

Newsletter 21, September 2016

This is the 21st 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,

I hope you had a good summer break and enjoyed some of the transition-related conferences (see under 'event reviews' below). The 7th International Sustainability Transitions conference, organized by the Wuppertal Institute, was a great success, and I want to thank the organizers for making it a memorable event. Next year's conference will be organized by Chalmers University and take place in Gothenburg 18-21 June (see <http://ist2017.org/>).

As reported below (under 'network news'), the STRN Steering Group has been changed in some respects. We welcome four new members to the group, who will bring new ideas and perspectives: Bruno Turnheim, Paula Kivimaa, Kathleen Araujo, Lea Fünfschilling. Six members are stepping down, and, on behalf of the SG, I want to sincerely thank them for their actions and initiatives in the last few years. They are: Alex.Haxeltine, Erik Paredis, Bernhard.Truffer, Derk Loorbach, Ukrik Jorgensen, and Lars Coenen.

The renewed Steering Group is engaging in various activities (e.g. renewing the STRN research manifesto, internationalization, changing the website), on which we will report in future newsletters. Meanwhile, the number of STRN members has grown further to 1262, which makes us a sizeable community.

Our research is also gaining visibility within the IPCC (Intergovernmental Panel on Climate Change). I participated as invited expert, nominated by Future Earth, in the Scoping Meeting for the *Special Report on 1.5 Degree Climate Change* (15-18 August, 2016). In the context of investigating possibilities to 'accelerate the global response', several members of the IPCC Scientific Steering Committee recognize the importance of transitions and system change. The 2014 IPCC report (Working Group III, section 4.5.2.2.) already included transitions thinking (although somewhat hidden in a large report). But in the Special Report (due in 2018), transitions thinking may play a more prominent role. I was asked to give a scene-setting keynote presentation (together with 11 others) and highlighted both STRN and

transitions thinking (to complement the integrated assessment models). During the 4-day meeting, there was quite some pushback from climate scientists and modelers (who did not like the stronger role of the social sciences in this IPCC report) and from country representatives (especially Saudi Arabia and the USA), leading to increasingly bland language for the Special Report chapter outline and content. Specific formulations were hammered out in a brutal closing session. Chapter 4 ('Strengthening the global response to the threat of climate change') and chapter 5 ('Approaches to implementing a strengthened global response to the threat of climate change') offer scope for introducing transition related ideas into the IPCC report. In particular, the third bullet point in chapter 4 includes reference to 'transitions' and 'systems', although embedded in woolly language. The agreed bullet point text reads that the chapter will evaluate research with regard to: "The potential and capacity for development and deployment of adaptation and mitigation responses to **accelerate transitions** and strengthen the global response to the threat of climate change within and **across relevant scales and systems**" (my emphasis). The proposed chapter structure and bullet point contents will be discussed (and hopefully) agreed at a UNFCCC meeting in October. Then there will be a process of nominating and selecting authors for various chapters and sections, which may be of interest to STRN members. So, also at some of the highest scientific/political levels interest in transitions and transition research is increasing. It would be great to get our thinking/findings into this Special Report, which after the Paris agreement is likely to receive much attention, as policymakers and stakeholders around the world are increasingly focusing on implementation issues (besides general targets).

I hope you will enjoy this newsletter, which is again filled to brim with network updates, new projects, event announcements, event reviews, and new publications.
Frank Geels, Chairman of STRN (frank.geels@manchester.ac.uk).

Environmental Innovation and Societal Transitions

Volume 20 of *Environmental Innovation and Societal Transitions* was already published. Cause for celebration. The latest volume contains seven original research papers:

- Mainstreaming solar: Stretching the regulatory regime through business model innovation - *J. Huijben, G. Verbong and K. Podoyntsyna*
- The institutional evolution process of the global solar industry: The role of public and private actors in creating institutional shifts - *R. Bohnsack, J. Pinkse and A. Waelpoel*
- Alternative liquid fuels in the UK in the inter-war period (1918–1938): Insights from a failed energy transition - *V. Johnson, F. Sherry-Brennan and P. Pearson*
- Are scenarios of hydrogen vehicle adoption optimistic? A comparison with historical analogies - *W. McDowall*
- Unpacking landscape pressures on socio-technical regimes: Insights on the urban waste management system - *P. Morone, A. Lopolito, D. Anguilano, E. Sica and V. Tartiu*
- Not only peasants' issue: Stakeholders' perceptions of failures inhibiting system innovation in nutrient economy - *A. Kuokkanen, M. Mikkilä, H. Kahiluoto, M. Kuisma and L. Linnanen*
- Productivity growth as a barrier to a sustainability transition - *P. Ferguson*

In the meantime, EIST has made the transition to the new article submission system, EVISE. Articles submitted in the old (EES) system will, though, be finished there. It is too early to say whether the transition was successful. While the EVISE system probably didn't satisfy all the "transition conditions" as published earlier in EIST (suggesting that the journal is not read by the Elsevier staff itself), the good news is that the system is still being improved. Hence, any suggestions from your side are very welcome and will be gladly transferred by us to the technical staff. As always, we look forward to receive your submissions. Topics for special issues of EIST are still welcome. Please contact the editors to discuss any proposals. And, of course, don't forget to read, and if relevant cite, EIST.

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

Network News

Any news related to ongoing activities of STRN

Steering Group news and activities

The first step of the renewal and professionalization STRN Steering Group has been completed successfully. Following the call in June, we received nine very promising applications, out of which four new members were elected. We are happy to welcome: Kathleen Araujo (Stony Brook University, NY/US), Lea Fuenfschilling (Lund University), Paula Kivimaa (SPRU) and Bruno Turnheim (King's College London) in the steering group! We are equally happy that Björn Sandén (Chalmers University) joins the Steering Group as the host of next year's IST conference in Gothenburg (see <http://ist2017.org/>). The complete list of SG members will soon be available on the new STRN website.

Another novel element of our network is the STRN Board, which consists of Frank Geels (chairman, Manchester University), Rob Raven (Utrecht University) and Jochen Markard (ETH Zurich). As board members, we will be responsible for short-term decisions and management tasks in the network. You can contact us anytime with suggestions for new initiatives, thematic groups or other contributions you want to make.

A third element includes the creation of different groups: Thematic Groups in the sense of standing committees and Working Groups for temporary tasks. Initiatives for setting up further groups are very much welcome!

Thematic Groups: At the moment, three Thematic Groups are active: 1) the STRN PhD network (see below), 2) the transLACASAF group of researchers interested in transition studies in Latin-America, Asia and Africa (Contact: Anna Wieczorek, Verena Streitferdt) and 3) the Modeling Transitions group (Contact: Fjalar de Haan, Jonathan Köhler).

Working Groups: There are currently two active Working Groups. The first (led by Jonathan Köhler, in collaboration with Anna Wieczorek, Florian Kern and Frank Geels) is responsible for the renewal of the STRN research manifesto. The second with Rob Raven, Jens Marquardt and Jochen Markard works to renew the STRN website. The working group on STRN governance (chaired by Flor Avelino) has ceased its activity with the introduction and implementation of our new governance structures. We thank Flor Avelino for her great commitment and initiative. **Jochen Markard**, on behalf of the STRN board

Update from the TransLACASAF network (Transitions in Latin America and the Caribbean, Asia and Africa)

The membership of the TransLACASAF network has increased from 87 to 113 with members coming from a wide variety of countries and research institutes. The IST-2016 showed that international transitions research is happening. Almost in all sessions one non-European transition study was presented. There were also dedicated sessions on transitions in a TRANSLACASAF context. These sessions explored issues like: 1) methods that try to acknowledge cultural differences with regard to transition methods, 2) theoretical challenges for existing conceptual frameworks (and integration with approaches and tools from other disciplines), 3) international cooperation and the tendency that that international organisations in India are driving their technologies rather than investigating the context and framework before coming up with technological answers. In addition, the bilateral meetings of the TRANSLACASAF network at the IST-2016 provided some space for researchers from non-European context to exchange. Further it was decided to continue with the webinar series and try to encourage participation of the STRN committee members; develop an online participant list, so that members can identify interesting researchers to exchange with. Currently a paper publication is planned to discuss methods in a non-European context and a viewpoint to highlight some of the theoretical challenges of transition studies network once applied to a non-European context. If you would like to join the network please email to: transitions.lac.as.af@gmail.com.

News from the PhDs in Transitions Network

Following its initial activities at the 6th IST conference (2015), the *PhDs in Transitions Network* has been growing and developing over the past academic year. The aim of the network is to provide a complement to the activities of the STRN network, focusing on providing resources and enabling communication and collaboration between PhD students and other early career researchers. Following is a brief summary of the network's activities, and an announcement of things to come:

- The network has developed a *blog site* at <https://phdsintransitions.wordpress.com/> which serves as a hub for contributions by network members and others, ranging from reports and reflections on current events to relevant news and guide articles related to the different aspects of an early-career researcher's development. The site also includes a public calendar listing relevant calls, events and seminars within the Transitions community and a mailing list summarizing important news and upcoming events.
- We have successfully organised our first stand-alone event: the 1st *PhDs in Transitions Conference* which took place at the University of Greenwich, London, UK on April 27th and 28th 2016. Over two days, PhDs and ECRs from across Europe took part in lectures, workshops and presentations in a relaxed and inclusive environment, sharing experiences and knowledge. A conference report can be found on the *blog site*.
- Finally, we would also like to announce our second stand-alone event: the 2nd *PhDs in Transitions Conference*, taking place at the EPFL Lausanne, Switzerland on April 27th and 28th 2017. Conference speakers will include Prof. Bernhard Truffer, Dr. Jochen Markard and Prof. Claudia Binder. More details on the conference programme as well as a call for abstracts will be published on our blog site shortly.

We intend to keep the network developments as an open process and would therefore invite and greatly appreciate the contribution of all interested PhDs and other ECRs in the further development of our community. If you are interested in becoming part of the process, learning about our planned actions and events, contributing to the blog site or if you would just like to say 'hi' to us, please contact us at welcome2transitions@gmail.com.

TESS develops two online tools

The FP7 research project TESS (Towards European Societal Sustainability) has developed two online tools which will enable better understanding of the contribution of community-based initiatives to tackling climate change, as well as helping groups to consider the social impact of their activities. The *Track-It tool* estimates carbon emissions which are avoided by different activities such as food growing or cycling rather than using a car. The *Resilience Compass* provides a structured process for groups to understand and prioritise how they tackle societal change within their communities. Both tools are available on our websites <http://www.sustainable-communities.eu/tools/> and <http://www.tess-transition.eu/tools/> along with supporting materials in the form of Information Sheets and an online video. We will be holding two webinars to introduce and discuss the use of these tools and you can register for one or both of these through the websites. The tools are the result of research with over 60 community-based initiatives in six countries (Scotland, Finland, Spain, Italy, Germany, Romania) to understand and demonstrate the impact and potential of community-based groups to contribute to tackling climate change and societal transition.

Event announcements

Calls for upcoming relevant events such as workshops and conferences

Practicing the commons: Self-governance, cooperation, and institutional change

Utrecht University hosts the global XVI Biennial Conference, 'Practicing the commons: Self-governance, cooperation, and institutional change' of The International Association for the Study of the Commons (IASC) in the historical city centre of Utrecht, 10-14 July 2017.

The conference is expected to attract over 600 participants from all over the world: academics, practitioners, and others interested in the field of commons, common-pool

resources, and cooperatives. The [IASC](http://www.iasc2017.org/) is the world's leading professional organization for the interdisciplinary study of commons, common-pool resources, and other resources that are (or could be) held or used collectively by communities, both in developing and developed countries. The association is devoted to understanding and improving institutions for the management and governance of such resources. The IASC is open to both academic scholars as well as expert practitioners, and hence has become the (non-profit) association *par excellence* for the mutual exchange between scholars and practitioners on commons' issues. More information: <http://www.iasc2017.org/>

Third International Conference of the Global Research Forum on Sustainable Production and Consumption Sustainable Lifestyles, Livelihoods and the Circular Economy, 27-29 June 2017, Brighton, UK

The Global Research Forum invites session and paper proposals for its third international conference on the theme of "Sustainable Lifestyles, Livelihoods and the Circular Economy," hosted by the Institute of Development Studies and the Science Policy Research Unit (SPRU) at the University of Sussex. The conference will convene researchers, development practitioners, policymakers and representatives from business, government and civil society to explore paths to sustainable production and consumption through the synergies and tensions among the circular economy, sustainable lifestyles and livelihoods, and their implications for the UN's Sustainable Development Goals (SDGs). Keeping with GRF's emphasis on global perspectives, we will explore these questions across different regions and communities, in both industrialized and developing countries.

Contributions can take several formats including session proposals (deadline 1 November 2016), individual papers & posters (deadline 1 December 2016) and Special Work Studios (deadline 1 November 2016). Detailed call for contributions and proposal submission instructions are available on the conference webpage. Conference partners: Tearfund UK, EU SWITCH-Asia Programme, SCORAI Europe, Collaborating Centre on Sustainable Consumption and Production (CSCP), and the MORE-SL Initiative of the 10YFP Sustainable Lifestyles and Education Programme.

Call for papers: Urban transformative capacity: Enabling sustainability transitions in and through cities

Against the backdrop of critical urban transformation challenges, this special issue of 'Habitat International' aims to feature new conceptual and empirical insights into the specific capacities required for effectively enabling, initiating, steering and performing systemic urban change for sustainability at local and global scales. Across contributions, the objective is to illuminate how building such capacities translates into urban (meta-) governance, policy and practice. Analyses from the global North and South are requested that can enable new understandings of the similarities and differences in terms of capacity for urban transformation. Guiding questions are: What are constitutive and distinctive components of urban transformative capacity, and how do they interact? How can such capacity be consistently assessed and compared between world regions, countries and places? How can this focus on capacity contribute to purposefully shape urban transitions towards sustainability and resilience? Extended abstracts of 500 words (plus key references) should be submitted by 31.10.2016 to: m.wolfram@yonsei.ac.kr. More information: <https://goo.gl/jw4Gjf>

Call for papers: Energy and the Future

The Frederick S. Pardee Center for the Study of the Longer-Range Future at Boston University will be producing a special issue collection of latest and original interdisciplinary papers on 'the future of energy,' and 'energy and the future' that consider emergent and crucial contemporary situations and developments in *Energy Research & Social Science*. This collection aims to highlight plausible and multiple energy futures based on new and emerging directions for energy production, distribution and networks, consumption, and

policy and governance. The collection also aims to focus on the critical assessment of the future synergies, trade-offs, and tensions among issues of energy resource supply and demand, environmental sustainability and climate change, access, innovation, strategy, security, decision-making, justice and fairness, markets, and institutional arrangements on local, national, and international levels. The collection will include policy, conceptual, theoretical, and empirical paper contributions from researchers whose work are clearly focused on the *issues of temporality and futurity of energy* that spans the following themes, and their surrounding controversies: future energy transitions, visions of 'energy and the future', energy modeling and the future, future governance of energy, and ways of thinking about the future of energy. Depending on available resources, some or all authors will be invited to present their manuscripts at a writing workshop at Boston University in April 2017. Travel funds will be available to presenting authors. See full call for papers at: <http://www.journals.elsevier.com/energy-research-and-social-science/call-for-papers/call-for-papers-special-issue-on-energy-and-the-future>

Event Reviews

Review of events interesting to the STRN community

Impressions from the IST-2016 conference

The 7th IST conference in Wuppertal was a success with perfect weather, inspiring keynotes, vivid discussions in regular paper sessions, dialogue and 'speed-talk' sessions, and plenty of networking opportunities among more than 400 participants. Most participants came from Germany (>200), about 40 each from Scandinavia and the Netherlands/Belgium, and another 30 from Switzerland and Austria. It was also great to see many new faces! In fact, the crowd was somewhat different from the years before with many early career researchers and rather few of the 'incumbent actors'. There were many highlights, such as a well-attended dialogue session on technological innovation systems on Thursday evening, which quickly led us into some of the foundational questions related to improving the framework. The conference also drew a lot of attention to the often transdisciplinary nature of transitions research, in particular in the context of urban regions. How can academics collaborate with urban stakeholders in new ways to produce transformative knowledge relevant to urban sustainability transitions? The range of new projects presented at the conference is likely to shape the content of transition debates for several years to come. We thank the organizers for their great work and a memorable event! **Jochen Markard and Rob Raven**

Impressions from IST-2016 Conference 2016

Being a new entrant into the transitions network, I was looking forward to being a part of this steadily growing community, and to the intellectually stimulating presentations and discussions over the three day conference. The prominent themes covered in Wuppertal were: energy transitions (esp. community energy), conceptual and theoretical advances in transitions literature, geography of transitions, and urban transitions. Some new topics/concepts for me included: visualisation of discourse network analysis, the politics of temporality, resilience thinking in transitions and the new institutionalism, among others. Several of the presentations reiterated the challenges in bridging the gap between conceptual frameworks and the complexity of the empirical contexts, and also in applying some of the models to real life scenarios. Some of the broader sets of thoughts, queries and critical problems included: How to reconcile with plurality if only a representative set of actors are selected for decision-making? How do the key actors induce policy change in support of sustainable niches? What are the effects of the governance model on urban transitions? How to conceptualize/analyse the role of sector boundaries? Does stability or instability of regimes hinder transitions? In what ways does power manifest in transitions, how can that be conceptualized further and applied to test in empirical cases? The sessions were well-timed, well-themed, and included empirical cases from both developed and developing countries. The conference familiarized me with the breadth of conceptual

approaches/possible lenses through which to study transitions and provoked me to think more deeply about the theory-practice linkages. However, there were limited discussions around the themes of power/politics of transitions, and particularly from a developing country perspective. While some session formats worked well (dialogue sessions), some did not seem to work well (speed talk sessions). The conference seemed to have been well planned and was well organized. Overall, it was an insightful experience to be a part of IST2016 and I am already looking forward to the next IST2017 in Gothenburg, Sweden. **Lakshmi Bhamidipati (lakpa@dtu.dk).**

SPRU anniversary conference, 7-9 September 2016

The title of SPRU's 50th anniversary conference was 'transforming innovation'. While this topic was discussed with regard to a wide range of the issues (e.g. entrepreneurship, regional development, science systems), there were several dedicated sessions with regard to sustainability transitions, which discussed infrastructure, grassroots innovation, experiments, competencies, finance, and intermediary actors. Because many STRN scholars presented their work, they could not participate at the IST-conference, which unfortunately coincided with the SPRU conference.

Transitions research was also emphasized in plenary sessions. The first plenary session (by Johan Schot), for instance, suggested that the grand societal challenges require broader conceptual frameworks to analyse socio-technical systems and broader policy approaches. With regard to the latter, the session included the launch of the *Transformative Innovation Policy Consortium* (TIPC), which aims for co-production relationships between scholars and policymakers to address problems like climate change, inequality, employment and future growth. Policy representatives from founding countries (Colombia, Norway, South Africa) signed the agreement at the conference.

The plenary session by Nicholas Stern also emphasized the importance and urgency of rapid and comprehensive system change to address climate change. Unfortunately, his presentation did not say much about the dynamics of these transitions, despite paying lip service to evolutionary thinking and radical innovation. A third plenary session (on 'energy systems in an uncertain world') was also mostly about transitions. One of the panelists (Kelly Gallagher) made some insightful observations about climate change policy and transitions, e.g. too much supply-side bias (e.g. focus on electricity), industrial country bias, limited market formation policies, mitigation bias (too little adaptation), still much apathy (even after the Paris agreements). She particularly called for more research on the speeding up of transitions, arguing that many 'solutions' exist, but are being deployed too slowly. All in all, it was a well-organized and highly stimulating conference, where transitions research figured prominently in both plenary and parallel sessions.

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

LUCSUS PhD course, Lund, 29-31 August

In August 29th – 31st 2016, LUCSUS (Lund University Center for Sustainability Studies) hosted a 3-ECTS PhD course "Niches in Transition Arenas: Critical Perspectives" as a part of capacity building initiatives within the T-GroUp project, which stands for "Experimenting with practical transition groundwater management strategies for the urban poor in Sub Saharan Africa". T-GroUp is one of the UPGro Consortium Projects. More info about the project is available at: www.t-group.science. During three intensive days of lectures and seminar discussions, around 20 participants from Ghana, Uganda, Sweden, Netherlands, Finland and Norway were actively engaged in theoretical debates on concepts behind transition management approach, including limits of system thinking, politics of socio-technological niches and levels of participation. The highlight of the course, as expressed by the participants, was the role play: an exercise of simulating a transition arena wherein participants were assigned with different roles of actors whom should deal with water pollution issue in a given peri-urban area. The local transition teams from the T-GroUp project took an active part in facilitating the simulated arena and discussed challenges associated with transition management approach in their cases. For more info about the

course can be found at: <http://t-group.science/2016/09/phd-course-niches-in-transition-arenas-critical-perspectives/>.

New research projects

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

Horticultural food systems based on ecologically intensive production and socio-economically sustainable value chains in the emerging economies Chile and Uruguay (HortEco)

The HortEco programme recognizes that development of ecologically and socio-economically sustainable food systems is highly important for balanced economic growth, but has remained understudied for emerging countries when compared to developing or developed countries. Vegetable systems in Chile and Uruguay place high pressure on natural resources, while at the same time there is a noted lack of safe and affordable vegetables for urban populations. Therefore the objective of the HortEco programme, funded by the Dutch Science Council (NWO-WOTRO), is to enhance the sustainability of vegetable food systems in emerging countries by investigating and supporting organization of sustainability transitions working on the production and marketing of low-or-no-pesticide vegetables. To achieve this objective, the programme will focus on three pillars:

1. ecologically intensive horticultural production,
2. socio-economically sustainable horizontal and vertical value chain collaboration models, and
3. change agents in the innovation system to support the transition to sustainable horticultural farms and markets.

Knowledge development and innovation will be connected through a systemic learning-for-innovation approach, linked to nine ongoing innovation-oriented projects of private, public and academic partners in Chile and Uruguay. This project will have three PhD positions on the three pillars and a postdoc supporting action research and integration of insights from the three PhD projects. The programme will be kicked-off in December with a workshop in Chile. For more information: Walter.Rossing@wur.nl or Laurens.Klerkx@wur.nl

Junior Research Group DynaMo (Mobility-Energy-Dynamics in Urban Areas)

Within this five-year project, four Ph.D. students and two Postdocs will examine current processes of change as well as future potentials for change (dynamics) in the urban mobility sector. Thereby, DynaMo will focus on social and technical innovations in the sociotechnical system of mobility investigating options for a more sustainable (economic, social and ecological) design of urban mobility systems. The team will analyze different mobility-related case examples with an emphasis on the following perspectives and research questions:

1. Technology integration: a) How can information and communication technology help to foster sustainable mobility innovations? b) What are profitable business models for sustainable mobility innovations?
2. Changes in mobility practices and associated lifestyles: a) To what extent does the expansion of sustainable mobility innovations require changes in mobility practices and associated lifestyles? b) How can sustainable mobility innovations trigger changes in mobility practices and associated lifestyles?
3. User participation and legitimacy: a) How can sustainable mobility innovations be governed? b) When do users perceive those innovations as legitimate?

DynaMo is funded from the research funding program 'Social-Ecological Research' of Germany's 'Federal Ministry of Education and Research' (BMBF). For further information please contact the research group leaders Antonia Graf (University of Münster; antonia.graf@uni-muenster.de) or Marco Sonnberger (University of Stuttgart; marco.sonnberger@ziri.us.uni-stuttgart.de).

Publications

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

PhD thesis: Xu, L. 2016. *Interaction between Policy and Niche in Sustainability Transition of China's Automobile Industry*. Tsinghua University.

Interaction between elements in niche and transition policy is an important issue of sustainability transition, and the transition behavior of firms are vital for niche evolution, this study thus analyzes the case of China's new energy vehicle (abbr. NEV) between 1991 and 2015 to understand two questions: Firstly, what influences the transition behavior of a firm? Secondly, why does the transition policy change? In the first part, comparing six passenger car manufacturers, the thesis finds that transition policy may influence the change of a firm's technological trajectory via three approaches, namely economic incentives, regulation, and shaping expectation. The difference among firms regarding trajectory diversification is determined by a firm's resources, its expectation towards uncertainty of future market and technology, and direct intervention of local governments. This finding contributes to the strategy management literature by revealing two new influential mechanisms other than economic incentive and regulation that are frequently discussed. In the second part, the thesis finds that policy change of NEV industry is a typological process contingent on the level and influential mechanism. Four levels of policy are identified, i.e. strategic mission, supporting task, policy instrument, and policy calibration, which constitute a hierarchy. High-level and supply-side policy change tends to be a proactive learning process, which is more driven by elements of landscape and socio-technical regime; whereas low-level and demand-side policy change tends to be an adaptive learning process, which is more driven by elements in niche. In the entire history of policy change, technology leapfrogging is the most prominent driving force. Summarizing the two parts, the thesis extends the current knowledge stock of sustainability transition in the context of China regarding the interaction between niche and transition policy. It also offers for the first time a very intensive investigation of China's NEV policy and main OEMs' strategy, which may be a valuable empirical base for future inquiries.

PhD Thesis: Lin, X. (2016). *Future Perspective of Electric Bicycles in Sustainable Mobility in China*, PhD Thesis, Cardiff University.

The thesis seeks to analyse the electric bicycle (e-bike) transition phenomenon in China by applying the Multi-Level Perspective (MLP) Transition Theory and Multi-scalar Perspective MLP. We synthesised secondary data to investigate the e-bike transition at the national level (China) and the city level ("mini" case studies of Beijing and Fuzhou) to explore the research questions of 1) Can socio-technical transition occur without deliberate policy support (RQ1)? 2) How can we explain the rapid emergence and enduring popularity of e-bikes in China (RQ2)? We also performed exploratory research in Cardiff (UK) and Nanjing (China) using semi-structured interviews. The interview results were used to design survey questionnaire in Nanjing case study. It is the key research step and addresses the following research questions: 1) How are e-bikes embedded in the current transport regime (RQ3)? 2) How much longer can e-bikes continue to be embedded in the transport regime (RQ4)? 3) What are the mechanisms underlying the rapid emergence of e-bikes (RQ5)? The thesis aims to fill a gap in the Multi-Level Perspective (MLP) by looking at geographical and socio-political heterogeneity. We also investigated the individual role in travel mode behaviour. We invited various groups in the survey, including e-bike users, bicycle users, car drivers, pedestrians and traffic police. The thesis explores a wide range of influencing factors, such as user anxiety, feelings related to e-bike adoption, e-bike user charging behaviour, other travel mode users and traffic police attitude towards e-bike development which have not been studied in previous e-bike literatures. The main findings are: 1) The fast emergence of e-bikes in China is spontaneous, without direct policy support from governments; 2) E-bike transition in China begins with transformation pathway (P1), followed by de-alignment and re-alignment pathway (P2); 3) E-bike users in China are mainly young career-aged

commuters and have a much higher education level than average, which are different from other countries; 4) E-bikes are well embedded in the current transport regime and they are adopted widely in many aspects of people's daily lives, including commuting, going shopping, and collecting children; 5) e-bikes are adopted because they provide affordable personal mobility due to the advantages of effort saving, flexible trip times, time saving in traffic jams, and high accessibility, whereas environmental and health factors are negligible; 6) E-bikes are possibly an intermediate mode on Nanjing's motorisation pathway.

PhD thesis. Edomah, N. 2016. *Nigeria's energy transitions: policy decisions, influences, and unintended consequences.* Global Sustainability Institute, Anglia Ruskin University, Cambridge, UK.

It is argued that policy makers have very important roles in governing transitions in any given society through established institutional frameworks. Energy infrastructure choices are determined by institutional dynamics and structures. However, what are the influences underlying past changes in energy supply infrastructure? Not many studies have been done on these underlying influences, particularly in a developing economy context. This thesis focusses on highlighting the role of the policy making processes and institutions, and their influences on the kind of energy infrastructure provided. Informed by critical realism as the chosen research philosophy, the use of mixed methods was adopted in conducting the study with a specific focus on the Nigerian case. Documentary data were gathered from documents and archives of various institutions, and from published literature. Qualitative data were gathered, using semi-structured interviews, from people who have been involved in the policy making process, and those who have been involved in planning, specification, and maintenance of new and existing energy infrastructure. The study reveals: that there is a complex relationship between resources, institutions, and political structures in the governance of energy infrastructure; that energy transitions were influenced by government policies implemented within and through institutions; and that there is increased need for partnership and interaction between public and private institutions in the governance and provision of energy infrastructure. The study concludes by highlighting that: (1) energy infrastructure provision is primarily a political choice. (2) The changing nature of energy infrastructure provision has been one of the main drivers of the capitalist nature of society, which is reflected in the increased demand and consumption of energy. (3) Resource availability is dynamic, and is 'constructed' by changing economics, technology, and geological knowledge. (4) Institutional workings, social practices, and technological change, constitute the key drivers of energy transitions.

Book: Marletto, G., Franceschini, S., Ortolani, C., and Sillig, C., 2016, *Mapping Sustainability Transitions: Networks of Innovators, Techno-economic Competences and Political Discourses*, Springer

This book was written for anyone wishing to understand how sustainable scenarios emerge from current innovations. It complements current sustainability transition research by providing a "socio-technical map," an analytical and operational tool that can be used to explain the current positioning of innovators and their networks; to form alternative transition pathways and scenarios; and to design policies for a sustainability transition. Drawing on multiple disciplinary approaches to the study of "green" innovations and focusing specifically on operational directives, it examines and assesses multiple transition pathways (and supporting networks). Lastly, it presents three sectorial case studies (urban mobility, agri-food, and lighting) to demonstrate how the "socio-technical map" can be concretely put into practice.

Book: Brauch, H.G., Oswald Spring, U., Grin, J. and Scheffran, J. (eds.), 2016, *Handbook on Sustainability Transition and Sustainable Peace*, Springer

In this book 60 authors from many disciplines and from 18 countries on five continents examine in ten parts: Moving towards Sustainability Transition; Aiming at Sustainable Peace; Meeting Challenges of the 21st Century: Demographic Imbalances, Temperature Rise and

the Climate–Conflict Nexus; Initiating Research on Global Environmental Change, Limits to Growth, Decoupling of Growth and Resource Needs; Developing Theoretical Approaches on Sustainability and Transitions; Analysing National Debates on Sustainability in North America; Preparing Transitions towards a Sustainable Economy and Society, Production and Consumption and Urbanization; Examining Sustainability Transitions in the Water, Food and Health Sectors from Latin American and European Perspectives; Preparing Sustainability Transitions in the Energy Sector; and Relying on Transnational, International, Regional and National Governance for Strategies and Policies Towards Sustainability Transition. More information at: http://www.afes-press-books.de/html/hexagon_10.htm. The hardcover and ebook may be obtained at: <http://www.springer.com/de/book/9783319438825>

Book: Göpel, M., 2016, *The Great Mindshift: How a New Economic Paradigm and Sustainability Transformations go Hand in Hand*, Springer

This book describes the path ahead. It combines system transformation research with political economy and change leadership insights when discussing the need for a *great mindshift* in how human wellbeing, economic prosperity and healthy ecosystems are understood if the Great Transformations ahead are to lead to more sustainability. It shows that history is made by purposefully acting humans and introduces *transformative literacy* as a key skill in leading the *radical incremental change strategies* that wicked problems require, illustrating their nature through mapping pioneering practices and their commonalities. More information at: http://www.afes-press-books.de/html/APESS_02.htm.

Book: Delina, L., 2016, *Strategies for rapid climate mitigation: Wartime mobilisation as a model for action?*, Routledge

To keep the global average temperature from rising further than 2°C, emissions must peak soon and then fall steeply. This book examines how such rapid mitigation can proceed – in the scale and speed required for effective climate action – using an analogy provided by the mobilisation for a war that encompassed nations, the Second World War. *Strategies for Rapid Climate Mitigation* examines the wartime-climate analogy by drawing lessons from wartime mobilisations to develop contingency plans for a scenario where governments implement stringent mitigation programs as an ‘insurance policy’ where we pay for future benefits. Readers are provided a picture of how these programs could look, how they would work, what could trigger them, and the challenges in execution. The book analyses in detail one plausible approach to a crucial issue – an approach built upon knowledge of climate science and on proven and demonstrated mitigation measures. The book is meshed with a social and political analysis that draws upon narratives of mobilisations during the war to meet a transnational threat, while also addressing the shortcomings of the analogy and its strategies.

Book: Ockwell, D. and Byrne, R., 2017, *Sustainable Energy for All: Innovation, Technology and Pro-Poor Transformations*, Eartscan, Routledge,

Despite decades of effort and billions of dollars spent, two thirds of people in sub-Saharan Africa still lack access to electricity, a vital pre-cursor to economic development and poverty reduction. Ambitious international policy commitments seek to address this, but scholarship has failed to keep pace with policy ambitions, lacking both the empirical basis and the theoretical perspective to inform such transformative policy aims. *Sustainable Energy for All* aims to fill this gap. Through detailed historical analysis of the Kenyan solar PV market the book demonstrates the value of a new theoretical perspective based on Socio-Technical Innovation System Building. Importantly, the book goes beyond a purely academic critique to detail exactly how a Socio-Technical Innovation System Building approach might be operationalized in practice, facilitating both a detailed plan for future comparative research as well as a clear agenda for policy and practice. These plans are based on a systemic perspective that is more fit for purpose to inform transformative policy ambitions like the UN’s Sustainable Energy for All by 2030 initiative and to underpin pro-poor pathways in sustainable energy access. This book will be of interest to academic researchers, policy

makers and practitioners in the field of sustainable energy access and low carbon development more broadly.

Teaching case: Bohnsack, R. & Heemstra v. P., 2016, The Rise of a New Industry: Business Model Innovation at the Intersection of Energy and Mobility [at thecasecentre.org / Reference: 316-0196-1]. This teaching case by Rene Bohnsack and Pico van Heemstra won the 2nd prize of the 2016 oikos case writing competition and presents the case of Cofely, a technical service provider in the electricity industry, which sees an opportunity arising related to the increasing number of electric vehicles in the Netherlands. The case explains the background, strategic issues, and players in this newly arising industry since smart electric grids in combination with large numbers of electric vehicles offer many new business opportunities. The case can be used with students in the field of innovation management to discuss how new technologies emerge in niches, the roles of incumbents and new entrants and the role of public and private protection, applying the MLP. The case, including an extensive teaching note, is available at the www.thecasecentre.org. An inspection copy can be checked on <https://oikos-international.org/publications/e-mobility/>.

Special Issue: The politics of sustainability transitions, *Journal of Environmental Policy & Planning*, 2016, 18(5)

Sustainability transitions are processes of fundamental social change in response to societal challenges. They reflect a particular diagnosis of persistent social problems, in which persistence is attributed to the path dependency of dominant practices and structures (i.e. 'regimes'), whose resolution requires structural and long-term change. By their nature, transitions involve politics in the broadest sense of the word. There are recurring calls for an increased attention to the politics of transition highlighting that the existing body of research has failed to consolidate, remain relatively dispersed and lack in systematic comparison of otherwise rich case studies. This virtual special issue reasserts this conviction and the papers included here cast light on this from a range of fields including Environmental Governance, Post-structuralist Theories, Political Science, Policy Studies, Science and Technology Studies, Practice Theory, Political Geography and Development Studies. It takes up the challenge to expand our understanding of the politics of sustainability transitions and highlights the disciplines and ontologies that could be central to this, with the papers in this issue offering important contributions to these debates.

Avelino, F., Grin, J., Jhagroe, S. and Pel, B., (2016) The politics of sustainability transitions, *Journal of Environmental Policy & Planning*, 18(5), 557-567

Kenis, A., Bono, F. and Mathijs, E., 2016, Unravelling the (post-)political in transition management: Interrogating pathways towards sustainable change, *Journal of Environmental Policy & Planning*, 18(5), 568-584

Chilvers, J. and Longhurst, N., 2016, Participation in transition(s): Reconceiving public engagements in energy transitions as co-produced, emergent and diverse, *Journal of Environmental Policy & Planning*, 18(5), 585-607

Gaede, J. and Meadowcroft, J., 2016, A question of authenticity: Status quo bias and the International Energy Agency's World Energy Outlook, *Journal of Environmental Policy & Planning*, 18(5), 608-627

Avelino, F. and Wittmayer, J.M., 2016, Shifting power relations in sustainability transitions: A multi-actor perspective, *Journal of Environmental Policy & Planning*, 18(5), 628-649

Swilling, M., Musango, J. and Wakeford, J., 2016, Developmental states and sustainability transitions: Prospects of a just transition in South Africa, *Journal of Environmental Policy & Planning*, 18(5), 650-672

Pel, B., 2016, Trojan horses in transitions: A dialectical perspective on innovation 'capture', *Journal of Environmental Policy & Planning*, 18(5), 673-691

Hoffman, J., and Loeber, A., 2016, Exploring the micro-politics in transitions from a practice perspective: The case of greenhouse innovation in the Netherlands, *Journal of Environmental Policy & Planning*, 18(5), 692-711

Broto, V.C., 2016, Innovation territories and energy transitions: Energy, water and modernity in Spain, 1939–1975, *Journal of Environmental Policy & Planning*, 18(5), 712-729

Wigboldus, S., Klerkx, L., Leeuwis, C., Schut, M., Muilerman, S. and Jochemsen, H., 2016, Systemic perspectives on scaling agricultural innovations. A review, *Agronomy for Sustainable Development*, 36: 46.

Agricultural production involves the scaling of agricultural innovations such as disease-resistant and drought-tolerant maize varieties, zero-tillage techniques, permaculture cultivation practices based on perennial crops and automated milking systems. Scaling agricultural innovations should take into account complex interactions between biophysical, social, economic and institutional factors. Actual methods of scaling are rather empirical and based on the premise of 'find out what works in one place and do more of the same, in another place'. These methods thus do not sufficiently take into account complex realities beyond the concepts of innovation transfer, dissemination, diffusion and adoption. As a consequence, scaling initiatives often do not produce the desired effect. They may produce undesirable effects in the form of negative spill-overs or unanticipated side effects such as environmental degradation, bad labour conditions of farm workers and loss of control of farming communities over access to genetic resources. Therefore, here, we conceptualise scaling processes as an integral part of a systemic approach to innovation, to anticipate on the possible consequences of scaling efforts. We propose a method that connects the heuristic framework of the multi-level perspective on socio-technical transitions (MLP) to a philosophical 'modal aspects' framework, with the objective of elucidating the connectedness between technologies, processes and practices. The resultant framework, the PRactice-Oriented Multi-level perspective on Innovation and Scaling (PROMIS), can inform research and policymakers on the complex dynamics involved in scaling. This is illustrated in relation to three cases in which the framework was applied: scaling agro-ecological practices in Nicaragua, farmer field schools on cocoa cultivation in Cameroon and 'green rubber' cultivation in Southwest China.

Wolfram, M., 2016, Cities shaping grassroots niches for sustainability transitions: Conceptual reflections and an exploratory case study, *Journal of Cleaner Production*, in press

This paper discusses the crucial role cities play in the emergence and formation of grassroots socio-technical niches for sustainability transitions. Drawing on research engaged with strategic niche management, grassroots innovations and urban social innovations, it conceptualizes the interdependencies between urban contexts and grassroots niche dynamics, and explores a critical case in point: Current policy efforts in the city of Seoul to create, diversify and network social innovations in urban neighborhoods. The case illustrates how innovative place-making activities in everyday-life urban environs draws on empowerment, proximity and institutional thickness to meet basic conditions for niche formation in terms of networking, shared expectations and social learning, while also raising new issues of inclusion, legitimacy and strategy. In conclusion, four issues are highlighted that appear to decisively impact on the formation of urban grassroots niche and related sustainability transition pathways: 1) Urban empowerment capacities, 2) Embedded holistic innovation, 3) Novel community-oriented governance modes, and 4) Urban niche/regime interactions. These issues thus require particular attention in future research and policy in order to guide the coevolution of cities and urban grassroots initiatives towards sustainability.

Hossain, M., 2016, Grassroots Innovation: A systematic review of two decades of research, *Journal of Cleaner Production*, in press

Grassroots innovation (GI) is an important strand for cleaner production and sustainable development. Studies have explored various facets of grassroots innovation. Despite two decades of research, however, there is no systematic review of the GI literature. The objective of this study is to synthesize the existing literature on GI. It identifies the main theories, characteristics, stakeholders, challenges, diffusion, and potential of GI, among

others. The study points out how GI contributes to sustainability. It shows that only a few scholars have a significant contribution, which limits the broad expansion of the GI discipline. Moreover, GI literature has not been linked with the mainstream innovation literature. Even though GI is significant for sustainable development, its impact is limited in reality.

Mylan, J., Holmes, H. and Paddock, J., 2016, Re-introducing consumption to the 'circular economy': A sociotechnical analysis of domestic food provisioning, *Sustainability*, 8(8), 794

The paper makes two contributions to the advancement of the 'circular economy' as a blueprint for a more sustainable society. The first is to highlight the importance of understanding the dynamics of consumption and waste in the domestic sphere. The second is to illustrate two ways in which using insights from socio-technical literature on sustainable consumption, in combination with the sociology of food, could contribute to redressing this shortfall. This includes understanding why people use or consume particular goods or services, and how this might be altered; and what drives the production of waste and the adoption of strategies for its reduction by consumers. We mobilise insights from a socio-technical perspective on consumption, which highlights the importance of everyday interactions between routine activities, mundane technologies and cultural meanings in (re)producing patterns of consumption. These insights are illustrated with reference to domestic food provisioning, using empirical data generated through twenty semi-structured interviews with consumers in relation to meat consumption and thriftiness. Two suggestions for the development of the 'circular economy' to better take account of consumption within the domestic sphere are made. The first is a shift from imagining consumers as 'users' of particular products or services, to conceptualisation as 'doers' of everyday activities. The second is a broadening of the principle of 'eco-effectiveness' to take account for the social value of consumption.

Waddell, S., 2016, Societal change systems: A framework and tool to address wicked problems, *Journal of Applied Behavioral Science*, in press

Problems referred to as wicked, messy, complex, and meta-level, by their very nature, require involving multiple and diverse organizations. Issues such as climate change, poverty, sustainable agriculture, and health care involve many hundreds of organizations at a national level; at a global level this easily increases to many thousands. Emerging their collective power into an effective force represents an enormous organizing challenge. Drawing from complexity and global networking knowledge, and building on the concept of "innovation system," this article develops the concept of "societal change system" as a framework to support addressing the organizing challenge. This arose through analysis of global change initiatives aiming to integrate sustainability concerns into the production of electricity, which included a meeting of leaders of such change initiatives. The activities produced recommendations for greatly enhancing change efforts with pragmatic steps to develop the societal change system in which they are embedded

Ryszawska B. (2016). Sustainability transition needs sustainable finance. *Copernican Journal of Finance & Accounting*, 5(1), 185–194

Transition is a term used to describe conversion (evolution) from the existing model of economy and finance towards one based on increased social and environmental responsibility. The purpose of this study is to emphasise the role of sustainable finance in the sustainability transition process. The main thesis can be expressed as follows: the role of finance is changing from the dominant view rooted in neoclassical economic theory (to maximize profits, and shareholder wealth) towards one supporting sustainable development, green economy, low carbon economy also adaptation and mitigation of climate change. The article uses the multilevel perspective created by F.W. Geels effective in the analysis of the sustainability transition. Results of analysis: There is evidence that the old regime of finance destabilizes. Finances are slowly responding to new demand in sustainable economy to align with it.

Becker, S.L. and Reusser, D.E., 2016, Disasters as opportunities for social change: Using the multi-level perspective to consider the barriers to disaster-related transitions, *International Journal of Disaster Risk Reduction*, 18, 75-88

We examine the suitability of using the multi-level perspective to describe disaster-related transitions and their barriers in an institutional environment that expects disaster responders, such as government agencies, to adhere to the increasingly established principles of disaster risk reduction. We created a process-tracing test based on disaster and transition literature and applied it to two cases: Cyclone Nargis and Hurricane Katrina. In applying this test we found that multi-level perspective is a valid way to describe disaster-related transitions. We also determined that both the concepts of build back better and disaster risk reduction influenced the transitions. Moreover, a lack of resources and a strong government desire for control presented obstacles to transition. These disaster-related transitions have implications for policy considerations. Knowledge from this article can inform future studies on disaster response and recovery.

Stahlbrand, L., 2016, The food for life catering mark: Implementing the sustainability transition in university food procurement, *Agriculture*, 6(3), 46

This article presents a case study of the application of the Soil Association's Food For Life Catering Mark at two universities in England: Nottingham Trent University and University of the Arts London. This procurement initiative has had noteworthy success in the U.K., with more than 1.6 million Catering Mark meals served each weekday. This article, based on 31 in-depth interviews conducted in 2015, is the first to examine its impact and significance at the university level. In particular, this article tests the concepts of the niche, regime and landscape in the multi-level perspective (MLP), a prominent theoretical approach to sustainability transition, against the experience of the Food For Life Catering Mark. The article confirms the importance of the landscape level of the MLP in the food sustainability transition, while adding additional considerations that need to be specified when applying the MLP to the food sector. By highlighting the essential role of civil society organizations (CSOs), public institutions and many champions, this article proposes that more room must be made within the MLP for the explicit role of agency, champions and the implementation process itself. Indeed, this article argues that implementation, the daily practice, is deserving of both increased recognition and theory.

De Gooyert, V., Rouwette, E., Van Kranenburg, H., Freeman, E. and van Breen, Sustainability transition dynamics: Towards overcoming policy resistance, *Technological Forecasting and Social Change*, in press

Sustainability transitions receive major scholarly attention, often explicitly with the intention to develop policy recommendations aimed towards progressing such transitions. Despite these efforts, many implemented transition policies have not been able to meet expectations. This tendency of systems to defeat the policies that have been designed to improve them is known as 'policy resistance'. This paper addresses the question how we can explain the persistence of policy resistance in the context of sustainability transitions, and aims to bring us a step further in the direction of identifying policies that support overcoming policy resistance. System dynamics is an approach that explicitly addresses policy resistance and we investigate how this approach complements existing transition approaches. As an illustration, we apply the approach to the case of the Dutch energy transition, with the participation of 96 experts. We conclude that system dynamics complements the dominant multi-level perspective and the transition management approach by providing a middle ground between emphasizing agency or structure. Moreover, the approach helps overcoming policy resistance by mapping out the structure of the system responsible for policy resistance, thereby enabling the identification of high leverage points that support sustainability transitions.

Markard, J. and Hoffmann, V.H., 2016, Analysis of complementarities: Framework and examples from the energy transition, *Technological Forecasting and Social Change*, 111, 63-75

Complementarities play a crucial role in socio-technical transitions as they accelerate technology development or decline. Missing complementary components in contrast may hamper the emergence of new technologies or negatively affect sector performance. In this paper, we introduce a conceptual framework to analyze complementarities and to understand their consequences for transitions. Our framework consists of four building blocks: i) different relationships, ii) different components, iii) different purposes and iv) complementarity dynamics. The latter two aspects go beyond existing concepts as they highlight the relative and dynamic nature of complementarities. We illustrate the applicability of the framework with examples from the ongoing energy transition. Finally, we discuss a series of complementarity bottlenecks and potential strategies by firms and policy makers of how to resolve these.

Tenggren, S., Wangen, J., Nilsson, M. and Nykvist, B., 2016, Transmission transitions: Barriers, drivers, and institutional governance implications of Nordic transmission grid development, *Energy Research & Social Science*, 19, 148-157

Transmission grid development is key for the decarbonization of our energy systems, but has not been much addressed within the social sciences of energy studies. This paper addresses this gap and examines institutional barriers for developing the grid towards a decarbonized Nordic power system by 2050. The analysis focuses on current grid development practices from an institutional perspective to understand barriers and drivers to grid development for the case of Sweden. The results show that the transmission grid development regime is generally capable of implementing the grid investments needed to support a decarbonized Nordic power system, but that there are a few key barriers that need to be addressed. From this analysis we deduce possible governance options that could alleviate the barriers, enabling the development of the transmission grid that is needed for the Nordic power grid to become decarbonized by 2050.

Kanger, L., Schot, J. 2016. User-made immobilities: A transitions perspective, *Mobilities*, 11(4), in press

In this paper we aim to conceptualize the role of users in creating, expanding and stabilizing the automobility system. Drawing on transition studies we offer a typology of user roles including user-producers, user-legitimizers, user-intermediaries, user-citizens and user-consumers, and explore it on the historical transition to the automobile regime in the USA. We find that users play an important role during the entire transition process, but some roles are more salient than others in particular phases. Another finding is that the success of the transition depends on the stabilization of the emerging regime that will trigger upscaling in terms of the numbers of adopters. The findings are used to reflect on potential crossovers between transitions and mobilities research.

Flynn, B., 2016, Marine wind energy and the North Sea Offshore Grid Initiative: A Multi-Level Perspective on a stalled technology transition?, *Energy Research & Social Science*, 22, 36–51

Building electricity grids out to sea implies a radical transformation of grid topologies. In time, a marine super-grid is conceivable. If growing numbers of subsea electricity cables are meshed with marine renewable, a 'greening' of such grids is also possible. Based on interview research, this paper examines one such ambitious proposal: the Northern Seas Countries Offshore Grid Initiative (NSCOGI). The Multi-Level Perspective (MLP) on technology transitions is used to evaluate progress to date. Obstacles uncovered include competing and still immature grid technology niches. There is only equivocal support from key actors within the relevant socio-technical electricity regime. National grid Transmission System Operators (TSOs) appear more interested in subsea cables to trade electricity rather than enhancing marine renewables. While the EU might be assumed to be a vital actor to

support a North Sea Grid, it has only limited influence. National policy insiders and decisions matter more. This paper stresses the residual importance of the national level for offshore wind and electricity grids. A marine super-grid wired up with offshore wind-farms throughout the North Sea, is both more tentative in its emergence, but also ambiguous in its support for offshore wind.

Stafford, B.A. and Wilson, E.J., 2016, Winds of change in energy systems: Policy implementation, technology deployment, and regional transmission organizations, *Energy Research & Social Science*, 21, 222–236

Changes in the electricity sector since the turn of the century have brought significant penetration of wind generation resources onto the electric power grid. Creating a low-carbon and sustainable electric systems to respond to climate change and meet societal energy needs requires different technologies and changes in supporting policies and institutions. But just how these institutions are creating and implementing new policies has emerged as an important area of inquiry. Changing how the electricity system works requires coordinated interaction across many different stakeholder groups and multiple levels of governance. We explore these emerging processes of policy implementation by examining how wind energy resources are changing the operation of the electric grid. To do this, we develop an in-depth, grounded case study examining decision making within the Midcontinent Independent System Operator, a U.S. Regional Transmission Organization. We use a multi-method approach to the strategic action field theory (SAF; e.g. Moulton and Sandfort, 2015) to examine how MISO created and implemented policy, changing energy markets and power systems operation to allow for the integration of wind resources. Our study examines the critical and understudied role of energy policy implementation in practice and focuses on how stakeholders are making decisions which are shaping the use and value of new and existing energy technologies and, in doing so, transforming the energy system.

Alic, J.A. and Sarewitz, D., 2016, Rethinking innovation for decarbonizing energy systems, *Energy Research & Social Science*, 21, 212–221

While technological innovation is an implicit element of any plausible strategy for responding to climate change, the complexity of innovation processes has not been adequately accounted for in such strategies. Using many examples from different areas of technological innovation, we show that the inevitable unintended and unforeseeable consequences of innovation likely make it impossible to strategically steer the global energy system in desired directions. Given this conclusion, we then look at technological complexity in terms of a simple three-level schema of sociotechnical change. This perspective points towards innovation policies that focus on long-term, incremental advance at the level of individual technologies, and on public policies that use a public goods-public works rationale to justify government investments in the needed innovations.

Li, F.G.N., Pye, S. and Strachan, N., 2016, Regional winners and losers in future UK energy system transitions, *Energy Strategy Reviews*, 13/14, 11-31

This paper demonstrates the integration of institutional perspectives on energy system transitions into formal energy economic modelling. The perspectives of key UK energy system stakeholders have been used to develop three socio-technical narratives of energy system change that are quantified in a 24-region techno-economic model of the country. Implementing these three narratives in the model environment allows their feasibility for meeting climate targets to be assessed as well as articulating their implied sub-national regional outlooks for technologies and investment. The latter elements are discussed in light of the regional socioeconomic and demographic landscape. The study highlights some of the regional political dimensions associated with future investment targeting in the UK energy system. In particular, energy policy decisions may create tensions between the four different UK government administrations as well as raising important questions about regional economic development and how an equitable energy transition can be achieved for all.

Pereverza, K., Pasichnyi, O., Lazarevic, D. and Kordas, O., 2016, Strategic planning for sustainable heating in cities: A morphological method for scenario development and selection, *Applied Energy*, in press

The transition to more sustainable heating systems requires socio-technical approaches to strategic planning. Scenario development plays a key role in strategic planning, as the process supports the development of future visions and actions required for their realisation. However, new approaches to scenario development are required to address the limitations of conventional scenario development methods, such as the cognitive barriers of 'groupthink', reluctance to consider 'outside-the-box' options, handling of complexity, and ad hoc scenario selection and general non-transparency of scenario development processes. This paper describes the development and implementation of a novel method for scenario development and selection in the context of participatory strategic planning for sustainable heating in cities. The method is based on the morphological approach and a number of scenario criteria including transparency, reliability, coverage, completeness, relevance/density, creativity, interpretability, consistency, differentiation and plausibility. It integrates creativity workshops and interdisciplinary stakeholder participation to enhance the ownership and legitimacy of the scenarios. The approach entails the generation of a complete space of scenarios for heating systems and reduction of this space using cross-consistency analysis and project-specific requirements. Iterative development and implementation of the method is illustrated using two participatory backcasting projects focused on strategic planning for providing a comfortable indoor climate for Bila Tserkva, Ukraine, and Niš, Serbia by the year 2030. The results demonstrate that the method helps overcome the limitations of conventional approaches to scenario development and supports rigorous and transparent selection of a scenario set for participatory analysis. The method fostered the elicitation of consensus-based scenarios for more sustainable heating systems in both cities with regard to the quality of indoor comfort, environmental impact, resource efficiency and energy security.

Fichter, K. and Clausen, J., 2016, Diffusion dynamics of sustainable innovation: Insights on diffusion patterns based on the analysis of 100 sustainable product and service innovations, *Journal of Innovation Management*, 4(2), 30-67

There is a growing consensus about the urgent necessity to green the economy and to decouple economic growth from environmental pressure. Against this background, the article explores three questions: (1) What are key factors influencing diffusion dynamics of sustainable product and service innovations? (2) To what extent do diffusion processes of sustainable product and service innovations differ from each other, and can different groups of diffusion processes be identified? (3) Which factors, actors, and institutional settings are characteristic of different groups of diffusion processes? While diffusion research on sustainable innovation so far has been limited to case studies with just one or a small number of cases or has been focused on individual sectors, the empirical data presented here cover a large number of cases from a broad variety of product fields. This allows for generalizations as well as relevant insights and conclusions for sustainability, environmental and innovation policies. The empirical investigation of 100 sustainable product and service innovations revealed that diffusion processes of sustainable innovations differ substantially: The cluster analysis showed that five groups of sustainable innovations can be differentiated which differ significantly in terms of the factors influencing the diffusion process. The empirical results thus both support the assumption that different types of diffusion paths do in fact exist and also permit characterization of the various types of diffusion paths. The evolutionary concept of diffusion paths develops significant explanatory power on the basis of which faster or slower cases of diffusion and the success or failure of sustainable innovations can be better understood.

Beerman, J. and Tews, K., 2016, Decentralised laboratories in the German energy transition. Why local renewable energy initiatives must reinvent themselves, *Journal of Cleaner Production*, in press

This study addresses research demands for a more critical empirical assessment of the innovation capacity of the decentralised, sub-national level. In Germany, the extensive involvement and contributions of new locally-rooted renewable energy initiatives have been one of the most striking features of the country's energy transition process. This study analyses the enabling conditions, current challenges and future prospects of decentralised experimentation in the German energy system. It finds that whereas the national support scheme has for a long period protected decentralised deployment of renewable energies by locally-rooted actors in the energy field, recent reforms of the scheme now threaten their further participation in the energy market. The paper observes that decentralised initiatives not only struggle to adjust to the new framework conditions. They have also not yet sufficiently addressed the new governance challenges arising from the fact that renewable energies have reached a stage of systemic importance for the whole power system, which requires decentralised initiatives to make their own efforts compatible with overall energy system transition needs. The study concludes that in order to remain an important innovator in the German energy transition, decentralised initiatives have to prove their ability to provide solutions to the systemic challenges of the energy transition process, such as horizontal and vertical multi-level coordination and decentralised contributions to the security of supply.

Smedby, N. and Quitzau, M-B., 2016, Municipal governance and sustainability: The role of local governments in promoting transitions, *Environmental Policy and Governance*, in press

This research addresses local governance for building energy efficiency. In order to turn an increasingly proactive environmental policy agenda at subnational levels into practice, local governments experiment with new forms of governance. One important policy area in this regard is building energy use, often addressed through urban development projects. Such initiatives provide important insight into the role that local governments may play in terms of pushing developers from mainstream building practices towards the uptake of more radical energy efficient solutions by enabling socio-technical translation. The analysis is based on two case studies from Sweden and Denmark, where the local governments have actively sought to challenge mainstream building practices through a combination of different modes of governing. It is shown how this combination of different modes of governing at the local level provides several translation entries for local governments seeking to foster sustainability transitions. The article concludes that more attention should be directed towards translation as part of the practical environmental governing at the local level.

Lockwood, M., Kuzemko, C., Mitchell, C., Hoggett, R., 2016, Historical institutionalism and the politics of sustainable energy transitions: A research agenda, *Environment and Planning C*, in press

Improving the understanding of the politics of sustainable energy transitions has become a major focus for research. This paper builds on recent interest in institutionalist approaches to consider in some depth the agenda arising from a historical institutionalist perspective on such transitions. It is argued that historical institutionalism is a valuable complement to socio-technical systems approaches, offering tools for the explicit analysis of institutional dynamics that are present but implicit in the latter framework, opening up new questions and providing useful empirical material relevant for the study of the wider political contexts within which transitions are emerging. Deploying a number of core concepts including veto players, power, unintended consequences, and positive and negative feedback in a variety of ways, the paper explores research agendas in two broad areas: understanding diversity in transition outcomes in terms of the effects of different institutional arrangements, and the understanding of transitions in terms of institutional development and change. A range of issues are explored, including: the roles of electoral and political institutions, regulatory agencies, the creation of politically credible commitment to transition policies, power and incumbency, institutional systems and varieties of capitalism, sources of regime stability and instability, policy feedback effects, and types of gradual institutional change. The paper concludes with some observations on the potential and limitations of historical

institutionalism, and briefly considers the question of whether there may be specific institutional configurations that would facilitate more rapid sustainable energy transitions.

Steen, M., 2016, Reconsidering path creation in economic geography: aspects of agency, temporality and methods. *European Planning Studies*, 24(9), 1605-1622.

The emergence of new industrial development paths is an important topic in economic geography. However, current perspectives emphasizing the constraining forces of historical trajectories on innovation and change have shortcomings in accounting for how and where new industries arise. This article argues that more attention needs to be paid to agency, and that agency must be seen as inter-temporal in the sense that actors, activities and strategies are framed by combinations of experiences and expectations. As such, the article combines insights from economic geography, transitions studies and the sociology of expectations (SoE) literature to expand extant theory on path creation. A brief analysis of the emerging Norwegian offshore wind power (OWP) sector serves to illustrate how experience (the past) and different types of expectations (the future) have tangible effects on agency, and in effect on path creation processes. These insights have methodological implications, essentially favouring qualitative approaches over quantitative ones to understand formative phases in industrial development.

Edomah, N., Jones, A., Foulds, C. 2016. The role of policy makers and institutions in the energy sector: the case of energy infrastructure governance in Nigeria. *Sustainability*, 8(8), 829

This paper focuses on investigating the linkages and consequences of the policy decision process in the governance of energy infrastructure in Nigeria. It attempts to gain a better understanding of the role of policy makers and institutions in the provision of energy infrastructure in Nigeria. Using a combination of semi-structured interviews and documentary evidences from published literature, this study reveals three essential areas where the policy-making processes (and therefore policy makers) intervene in the provision of energy infrastructure. These are: (1) granting access to historical data; (2) regulations; and (3) permitting/issuance of licenses. This study also reveals three major unintended consequences of the policy decision processes and institutions in the governance of energy infrastructure provisions in Nigeria, which are: (1) government financing corruption in the energy sector; (2) economic delusion; and (3) uncontrolled growth in energy demand driven more by export and not local internal demand.

de Haan, FJ, Rogers, BC, Brown, RR & Deletic, A 2016, Many roads to Rome: The emergence of pathways from patterns of change through exploratory modelling of sustainability transitions, *Environmental Modelling & Software*, 85, 279–292.

This article presents an exploratory modelling approach that illustrates how overall transition pathways can emerge from a limited number of underlying change patterns. Pathways describe the temporal development of transitions, they are trajectories of change that carry societal systems such as health care, energy supply or water management into qualitatively different states. Under any given input scenario, a very large number of different pathways may result due to uncertainties such as those related to human agency. Though the pathways all differ in detail, clusters of pathways share enough qualitative similarities to allow identification of a small number of ideal types: many roads to Rome. The input scenario influences how often the various types of futures emerge, not what types emerge. The article explores this using a series of hypothetical cases and compares the results with ideal-typical pathways from the literature. A historical case is simulated for illustration.

Pearl-Martinez, R. and J. Stephens, 2016, Toward a gender diverse workforce in the renewable energy transition. *Sustainability: Science, Practice and Policy*, 12(1).

This paper explores gender diversity in the energy workforce and highlights the value of systematic assessment of women's participation in the move toward sustainable renewable-energy systems. A gender imbalance in the energy sector workforce is apparent in countries

throughout the world, yet women's participation in, and contributions to, the energy industry have not been systematically characterized. As the energy sector transitions from fossil-fuel dominated systems toward more efficient, sustainable renewable-based systems, new opportunities for a more inclusive energy workforce are emerging. We are concerned, however, that if the energy industry does not prioritize gender diversity now, the renewable energy transition could perpetuate and deepen, rather than reduce, gender inequality. Although research demonstrates that diversity enhances innovation and creativity, there is minimal attention to considering and promoting diversity within the energy workforce. In this Community Essay we explore how greater consideration of the role of gender and the value of diversity in energy could provide multiple social benefits, including promoting more sustainable practices, accelerating innovation, enhancing women's opportunities, and empowering communities to engage in energy-system change.

Schmidt, T.S., Battke, B., Grosspietsch, D. and Hoffmann, V.H., 2016. Do deployment policies pick technologies by (not) picking applications?—A simulation of investment decisions in technologies with multiple applications. *Research Policy*, in press

The role of deployment policies that aim to foster technological change has grown considerably, especially in the fields of energy and climate. However, recent research has shown that the adoption of deployment policies carries the potential of locking in the technology that is most cost-effective at the point of policy introduction, but may be inefficient in the long term. The present paper contributes to the emerging literature on the role of deployment policies in creating path-dependency and eventually technology lock-in. While previous studies focused on the relationship between lock-in and the technology-specificity of deployment policies, this paper introduces a new factor: the existence of multiple applications for a technology. We argue that this factor is highly relevant for technological lock-in and should be considered by policy makers. To support our argument, we simulate the competition among four stationary battery technologies across energy system applications in an investment simulation model. This simulation shows that the degree of competition among technologies differs strongly across applications, which corresponds with a highly varying lock-in probability. Hence, selecting applications in deployment policies very likely corresponds to selecting technologies. We discuss the implications of these results for both policy makers and for the academic debate on deployment policies and technological lock-in as well as on technology assessment and governance more generally. Based on the notion that policies can have different technology-specificity levels, we develop the idea of the application-specificity of policies and provide examples of currently enacted deployment policies that vary in terms of their technology and application specificity.

Wesseling JH., Van der Vooren A., 2016, Lock-in of mature innovation systems, The transformation towards clean concrete innovations in the Netherlands. *Journal of Cleaner Production*, in press

Energy-intensive processing industries like the concrete industry form the base of the economy and account for a large part of global greenhouse gas emissions. Sectoral transformation to cleaner basic materials is therefore crucial, and institutional pressure to do so is increasing. However, socio-technical studies have not sufficiently addressed these sectors. This paper therefore sets out to analyze the systemic problems that inhibit the transformation of the mature innovation system of the concrete sector toward the development and diffusion of clean concrete innovations, for the case of the Netherlands. A structural-functional approach has been frequently applied to identify such systemic problems, but has been limited to emerging technological innovation systems. Consequently, the approach tends to overlook the systemic lock-in that arises from closed cycles of interdependent systemic problems and vested interests that characterize mature innovation systems and that hamper system transformation. This paper analyzes these characteristics to extend the application of the structural-functional approach to the transformation of mature innovation systems. Interviews with 28 stakeholders were conducted and triangulated with reports, websites and other documents. A list of systemic problems was identified that

originate within actors, institutions, networks, technology and infrastructure and that impaired the performance of all system functions except knowledge development. Systemic problems are indeed found to be sustained through systemic lock-in, i.e. closed cycles of interdependent systemic problems. Through strategic, often collective action, established firms with vested interests were able to reinforce these interdependent systemic problems to inhibit clean concrete innovation. The study concludes that systemic lock-in inhibits the sustainability transformation of the mature innovation system of concrete in the Netherlands and confirms that the application of the structural-functional approach can be extended from emerging to mature innovation systems. Overcoming systemic lock-in requires a series of well-coordinated policy measures that should be implemented in a specific order, to prevent reverting back to the lock-in around the original system configuration.

Hubeau, M., Marchand, F., Coteur, I., Mondelaers, K., Debruyne, L. and Van Huylenbroeck, G., 2017, A new agri-food systems sustainability approach to identify shared transformation pathways towards sustainability, *Ecological Economics*, 131, 52–63

Development and application of a new agri-food systems sustainability approach
A framework to assess the current sustainability state of the agri-food system
A transdisciplinary implementation method to involve stakeholders
A case study to identify shared transformation pathways, strategies and actions
Co-creation of system, target and transformation knowledge with emphasis on action

Meynard, J-M., Jeuffroy, M-H., De Bail, M., Lefevres, A., Magrini, M-B. and Michon, C., 2016, Designing coupled innovations for the sustainability transition of agrifood systems, *Agricultural Systems*, in press

Numerous signs underline an urgent need for innovation in the current agriculture and food industries. However, even though the components of the agrifood systems are all strongly interconnected, the design processes to improve their sustainabilities are still mostly managed separately. This frequently leads to innovating in one domain in order to adapt to the constraints or specifications of the other, such as tweaking the farming systems to address processing issues, or the other way round. The objectives of this paper are first to show the limits of such an organization, and second to provide a heuristic framework to organize the design of coupled innovations, by reconnecting the dynamics of innovation in agriculture and food, with a view to improving the whole agrifood system. Our framework highlights that working at this level requires designing in raw production, exchange, processing, and consumption, while taking into account synergies or antagonisms between upstream and downstream. Thus, the innovations are not only technological – e.g. concerning cropping systems or processing – but also organizational and institutional. Based on several examples, in the cereal, linseed, legume, and market-gardening productions, at the junction of agriculture and food sciences, we also show that this perspective of designing coupled innovations calls for a renewed research agenda. Three main domains are thus questioned. First, coupling requires an innovative design process for radical innovations, challenging the coordination of exploration in both domains. Second, the development of “innovation niches” outside the dominant sociotechnical regime, in order to bypass the lock-in from the dominant system, faces the difficulty of favoring the building of renewed networks of actors, which were used to working separately so far. Third, the necessity to share expectations and knowledge, and to design together innovations that suit all sides, leads to making several recommendations for the governance of the design process. Finally, we conclude that the need for innovation in the agrifood systems requires going beyond the historical specialization of skills, and the usual forms of coordination between designers.

Aune, M., Godbolt, Å.L. and Sørensen, K.H., 2016, Mismatch or misunderstanding? Calculation and qualculation among economists and consumers in their framings of the electricity market. *Acta Sociologica*, in press

This paper analyzes how economists engaged in energy policymaking and household consumers frame the electricity market and thus shape conditions with regard to energy efficiency transitions. We interviewed prominent economists and conducted focus group interviews with household consumers to explore these issues. Drawing on economic sociology, we analyze the processes of framing involved in the sense-making around the electricity market, including electricity consumption, and the observation that current policymaking has been fairly ineffective in stimulating energy efficiency in households. We find that the interviewed economists predominantly drew on a framing of the electricity market according to an economic textbook understanding of the issues. The interviewed consumers provided a more inclusive and complex framing of the energy market. While the economists' framing was narrow to allow for calculation, the consumers' framing led to them to include moral, social and political issues and thus to qualculate. We ask whether the different framings emerged from consumers' misunderstanding of market mechanisms or from a mismatch in the ways in which framings were performed. The analysis supports the latter conclusion, which means that energy policymaking to promote energy efficiency transitions is caught in a stalemate between calculating policymakers and qualcalculating consumers.

Webb, J. and Hawkey, D., 2016, On (not) assembling a market for sustainable energy: Heat network infrastructure and British cities, *Journal of Cultural Economy*, in press
Energy policies increasingly rely on market instruments to meet societal objectives for climate change mitigation. We explore the application of such instruments in low carbon heat markets. Using a conceptual framework derived from actor network theory and economic sociology, we examine the role of technical-economic models as market devices in two heat network proposals in British cities. Government intermediaries relied on the models to enact the mutual financial and carbon benefits of an area-wide heat market, and to enrol multiple public sector organisations in innovation. In practice, the models produced the opposite response: parties synthesised the modelled cost-benefit calculations into the existing public services market agencement and translated the model numbers into opportunities to secure competitive advantage for their own organisation. These activities undermined the projected cost and carbon saving logic of the collective actor solution. The findings demonstrate the potent economic agency of marketemulating public finance and competitive procurement instruments in governing such organisational decisions, and indicate the limited traction of a low carbon calculus, which lacked significant political or senior management sponsorship. Questions are posed about the formatting of economic agency suited to securing the common goods of a sustainable society.

Aune, M., Godbolt, Å.L., Sørensen, K.H., Ryghaug, M., Karlstrøm, H. and Næss, R., 2016, Concerned consumption. Global warming changing household domestication of energy. *Energy Policy*, 98, 290-297.

This paper addresses possible effects of the growing focus on global warming on households' domestication of energy and the dynamics of energy consumption by comparing data pertaining to the domestication of energy within Norwegian households from two time periods: first, 1991-1995, when climate change was given little public attention, and, second, 2006-2009, after climate change became a major public concern. In the first period, we observed that the domestication of energy resulted in an energy culture emphasizing comfort and convenience with respect to everyday life and the abundant supply of clean hydropower. In the second period, this culture seemed to have changed through a transition where households have been made more concerned about their energy consumption. Consumption of energy was linked to climate change, and many interviewees claimed to save energy. However, the dominant expectation was still to be able to manage everyday life in a convenient and comfortable way. Thus, climate change concerns produced some but not very radical changes in the practical domestication of energy, including energy saving. A main effect was feelings of guilt, tempered by arguments regarding why change is difficult and complaints about political inaction. Thus, public engagement with climate change issues

may facilitate policies regarding energy efficiency transitions but to succeed, wider climate policy measures seem to be needed.

Fouquet, R., 2016, Path dependence in energy systems and economic development. *Nature Energy*. 16098, doi: 10.1038/NENERGY.2016.98

Energy systems are subject to strong and long-lived path dependence, owing to technological, infrastructural, institutional and behavioural lock-ins. Yet, with the prospect of providing accessible cheap energy to stimulate economic development and reduce poverty, governments often invest in large engineering projects and subsidy policies. Here, I argue that while these may achieve their objectives, they risk locking their economies onto energy-intensive pathways. Thus, particularly when economies are industrializing, and their energy systems are being transformed and are not yet fully locked-in, policymakers should take care before directing their economies onto energy-intensive pathways that are likely to be detrimental to their long-run prosperity.

Koirala BP, Koliou E, Friege J, Hakvoort RA, Herder PM., 2016, Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems. *Renewable and Sustainable Energy Reviews*, 56:722–44.

Energy systems across the globe are going through a radical transformation as a result of technological and institutional changes, depletion of fossil fuel resources, and climate change. At the local level, increasing distributed energy resources requires that the centralized energy systems be re-organized. In this paper, the concept of Integrated Community Energy Systems (ICESs) is presented as a modern development to re-organize local energy systems to integrate distributed energy resources and engage local communities. Local energy systems such as ICESs not only ensure self-provision of energy but also provide essential system services to the larger energy system. In this regard, a comparison of different energy system integration options is provided. We review the current energy trends and the associated technological, socio-economic, environmental and institutional issues shaping the development of ICESs. These systems can be applied to both developed and developing countries, however, their objectives, business models as well as composition differs. ICESs can be accepted by different actors such as local governments, communities, energy suppliers and system operators as an effective means to achieve sustainability and thereby will have significant roles in future energy systems.

Newell, P. and Phillips, J., 2016, Neoliberal energy transitions in the South: Kenyan experiences, *Geoforum*, 74, 39-48

What is the relationship between the direction and form of an energy transition and the political economy within which it is embedded? This paper explores how the nature of (low carbon) energy transitions is strongly influenced by the process of neoliberalisation that shape energy policy in the South. We seek to understand emergent energy transitions and to advance their theorisation through an account of the political economy of energy transition in Kenya. In contrast to the often techno-managerial orientation of literatures on socio-technical transitions, we explore the political terrain upon which competing visions of energy futures and material interests collide and seek to accommodate one another. We develop a political economy account that emphasises the structural and disciplinary power of capital and global institutions to set the terms of transition. This expresses itself in both delimiting the autonomy of state actors and by reconfiguring domestic institutional and social power in ways that shape the distributional politics of transitions.

Skellern, K., Markey, R. and Thornthwaite, L., 2016, Identifying attributes of sustainable transitions for traditional regional manufacturing industry sectors – A conceptual framework, *Journal of Cleaner Production*, in press

Traditional manufacturing industry is facing significant transformation. Fundamental to this transformation, are the challenges of a changing social, economic, political and environmental future in response to climate change, global competition and limits to finite

resources. These challenges have motivated a transition towards a new sustainable trajectory. Within a range of disciplinary fields, scholars have studied and developed conceptual frameworks to explain the processes, outcomes and effectiveness of particular transitions, yet, there remains limited evidence drawing together these conceptual approaches to identify the elements and attributes essential to holistic, practical and long lasting transitions within established manufacturing regions. To address this gap, this paper introduces an interdisciplinary framework, 'Attributes of Sustainable Transitions', by reviewing and integrating four existing conceptual approaches (Advanced Manufacturing, Sustainability Transitions, Spatiality of Regions and Transition Regions) to identify attributes of sustainable transitions within the manufacturing industry sector. In the process, this article also focuses on regions as important spaces for transitions, an emphasis currently missing from traditional economic approaches. Examples from international and Australian case studies are used to support the conceptual analysis, paving the way for future empirical research based on Australian firms.

Edson, W., 2016, State enrolment and energy-carbon transitions: Syndromic experimentation and atomisation in England, *Environment and Planning C*, in press

This article analyses how national governments seek to enrol different subjects and objects in energy-carbon restructuring. It takes analysis beyond consideration of particular subjectivities and governmentalities to consider an expanded range of objects and subjects of governing at a distance. Developing an analytical model of 'modes of enrolment' focusing on power modalities, forms of policy integration and policy targets, the article explores five broad modes of enrolment employed in England. The article shows how policy across all modes of enrolment in England has increasingly tended towards disordered, syndromic experimentation and government by-project rather than any systematic programme of government.

De Laurentis, C., Eames, M. and Hunt, M., 2016, Retrofitting the built environment 'to save' energy: Arbed, the emergence of a distinctive sustainability transition pathway in Wales, *Environment and Planning C*, in press

Combining insights from research on systems innovation and sustainable transitions with multi-level governance perspectives, this paper examines the 'Arbed' domestic housing retrofit programmes in Wales. In so doing, the paper demonstrates the critical role of sub-national government in the emergence of a distinctive sustainability-oriented pathway for domestic end-use energy demand reduction in Wales, and highlights the multi-level governance challenges involved. The governance processes contributing to this purposive transformation (e.g., policies and institutions; a 'shared' normative vision; network building; competencies, resource mobilisation, etc.) are illuminated and how they simultaneously cut across multiple spatial scales is discussed. Rather than simply viewing such transition arenas as simple sites of experimentation, the paper argues that sub-national sustainable energy transitions and pathways are shaped by pressures and opportunities that are mediated by unique place and context-specific conditions that exert influence on the mobilisation of resources, governance capabilities and actor-networks.

Moss, T., 2016, Discarded surrogates, modified traditions, welcome complements: The chequered careers of alternative technologies in Berlin's infrastructure systems, *Social Studies of Science*, in press

This article takes an historical perspective on current attempts to 'open up' established, centralized systems of urban infrastructure to alternative technologies designed to minimize resource use and environmental pollution. The process of introducing alternative technologies into, or alongside, centralized urban infrastructures is not a novel phenomenon, as is often assumed. The physical and institutional entrenchment of large technical systems for urban energy, water or sanitation services in industrialized countries in the late 19th and early 20th centuries did not close the door completely on alternatives. I investigate a number of alternative technologies used in Berlin in the interwar period (1920–1939), in order to

reveal the rationales developed around each technology and the ways in which each emerged, disappeared and re-emerged or survived across highly diverse political regimes. The selection of cases is guided by the desire to illustrate three different phenomena of alternative technology diffusion (and exclusion) experienced in Berlin: (1) technologies promoted by early pioneers and discarded by their successors (waste-to-energy), (2) technologies modifying traditional practices that were at odds with modernized systems (wastewater reuse for agriculture) and (3) technologies co-existing alongside the dominant centralized system throughout the 20th century (cogeneration). The empirical findings are interpreted with reference to their contribution to scholarship on urban socio-technical transitions.

Xu, L., and Su, J. 2016. From government to market and from producer to consumer: Transition of policy mix towards clean mobility in China. *Energy Policy*, 96, 328–340.

This paper proposes a new typology that classifies innovation policy instruments into two dimensions: government-selection versus market-selection, and producer-orientation versus consumer-orientation. Such a typology articulates the importance of consumer behavior in the policy design for a transition, and the relevance for the market to select target subjects of policy at the deployment stage of clean technology innovation. We apply this typology to policy instruments of China's new energy vehicle (NEV) industry between 1991 and 2015 in order to explain the industry's rapid growth. The focus of China's policy mix has changed from government-selection to market-selection, and from producer-orientation to consumer-orientation. Other than the new typology, this paper traces the entire history of policy transition within China's NEV industry, and finds the transition to be a result of policy learning, thus contributing to future empirical studies of this industry.

Schneidewind, U. and Augenstein, K., 2016, Three schools of transformation thinking: The impact of ideas, institutions, and technological innovation on transformation processes, *GAIA: Ecological Perspectives for Science and Society*, 25(2), 88-93

To identify the main drivers of transformation, it is helpful to identify the transformation perspectives of three specific schools of thought: idealist, institutional, and technological innovation. By differentiating among these schools of thought, a more informed transformation debate becomes possible, thereby increasing transformative literacy in academia and society.

Gillard, R., 2016, Unravelling the United Kingdom's climate policy consensus: The power of ideas, discourse and institutions, *Global Environmental Change*, 40, 26-36

As climate change policies and governance initiatives struggle to produce the transformational social changes required, the search for stand out case studies continues. Many have pointed to the period between 2005 and 2008 in the United Kingdom as a promising example of national level innovation. With strong cross-party consensus and a first-of-its-kind legislation the UK established itself as a climate policy leader. However, early warning signs suggest that this institutionalised position is far from secure. Through a novel application of discursive institutionalism this article presents a detailed analysis of the role of ideas in unravelling this ambition under the Conservative-Liberal coalition administration (2010–2015). Discursive interactions among policymakers and other political actors were dominated by ideas about governmental responsibility and economic austerity, establishing an atmosphere of climate policy scepticism and restraint. By situating this conspicuous and influential process of bricolage within its institutional context the importance of how policymakers think and communicate about climate change is made apparent. The power of ideas to influence policy is further demonstrated *through* their cognitive and normative persuasiveness, by imposing *over* and excluding alternatives and *in* their institutional positioning. It can be concluded that despite innovative legislation, institution building and strategic coordination of different types of governance actors the ideational foundations of ambitious climate change politics in the UK have been undermined.

Linquiti, P and Cogswell, N. 2016. The Carbon Ask: Effects of climate policy on the value of fossil fuel resources and the implications for technological innovation. *Journal of Environmental Studies and Science*, in press

Strong policies to address climate change will almost certainly require that large quantities of oil, natural gas, and coal remain underground. Because these resources have economic value, action to reduce carbon emissions means that fossil fuel owners and producers, and other entities in the fossil fuel supply chain, will experience a reduction in wealth. They will be on the receiving end of what we call the “Carbon Ask.” We compile disparate data sources, make some simplifying assumptions, and approximate the value of the Carbon Ask for the world as a whole. We find that the value of the world’s fossil fuel enterprise in a business-as-usual case, unconstrained by climate policy, is about \$295 trillion. In a world with a strong climate policy, the value of these resources drops to about \$110 trillion, a decrease of \$185 trillion, or 63 %. The Carbon Ask is equivalent to 2.4 years of global GDP. After reviewing the literature on resistance to technological innovation during the past two centuries and examining legal challenges to recent US greenhouse gas regulations, we find it unsurprising that the Carbon Ask creates powerful incentives for many stakeholders—who may be firms, workers, consumers, and governments—to resist policies to speed the development and diffusion of new, more environmentally benign technologies. We also find few precedents for policy-driven, rather than market-driven, technological transformations with a scale and scope similar to decarbonization of the global economy.

Kishna, M., Negro, S., Alkemade, F., Hekkert, M., 2016, Innovation at the end of the life cycle: discontinuous innovation strategies by incumbents, *Industry and Innovation*, in press

This paper focuses on the strategies of incumbents that seek to develop discontinuous innovations within the boundaries of a mature innovation system. Mature innovation systems do not provide support for these discontinuous innovations. This article focuses on exploring why incumbents in these setting engage in discontinuous innovation and what strategies they deploy to become successful. We analyse 10 cases of incumbents developing discontinuous innovations in the mature Dutch greenhouse horticulture sector. The results of our analysis show that the incumbents are primarily triggered by dissatisfaction with the current way of doing business and that the existing institutions are the main barrier to discontinuous innovation. In response, the incumbents try to circumvent the existing innovation system in their innovation process, but when successful also engage in changing the existing innovation system. This paper contributes to the understanding of the role of incumbents as source of discontinuous innovation in mature innovation systems.

Axon, S. (2016), “The Good Life”: Engaging the public with community-based carbon reduction strategies, *Environmental Science & Policy*, 66: 82-92.

In recent years the UK has positioned itself to become a global leader in addressing climate change. Along with this positioning, there has been an increasing emphasis on the role of communities to facilitate, increase and sustain carbon reduction practices. Previous research into community-based carbon reduction projects has highlighted the difficulty of engaging the public in community initiatives and sustaining pro-environmental behaviours. The importance placed on addressing climate change necessitates an understanding of how individuals respond to, and engage with, (or even ignore) community-based carbon reduction strategies. The paper presents findings from focus groups in three urban communities and investigates individual engagements with community-based carbon reduction strategies. Focusing on the three dimensions of engagement: cognitive; affective and; behavioural, the paper discusses what people know, feel and do about addressing climate change at the community level. An “information-vacuum” is reported that leads to an “awareness-involvement gap” that inhibits sustained engagement with community projects. Drawing on these findings, the paper advances a new theoretical framework and a “what works” approach for community-based

initiatives attempting to meaningfully engage the public with addressing climate change and sustainable living.

Kishna, M., Niesten, E., Negro, S., Hekkert, M.P. (2016) The role of alliances in creating legitimacy of sustainable technologies: A study on the field of bio-plastics, *Journal of Cleaner Production*, in press

In the transition to a more sustainable world, the development of sustainable technologies needs to be accompanied by promoting the legitimacy of the technologies. Consumers that perceive a technology as desirable and appropriate are more likely to adopt it. Organizations can collaborate to enhance the legitimacy of new technologies. While previous research has emphasized the importance of collaboration in the field of sustainability, it has not studied collaborative efforts of organizations aimed at achieving legitimacy of sustainable technologies. The contribution of this paper is therefore to analyze the role of inter-organizational alliances in creating legitimacy for a sustainable technology. The paper contributes to the literature by analyzing how alliances create three types of legitimacy: technology-sourced market legitimacy, technology-sourced social legitimacy and technology legitimacy. It focuses on the case of bio-plastics, which is emerging as a sustainable technology in the chemical industry. The analysis is based on a database containing information on 105 alliances in the field of bio-plastics over the period 1990–2013. The results show that alliances aim to promote technology-sourced market and social legitimacy by providing access to the sustainable technology of a partner, by collaboratively developing a sustainable technology, or by providing the technology of a partner with access to customers and production capacity. Alliances promote technology legitimacy by relying on positive externalities, by exercising their signaling role, and by acting as institutional entrepreneurs. The paper concludes that there are differences between alliances that create technology-sourced market and social legitimacy on the one hand, and technology legitimacy on the other hand. The first type of alliances are often bilateral alliances between for-profit companies that produce and market sustainable technologies. In contrast, alliances that stimulate technology legitimacy are multilateral alliances that operate in the pre-competitive stage of the value chain and involve not-for-profit organizations.

Upham, P., Klitkou, A., Sutherland Olsen, D. Using Transition management concepts for the evaluation of intersecting policy domains ('Grand Challenges'): the case of Swedish, Finnish and UK biofuel policy, *International Journal of Foresight and Innovation Policy*, Vol. 11, Nos. 1/2/3, pp.73-95

The notion of 'grand challenges' (GC) is increasingly used in international research and innovation discourse, but risks being used rhetorically to justify business as usual policy approaches. We draw on a study that maps the characteristics of policy problems and proposals referred to in association with 'GC', showing how transition management fits well as a response to these characteristics. We then use the transition management perspective to evaluate prevailing research and innovation policy for an exemplar policy sector (biofuels), in countries with differing policy histories for that sector (the UK, Norway and Sweden). We argue that transition management functions well as a means of highlighting not only policy shortcomings in a sector, but also policy directions appropriate to the scale of GC.

Foulds, C. and Christensen, T.H., 2016, Funding pathways to a low-carbon transition, *Nature Energy*, 16087

The framing of funding programmes can sustain existing ways of conceptualizing particular problems, as well as create new ones. Yet, without more prominent roles for social sciences and humanities, the techno-economic conceptualization of energy consumers could hinder long-term low-carbon aspirations.

Hermans, F., Roep, D., Klerkx, L., 2016. Scale dynamics of grassroots innovations through parallel pathways of transformative change. *Ecological Economics*, 130, 285-295

An important issue for the study of grassroots innovations and the geography of sustainability transitions is how scales affect transformative change. In this paper we will address the questions of 1) how grassroots innovations for sustainable agriculture are scaled and 2) the consequences of crossing different scales and levels on the characteristics of the grassroots innovation. We propose a framework of five different scales to analyze the development of grassroots innovations and we apply this framework on the long-term development of an agricultural grassroots innovation movement that pioneered innovative dairy farming practices combined with landscape management. The results show how the initial innovation coalition built around low external input farming became fragmented. Each of the resulting new grassroots innovation coalitions used different strategies for upscaling and outscaling that depended on differences in their (regional) contexts and institutional support. The grassroots innovation thus developed along three parallel, at times intersecting, innovation pathways. The distributed agency of multiple actor groups working in parallel leads to a continuous renegotiating of meaning that poses a challenge to the idea of planned processes of outscaling and upscaling of grassroots innovations.

Luederitz, C. et al., 2016, Learning through evaluation – A tentative evaluative scheme for sustainability transition experiments, *Journal of Cleaner Production*, in press

Transitions towards sustainability are urgently needed to address the interconnected challenges of economic development, ecological integrity, and social justice, from local to global scales. Around the world, collaborative science-society initiatives are forming to conduct experiments in support of sustainability transitions. Such experiments, if carefully designed, provide significant learning opportunities for making progress on transition efforts. Yet, there is no broadly applicable evaluative scheme available to capture this critical information across a large number of cases, and to guide the design of transition experiments. To address this gap, the article develops such a scheme, in a tentative form, drawing on evaluative research and sustainability transitions scholarship, alongside insights from empirical cases. We critically discuss the scheme's key features of being generic, comprehensive, operational, and formative. Furthermore, we invite scholars and practitioners to apply, reflect and further develop the proposed tentative scheme – making evaluation and experiments objects of learning.

Gailing, R., 2016, Transforming energy systems by transforming power relations. Insights from dispositive thinking and governmentality studies, *Innovation: The European Journal of Social Science Research*, in press

Energy transitions bring about changes in the infrastructural energy system and in the social sphere. Crucially, these changes touch upon power relations. Thus, studying the social order through the perspective of the energy system should include an understanding of “power”. Dispositive thinking and governmentality studies are two promising approaches for conceptualizing power relations. Whereas dispositive thinking is important for understanding powerful and strategic socio-material configurations, the concept of governmentality provides a framework for the analysis of how and why individuals adopt certain subject positions in the face of technologies of power. The value of the two approaches is illustrated with an empirical case study from the German *Energiewende*: renewable energy development in north-western Brandenburg. The paper concludes by comparing the relative strengths and weaknesses of dispositive thinking and governmentality studies and by discussing how further research on the role of power in energy systems can be conceptualized.

Droste, N., Hansjurgens, B., Kuikman, P., Otter, N., Antikainen, R., Leskinen, P., Pitkanen, K., Saikku, L., Loiseau, E., Thomsen, M., 2016, Steering innovations towards a green economy: Understanding government intervention, *Journal of Cleaner Production*, 135, 426–434

In this paper we analyse institutional conditions facilitating the transition towards a green economy by encouraging investment in the enhancement of natural capital and social equity, focussing especially on government interventions. Presenting a conceptual institutional

model how innovation generally occurs, we depict system levels that can be influenced by government interventions to facilitate societal innovations towards a green economy. We hypothesize that the transition to a green economy is about extending the possibility frontier outwards towards a greener economy while at the same time limiting the “action space” at the brown economy end; a normative evaluation framework is presented to assess transitions correspondingly. We elaborate on the emerging lessons for governance by examining evidence from five selected European case studies, and provide a non-exhaustive list of impacts that government intervention may have on the action spaces available at different system levels.

Doci, G. and Gotcheb, B., 2016, When energy policy meets community: Rethinking risk perceptions of renewable energy in Germany and the Netherlands, *Energy Research and Social Science*, 22, 26-35

Although in academic literature several analyses can be found concerning energy policy instruments and their effectiveness in supporting renewables, usually no distinction is made between different investor groups that these instruments address. The present article focuses on an emerging group of investors, namely renewable energy communities, and on policy instruments fostering their operation and spread. The aim of the article is to assess and compare national support systems in Germany and in the Netherlands, respectively to identify which instruments are perceived as the ones most effectively supporting community-based renewable energy projects. To do so, first we adopt an investors’ risk framework to evaluate the effectiveness of support systems according to their ability to decrease investors’ risks, and we operationalize this framework by introducing indicators for a theory led analysis. Second, we also explore the investors’ perceptions of the policy instruments by conducting interviews with community members to see which instruments are perceived supportive in practice and which ones are less popular among community investors. Our results show that in both countries instruments designed and expected to reduce specific types of risk do not always achieve that goal practice, and this is reflected in the perception of the aforementioned investor groups.

Batel, S., Castro, P., Devine-Wright, P., and Howarth, C., 2016, Developing a critical agenda to understand pro-environmental actions: Contributions from Social Representations and Social Practices Theories, *WIREs Climate Change*,

Debates over the value and compatibility of different approaches to understanding and changing environmental-relevant actions proliferate across the social sciences. This article reviews and discusses some of the (socio-)psychological and sociological approaches in those debates. We will start by critically reviewing the (socio-)psychological perspectives, highlighting two main shortcomings. First, they are often partial in their focus—concentrating on the consumption side of climate-relevant actions and, relatedly in changing these actions at the individual level. They tend to assume that individual change equates to social change and, with that, fail to contextualize ‘anti’-environmental actions in current neoliberal, capitalist societies. Second, they usually present the mainstream (socio-)psychological approaches, which are ontologically individualistic and cognitive, as the only existent ones, therefore neglecting other perspectives within Social Psychology which might actually be (more) compatible with sociological perspectives. We then suggest that Social Representations Theory (SRT), as an ontologically social-psychological approach and a theory of social change, might be reconciled with sociological approaches, such as Social Practices Theory (SPT), in contrast to the more individualistic (socio-)psychological perspectives. After reviewing the main tenets of SRT, its discrepancies and potential synergies with SPT, we discuss how both can be articulated to understand different stages of the social change process toward more environmentally sustainable societies. While SPT might be more suitable to understand stability or how some actions become habitual, SRT might be better equipped to understand how those change, or how individuals and groups negotiate new actions with old ones.

Zahraie, B., Everett, A.M., Walton, S. and Kirkwood, J., 2016, Environmental entrepreneurs facilitating change toward sustainability: A case study of the wine industry in New Zealand, *Small Enterprise Research*, in press

This research explores the roles and strategies of environmental entrepreneurs in fostering wider change within their sociotechnical system, employing a qualitative case study in the context of the New Zealand wine industry to provide illustrative depth. A combination of strategic niche management and evolutionary theory of organizational change is used to explain the findings, focusing on the three key aspects of learning, networking, and articulation taking place at niche level. The research proposes that while environmental entrepreneurs facilitate processes of change through their actions, they are strongly influenced by broader business environment factors such as financial pressures and acceptance of their philosophies among the wider population; as a consequence, their actions indicate role shifts between being proactive, influential actors and reactive, self-centered players.

Sharpe, B., Hodgson, A., Leicester, G., Lyon, A. and Fazey, I., 2016, Three horizons: A pathways practice for transformation, *Ecology and Society*, 21(2):47

Global environmental change requires responses that involve marked or qualitative changes in individuals, institutions, societies, and cultures. Yet, while there has been considerable effort to develop theory about such processes, there has been limited research on practices for facilitating transformative change. We present a novel pathways approach called Three Horizons that helps participants work with complex and intractable problems and uncertain futures. The approach is important for helping groups work with uncertainty while also generating agency in ways not always addressed by existing futures approaches. We explain how the approach uses a simple framework for structured and guided dialogue around different patterns of change by using examples. We then discuss some of the key characteristics of the practice that facilitators and participants have found to be useful. This includes (1) providing a simple structure for working with complexity, (2) helping develop future consciousness (an awareness of the future potential in the present moment), (3) helping distinguish between incremental and transformative change, (4) making explicit the processes of power and patterns of renewal, (5) enabling the exploration of how to manage transitions, and (6) providing a framework for dialogue among actors with different mindsets. The complementarity of Three Horizons to other approaches (e.g., scenario planning, dilemma thinking) is then discussed. Overall, we highlight that there is a need for much greater attention to researching practices of transformation in ways that bridge different kinds of knowledge, including episteme and phronesis. Achieving this will itself require changes to contemporary systems of knowledge production. The practice of Three Horizons could be a useful way to explore how such transformations in knowledge production and use could be achieved.

Abson, D.J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., Von Wehrden, H., Abernethy, P., Ives, C.D., 2016, Leverage points for sustainability transformation, *Ambio*,

Despite substantial focus on sustainability issues in both science and politics, humanity remains on largely unsustainable development trajectories. Partly, this is due to the failure of sustainability science to engage with the root causes of unsustainability. Drawing on ideas by Donella Meadows, we argue that many sustainability interventions target highly tangible, but essentially weak, leverage points (i.e. using interventions that are easy, but have limited potential for transformational change). Thus, there is an urgent need to focus on less obvious but potentially far more powerful areas of intervention. We propose a research agenda inspired by systems thinking that focuses on transformational 'sustainability interventions', centred on three realms of leverage: reconnecting people to nature, restructuring institutions and rethinking how knowledge is created and used in pursuit of sustainability. The notion of leverage points has the potential to act as a boundary object for genuinely transformational sustainability science.