable PSS innovations.

Bohnsack, R., Pinkse, J., and Kolk, A., 2014, Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles, *Research Policy*, 43(2), 284-300

Sustainable technologies challenge prevailing business practices, especially in industries that depend heavily on the use of fossil fuels. Firms are therefore in need of business models that transform the specific characteristics of sustainable technologies into new ways to create economic value and overcome the barriers that stand in the way of their market penetration. A key issue is the respective impact of incumbent and entrepreneurial firms' path-dependent behaviour on the development of such new business models. Embedded in the literature on business models, this paper explores how incumbent and entrepreneurial firms' path dependencies have affected the evolution of business models for electric vehicles. Based on a qualitative analysis of electric vehicle projects of key industry players over a five-year period (2006–2010), the paper identifies four business model archetypes and traces their evolution over time. Findings suggest that incumbent and entrepreneurial firms approach business model innovation in distinctive ways. Business model evolution shows a series of incremental changes that introduce service-based components, which were initially developed by entrepreneurial firms, to the product. Over time there seems to be some convergence in the business models of incumbents and entrepreneurs in the direction of delivering economy multi-purpose vehicles.

Pinkse, J, Bohnsack, R. & Kolk, A., 2014. 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*, 31, 43-60.

In the automotive industry, the need to move toward 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 U.S. policies. The empirical analysis is conducted on a data set consisting of more than 9000 articles from two trade magazines, a car magazine and a financial newspaper for the period of 1997–2010. 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. In addition, 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.

Bos J.J and Brown R.R. (2014), Assessing organisational capacity for transition policy programs' *Technological Forecasting and Social Change*, 86, 188–206

Socio-technical system change demands engagement of and interaction between different types of social actors. Within the sustainability transitions scholarship there is limited understanding of the characteristics and capacity of these social actors in transition processes. In particular, little is known about the organisation as a social actor that can exert influence on transition policy programs. In addition, no analytical tools exist in the sustainability transitions literature to map organisational attributes that affect transition processes. This paper presents a multi-actor assessment procedure for studying characteristics of organisations engaged in purposive transition programs. Application of this procedure, which fundamentally provides insight into the capacity of organisations to pursue a specific sustainability goal, reveals the importance of systemic multi-actor assessment processes; demonstrates the utility of such procedures; and outlines important insights for the design of purposive transition programs. By presenting the multi-actor assessment procedure, this paper provides pragmatic guideposts for the design of future transition policy programs.