

Newsletter 18, December 2015

This is the 18th 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,

As the COP-21 negotiations in Paris draw to a close, the attention for transitions and system innovation continues to increase, as such changes will be necessary to reach the goals of limiting climate to 1.5 or 2 degrees. Some high-level examples are the following.

- The Vice Chair of the IPCCs Working Group 3 (Diana Ürge-Vorsatz) told me that she and the new Co-Chair (Jim Skea) would like to introduce much more transition science into the next round of the IPCC review process and perhaps also invite transition scholars into the working group itself.
- The OECD has organized a major workshop on ‘Enabling the next industrial revolution: Systems innovation for green growth’ (14-15 December 2015, Paris). The accompanying issue paper suggests that the OECD has adopted substantial parts of our problem framing, since they define system innovation as “radical innovations in socio-technical systems that fulfil societal functions, entailing changes in both the components and the architecture of systems, They are characterized by three main features: 1) disrupting knowledge and technical capabilities, 2) fundamental changes in consumer practices and markets, 3) novel types of infrastructures, institutional rules and skill sets” (p. 12).
- An EU expert group on the circular economy recently published a report titled *From Niche to Norm*, which advocates a “systemic approach to eco-innovation to achieve a low-carbon circular economy”.
- Another EU expert group on Green Growth and Jobs, chaired by Carlota Perez, is due to publish its report in January 2016. The chair told me ideas of transition and system innovation are likely to figure prominently in their recommendations.

- A recent World Energy Outlook report from the International Energy Agency (*Energy and Climate Change*) has a chapter on 'Achieving the transition: Long-term energy sector transformation'.

These examples are encouraging because they show that the discourse of transitions and system innovation is entering the thinking of high-level international think tanks, policy bodies and research platforms. It seems likely that this process will continue in 2016, especially if the COP-21 closes with an ambitious agreement.

This newsletter informs you about recent scientific outputs and events in the sustainability transitions community. The publications section again takes up about 3/4 of the newsletter, demonstrating continued high-quality output in a wide range of journals. It also includes several new PhD theses, which document new work by early career researchers, and several books. The 'network news' section shows that the two recently created networks are very active in several ways. These networks are the 'PhD in transition network' and the Transition LACASAF Network (Latin America and the Caribbean, Asia & Africa). The modelling-oriented network has also been active, publishing, for instance, a position paper in EIST. The STRN Steering Group welcomes these bottom-up initiatives. Although the STRN Steering Group has no secretariat, no budget, and operates entirely on the basis of voluntary efforts, we are happy to support these initiatives through the newsletter, mailing list, website and personal contributions. If you are interested in joining and/or contributing to these new networks, please use the contact details provided below.

I hope you will enjoy the updates in this newsletter and wish you all the best for the festive season.

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

Environmental Innovation and Societal Transitions

Volume 17 (December 2015) of *Environmental Innovation and Societal Transitions* contains a special section, four regular papers, and a book review by M. Sawyer. The latter discusses the acclaimed book *Capital in the Twenty-First Century* by Thomas Piketty.

The regular papers are:

- Offshore oil and gas firms' involvement in offshore wind: Technological frames and undercurrents, by G.H. Hansen and M. Steen
- Substituting silver in solar photovoltaics is feasible and allows for decentralization in smart regional grids, by A. García-Olivares
- Success factors and strategies for sustainability transitions of small-scale communities - Evidence from a cross-case analysis, by N. Forrest and A. Wiek
- Prospects of modelling societal transitions: Position paper of an emerging community, by G. Holtz, F. Alkemade, F. de Haan, J. Köhler, E. Trutnevyte, T. Luthe, J. Halbe, G. Papachristos, E. Chappin, J. Kwakkel and S. Ruutu

The special Section deals with "The Geography of Sustainability Transitions", edited by B. Truffer, J.T. Murphy and R. Raven. It includes, next to an editorial, eight articles:

- The geography of sustainability transitions: Contours of an emerging theme, editorial by the guest editors
- Human geography and socio-technical transition studies: Promising intersections, by J.T. Murphy
- The geography of sustainability transitions: Review, synthesis and reflections on an emergent research field, by T. Hansen and L. Coenen
- Trajectories of sustainability transitions in scale-transcending innovation systems: The case of photovoltaics, by U. Dewald and M. Fromhold-Eisebith
- Dynamics of a policy-driven market: The co-evolution of technological innovation systems for solar photovoltaics in China and Germany, by R. Quitzow
- Transnational linkages in sustainability experiments: A typology and the case of solar photovoltaic energy in India, by A.J. Wiecezorek, R. Raven and F. Berkhout

- Toward a spatial perspective on niche development: The case of Bus Rapid Transit, by F. Sengers and R. Raven
- Towards an 'alternative' geography of innovation: Alternative milieu, socio-cognitive protection and sustainability experimentation, by N. Longhurst
- Transitioning the food system: A strategic practice management approach for cities, by N. Cohen and R.T. Ilieva

We look forward to receive your submission. Again, please don't forget to read, and if relevant to cite, EIST. For advice and tips on writing an effective article for EIST, see <https://phdsintransitions.wordpress.com/2015/12/01/a-brief-guide-to-article-writing>
Jeroen van den Bergh, Editor-in-Chief [jeroen.bergh@uab.es]

Network News

Any news related to ongoing activities of STRN

News from Transition LACASAF Network (Latin America and the Caribbean, Asia & Africa)

On the 16th of November the Network Transition LACASAF conducted a webinar. Anna Wiezoreck from the STRN steering group provided enthusiastic welcome remarks. The webinar focused on two topics: How to initiate a session at the next IST conference destined to challenges of transition studies in an developing and emerging country context and (2) the SEVEN research initiative by Pradip Swarnakar and Stephen Zavestoski.

A proposed session at the next IST conference 2016 at Wuppertal Institute, should particularly involve speakers from developing and emerging economies. A bullet point was added to the call for papers and further discussions with the IST organisers and the Wuppertal Institute will follow. If you want to participate in this initiative or would like to be a presenter, please contact the network.

The Sustainability Experimentation Venture Network (SEVeN) is conceived as a possible answer to the broad question of how community-based sustainability experiments can inform sustainability transitions. Focused on bottom-up resource for sustainability transitions, SEVeN aims to address the specific question of what it would take to aggregate knowledge from community-based sustainability experiments in a systematic way, and how that knowledge can be organized to be accessible across levels of expertise, cultural differences and language barriers. A case study in India is planned. If you would like to receive further information or if you have community based sustainable innovations then please contact directly the presenters: Pradip Swarnakar (swarnakar@gmail.com) or Steve Zavetoski (smzavestoski@usfca.edu).

The next webinar is planned on the Tuesday, 15th of December at 11.30am. Girogina Silvestri will present on: 'Co-creating transition pathways for empowering local communities' to act for sustainability. The case of 'La Botija' protected area, San Marcos de Colón, Honduras.' In particular I will describe an action research and the application of Transition Management in communities in a rural area in Honduras. If you want to subscribe to the network please send an email to: Linda Kamp and Verena Streitferdt at transitions.lac.as.af@gmail.com or at verena.streitferdt@uts.edu.au.

News from the PhD and ECR network

Our network is now called **PhDs in Transitions**, and we have inaugurated a blog (phdsintransitions.wordpress.com) and a mailing list for related announcements ([subscribe here](#)). In the blog, we have posts by invited authors which provide advice for students and young researchers, announcements and reviews of events and commentaries about research and careers. Recent posts include a [A Brief Guide to Article Writing for the Young Researcher](#) (by prof. Jeroen van den Bergh) and [Reflections on the STEPS Centre Summer School 2015](#) (co-authored by PhD candidates Fredric Bauer and Aniek Hebinck). Since its creation, the blog has been viewed by 250 visitors from 31 countries.

To reflect the diversity of our community, we will operate it with a group of editors and invited authors, which will curate the blog for periods of 2-3 months ([more information about this opportunity here](#)).

Also, we have recently announced a Conference hosted by Greenwich University. To better serve our community, the organising committee have decided to postpone the event. The conference will now take place on the 24th and 25th of April 2016.

Corrected dates

Deadline for call for abstract - 7th February

Notification of acceptance - 14th February

Registration - 14th February - 14th April

Event - 24th-25th

For more information, visit the [conference' website](#).

The event has four thematic areas: Public Service Reforms; Urban Transitions towards Sustainabilities; Mixed method approaches in Transitions Research; and Socio-technical change and transitions towards sustainability across geographies. Delegates will be able to present their work-in-progress and discuss topical, methodological, theoretical and practical issues related to their academic work, doctoral and postdoctoral research projects.

If you would like to know more about our network, or if you would like to contribute to the blog as an author or editor, please contact us on welcomed2transitions@gmail.com.

Event announcements

Calls for upcoming relevant events such as workshops and conferences

International Sustainability Transitions (IST) Conference 2016 in Wuppertal

The 7th International Sustainability Transitions (IST) Conference will take place in Wuppertal, Germany from 6 - 9 September 2016. The conference is the annual platform to share theoretical, empirical and practical advances in the field of sustainability transitions, covering a broad range of areas and disciplinary approaches. The theme for this IST conference is "Exploring Transition Research as Transformative Science" and there will be a special focus on impact- and solution-oriented research approaches enabling transitions in practice. Contributions are invited on the conceptual and methodological challenges of research that is actively involved in societal transformation processes as well as contributions focusing on the broad range of topics of the STRN research agenda. We want to make IST 2016 a very practical transition experience and we are pleased to welcome you to Wuppertal and our urban real-world lab with its many exciting projects and initiatives and we are looking forward to an engaging and impactful IST 2016. The Call for Papers has been sent to the STRN mailing list and can be downloaded at the conference website: www.ist2016.org. Submission and Registration will open mid-January 2016.

'Innovation and disruption: The energy sector in transition', 21-22 September, 2016, Oxford, UK, organized by British Institute of Energy Economics (BIEE)

The 2016 conference will focus on the themes of disruption and innovation which are characteristics of current energy industries and markets, nationally and globally. Every part of the energy sector is experiencing rapid change and high rates of innovation, with some examples of managed transitions, but often with disruptive transformation driven by external factors. This conference will explore how energy economics and policy analysis can help chart a course through the uncertainties, facilitating technology development, investment and securing consumer trust, towards low carbon, secure and affordable sustainable energy systems in the long-term.

Submissions aligned to the conference theme are welcomed from energy researchers and practitioners in the policy, industry, financial, analyst, consulting and media communities for presentation in the conference parallel sessions. The deadline for submitting abstracts is March 2nd 2016. Conference website: <http://www.biee.org/oxford-2016-innovation-disruption-energy-sector-transition/>.

Track at EGOS conference + special Issue on “Multinationals, Sustainability and Social Change”

The EGOS conference 2016 hosts a track which deals with the role of multinational corporations in sustainability transitions (connected with a special issue in the International Journal of Business Environment).

Recent years have seen growing recognition that multinational corporations (MNCs) are resourceful actors that can play a crucial role for sustainable development and social change (Salciuviene et al. 2009). However, while these roles are widely recognised, relevant theories and debates have often remained unconnected. A key aim of this special issue is to explore the theoretical intersections around the complexities of MNCs, sustainability and social change. Diverse theoretical perspectives implicitly or explicitly address the role MNCs play in sustainable development and social change, such as (i) the growing literature on sustainability transitions (e.g., Geels 2011; Loorbach & Wijsman 2013), (ii) network theories (Webb et al. 2010, Ritvala et al. 2014), (iii) institutional change and the role of MNCs in institutional voids (e.g., Mair and Martí 2009, Pinkse and Kolk 2010, Tracey and Phillips 2011), (iv) more traditional international business perspectives (e.g., Shane & Venkataraman 2000, Birkinshaw et al. 2005, Freeman et al. 2010, Khanna & Palepu 2010, Ellis 2011, Jones 2011), and (v) complexity theory (de Lange et al. 2015). However, these theoretical approaches are primarily discussed in separate streams of literature. This special issue therefore aims to provide a platform for linking previously unconnected streams of literature on the (positive and negative) contributions of MNCs to sustainable development and social change, as well as to discuss the relevant theoretical concepts based on new empirical insights. It will explore the manifold roles of MNCs in the institutional, environmental and social domain. The issue will carry revised and substantially extended versions of selected papers presented at the “Multinationals and Entrepreneurship” subtheme of EGOS 2016, but we also strongly encourage researchers unable to participate in the conference to submit articles for this call.

Special issue: <http://www.inderscience.com/info/ingeneral/cfplist.php?jcode=ijbe>
EGOS Conference: http://www.egosnet.org/jart/prj3/egos/main.jart?rel=de&reserve-mode=active&content-id=1434639284029&subtheme_id=1407070330982

Call for papers for special EIST on “Perspectives on the sharing economy” edited by Koen Frenken (Utrecht University), deadline 1 March 2016.

This special issue will tackle the many sides of the sharing economy, looking at economic, social and environmental effects and discussing possible policies and regulations. Among the questions are: i. What theoretical perspectives help to explain the nature and growth of the sharing economy? ii. What are the economic, social and environmental impacts of the sharing economy? iii. How do sharing platforms disrupt existing industries? iv. What are the institutional responses across industries and across localities? And v. How does sharing affect inequality in society?

All those who attended the 1st International Workshop on the Sharing Economy in Utrecht (June 2015) or who will attend the 2nd edition in Paris (January 2016) are invited to submit their paper, as well as any other scholar who wishes to contribute. The published articles will be available through Open Access for six months after the issue is published.

For more information, see: <http://www.uu.nl/en/news/call-for-papers-for-a-special-issue-in-environmental-innovation-and-societal-transitions>

Transitions Hub Launch Event: Tuesday 2nd February 2016 – 9:00-16:00, Brussels

It is with great pleasure that we announce the launch of Transitions Hub, the European competence and training centre for applied transition management. COP 21 will build substantial momentum for the transition to low carbon society and economy. If we are to tackle climate change effectively, capacity building and knowledge development at the practitioner level is required within public administration, industry, business and policy making. Join our free one-day launch event which will feature;

- A forum for discussion with leading experts from academia, international organisations, policy making and innovation
- An introduction to our practitioner-orientated approach to enabling systemic management of innovation on climate change
- Networking opportunities and interactive breakout sessions to grow our community

You are kindly invited to share this invitation amongst your colleagues and networks. You can register or find more information at [this link](#):

<https://www.eventbrite.co.uk/e/the-transitions-hub-launch-event-tickets-19802016364>

Or you can contact **Stuart Bowles** (stuart.bowles@climate-kic.org).

Event Reviews

Review of events interesting to the STRN community

A training pathway for Climate-KIC Transition Facilitators of Emilia-Romagna

From October to December 2015, a series of Local Seminars called “The Transition Facilitator” has been held in Emilia Romagna Region (Italy). The training pathways was designed for three week-ends and addressed to 25 regional transition practitioners developing transition initiatives in cities and local communities in Emilia-Romagna. In this Region, a growing number of local Transition Towns Initiatives have been already activated and connected with the local governments, schools, university and other groups of activists. This fact has created a good environment to experiment with new ways to ignite social and sustainable innovation. The Local Seminars on Transition Facilitator has provided a framework for nurturing local existing transition initiatives through interdisciplinary and inspiring sessions on sustainability transition, facilitation methods and in working projects. At the end of the course, participants have deepened their knowledge and empowered their innovative role for a systemic change. The training concept has been created by a combination of experiences developed through the Climate-KIC RIC Emilia-Romagna and the Transition Italia, very active movement in the Regional context. The course was also supported by ANCI Emilia-Romagna. We are willing to share this training pathway for furthermore application in different contexts and scale-up. francesca.cappellaro@enea.it; paola.valandro@aster.it Links: Climate-KIC Emilia-Romagna www.climatekicemiliaromagna.it/articoli/il-facilitatore-della-transizione Climate-KIC www.climate-kic.org

8th Annual Integrated Assessment Modeling Consortium (IAMC) Meeting, 15-18 November 2015, Potsdam, Germany

Integrated Assessment Modeling Consortium (IAMC) is a group of research organizations that develop and use integrated assessment models of climate change. Such models encompass climate modeling on the one hand and modeling of impacts, adaptation, and vulnerability on the other. The consortium was created in 2007 in response to a call of the Intergovernmental Panel on Climate Change (IPCC) for an organization that leads the development of new scenarios for the near-term and long-term analysis of climate change.

Although STRN and IAMC traditionally adopt very different perspectives to analyzing transitions, in the IAMC annual meeting this year Evelina Trutnevyte from ETH Zurich joined the panel session on “Future of integrated assessment modeling” to comment on the links between the STRN agenda and potential synergies with integrated assessment modeling.

During the session several thematic topics were raised by the panel and the audience for potential collaborations. Integrated assessment models rarely consider context-specific, non techno-economic drivers of transitions. Transition scholars could add this missing perspective, e.g. the role of multi-actor governance, culture, or behavior. In return, integrated assessment models could quantify the climate change implications of the factors that transitions scholars analyze. Integrated assessment models could also be tools to aggregate the local, context-specific insights to the global level.

During this session an idea was raised to organize a workshop with researchers from the two communities on "equal footing", i.e. represented in 50/50 shares, in order to elaborate on the potential collaborations further. More information, including a meeting report and presentation slides, will be available soon on the IAMC website:

<http://www.globalchange.umd.edu/iamc/events/eighth-annual-meeting-of-the-iamc-2015/>

Publications

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

PhD thesis: John Cameron Roberts (defended on 6 November 2015), *The evolution of discursive story-lines during socio-technical transitions: An analytical model applied to British and American road and rail transport during the twentieth century*, Manchester Business School, University of Manchester

This thesis develops and tests an analytical model describing the development of discursive story-lines at the niche and regime levels during a socio-technical transition. The problem is considered from a longitudinal and symmetrical perspective, meaning that it accounts for both positive and negative story-lines about niche and regime technologies over the entire course of a transition. The thesis develops a four-phase analytical model to describe how these storylines make sense of niche and regime technologies during a transition. This model is based on insights from two theoretical fields. The first is transitions theory, which describes how the relationship between niche and regime technologies changes over time, and suggests four moments of struggle during a transition. The second of these is Snow and Benford's theory of frame resonance, which suggests four discursive resources which determine the appeal of story-lines. By combining these two theories, it is possible to identify the discursive resources available to niche and regime actors at different struggles during a transition, and the content of the story-lines that will be based on these resources. This leads to an analytical model in which niche and regime story-lines go through four identifiable phases as a niche technology replaces an incumbent regime. During each phase, story-lines promoted by niche and regime actors are shaped by the relationship of the two technologies to each other, the influence this has on niche and regime actors' access to the four discursive resources, and by the 'cultural landscape', which accounts for large-scale changes in public cultural repertoires. This theory is tested using two case studies, based on primary historical research on the transition from a rail-dominated transport system to a road-dominated transport system in the United Kingdom and the United States. Each of these transitions is broken down into four periods corresponding to the four phases of the analytical model. For each period, research on newspapers, magazines, and political debates provides an account of the dominant story-lines in each period, which are then compared with the analytical model. The findings of this research demonstrate that with some modifications, the analytical model is plausible. This has important implications for transitions theory, most notably that negative story-lines can be a destabilising influence in a socio-technical regime. It is also an important contribution to the debate over the role of conflict, politics, and contested understandings of technology during a socio-technical transition.

PhD thesis: Magda Smink (2015): *Incumbents and institutions in sustainability transitions*, Utrecht University

The field of sustainability transitions has acknowledged the central role of institutions and the importance of incumbents in transition processes. However, little attention has been paid to the relationship between incumbents and institutions. This thesis focuses on how incumbents influence institutions as well as on how institutions influence incumbents. The theoretical framework consists of the institutional work and institutional logics stream within institutional theory. This thesis contains four case studies in the context of the Dutch fossil fuel system. The Netherlands was chosen for its stagnant energy transition and its many

large incumbents related to fossil fuel activities. In terms of institutional work, this thesis concludes that incumbents influence institutions by cooperating with government, providing an alternative plan, framing private interests as public interests, commissioning research, and by speaking through the media. Incumbents are very capable at influencing institutions to their own benefit, and are more effective than new entrants' institutional work. In terms of institutional logics, this thesis concludes that incumbent network operators' behavior is guided by a hierarchy logic featuring operation according to the Gas Law, responsibility for safety and reliability, and preference for large-scale arrangements. Innovative practices tend to be at odds with this logic, as is the case with biomethane production.

The PhD thesis can be downloaded at https://e-pubs.nl/?epub=m.smink#epub_237 or request a hardcopy via magdasmink@gmail.com.

PhD thesis: Marius Korsnes (2015): *Chinese Renewable Struggles: Innovation, the Arts of the State and Offshore Wind Technology*, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

This dissertation studies innovation and technological learning in the making of China's offshore wind industry, and is based on 55 semi-structured interviews and a two-month participant observation in a Western company in China. Innovation is viewed broadly, incorporating interactive learning and circulation of knowledge, competencies, experiences and expectations connected with offshore wind technology. The thesis examines the offshore wind industry in order to better understand the ways in which innovation and technological learning happen and can be understood within one branch of China's renewable energy industries. Using this industry as a case, the thesis may also shed light on innovation processes more generally in the context of China, and how these innovation processes can be conceptualised. The thesis shows how innovation and learning are processes embedded in complex negotiations of power, pride and culture that transcend the technology. The main research questions are therefore: How does China's offshore wind technology development unfold, and how can this process be understood and conceptualised? These questions are explored by comparing and contrasting the way in which three theoretical frameworks can highlight innovation in a Chinese context. These are: Innovation systems, sustainability transitions and actor-network theory. Through four papers and an overview and tie-up essay we observe that Chinese government and offshore wind industry actors are willing and able to take on risk and genuine uncertainty. This risk is identified as related to the uncertainty of rendering technologies and practices Chinese, and whether or not something new will come out of it in the end. In short, the dissertation concludes that Chinese actors take risks to learn. Chinese actors appear to be avid learners, willing to take chances and they seek to be independent. A Chinese innovation environment as described through studying the offshore wind industry can be considered a space where experimentation, learning and exchange of knowledge and experiences eventually will lead to innovation.

PhD thesis: J.C.C.M. Huijben (2015), *Mainstreaming Solar: PV Business Model Design under Shifting Regulatory Regimes*, Eindhoven University of Technology

New technologies like Solar PV require protected spaces called niches where they are shielded from mainstream selection pressures. One form of shielding is financial support that makes the technology competitive with fossil alternatives. However, shielding is always partial in nature. Niche entrepreneurs also have to deal with mainstream regulations. These sometimes counterproductive forces shape the form of the niche. For this thesis we define the combination of niche financial support and mainstream regulations as the *Regulatory Regime* at play. Niche entrepreneurs follow different strategies for dealing with the regulatory regime, ranging from adaptation to attempts to alter it in their favor. Additionally, literature indicates the importance of *Business Model* design in the niche for marketing the technology. However, so far a thorough investigation of the interplay between the regulatory regime and niche business model design has not been done. This thesis aims to fill this gap. A mixed methods research approach was applied including both primary and secondary

sources of data, using a process approach, virtual anthropology and a discourse analysis on barriers for solar PV market up-scaling. Two cases were studied: the Netherlands and the Flanders region of Belgium with relatively low and unstable and high and stable levels of governmental support in place during their exponential growth in the period 2006-2013, resulting in very different business model landscapes over time. The thesis shows the effect of different strategies for dealing with the regulatory regime on niche business model design and how the business model can be a very effective means for stretching the existing regulatory regime, in particular in case of relatively low support levels. I also reflect on the different dimensions of solar PV business models and their ability to remove barriers for up-scaling as well as on impacts of market support costs on broader cost-benefit allocation over different stakeholders within the energy system. The thesis ends with management and policy recommendations, as well as directions for future research.

Book: Brown, L.R., with Larsen, J., Roney, J.M. and Adams, E.E., 2015, *The Great Transition: Shifting from Fossil Fuels to Solar and Wind Energy*, W. W. Norton & Company

The great energy transition from fossil fuels to renewable sources of energy is under way. As oil insecurity deepens, the extraction risks of fossil fuels rise, and concerns about climate instability cast a shadow over the future of coal, a new world energy economy is emerging. The old economy, fueled by oil, natural gas, and coal is being replaced with one powered by wind, solar, and geothermal energy. *The Great Transition* details the accelerating pace of this global energy revolution. As many countries become less enamored with coal and nuclear power, they are embracing an array of clean, renewable energies. Whereas solar energy projects were once small-scale, largely designed for residential use, energy investors are now building utility-scale solar projects. Strides are being made: some of the huge wind farm complexes under construction in China will each produce as much electricity as several nuclear power plants, and an electrified transport system supplemented by the use of bicycles could reshape the way we think about mobility.

Book: Kent, J. (2015), *Community Action and Climate Change*, Routledge, UK.

Climate change presents the greatest risk to humanity this century. Decades of international negotiations amidst fluctuating citizen concern has resulted in little tangible progress towards a future, safe climate. Recently, interest in the action of individuals and community organisations has come to the fore. Governments are increasingly calling on their citizens to take responsibility for climate change. This *individualization of responsibility* positions climate change action at the centre of personal lifestyle choice and individual behaviour. In this book I argue that this *politics of behaviour* fails to engage with broader communities. I develop a theoretical framework for conceptualising how individual agency shifts to collective agency and under the conditions of collective agency citizens develop democratic agency. The wide spread rise in grassroots organisations engaged in forms of social innovation in recent times augurs the potential for broader social transformation. My empirical research involved a multiple case study of eight Australian Climate Action Groups (CAGs). I analysed my multiple case study through the lens of sustainability transitions theory. From this theoretical perspective I argue that CAGs operate as niches of radical innovation with the potential to translate innovation from their niche to the incumbent regime or otherwise destabilise the regime in order for broader social change to occur.

Book: Hodson, M. and Marvin, S. (eds.), 2015, *Retrofitting Cities: Priorities, Governance and Experimentation*, Routledge

Retrofitting Cities comparatively explores how urban scale retrofitting can be conceptualised as a socio-technical transition; to critically compare and contrast different national styles of response in cities of the north and global south; and, to develop new research and policy agendas on future development of progressive retrofitting. Bringing together a group of researchers from a variety of disciplinary backgrounds that reflect the complexity of the research challenge, *Retrofitting cities* looks across different infrastructures and types of built

environment, dealing with diverse urban contexts and examining formal as well as community responses. This is a uniquely practical book for urban planning and policy professionals as well as for researchers in urban studies and urban design.

Hermwille, L., 2016, The role of narratives in socio-technical transitions—Fukushima and the energy regimes of Japan, Germany, and the United Kingdom, *Energy Research & Social Science*, 11, 237-246

In order to reconfigure global socio-economic systems to be compatible with social imperatives and planetary boundaries, a transition towards sustainable development is necessary. The multi-level perspective (MLP) has been developed to study long-term transformative change. This paper complements the MLP by providing an ontological framework for studying and understanding the role of narratives as the vehicle of meaning and intermediation between individual and social collective in the context of ongoing transitions. Narratives are established as an analytical entity to unpack how disturbances at the level of the socio-technical landscape are translated into and contribute to the transformation of socio-technical regimes. To illustrate and test the approach, it is applied to the case of the Fukushima catastrophe: The narratives in relation to nuclear power in Japan, Germany and the United Kingdom are scrutinized and it is explored how these narratives have co-determined the policy responses and thus influenced ongoing transformation processes in the power sectors of the respective countries.

Switzer, A., Bertolini, L. and Grin, J., 2015, Understanding transitions in the regional transport and land-use system: Munich 1945–2013, *Town Planning Review*, 86(6), 699–723

The broadly advocated coordination between transport and land-use planning is being hindered by barriers nested in persistent societal structures and intertwined practices. In order to understand how such barriers can be overcome, we use insights from transition studies to develop hypotheses with regard to why and how transitions in transport and land-use planning take place through an imbedded case study of transitions in the region of Munich from the period of 1945–2013. Of importance are changes in the practices of households and firms, attention from interest groups, institutions allowing for conflict but also being supportive of conflict resolution and the identity of the city as a powerful discursive element in urban transitions.

Hörisch, J., 2015, The role of sustainable entrepreneurship in sustainability transitions: A conceptual synthesis against the background of the Multi-Level Perspective, *Administrative Sciences*, 5(4), 286-300

This paper conceptually synthesizes prior studies on sustainable entrepreneurship against the background of the multi-level perspective. It thereby relates separate streams of literature on sustainable entrepreneurship, sustainability transformations and ecopreneurship, which have previously not been systematically connected and synthesized, to the multi-level perspective. The paper furthermore provides suggestions on how the multi-level perspective can be advanced based on the inspirations of these previously only sparsely-connected streams of literature. Finally, implications for entrepreneurs, academia and politics are presented: means to increase the contribution of sustainable entrepreneurship to sustainability transitions are suggested, and the importance of growth and degrowth is discussed in the context of sustainable entrepreneurship.

Büscher, C. and Sumpf, P., 2015, “Trust” and “confidence” as socio-technical problems in the transformation of energy systems, *Energy, Sustainability and Society*, 5:34

For the development of a sustainable energy system, the public's contribution to the sustainment of the system's current operations will become vital. The public's role is expected to change from that of passive service abiders to active service providers, as

anticipated by visions of prosumers, smart grids, demand side management, virtual power plants, and electric vehicle management. Smart technology and new business models will increase system complexity and the experience of uncertainty and risk for all parties. *Actionability* of the public's participation in the opportunities arising from the transformation of energy systems will become a problem. With a qualitative functionalist method, we analyze the prerequisites of the public's participation: the capacity of social mechanisms, such as trust, for the solution of social problems. Functional problems affect the continuation of communication, i.e., the possibility of the sustainment of social reality. We isolate three case studies that illustrate concrete effects of trust, distrust, and confidence on three parties, respectively: consumers, investors, and those affected by grid extensions. We argue that the social mechanisms of trust and confidence are more vital for consumers, investors, and those affected than previous research has noticed. These mechanisms determine the achievement of sustainability in energy systems by sustaining actionability as a favorable expectation (trust, confidence), or an unfavorable expectation (lack of trust, distrust). Even lack of trust and distrust can be valuable contributors on the road to sustainability, since they uncover flaws and setbacks of a fledgling smart grid.

Nieminen, M. and Hyytinen, K., 2015, Future-oriented impact assessment: Supporting strategic decisionmaking in complex socio-technical environments, *Evaluation*, 21(4) 448–461

The article proposes a systemic and future-oriented evaluation approach designed to support decision-making in complex socio-technical environments. The approach integrates established methods of evaluation, foresight, impact assessment, system dynamic modelling and societal embedding within a single framework to provide versatile information to increase strategic intelligence in decision-making. This generic and flexible framework aims to support decisionmaking in various policy and decision-making situations. It is designed to meet the challenges of the changing innovation environment.

Schmid, E., Knopf, B. and Pechan, A., 2016, Putting an energy system transformation into practice: The case of the German Energiewende, *Energy Research & Social Science*, 11, 263-275

Low-carbon energy system transformations are usually seen from a technical perspective; the decisive societal dimensions of actors and institutions are widely neglected. We contribute to filling this gap by reviewing the German energy transition (Energiewende), which targets a competitive low-carbon economy until 2050, jointly from the three perspectives of technology, actors and institutions. We analyze seven sub-fields of the electricity system that are central for decarbonization from a technology view. For each, we identify and characterize key actors and institutional conditions for future electricity infrastructure developments they favor. The analysis reveals a large variety of engaged actors that differ with respect to their motives and underlying worldviews. Electricity infrastructure visions range from the archetypes of decentralized regional solutions (favored by challengers) to centralized European solutions (favored by incumbents). We illustrate that the determining factors for both developments are primarily of institutional nature and will be fought out between actors in the political arena. From a technology perspective centralized and decentralized solutions may well coexist to a certain degree. However, in either case the long latency period in technical infrastructure development requires anticipatory planning.

Zhao, Z-Y., Chang, R-D., and Chen, Y-L., 2016, What hinder the further development of wind power in China?—A socio-technical barrier study, *Energy Policy*, 88, 465-476

Promoting wind power is a long-term strategy of China to respond to both energy shortage and environmental pollution. Stimulated by various incentive policies, wind power generation in China has achieved tremendous growth, with the cumulative installed capacity being the largest worldwide for five consecutive years since 2010. However, obstructed by various barriers, wind power provides only 2.6% of national electricity generation in China, despite

the strong support from the government. From a socio-technical transition perspective, this paper aims to systematically analyze the barriers hindering the further development of China's wind power. A wind power niche model is established to illustrate the complex interactions among actors in the wind power industry and electricity supply regime. Then, qualitative content analysis is adopted to process the related evidence and data, and four categories of socio-technical barriers are identified, including technology, governance, infrastructure and culture barriers. The study shows that various interrelated barriers form a blocking mechanism which prohibits the further development of wind power in China. Policy suggestions are proposed to eliminate the barriers and further empower the wind power niche. The lesson learned from China can offer useful references for other economies to promote wind power industries of their own.

McLean, A., Bulkeley, H. and Cragg, M. 2015, Negotiating the urban smart grid: socio-technical experimentation in the city of Austin', *Urban studies*, in press

A growing body of literature has emerged that examines cities as key sites for socio-technical experimentation with a variety of initiatives and interventions to reduce carbon emissions, upgrade ageing infrastructure networks and stimulate economic development. Yet while there has been a wide survey of global initiatives and attempts to explain the wider processes driving such experimentation (Bulkeley and Castán Broto, 2013) there remains a lack of empirical case study analysis to bring the concepts into context. In this paper we use the concept of urban experimentation as a lens to discuss the political and social ramifications of one such intervention in a city's energy infrastructure network, with an examination of the Pecan Street smart grid project in Austin, Texas. The ability for cities to manage socio-technical transitions and their inflections by specific locales has been largely neglected in social science research, yet cities around the world are facing similar problems of ageing infrastructures, pressures of resource consumption and demanding shifts towards intermittent renewable technologies. We argue that cities are key arenas for the trialling, testing and development of smart products that can help transition towards a low-carbon economy, however the 'opening up' of cities as experimental nodes is contributing to a restructuring in socio-technical urban governance, creating new spaces for private investment while delegating responsibilities for carbon control down to urban citizens.

Fuenfschilling, L. and Truffer, B., 2016. The interplay of institutions, actors and technologies in socio-technical systems - An analysis of transformations in the Australian urban water sector. *Technological Forecasting and Social Change* (103), 298-312.

Literature on socio-technical transitions has primarily emphasized the co-determination of institutions and technologies. In this paper, we want to focus on how actors play a mediating role between these two pillars of a socio-technical system. By introducing the theoretical concept of institutional work, we contribute to the conceptualization and empirical assessment of agency processes in socio-technical systems. We illustrate this approach by analyzing recent developments in the Australian urban water sector, where seawater desalination technology has experienced an unexpected, but rapid diffusion to all major cities, often interpreted as a reaction to a major multi-year drought. However, the drought broke and left all but one plant unused. This has led many commentators wonder how such a massive investment – which is likely to limit alternative development trajectories in the sector for the coming decades – could have happened so quickly and why other, potentially more sustainable technologies, have not been able to use the momentum of the crisis to break through. A comparative analysis between seawater desalination and its main rival wastewater recycling in regard to processes of institutional work provides valuable insight into how technology, actors and institutions mutually shaped each other.

Quezada, G., Walton, A. and Sharma, A., 2015, Risks and tensions in water industry innovation: Understanding adoption of decentralised water systems from a socio-technical transitions perspective, *Journal of Cleaner Production*, in press

Globally, centralised urban water systems are under pressure to respond to environmental and economic pressures. In Australia, high infrastructure costs and variable rainfall have prompted governments, end-users and property developers to begin investing in more decentralised systems that use alternative water sources (rainwater, stormwater and wastewater). This trend is based on a fit-for-purpose principle and is part of a global shift toward sustainable urban water management. These developments suggest that Australia's urban water sector may be in the early stages of transition and represent a multi-decadal shift from centralisation of water supply and sanitation to partial decentralisation based on local conditions. Much of the scholarship on decentralised systems focuses on drivers and barriers to adoption, which implies a static and mechanistic process of change, and overlooks the complex interplay between exogenous pressures, innovation, multiple actors and industry reform. This paper addresses this gap by analysing temporal processes of Australia's urban water sector, using a regionally based case study comprising an historical review and interview study that analyses the multi-level, -decadal and -actor developments at the nexus between water service provision and property development. The analysis revealed emerging tensions between incumbent water utilities, property developers and end-users, and an inherent conflict between neo-liberal and environmental policy agendas. Such tensions and conflicts are missing from urban water policy and research discourse.

Bouzarovski S. and Herrero S.T., 2015, The energy divide: Integrating energy transitions, regional inequalities and poverty trends in the European Union, *European Urban and Regional Studies*, in press

This paper explores the geographical implications of energy transitions with the EU context. We focus on the spatial distribution of 'energy poverty' - commonly understood as the inability of a household to secure a socially and materially necessitated level of energy services in the home. The existence of a energy poverty 'divide' in the EU provides a starting point for understanding how energy transitions impinge upon the well being of households, as well as existing patterns of regional economic inequality. We have undertaken a comprehensive analysis of spatial and temporal trends in the national-scale patterns of energy poverty, as well as gas and electricity prices. The results of our work indicate that the classic economic development distinction between the core and periphery also holds true in the case of energy poverty, as the incidence of this phenomenon is significantly higher in Southern and Eastern European EU Member States. The paper thus aims to provide the building blocks for a novel theoretical integration of questions of path-dependency, uneven development and material deprivation in existing interpretations of energy transitions.

Markard, J., Wirth, S. and Truffer, B., 2016, Institutional dynamics and technology legitimacy – A framework and a case study on biogas technology, *Research Policy*, 45(1), 330-344

Legitimacy is central for both novel and established technologies to mobilize the resources necessary for growth and survival. A loss of legitimacy, in turn, can have detrimental effects for an industry. In this paper, we study the rise and fall of technology legitimacy of agricultural biogas in Germany over a period of more than 20 years (1990–2012). The field witnessed impressive growth and professionalization for many years and has become one of the key technologies in Germany's energy transition. In recent years, however, it has been confronted with major criticism, which finally resulted in a substantial cut-back of public and political support. The aim of our study is twofold. In empirical terms, we will explain the technology's loss of legitimacy despite its compliance with original policy objectives: growth and maturation. In theoretical terms, we work toward a more general framework to understand technology legitimacy and to explain the institutional dynamics of technological innovation systems.

Binz, C., Harris-Lovett, S., Kiparsky, M., Sedlak, D. L., and Truffer, B., 2016, The thorny road to technology legitimation — Institutional work for potable water reuse in California, *Technological Forecasting and Social Change*, 103, 249-363

Technological innovation that is incongruous with established social rules and practices is often confronted with strong skepticism and a lack of societal legitimacy. Yet, how the early actors in a new technological field create legitimacy for new products is not well researched. This paper addresses this gap by proposing an analytical framework for the early technology legitimation phase that combines recent insights from innovation studies and institutional sociology. Both literatures agree that technology legitimation depends on a complex alignment process in which the technology and its institutional context mutually shape each other. Innovation system studies recently proposed to explore these processes in more detail. So far, this literature has mainly treated legitimacy as an outcome of overall system maturation and has not ventured into assessing legitimation as an active process. The framework we put forward in this paper conceptualizes technology legitimation as being enacted by different actors in a technological innovation system through specific forms of institutional work. This framework is illustrated with a case study on potable water reuse, in this case the injection of treated wastewater into drinking water reservoirs — a technology most consumers confront with revulsion. California is among very few regions worldwide where this technology is becoming common practice. Interviews with 20 key stakeholders and content analysis of 124 newspaper articles reveal how technology proponents worked on legitimizing this controversial technology by engaging in system building and institutional work at various levels. We outline how the legitimation process interrelates with other core development processes of a technological innovation system and discuss how our framework informs recent work in innovation and transition studies.

Vogel, N., 2015, Municipalities' ambitions and practices: At risk of hypocritical sustainability transitions?, *Journal of Environmental Policy and Planning*, in press

In contemporary planning discourse and practice, different planning ideas co-exists. How this affects the transition towards a sustainable development is an important question for both research and practice. The aim of this study is to explore potential conflicts between planning goals caught between growth-led planning and sustainability commitments in a case study of Fredericia, Denmark. The paper discusses the underlying, framing and controlling conditions for transition dynamics. The analysis builds largely on the formulated policies, strategies or national goal achievements towards sustainable futures. These are put in the context of planning and political practices, which are interpreted from a sustainability rationale. Here this study introduces hypocrisy as a theoretical-analytical perspective to dispute actual sustainability practices to respond to continuous ambivalent planning measures. The author concludes that disregarding the inherently different internal logics of growths and sustainability leads to planning paradoxes and impedes sustainable transitions pursued.

Swilling, M., Musango, J. and Wakeford, J., 2015, Developmental states and sustainability transitions: Prospects of a Just Transition in South Africa, *Journal of Environmental Policy & Planning*, in press

Since the onset of the global economic crisis in 2007/2008 two key trends have made it necessary to reconceptualize the relationship between development and sustainability: the rapid rise of the so-called 'BRICS' and the emergence of the green economy discourse and now since 2015 the adoption of the Sustainable Development Goals. To address this challenge with respect to developing economies in the global South, this paper endeavours to fuse the core conceptual concerns of the developmental state and sustainability transition literatures. It is argued that a just transition would consist of a dual commitment to human well-being (with respect to income, education and health) and sustainability (with respect to decarbonization, resource efficiency and ecosystem restoration). However, to understand

these processes we need a better understanding of political dynamics, and for this purpose the notion of a socio-political regime is introduced. A case study of South Africa's dual developmental and environmental trajectories is presented, revealing how different it is to the East Asian experience. Although a just transition in South Africa is currently unlikely, the rapid emergence of the renewable energy niche signals what may be possible if political and environmental shocks are experienced by key actors within the socio-political regime.

Scholten, D. and Bosman, R., 2016, The geopolitics of renewables; exploring the political implications of renewable energy systems. *Technological Forecasting and Social Change*, 103, 273-283

This paper explores the potential political implications of the geographic and technical characteristics of renewable energy systems. This is done through a thought experiment that imagines a purely renewable based energy system, keeping all else equal. We start by noting that all countries have access to some form of renewable energy, though some are better endowed than others. We find two major implications for renewable energy based markets: a) countries face a make or buy decision, i.e. they have a choice to produce or import energy; b) electricity is the dominant energy carrier, implying a more physically integrated infrastructure with stringent managerial requirements. Two scenarios illustrate the strategic concerns arising from these implications: Continental, following a buy decision and more centralized network, and National, following a make decision and more decentralized network. Three observations stand out compared to the geopolitics of an energy system based on fossil fuels. First, a shift in considerations from getting access to resources to strategic positioning in infrastructure management. Second, a shift in strategic leverage from producers to consumers *and* those countries being able to render balancing and storage services. Finally, the possibility for most countries to become a 'prosumer country' may greatly reduce any form of geopolitical concern.

Phillips, M. and Dickie, J., 2015, Climate change, carbon dependency and narratives of transition and stasis in four English rural communities, *Geoforum*, 67, 93–109

This paper explores the carbon dependency of life in four villages in England, the degree to which residents in these villages are aware of and concerned about this dependency and its relationship to climate change, and the extent to which they undertake actions that might mitigate or adapt to this dependency. The paper identifies high degrees of carbon dependency and awareness and concern about climate change and carbon dependency, although relatively low levels of mitigative or adaptive actions. The paper explores how this disjuncture between awareness and actions persists, arguing that attention needs to be paid to how people narrate stories to themselves and others that account for inaction. Five narratives of non-transition or stasis are identified, along with three, less widely adopted, narratives of transition. The significance of rurality and emotions within these narratives is highlighted.

Hall, S., Foxon, T.J. and Bolton, R., 2015, Investing in low-carbon transitions: energy finance as an adaptive market, *Climate Policy*, in press

The amount of capital required to transition energy systems to low-carbon futures is very large, yet analysis of energy systems change has been curiously quiet on the role of capital markets in financing energy transitions. This is surprising given the huge role finance and investment must play in facilitating transformative change. We argue this has been due to a lack of suitable theory to supplant neoclassical notions of capital markets and innovation finance. This research draws on the notion from *Planetary economics: Energy, climate change and the three domains of sustainable development*, by Grubb and colleagues, that planetary economics is defined by three 'domains', which describe behavioural, neoclassical, and evolutionary aspects of energy and climate policy analysis. We identify first- and second-domain theories of finance that are well established, but argue that third-domain approaches, relating to evolutionary systems change, have lacked a compatible theory of

capital markets. Based on an analysis of electricity market reform and renewable energy finance in the UK, the 'adaptive market hypothesis' is presented as a suitable framework with which to analyse energy systems finance. Armed with an understanding of financial markets as adaptive, scholars and policy makers can ask new questions about the role of capital markets in energy systems transitions.

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*,

This article takes up the challenge of moving beyond a dichotomous reading of 'niches' and 'regimes' in transition literature in order to grasp the power struggles involved in fundamental societal transformations. It is argued that the 'practice turn' in the social sciences, and particularly Knorr-Cetina's perspective on objects of knowledge, offer a promising starting point for doing so. To understand the micro-politics of transitions, an analytic framework is developed that combines a focus on power with a focus on the creativity at work in the reconfiguration of novel practices. It is used to analyse innovations in the domain of Dutch greenhouse farming and research in the 1990s and 2000s. In contrast with the definition of niches as purposeful constructions, it concludes that innovative practices are gradually and experimentally created out of discontent with, and in relation to, existing practices and that power dynamics involved in the process are tied up with three forms of creativity: (1) the articulation of innovative networks and concepts, (2) the consolidation of the resulting transformation of existing practices, and (3) the innovation of actual material objects. The second form of creativity is employed notably by 'regime-actors'.

Ehlers, M.-H. and Sutherland, L.-A., 2016, Patterns of attention to renewable energy in the British farming press from 1980 to 2013, *Renewable and Sustainable Energy Reviews*, 54, 959-973

The farming sector is a major actor in developing renewable energy, providing sites, feedstock and investment. Media coverage can both drive and reflect levels of interest in renewable energy, and affect policy support and farmer decision-making about deployment. This paper presents a content analysis of attention to renewable energy in the British farming press from 1980 to 2013, identifying the topics which sparked sustained media interest. Cycles of increased attention to specific types of renewable energy are made evident through quantification of article frequencies and qualitative analysis of content. The findings contribute to the explanation of the role of information in the diffusion of renewable energy. Wind energy and liquid biofuels have received the most attention, with multiple attention cycles, whereas photovoltaics and anaerobic digestion have received focused attention only in recent years. Policy changes, particularly support measures, emerge as the most important driver of media attention, although public controversies, particularly in relation to wind energy, lead to longer periods of attention. Attention typically increases when opportunities in renewable energy emerge and then quickly shifts to a longer stage of focused attention, in which opportunities, problems and solutions are explored and advice is offered, before attention declines. The media thus clearly play a role in informing farmers about opportunities arising in relation to renewable energy technology and policy developments, but are less helpful in providing on-going and consistent information about recurrent and more complex problems. Thus the farming press appears likely to have the strongest impact on 'early adopters' of renewable technologies, but is unlikely to contribute to diffusion at later stages, when potential adopters are less willing to bear uncertainties.

Hecher, M., Vilsmaier, U., Akhavan, R. and Binder, C.R., 2016, An integrative analysis of energy transitions in energy regions: A case study of *ökoEnergieLand* in Austria, *Ecological Economics*, 121, 40-53

'Energy regions' are regional initiatives, which are engaged in becoming energy self-sufficient by using regionally available energy sources. They support the overall transition

towards renewable-based energy and are of key interest to understand how the energy systems and institutional settings in these energy regions changed over time. In this article, a historical and integrative perspective is employed in analyzing the transition process of an Austrian energy region towards energy self-sufficiency. Specifically, (i) an Energy Flow Analysis (EFA) was performed for three points in time (1990, 2000, and 2010); (ii) the institutionalization process was analyzed in terms of the key actors, key milestones, and key factors influencing the transition process; and (iii) an integrative analysis was performed to indicate how the technical and social systems are interrelated. It was found that the most significant changes in the energy region were the efforts made in setting up a decentralized energy system. The co-action of actors from all spheres of society is crucial for aiding energy transition while this process needs to be supported by activities fostering awareness, generate acceptance, and engage the public at large. While there is a clear correspondence between improvements in energy self-sufficiency and the requisite effort at institutionalization, there is also a noticeable time delay between the development of an 'energy vision' and the subsequent impact on energy infrastructure.

Martin, C.J., 2016, The sharing economy: a pathway to sustainability or a new nightmarish form of neoliberalism?, *Ecological Economics*, 121 149–159

The sharing economy seemingly encompasses online peer-to-peer economic activities as diverse as rental (Airbnb), for-profit service provision (Uber), and gifting (Freecycle). The Silicon Valley success stories of Airbnb and Uber have catalysed a vibrant sharing economy discourse, participated in by the media, incumbent industries, entrepreneurs and grassroots activists. Within this discourse the sharing economy is framed in contradictory ways; ranging from a potential pathway to sustainability, to a nightmarish form of neoliberalism. However, these framings share a common vision of the sharing economy (a niche of innovation) decentralising and disrupting established socio-technical and economic structures (regimes). Here I present an analysis of the online sharing economy discourse; identifying that the sharing economy is framed as: (1) an economic opportunity; (2) a more sustainable form of consumption; (3) a pathway to a decentralised, equitable and sustainable economy; (4) creating unregulated marketplaces; (5) reinforcing the neoliberal paradigm; and, (6) an incoherent field of innovation. Although a critique of hyper-consumption was central to emergence of the sharing economy niche (2), it has been successfully reframed by regime actors as purely an economic opportunity (1). If the sharing economy follows this pathway of corporate co-option it appears unlikely to drive a transition to sustainability.

Haarstad, H. and Rusten, G., 2016, The challenges of greening energy: Policy/industry dissonance at the Mongstad refinery, Norway, *Environment and Planning C*, in press

The interaction between policy making and industry is a key to understanding the conditions for 'greening' contemporary energy systems. This article uses efforts toward greening the Mongstad oil refinery in Norway as a case to analyse the challenges involved in politically stimulated shifts towards increased sustainability in the energy sector. A technology test centre and a full-scale carbon capture and storage (CCS) project at Mongstad were the centrepiece of the Stoltenberg government's (2005–2013) climate strategy. However, the project suffered delays and cost overruns until the full-scale carbon capture and storage project was eventually stopped. It is argued that interactions between the policy-making and industrial innovation arenas involved in this case are challenging because they operate according to different internal logics. We conceptualize this divergence as 'policy/industry dissonance' and suggest that this concept is a useful complement to literatures on regional innovation systems (RIS) and the multilevel perspective on sustainability transitions (MLP).

Erickson, P., Kartha, S., Lazarus, M. and Tempest, K., 2015, Assessing carbon lock-in, *Environmental Research Letters*, 10, 084023.

The term 'carbon lock-in' refers to the tendency for certain carbon-intensive technological systems to persist over time, 'locking out' lower-carbon alternatives, and owing to a

combination of linked technical, economic, and institutional factors. These technologies may be costly to build, but relatively inexpensive to operate and, over time, they reinforce political, market, and social factors that make it difficult to move away from, or ‘unlock’ them. As a result, by investing in assets prone to lock-in, planners and investors restrict future flexibility and increase the costs of achieving agreed climate protection goals. Here, we develop a straight-forward approach to assess the speed, strength, and scale of carbon lock-in for major energy-consuming assets in the power, buildings, industry, and transport sectors. We pilot the approach at the global level, finding that carbon lock-in is greatest, globally, for coal power plants, gas power plants, and oil-based vehicles. The approach can be readily applied at the national or regional scale, and may be of particular relevance to policymakers interested in enhancing flexibility in their jurisdictions for deeper emissions cuts in the future, and therefore in limiting the future costs associated with ‘stranded assets’.

Köning, A., 2015, Towards systemic change: on the co-creation and evaluation of a study programme in transformative sustainability science with stakeholders in Luxembourg, *Current Opinion in Environmental Sustainability*, 2015, 16:89–98

This paper examines a study programme in ‘Sustainability and social innovation’ at the University of Luxembourg that was co-created with key external stakeholders in local sustainability transitions. The programme’s aim is to equip scientists and citizens for the practice of transformative sustainability science to change human environment interactions. Addressing socially salient, complex problems invites a re-conception of what role universities can play in knowledge production processes in more applied and local contexts. We critically discuss the programme’s ambition to provide a platform for transformative social learning for sustainability and to contribute to fostering systemic change in Luxembourg. We deduce design requisites to achieve these ambitions. The paper also discusses the role of different forms of evaluation in effecting individual, programme and systemic change. Research insights were drawn from documentary and literature research, concept-building, programme implementation, observation, analysis, and evaluation by students and contributors.

Messner, D., 2015, A social contract for low carbon and sustainable development: Reflections on non-linear dynamics of social realignments and technological innovations in transformation processes, *Technological Forecasting and Social Change*, 98, 260–270

The transition to a low carbon and sustainable economy represents a major transformation that can only be compared to one other comprehensive transition in modern human history: the industrial revolution. Like the low-carbon transformation, the process of industrialisation was above all an energy regime change. However, industrialisation cannot be solely reduced to a fundamental change in the energy system. The “global metamorphosis” towards industrial societies was driven by economic, cultural and social processes progressing at different speeds. Transformations are actually the result of “Häufigkeitsverdichtungen von Veränderungen” (Osterhammel, 2009), a concurrence of multiple changes. The non-linearity of far-reaching transformations becomes particularly apparent in the non-parallelism between the history of ideas and real socio-economic changes. The social, cultural and cognitive “software” of modern societies was already developed by the thinkers of the Enlightenment. The concept of “Sustainability” follows very similar trajectories. Against this background the concept of a social contract for sustainability gains relevance. It symbolises that the transformation to sustainability implies a fundamental realignment of societies, which requires the legitimization of their citizens. In the last part of his paper the author describes emerging pillars for the social contract of sustainability. An optimistic interpretation of these trends would be: although global emissions are still rising, in many societies the cognitive, normative and cultural conditions for a sustainability transformation are now being established.

Bai, X., Van der Leeuw, S., O'Brien, K., Berkhout, F., Biermann, F., Brondizio, E.S., Cudennec, C., Dearing, J., Duraiappah, A., Glaser, M., Revkin, A., Steffen, W., Syvitski, J., 2016, Plausible and desirable futures in the Anthropocene: A new research agenda, *Global Environmental Change*, in press

While the concept of the Anthropocene reflects the past and present nature, scale and magnitude of human impacts on the Earth System, its true significance lies in how it can be used to guide attitudes, choices, policies and actions that influence the future. Yet, to date much of the research on the Anthropocene has focused on interpreting past and present changes, while saying little about the future. Likewise, many futures studies have been insufficiently rooted in an understanding of past changes, in particular the long-term co-evolution of bio-physical and human systems. The Anthropocene perspective is one that encapsulates a world of intertwined drivers, complex dynamic structures, emergent phenomena and unintended consequences, manifest across different scales and within interlinked biophysical constraints and social conditions. In this paper we discuss the changing role of science and the theoretical, methodological and analytical challenges in considering futures of the Anthropocene. We present three broad groups of research questions on: (1) societal goals for the future; (2) major trends and dynamics that might favor or hinder them; (3) and factors that might propel or impede transformations towards desirable futures. Tackling these questions requires the development of novel approaches integrating natural and social sciences as well as the humanities beyond what is current today. We present three examples, one from each group of questions, illustrating how science might contribute to the identification of desirable and plausible futures and pave the way for transformations towards them. We argue that it is time for debates on the sustainability of the Anthropocene to focus on opportunities for realizing desirable and plausible futures.

Jolly, S. and Raven, R.P.J.M., 2016, Field configuring events shaping sustainability transitions? The case of solar PV in India, *Technological Forecasting and Social Change*, in press

The sustainability transitions literature has emphasized the analytical challenges in understanding the trade-offs in protecting niche innovations. This paper builds on an emerging body of literature that argues that the concept of field-configuring events (FCE) is useful for understanding such trade-offs. We explore how this concept can be fruitful for analysis of niche protection in solar PV technology in India. The paper finds two important focal points of debate: (1) supporting domestic capabilities to improve competitiveness; and (2) using public financial mechanisms efficiently. Our research suggests that, whilst FCEs indeed seem an appropriate venue for investigating on-going debates in niche protection, it is challenging to develop causal relationships between these events and their wider, field-level influence. As such, the paper reflects conceptually on the usefulness of the notion of FCEs as temporally and spatially bounded venues for analysis of emerging niche trajectories and their politics.

Bolton, R., Foxon, T. and Hall, S., 2016, Energy transitions and uncertainty: Creating low carbon investment opportunities in the UK electricity sector, *Environment and Planning C: Government and Policy*, in press

This paper examines how actors in the UK electricity sector are attempting to deliver investment in low carbon generation. Low carbon technologies, because of their relative immaturity, capital intensity and low operational costs, do not readily fit with existing electricity markets and investment templates which were designed for fossil fuel based energy. We analyse key electricity market reforms and infrastructure policies in the UK and highlight how these are aimed at making low carbon technologies 'investable' by reducing uncertainty, managing investment risks, and repositioning actors within the electricity sociotechnical 'regime'. We argue that our study can inform contemporary debates on the politics and governance of sustainability transitions by empirically investigating the agency of

incumbent regime actors in the face of uncertainty and by offering critical insights on the role of markets and finance in shaping socio-technical change.

Altenburg, T., Schamp, E.W. and Chaudhary, A., 2015, The emergence of electromobility: Comparing technological pathways in France, Germany, China and India, *Science and Public Policy*, in press

Globally, new forms of electromobility are challenging established transport technologies based on internal combustion engines. We explore how this transition is simultaneously unfolding in four countries, enabling us to shed some light on the dynamics and determinants of technological path creation. Our analysis covers two old industrialized countries (France and Germany) and two newly industrialized countries (China and India) with very different market conditions and policy frameworks. It reveals enormously different choices of technologies and business models and traces them back to four main drivers of divergence: technological capabilities, demand conditions, political priorities and economic governance.

Schut, M., Klerkx, L., Sartas, M., Lamers, D., Campbell, M., Ogbonna, I., Kaushik, P., Atta-Krah, K. and Leeuwis, C., 2015, Innovation platforms: Experiences with their institutional embedding in agricultural research for development, *Experimental Agriculture*, in press

Innovation Platforms (IPs) are seen as a promising vehicle to foster a paradigm shift in agricultural research for development (AR4D). By facilitating interaction, negotiation and collective action between farmers, researchers and other stakeholders, IPs can contribute to more integrated, systemic innovation that is essential for achieving agricultural development impacts. However, successful implementation of IPs requires institutional change within AR4D establishments. The objective of this paper is to reflect on the implementation and institutionalisation of IPs in present AR4D programmes. We use experiences from sub-Saharan Africa to demonstrate how the adoption and adaptation of IPs creates both opportunities and challenges that influence platform performance and impact. Niche-regime theory is used to understand challenges, and anticipate on how to deal with them. A key concern is whether IPs in AR4D challenge or reinforce existing technology-oriented agricultural innovation paradigms. For example, stakeholder representation, facilitation and institutional embedding determine to a large extent whether the IP can strengthen systemic capacity to innovate that can lead to real paradigm change, or are merely 'old wine in new bottles' and a continuation of 'business as usual'. Institutional embedding of IPs and – more broadly – the transition from technology-oriented to system-oriented AR4D approaches requires structural changes in organisational mandates, incentives, procedures and funding, as well as investments in exchange of experiences, learning and capacity development.

Bergset, L., and Fichter, K., 2015, Green start-ups – a new typology for sustainable entrepreneurship and innovation research, *Journal of Innovation Management*, 3(3), 118-144

There is a growing political consensus about the necessity to decouple economic growth from environmental impacts. For a transition towards a green economy radical innovation plays a central role. Start-ups are key market actors in the development and market introduction of radical sustainable innovation, but so far there is little research on the specific challenges and opportunities of green start-ups. In this conceptual paper, we bring together research and theory on entrepreneurship and innovation as well as sustainable business practice and ask why and how different types of green start-ups may encounter specific financing challenges and opportunities when developing their products/services. As existing typologies are too unspecific to properly explain the financing challenges and opportunities of green start-ups, we elaborate on these and develop a new typology of green start-ups. This typology will enable further empirical exploration of specific challenges and opportunities that such start-ups have when looking for finance.

Moraglio, M. and Dienel, H-L., 2015, Shifts, turning points and inertia exploring long-term industry trends in European transport, *European Journal of Futures Research*, 3:12.

In this introduction to the topical collection on the “Future of Transport in Europe”, we argue that European transport regimes are at a turning point and despite the sector inertia, we can detect cultural, societal, and technical shifts. In this article, we assume that these shifts are central in defining possible future trends, far beyond their current fragile relevance. Such an analysis steps further into the technological realm, and targets social, industrial and political issues, which could affect the future of transport up until 2050, with a special focus on the post-ownership economy. Thus, we frame both technological innovations and societal shifts, aiming to discuss the future of transport as a socio-technical construction, far beyond the commercial and economic debate. In the conclusion, we report briefly on how two conflicting elements are now relevant for the future of transport, namely inertia and innovation: both can play a significant role in opening up different transport regimes in the future, or tying us to a repletion of old patterns. This article is based on the results of an EU-funded research network (www.race2050.org), which we coordinated.

Coenen, L., Hansen, T. and Rekers, J.V., 2015, Innovation policy for grand challenges. An economic geography perspective, *Geography Compass*, 9(9), 483-496

Grand challenges such as climate change, ageing societies and food security feature prominently on the agenda of policymakers at all scales, from the EU down to local and regional authorities. These are challenges that require the input and collaboration of a diverse set of societal stakeholders to combine different sources of knowledge in new and useful ways – a process that has occupied the minds of economic geographers looking at innovation in recent decades. Work in economic geography has in particular examined infrastructural, capability, network and institutional challenges that may be found in different types of regions. How can these insights improve researchers’ and policymakers’ understanding of the potential for innovation policies to address grand challenges? In this paper, we review these insights and then identify areas that push economic geographers to go beyond their previous focus and interests, notably by considering innovation policy in light of transformational rather than mere structural failures.

Grabs, J., Langen, N., Maschkowski, G. and Schöpke, N., 2016, Understanding role models for change: A multilevel analysis of success factors of grassroots movements for sustainable consumption, *Journal of Cleaner Production*, in press

In order to achieve sustainable societies, we need models of behavior that go beyond individuals equating wellbeing and material consumption levels. Lowering individual footprints might be more acceptable once we include social relations, adopting responsibilities for other human and non-human life as well as civic engagement as complementary sources of wellbeing. Grassroots initiatives can thus facilitate sustainable consumption and become role models for societal change. This review sets out to investigate why grassroots organizations are created and developed successfully by focusing on the processes of founding, engaging in, developing and maintaining grassroots initiatives. We look at insights from different disciplines that address behavioral change and social learning to develop an overview of factors that are from an interdisciplinary perspective appropriate and necessary to stimulate societal change processes. By means of a multilevel analysis focusing on three levels of human behavior – the individual level, the group level, and the societal level – we capture the multifaceted relationships influencing final behavioral choices. We present theoretical and empirical evidence that connects a number of concepts that can subsequently be used as testable factors in fieldwork investigating grassroots success.

Derwisch, S., Morone, P., Tröger, K. and Kopainsky, B., 2016, Investigating the drivers of innovation diffusion in a low income country context. The case of adoption of Improved maize seed in Malawi. *Futures*, in press

To match the rapidly changing demand for food to its supply, agricultural productivity needs to be increased. The adoption of improved agricultural technologies is therefore crucial for sustainable agricultural development. In this paper we investigate the adoption dynamics of improved seed by farmers in Sub-Saharan Africa. Farmers' expectation is found to be a particularly important element in defining the adoption decision process. The aim of this study is to assess ways to stimulate future expectation. Using survey data from Malawi, we examine the role of expectation in the decision-making process of farmers adopting improved seed. We use these data in a dynamic simulation model to assess historical seed adoption patterns in Malawi and examine how counterfeit seed and branding affect farmers expectations and adoption. The simulation model shows that the presence of counterfeit seed on the market can affect adoption considerably. Our analysis demonstrates, that branding has contributed to seed adoption in Malawi, confirming that it can further stimulate demand of improved seed.