

## Newsletter 25: September 2017

This is the 25th 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

The STRN steering group

## Words from the Chairman

Dear transition research colleagues,

New opportunities are opening up for transition researchers in the context of the IPCC, which just issued a call for experts for the 6<sup>th</sup> Assessment Report. The IPCC website ([http://www.ipcc.ch/scripts/session\\_template.php?page=46ipcc.htm](http://www.ipcc.ch/scripts/session_template.php?page=46ipcc.htm)) provides the chapter outlines for the different Working Groups. Working Group 3 (on mitigation) may be particularly relevant for STRN-members, as some of the chapter outlines include terms, foci and approaches that will be familiar, e.g. 'system transitions', 'socio-technical transitions', and 'technological innovation systems'. I have copied the outlines of three chapters below this welcome word (with potentially interesting parts highlighted). As the IPCC AR6 is explicitly adopting a 'solutions'-orientation, there seems increasing interest in our type of work, including case studies at different jurisdictional levels (including national, regional and local). So, I would like to encourage STRN-members to consider nominating themselves for the upcoming IPCC AR6.

The publications section in the newsletter keeps getting longer, which is encouraging in many ways. But if this trend continues, we may consider becoming somewhat stricter with regard to inclusion (as there may be some 'slippage' in submissions) or only include titles and not abstracts. The increasing volume is accompanied by greater depth, diversification and publication in top-level outlets (including *Nature Energy* and *Science*).

An interesting publication that caught my eye is the editorial to a special issue on *Experimentation for Climate Change Solutions* (Hildén, M. et al., 2017). While experimentation and local projects are central to several approaches in our community, the editorial provocatively asks if "experimentation also runs the risks of merely becoming a distraction that maintains status quo instead of contributing to transformative change." I don't have the answer, but note that this issue also popped up in some sessions at the recent IST-conference. In some countries and sectors, there indeed seem to have been experiments and demonstration projects for several years without this visibly leading to a transition. Perhaps policymakers or firms sometimes use experiments to deflect criticisms or demands for greater commitment (claiming that they're already working towards change through the experiments). So, I welcome the thought-provoking suggestion/question, which may trigger further research and reflexivity on experiments.

I hope you'll enjoy reading this newsletter, which informs you about achievements in the last few months, our EIST-journal, and new projects, events and articles.

**Frank Geels**, Chairman of STRN ([frank.geels@manchester.ac.uk](mailto:frank.geels@manchester.ac.uk)).

### **Chapter 3: Mitigation pathways compatible with long-term goals**

- Methods of assessment, including approaches to analysis of mitigation and development pathways
- **Socio-cultural-techno-economic assumptions** and projections, including regional differences (referring to baseline and mitigation scenarios, Shared Socio-economic Pathways (SSPs), etc.
- Modelled emission pathways compatible with the Paris Agreement, including the long-term temperature goal, and higher warming levels, taking into account CO<sub>2</sub>, non-CO<sub>2</sub> and short-lived climate forcers (including peaking, rates of change, balancing sources and sinks, and cumulative emissions)
- Role of changing climate on emissions
- **System transitions and/or transformation compatible with mitigation pathways, including supply and demand and integrating sectoral information**
- Economics of mitigation and development pathways, including mitigation costs, investment needs, employment effects, etc.
- **Technological and behavioural aspects of mitigation pathways and socio-technical transitions**
- Interaction between near- to mid-term action, and long-term mitigation pathways
- Links to sustainable development including risks, co-benefits, synergies, trade-offs and spill-over effects
- Links to adaptation including risks, co-benefits, synergies, trade-offs and spill-over effects
- Benefits of mitigation, including information from WG II
- Risk analysis of emission pathways considering uncertainty about climate response

### **Chapter 16: Innovation, technology development and transfer**

- Key findings from AR5 and recent developments
- **Role of innovation, technology development, diffusion and transfer in contributing to sustainable development and the aims of the Paris Agreement, including mitigation pathways**
- **Innovation and technology as systemic issues, evaluating literature on cases of technological innovation systems and innovation policy**
- Assessment of international institutions partnerships and cooperative approaches relevant to technology, innovation and R&D
- **Capacity for transformative change**, including capabilities for innovation, engineering, governance, R&D cooperation and deployment incentives
- **Assessment of experiences with accelerating technological change through innovation policy for climate change at the national level, including successful case studies**
- **Specific challenges in emerging economies and least-developed countries, e.g. SIDS and land-locked countries**
- **Acceptability and social inclusion in decision-making, communication and information diffusion**
- **Characterisation and implications of new disruptive technologies**
- Links to adaptation and sustainable development (including co-benefits, synergies and trade-offs)

### **Chapter 17: Accelerating the transition in the context of sustainable development**

- **Learning from integrative perspectives on sustainable development and climate change responses (synergies and trade-offs)**
- Pathways for joint responses to climate change and sustainable development challenges
- Climate change mitigation responses in the context of multi-objective policies across scales
- **Climate change mitigation response capacities and enabling conditions, including technology, finance & cooperation for sustainable development**
- Mitigation-adaptation interlinkages, including potential synergies & conflicts

- **Regional perspectives on climate change mitigation, including regional case studies on mitigation-adaptation interactions**
- Other emerging issues dealing with climate change responses and sustainable development in relation to the Agenda for Development 2030 and beyond
- Uncertainties and knowledge needs

## Environmental Innovation and Societal Transitions

Volume 24 of *Environmental Innovation and Societal Transitions* has just been published in September. From now on, as a transition to so-called “Article based publishing” (ABP) that is already in place for various other Elsevier journals, we will publish 10 articles in every regular issue until we fully move to ABP. The ten articles, one survey and nine research articles, in the current issue are the following:

- Exploring the governance and politics of transformations towards sustainability, a survey article by James Patterson, Karsten Schulz, Joost Vervoort, Sandra van der Hel, Oscar Widerberg, Carolina Adler, Margot Hurlbert, Karen Anderton, Mahendra Sethi and Aliyu Barau,
- Integrated assessment of renewable energy potential: Approach and application in rural South Africa, by Bastian Winkler, Stefanie Lemke, Jan Ritter and Iris Lewandowski.
- Interactions between systemic problems in innovation systems: The case of energy-efficient houses in the Netherlands, by Alco Kieft, Robert Harmsen and Marko Hekkert.
- Actor roles in transition: Insights from sociological perspectives, by Julia Wittmayer, Flor Avelino, Frank van Steenberg and Derk Loorbach.
- Redefining a stakeholder relation: Finnish energy “prosumers” as co-producers, by Laura Olkkonen, Kristiina Korjonen-Kuusipuro and Iiro Grönberg.
- Characteristics of investors in onshore wind power in Sweden, by Anna Darmani, Eva Niesten and Marko Hekkert.
- A transition to green buildings in Norway, by Hilde Nykamp.
- Factors behind sustainable business innovation: The case of a global carpet manufacturing company, by Adam Luqmani, Matthew Leach and David Jesson.
- Modelling energy transitions for climate targets under landscape and actor inertia, by Francis Li and Neil Strachan.
- Evolutionary models of sustainable economic change in Brazil: No-till agriculture, reduced deforestation and ethanol biofuels, by J. Ryan Hogarth.

We hope you will find something to your interest in this issue. As always, we look forward to receive your submissions and comments. And, please don't forget to read, or 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*

### **Update on the TransLACASAF network (Transitions in Latin America and the Caribbean, Asia and Africa)**

We would like to inform you about the planned webinar series for 2017/2018. The webinars are a platform for discussions within the transitions research community and beyond, on critical questions that have been raised in regard to the applicability and usefulness of transition frameworks in a different setting than the industrialized/western countries where they originate from. We invite not only researchers who work on Global South topics but also those who work on OECD countries, as cross-learning between the two sub-categories can provide useful insights to the broader transitions research. The first webinar is on the theme of informality. The topic: *How can transitions scholars include and conceptualize “informal” institutions, routines and networks?* Presenters are Monica Ramos-Mèjia and Elsie Onsongo, **17 October 2017, 3-4pm (CEST)**. Share with us your email address at

[transitions.globalsouth@gmail.com](mailto:transitions.globalsouth@gmail.com) to receive an invitation to the scheduled Google Hangouts. You can also watch at YouTube <https://www.youtube.com/watch?v=JIOousUXcBI>. For more information on the webinars, or if you want to be included in the Translacasaf mailing list, send us an E-Mail to the given address above. **Pauline Cherunya and Mara van Welie**

### **Name change of "PhDs in Transitions network" to "The NEST" + 3<sup>rd</sup> NEST-Conference**

The PhDs in Transitions Network is changing its name to The NEST, The Network of Early Career Researchers in Sustainability Transitions. This change reaffirms our founding commitments and reflects our maturation. From the beginning, we sought to create a safe space for new entrants in the field of sustainability transitions. Now, we are consolidating this space and making it more inclusive. Our activities have always focused on empowering early career researchers (PhD candidates and those recently graduated), and this will not change. Instead, we want to make clearer that the network is not exclusive for those pursuing their PhDs. In the coming months, we will also intensify our close collaboration with the STRN network through a permanent representation of the NEST in the STRN steering group. The name NEST also represents a lot of the ideas of the sustainability transitions research, which recognises the importance of protective spaces and niches in shielding, nourishing and empowering alternatives to existing socio-technical systems. Analogously, we hope to do the same to early career researchers, supporting their journeys. In the coming weeks, we will implement changes to our blog, newsletters and social media pages. The 3rd PhDs in transitions conference will be the first one to sail under the new flag. Stay tuned and help us build The NEST.

Following two successful events in London (Greenwich) and Lausanne (EPFL), we are very excited to inform you that the 3rd NEST-Conference will be hosted at the Copernicus Institute of Sustainable Development at Utrecht University on the 15th and 16th of March 2018. The conference will give around 50 PhD students and early career researchers a unique opportunity to present and discuss their work in progress, and to receive feedback from peers and senior researchers. To be eligible for the conference participants' research should be in line with the STRN research agenda. Sessions will be grouped along methodological, empirical and conceptual advancements. Dates:

- Call for papers - 15th of October 2017
- Submission deadline for extended abstracts - 15th of December 2017
- Notification of participation - 15th of January 2018
- Conference - 15th and 16th of March 2018

For further enquiries, please do not hesitate to contact us via [nest.conference@uu.nl](mailto:nest.conference@uu.nl).

Best regards on behalf of The NEST: Paul van Baal, Kristina Hojcková, Denise Reike, Katharina Schiller, Julius Wesche

## **Event announcements**

*Calls for upcoming relevant events such as workshops and conferences*

### **Call for Special Issue papers: Putting sustainability transitions into spatial and socio-cultural context (deadline for full paper submission: 30.01.2018)**

[http://www.mdpi.com/journal/sustainability/special\\_issues/Sustainability\\_Transitions\\_Spatial\\_Context](http://www.mdpi.com/journal/sustainability/special_issues/Sustainability_Transitions_Spatial_Context)

This Special Issue sheds light on the role of the spatial and socio-cultural context in sustainability transitions in cities and city-regions. We position that transition pathways towards sustainability will look fundamentally different in different socio, cultural, and spatial settings across cities and regions, but also within cities. We invite papers that help us to paint a more differentiated picture on how change dynamics might be stimulated, initiated, stabilizes and accelerated in different contexts within cities and across cities and regions. This includes theoretical and conceptual contributions, empirical evidence from single but preferably from multiple case studies and comparative case studies as well as papers on

methods and tools to capture and map the spatial dimensions of sustainability transitions. We invite contributions from a diversity of geographies and contexts (reporting different sizes of cities) to provide grounds for our special issue working hypothesis that diversity of context, drives diversity in sustainability transitions' patterns and pathways. Papers can deal with all possible sustainability domains (food, energy, mobility, etc.) but should highlight the socio, cultural or spatial implications and how they relate to context-specific sustainability challenges and aspirations. Papers that derive recommendations for policy makers, practitioners and urban change makers are particularly welcome. For more information contact **Markus Egermann** ([m.egermann@ioer.de](mailto:m.egermann@ioer.de)).

### **Beyond Oil conference, Bergen, Oct 25-27, 2017.**

The Spaces of Climate and Energy Laboratory (SpaceLab) research group is hosting its second Beyond Oil conference during 25-27 October 2017 at the University of Bergen. Society is inevitably moving beyond oil. The direction that this transformation will take is still highly uncertain. Transformations to societies beyond oil involve deliberate choices that lead to different outcomes with regards to power, justice, inequality and human-nature relations. A task for social scientists is to analyze the structures of inertia and capacities for change in current societies, and highlight the multiple futures that these make possible. As research moves from studying problems to proposing pathways and solutions, we therefore need to critically interrogate the particular solutions that are proposed and how they relate to the futures we wish to mobilize. As academics, we also need to consider our own role in transformations – whether as catalysts, participants, critics, or knowledge producers. We welcome researchers from a variety of research fields connected to the topics above. For the conference programme, see <http://spacelab.b.uib.no/conference-beyond-oil/>. **Siddharth Sareen** ([Siddharth.Sareen@uib.no](mailto:Siddharth.Sareen@uib.no))

## **New research projects**

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

### **STRIVE (Sustainable TRade and InnoVation transfer in the bioEconomy: from national strategies to global sustainable development goals)**

STRIVE, which started its work in October 2010, combines research expertise from economics, political science, and environmental geography to improve the knowledge base for the design of sustainable bioeconomy policies and investments with a focus on international regulatory frameworks. The project, headed by principal investigator Prof. Dr. Jan Börner from the Center for Development Research at the University of Bonn, focuses on the sustainability implications of transnational biomass trade, technological innovation, and innovation transfer in selected bioeconomy sectors with an emphasis on major biomass and knowledge producing countries and regions. Impacts of bio-based transformations will be evaluated against relevant sustainability dimensions, such as the Sustainable Development Goals (SDG) on poverty eradication (1), food security (2), reduced inequality (10), responsible consumption (12), climate action (13), and terrestrial ecosystems (15). The project is funded by the German Federal Ministry of Education and Research (BMBF) with a total sum of approximately 3 million Euros. The research team has adopted an interdisciplinary research approach integrating economics with natural and political science and rely on methods such as, economic modelling, statistical and econometric analysis, life-cycle assessment, technology & innovation management, and qualitative as well as quantitative case studies. For more information visit [www.strive-bioecon.de](http://www.strive-bioecon.de)  
**Lisa Freudenberger** ([lfreuden@uni-bonn.de](mailto:lfreuden@uni-bonn.de))

## **Challenges and Opportunities of Modular water Infrastructures for Greening the Swiss Economy (COMIX)**

The COMIX project aims at analyzing opportunities and challenges of a Swiss Sustainable Economy, which are associated with a foreseeable fundamental shift towards more modular system designs in many infrastructure sectors. The analysis will primarily be focused on the Swiss urban water management sector, scrutinizing impacts on Swiss industry, utilities, professional associations and regulators. The case of urban water management is particularly well suited to analyze these challenges due to strong path dependencies and considerable impacts on sustainable futures globally. The core research questions that will be analyzed in the project relate to in how far the challenges and opportunities of modular infrastructures could represent a first mover advantage for Swiss industry and a strategic chance to anticipate future system configurations for Swiss operators and regulators and in how far synergies between these two aspects could be identified. This is synthesized in a hypothesis about a so called lead market potential in Switzerland.

COMIX is conceived as an inter- and transdisciplinary project run by research teams from various disciplines such as management, economic geography, political science, economics and engineering. Additionally representatives from industry, utilities, professional associations and government will be involved in several sequences of participative workshops. The project is part of the recently started National Research Program “Sustainable Economy” (NRP73) of the Swiss National Science Foundation (<http://www.snf.ch/en/researchinFocus/newsroom/Pages/news-160616-call-for-proposals-of-nrp-73-sustainable-economy-and-new-website.aspx>) . Contact person and project leader: **Bernhard Truffer**, Eawag and Utrecht University.

## **Publications**

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

### **PhD thesis: Philippa Boyd, 2016, *From bicycles to buildings: an analysis of the adoption of building integrated photovoltaic technology (BIPV)*, The University of Reading**

The research contributes to an understanding of the transition of niche level technological developments to the regime. The research highlights the dynamics of disruptive change to the established practices of the building sector and it shows some of the ways in which “business as normal” disrupts the transition from niche sustainable technology to uptake in the built environment. . Broader landscape issues in terms of institutional artefacts and planning policy are shown to hinder adoption and also to diminish the sustainable contribution of the technology. The research uses Social Construction of Technology approach (SCOT) to study three UK commercial construction projects which include BIPV and then goes on to explore the broader issues of uptake. The research develops an understanding of the dynamic process of adoption of new technologies and concludes with practical implications for standard construction project procurement processes in the adoption of complex innovation.

### **PhD thesis: Amin Dehdarian, 2017, *Three essays on methodologies for dynamic modeling of emerging socio-technical systems: the case of smart grid development*, Ecole Polytechnique Federale Lausanne (EPFL)**

This research contributes to developing methods and models for analyzing the early stage of socio-technical transitions. By focusing on the case of smart grid development, three essays of this dissertation highlight some policy and theoretical issues arising in the early stage of energy transition, and propose methodological improvements for resolving these issues. In this respect, the first essay uses insights from modeling policy intervention in complex socio-technical systems and builds a System Dynamics model to investigate the cost recovery problem of smart metering roll-out. The second essay takes ideas from Technological Innovation System approach and develops a method to analyze the emergence of spatial

diversity in smart grid development by combining Social Network Analysis and Agent-Based Modeling. The third essay builds on ideas from network theory and evolutionary modeling to develop a method for investigating the main path of knowledge development and analyzing knowledge trajectories in smart grid initiatives.

**PhD thesis: Moallemi, Enayat A., 2017. *Policy Analysis of Energy Transition Pathways: A Dual Narrative-Modelling Approach Applied to India's Electricity Sector*. The University of Melbourne, Australia, <http://hdl.handle.net/11343/128523>**

The long-term policy analysis of societal transitions is identified as a wicked policy problem. To address this wickedness, a robust understanding of transition dynamics in the face of multiple plausible futures is required. Sustainability transitions and exploratory modelling are emerging fields which can gain this understanding but from different perspectives. This thesis aims to improve the policy analysis of transition pathways under deep uncertainty through the development of a novel approach, called the 'Dual Narrative-Modelling Approach', which can exploit the synergetic interactions between transition narratives and exploratory models. The Dual Narrative-Modelling Approach is applied to a case study of India's electricity sector. The application shows the dynamics of historical transitions (1990-2015) in a stylised narrative and uncovers non-linear and time-delayed interactions in a system dynamics model. The application also explores the unfolding of plausible transition pathways and the realisation of India's renewable targets in deeply uncertain futures (2015-2030).

**PhD thesis: Olufolahan Oluwapelumi Osunmuyiwa, 2017, *Beyond Technologies: The Politics of Energy Transitions in Rentier States*. Vrije Universiteit Amsterdam**

In the last two decades, renewable energy (RE) has emerged as a central ingredient in the broader sustainability transition spectrum. Complementarily, this has led to significant investments in renewable energy technologies by advanced industrialised countries and emerging economies like the BRIC countries. However, this renewable energy trend has eluded some developing countries of the South and, more importantly, rentier states. As such, numerous theoretical models have been developed in the sustainability transitions literature to understand how these renewable energy solutions have emerged and how they have continued to gain relevance in the global sphere. One of such theoretical construct is the multi-level perspective on sociotechnical transitions (MLP). The MLP understands energy transitions as the product of interactions between niche innovation, established regimes and the influence of landscape/exogenous factors. The theory relies on historical perspectives to identify how long-term societal transformations within energy systems emerge and propose pathways by which transitions can be achieved. However, due to its origins of structuration, the MLP's conceptualisation of power, resources, politics and hierarchies in transitions has been relatively weak, specifically within the context of developing countries. To address this gap, this thesis (i) conceptualises and empirically explores transitions in a developing country with a resilient fossil fuel industry (case study: Nigeria); (ii) the thesis adopts the political economy perspective to explore the influence of state structures and economic rent on the trajectory of transitions; (iii) it argues that transitions or the lack thereof are beyond technological transfers but rather lies in the political capabilities of actors; and (iv) it conceptually focuses on how natural resources produce socio-political materiality, which influences the interactions of actors within the political landscape and how this shapes energy transition pathways. The overall objective of this thesis is to contribute to the improvement of the existing sustainability transitions theory to accommodate politics and the role of economic rent in the analysis of energy transitions specifically for developing countries. It concludes that the fusion of the MLP and rentier theory enhances and provides a spatial recognition on geographies of transitions, which ultimately helps in problem definition and policy prescriptions in less developed societies.

**Book: Sioshansi, F.P., 2017, *Innovation and disruption at the grid's edge: how distributed energy resources are disrupting the utility business model*. Academic Press, Elsevier.**

*Innovation and Disruption at the Grid's Edge* examines the viable developments in peer-to-peer transactions enabled by open platforms on the grid's edge. With consumers and prosumers using more electronic platforms to trade surplus electricity from rooftop solar panels, share a storage battery, or use smart gadgets that manage load and self-generation, the grid's edge is becoming crowded. The book examines the growing number of consumers engaging in self-generation and storage, and analyzes the underlying causes and drivers of change, as well as the implications of how the utility sector—particularly the distribution network—should/could be regulated. The book also explores how tariffs are set and revenues are collected to cover both fixed and variable costs in a sustainable way. This reference is useful for anyone interested in the areas of energy generation and regulation, especially stakeholders engaged in the generation, transmission, and distribution of power.

**Book: Araujo, K., 2017, *Low Carbon Energy Transitions: Turning Points in National Policy and Innovation*, Oxford University Press**

The world is at a pivotal crossroad in energy choices. There is a strong sense that our use of energy must be more sustainable. Moreover, many also broadly agree that a way must be found to rely increasingly on lower carbon energy sources. However, no single or clear solution exists on the means to carry out such a shift at either a national or international level. Traditional energy planning (when done) has revolved around limited cost projections that often fail to take longer term evidence and interactions of a wider set of factors into account. The good news is that evidence does exist on such change in case studies of different nations shifting toward low-carbon energy approaches. In fact, such shifts can occur quite quickly at times, alongside industrial and societal advance, innovation, and policy learning. These types of insights will be important for informing energy debates and decision-making going forward. *Low Carbon Energy Transitions: Turning Points in National Policy and Innovation* takes an in-depth look at four energy transitions that have occurred since the global oil crisis of 1973: Brazilian biofuels, Danish wind power, French nuclear power, and Icelandic geothermal energy. With these cases, Dr. Araújo argues that significant nationwide shifts to low-carbon energy can occur in under fifteen years, and that technological complexity is not necessarily a major impediment to such shifts. Dr. Araújo draws on more than five years of research, and interviews with over 120 different scientists, government workers, academics, and members of civil society in completing this study.

**Special Issue: in *Sociologia Ruralis*, 2017, Vol. 57, issue 3: “Understanding sustainable food system transitions: Practice, assessment and governance”**

Maye, D., and Duncan, J., 2017, Understanding sustainable food system transitions: Practice, assessment and governance, *Sociologia Ruralis*, 57(3), 267–273

Jehlička, P., and Daněk, P., 2017, Rendering the actually existing sharing economy visible: Home-grown food and the pleasure of sharing, *Sociologia Ruralis*, 57(3), 274–296

Feyereisen, M., Stassart, P.M., and Mélard, F., 2017, Fair trade milk initiative in Belgium: Bricolage as an empowering strategy for change, *Sociologia Ruralis*, 57(3), 297–315

Duncan, J. and Pascucci, S., 2017, Mapping the organisational forms of networks of alternative food networks: Implications for transition, *Sociologia Ruralis*, 57(3), 316–339

Grivins, M., Keech, D., Kunda, I., and Tisenkopfs, T., 2017, Bricolage for self-sufficiency: An analysis of alternative food networks, *Sociologia Ruralis*, 57(3), 340–356

Kirwan, J., Maye, D., and Brunori, G., 2017, Reflexive governance, incorporating ethics and changing understandings of food chain performance, *Sociologia Ruralis*, 57(3), 357–377

Slätmo, E., Fischer, K. and Rööös, E., 2017, The framing of sustainability in sustainability assessment frameworks for agriculture, *Sociologia Ruralis*, 57(3), 378–395

Dupré, L., Lamine, C., and Navarrete, M., 2017, Short food supply chains, long working days: Active work and the construction of professional satisfaction in French diversified organic market gardening, *Sociologia Ruralis*, 57(3), 396–414

Beers, P.J. and Van Mierlo, B., 2017, Reflexivity and learning in system innovation processes, *Sociologia Ruralis*, 57(3), 415–436

**Hanmer, C. and Abram, S., 2017, Actors, networks, and translation hubs: Gas central heating as a rapid socio-technical transition in the United Kingdom, *Energy Research & Social Science*, 34, 176-173**

To achieve UK government targets to reduce carbon emissions by 80% on 1990 levels by 2050 will require a radical shift in domestic heating practices, which are currently dominated by gas central heating, installed in 82% of UK homes (Palmer and Cooper, 2014). Using a socio-technical systems analysis, based on Actor Network Theory, this paper examines what can be learned from previous transitions in heating, in particular the series of changes which led from the majority of UK homes being heated by open coal fires in the middle of the twentieth century, to a very high proportion of gas central heating by the end of the century. Two stages of transition are investigated: the expansion of central heating use in the 1950s and early 1960s, initiated by new technology development by the coal industry, followed by the dramatic increase in the use of gas for home heating as the supply was converted to North Sea gas in the late 1960s through to the 1970s. How did a new technology (small bore central heating systems) spread rapidly and effectively, and how was a fundamental change to a natural gas fuel infrastructure achieved? What does this tell us about the establish of strong and stable heating networks, and what are the lessons for future transitions to low carbon heating systems?

**Rosenbloom, D., Haley, B., Meadowcroft, J., 2018. Critical choices and the politics of decarbonization pathways: Exploring branching points surrounding low-carbon transitions in Canadian electricity systems. *Energy Research & Social Science*, 37, 22–36.**

Transition pathways have attracted increasing interest as a useful analytical lens through which to capture the interlocking processes, patterns, and directions that might constitute substantial movement toward sustainability. While recent research has elaborated the political character of pathways, there is still room to further scrutinize the role of critical choices and branching points in defining diverging pathways. Contributing to the growing body of research on pathways, this study develops an approach that: (1) elaborates the dynamics that open branching points and (2) illustrates how critical choices help define the direction taken at these openings, giving rise to diverging decarbonization pathways. As part of this, the contested nature of critical choices is examined, revealing how actors struggle to shape possible trajectories. This approach is demonstrated by exploring unfolding low-carbon pathways in Canadian electricity systems, drawing lessons for the practice and theory of pathways. In particular, findings indicate that attending to branching points more explicitly exposes the implications and trade-offs embodied within choices by linking near-term decisions to long-run low-carbon configurations.

**Sovacool, B., Noel, L. and Orsato, R., 2017, Stretching, embeddedness, and scripts in a sociotechnical transition: Explaining the failure of electric mobility at Better Place (2007-2013), *Technological Forecasting and Social Change*, 123, 24-34**

Based on field research, interviews, and participant observation, this study explores the failure of Better Place—a now bankrupt company—to successfully demonstrate and deploy battery swapping stations and electric vehicle charging infrastructure. To do so, it draws from concepts in innovation studies, sociotechnical transitions, management science, organizational studies, and sociology. The study expands upon the notion of “fit-stretch”, which explains how innovations can move from an initial “fit” (with existing user practices, discourses, technical form) to a subsequent “stretch” (as the technology further develops, new functionalities are opened up, etc.) in the process of long-term transitions. It also draws

from the “dialectical issue life cycle model” or “triple embeddedness framework” to explain the process whereby incumbent industry actors can introduce defensive innovations to “contain” a new niche from expanding. It lastly incorporates elements from design-driven innovation and organizational learning related to schemas and scripts, concepts that illustrate the vision-dependent and discursive elements of the innovation process. It uses the case study of Better Place to test and build upon these concepts. With a market valuation of more than \$2 billion, Better Place was poised to become one of the most innovative companies in the electric mobility market. Yet after operating for five years it declared bankruptcy and saw its assets sold off for less than \$500,000. We suggest here that Better Place failed because it “stretched” to the point that it “broke;” that it provoked a defensive response from both old automotive manufacturers (such as General Motors) and new ones (such as Tesla); and that the fantastic nature of its visionary scripts convinced its investors and promoters to unrealistically raise expectations and downplay persistent risks.

**Geels, F.W., Sovacool, B.K., Schwanen, T., Sorrell, S., 2017, Sociotechnical transitions for deep decarbonization: Accelerating innovation is as important as climate policy, *Science*, 357(6357), 1242-1244**

The acceleration of low-carbon transitions across the sociotechnical systems of electricity, heat, buildings, manufacturing, and transport requires new conceptual approaches, analytical foci, and policy recommendations.

**Kittner, N., Lill, F., and Kammen, D.M., 2017, Energy storage deployment and innovation for the clean energy transition, *Nature Energy*, 2, 17125**

The clean energy transition requires a co-evolution of innovation, investment, and deployment strategies for emerging energy storage technologies. A deeply decarbonized energy system research platform needs materials science advances in battery technology to overcome the intermittency challenges of wind and solar electricity. Simultaneously, policies designed to build market growth and innovation in battery storage may complement cost reductions across a suite of clean energy technologies. Further integration of R&D and deployment of new storage technologies paves a clear route toward cost-effective low-carbon electricity. Here we analyse deployment and innovation using a two-factor model that integrates the value of investment in materials innovation and technology deployment over time from an empirical dataset covering battery storage technology. Complementary advances in battery storage are of utmost importance to decarbonization alongside improvements in renewable electricity sources. We find and chart a viable path to dispatchable US\$1W□1 solar with US\$100kWh□1 battery storage that enables combinations of solar, wind, and storage to compete directly with fossil-based electricity options.

**Magnusson, T. and Berggren, C., 2017, Competing innovation systems and the need for redeployment in sustainability transitions, *Technological Forecasting and Social Change*, in press**

According to sustainability transitions theories, innovation policies should create protective spaces (‘niches’) for promising new technologies. Moreover they should support a cumulative process of market formation and growth. Based on results from comparative case studies of two competing technological innovation systems for heavy transport (biogas and electrification), this paper argues that these recommendations are contradictory when technology alternatives with different degrees of maturity compete for the same niche. Should innovation policies open up the niche for the promising but immature alternative, or should they continue to support the technology that already has attained a niche position? If this contradiction remains unsolved, there is a risk for conflicts that block the progress of both alternatives. The paper suggests that there is a need for differentiated policies to resolve the contraction. In order to facilitate further development of both systems, the paper suggests that niche nurturing for immature systems needs to be combined with redeployment into new market segments for more mature systems.

**Liedtke, C., Hasselkuß, M., Speck, M., and Baedeker, C., 2017, Transition and social practices, *Journal of Sustainable Development*, 10(5), in press**

Against the background of environmental problems arising from the growing extraction of natural resources and resource depletion, achieving a sustainable development is an indispensable challenge in the twenty-first century. In this article we want to show how socio-technical and product-service innovations can change social practices – the routine doings in everyday life – and, thus, support transition of socio-technical systems. We introduce theoretical considerations on how social practice theories and the framework of the Multi-Level Perspective in transition research can be linked to better understand transition processes from a micro-macro-link perspective. We then present cases based on desk research in the field of practices in bathing, heating and nutrition to show how these have changed over the past decades. Building on this, examples of concepts for sustainable product-service-design in these areas are introduced as leverage points to change social practices in everyday life. These have been developed in research projects or design student seminar works, respectively. We argue that this implies sustainable product-service-systems should be developed in a user- and actor-integrated framework, such as Sustainable LivingLabs. The integration of users and other stakeholders into participatory co-creation processes enables tailored solutions that take actual routines and dependencies seriously into account.

**Hildén, M., Jordan, A. and Huitema, D., 2017, Special Issue on *Experimentation for Climate Change Solutions* Editorial: The search for climate change and sustainability solutions: the promise and the pitfalls of experimentation, *Journal of Cleaner Production*, in press**

This editorial highlights the diversity in studies of experimentation that aims for solutions to climate change and wider sustainability challenges. The diversity is reflected in the theoretical underpinnings, the agency behind experiments, the niches in which experimentation occurs, in the governance of the experiments and in experiments with governance, in the way experiments contribute to learning and sharing of knowledge across levels and scales. This implies that experimentation and experiments can contribute to transitions in very different ways and that experimentation also runs the risks of merely becoming a distraction that maintains status quo instead of contributing to transformative change. In moving forward research should explore the diversity even more, and critically evaluate and discuss the possible contributions to policy and polycentric governance.

**Lee, S-Y., Zusman, E. and Lee, S., 2017, Tracing sustainability transitions in Seoul Governance: Enabling and scaling grassroots innovations, *Procedia Engineering*, 198, 293–304**

In 2011, the newly elected Seoul Mayor introduced administrative reforms that breathed new life into a series of grassroots initiatives. High-profile reforms helped strengthen the connection between Seoul's government, environment, and citizenry and the collection of reforms spurred changes that were pivotal to reorienting Seoul development trajectory. This article draws upon sustainability transitions literature to trace process enabling this reorientation. It highlights the critical role played by change agents such as Seoul Mayor in working at the boundary of 'regimes' and 'niches' to enable wider scale change; while citizen engagement can broaden grassroots innovation's impacts. It further underscores how key enablers in the transitions process can help scale changes to and within regime level. The paper, however, draws a subtle but under-examined distinction between organizational and institutional change within the regime level. This within-level distinction could be the difference between a sustainability transitions that changes Seoul as well as other cities in the future.

**Kvellheim, A.K., 2017, The power of buildings in climate change mitigation: The case of Norway, *Energy Policy*, 110, 653-661**

Centralized power production mainly from fossil fuels is increasingly challenged by decentralized power production from renewables. This is a trend caused by the greening of the European power grid which is to be carbon neutral by 2050. As a part of this trend, the number of power-producing buildings is growing. Even in Norway, which has a highly centralized power production based on hydropower, buildings are increasingly equipped with solar power panels. The introduction of cross-sectoral innovations like power producing buildings is likely to encounter resistance, as the conventional system and its powerful actors are challenged. The strategies to either promote or block the growth of power producing buildings in Norway have been explored employing the Strategic Niche Management framework. For this paper, 32 interviews were conducted with decision-makers and experts, both advocates and opponents of power-producing buildings. It has been found that narratives have the potential to work as a *bridging device* between the niche and the regime. If the narrative supporting power-producing buildings should become a bridging device, it would have to address challenges as defined by the regime incumbents. In Norway, this would be equivalent to addressing the challenge of peak load.

**Nuijten, E., De Wit, J., Janmaat, L., Schmitt, A., Tamm, L., Van Bueren, E.T.L., 2017, Understanding obstacles and opportunities for successful market introduction of crop varieties with resistance against major diseases, *Organic Agriculture*, in press**

Organic agriculture only allows a few 'natural' compounds for managing pests and diseases such as copper which is applied as fungicide in apple, grape, potato, and tomato production. But as a heavy metal, copper is under debate in the organic sector. One key strategy to replace copper use is the market introduction of resistant varieties. In this article, key obstacles and opportunities for the introduction of new apple and potato varieties are identified and described. A comparative analysis integrating agricultural, economic, cultural, and social perspectives is conducted based on literature review, information on internet, and interviews with key experts, mainly from the organic sector. As a framework for analysis, the concepts of brokerage and the multilevel perspective have been used. The following solution pathways are described: (a) make use of added value of varieties, (b) create demand (pull effects), (c) well-coordinated marketing concepts, (d) new marketing concepts such as the Flavour Group Concept, (e) gradual introduction through shorter chain (when limited funding), and (f) match varieties to food chain styles. Key lessons are the following: (i) there must be an urgent need that develops into a pull factor; (ii) for creating pull factors, it is important to involve others; (iii) a shared language and a common culture between involved stakeholders needs to be developed; (iv) without push factor, no new steps will be realised; (v) new concepts need to fit in existing chain structures; (vi) patience is often important, and (vii) some luck is often crucial.

**Jacobs, B., Cordell, D., Chin, J. and Rowe, H., 2017, Towards phosphorus sustainability in North America: A model for transformational change, *Environmental Science & Policy*, 77, 151-159**

Global food production and security rely heavily on finite reserves of newly mined phosphate for fertilizers. However, systemic inefficiencies result in the deposition in aquatic ecosystems of much of the phosphorus mined for food production causing costly eutrophication problems that damage aquatic ecosystems and human health. The Sustainable Phosphorus Alliance (SPA, formerly named North American Partnership for Phosphorus Sustainability) was created to implement sustainable phosphorus solutions through active engagement of stakeholders in both the private and public sectors. This paper describes a conceptual model of transformative change to a sustainable phosphorus system for the North American region. The model emerged from discussions at a series of formal and informal meetings held in conjunction with a 'Future of Phosphorus' event (National Science Foundation's Phosphorus Sustainability Research Coordination Network) and an inaugural SPA Board meeting. Model development drew on the multi-level perspective of socio-technical transitions to develop a

series of pathways to a transformed phosphorus system. The uses of the model and transition pathways are discussed in terms of their potential to form an important first step towards the development of a regional vision for improved phosphorus sustainability. The process provides an example of how research in sustainability science can contribute to action on environmental improvement.

**Osunmuyiwa, O., Biermann, F., and Kalfagianni, A., 2017, Applying the Multi-level Perspective on socio-technical transitions to rentier states: The case of renewable energy transitions in Nigeria, *Journal of Environmental Policy & Planning*, in press**

Although numerous studies have been conducted in recent years on energy transitions, they have been predominately developed and applied in industrialised countries. It is, however, important to question the applicability of transition theories, as they are currently formulated, beyond OECD countries. This study analyses renewable energy transitions in Africa, using Nigeria as a case study, to elucidate the analytical and methodological challenges that sustainability transition studies are facing in developing countries, particularly rentier states. In doing so, the study employs the lens of the multi-level perspective (MLP) on socio-technical transitions - a well-established theory that emphasises the role of “niches”, “regimes”, and “landscapes” in instituting transitions. Based on a detailed analysis of Nigeria, we argue for a more nuanced enquiry of the construct “regime” that better accounts for the rentier character of the state including the role of political elites and prevalent client patron relationships. As such, this study makes an important contribution to the further refinement and enrichment of the MLP by focusing on the political dimensions of energy transitions.

**Baptista, I. and Plananska, J., 2017, The landscape of energy initiatives in sub-Saharan Africa: Going for systemic change or reinforcing the status quo?, *Energy Policy*, 110, 1-8**

This article examines recent interventions by major players in sub-Saharan Africa's energy sector and asks whether they acknowledge or seek to address energy as a complex problem and energy systems as socio-technical systems. Several scholars have begun advocating the socio-technical approach to energy by noting that the mainstream conceptualization of energy challenges in strictly technological or economic terms does not capture the complexity and inertia inherent to energy systems. Moreover, the article also seeks to examine how well have recent interventions integrated pro-poor and low-carbon concerns, two of the major tenets of UN's Sustainable Development Goal 7. Findings suggest that initiatives studied take only partial consideration of key aspects of a socio-technical approach to the energy problem. Nonetheless, the initiatives have taken on board pro-poor and low-carbon concerns to a certain extent. Two main policy implications are drawn from this study: a continued focus on status quo approaches has the potential to generate investment inefficiencies; and an effective low-carbon transition will require a broader discussions about the types of lifestyles people in sub-Saharan Africa aspire to.

**Isgren, E., and Ness, B., 2017, Agroecology to promote just sustainability transitions: Analysis of a civil society network in the Rwenzori region, Western Uganda, *Sustainability*, 9(8), 1357**

Agroecology is gaining ground within the debate on how to address systemic social and environmental problems in agriculture. However, it remains marginalized in agricultural research and development plans around the world. This paper analyzes agroecology as a socio-technical niche in Uganda, where its emergence in part can be seen as an unintended consequence of neoliberalist development. The case studied is a civil society network that links farmer groups and non-governmental organizations across different levels. Through the analytical lens of regime dimensions, we find that agroecology is practiced as a smallholder-centric approach that champions collective action, locally appropriate technologies, participatory methods in research and extension, and calls for more active state guidance of agricultural change along specific principles. However, two major concerns are raised; the niche converges with the dominant discourse around commercialization, and policy

advocacy is hampered by the apolitical history of NGOs and an increasingly tense political climate. These two areas are critical for agroecology to contribute to just sustainability transitions, and civil society organizations with strong links to smallholder farmers need to be included in the growing scholarly debate both to inform it and to receive guidance from it. Transition frameworks can help facilitate the development of viable institutional designs and explicitly transformative strategies, but we also point towards the need for engagement with theories on civil society collective action and political mobilization.

**Jain, M., Hoppe, T. and Bressers, H., 2017, A governance perspective on net zero energy building niche development in India: The case of New Delhi, *Energies*, 10(8), 1144**

The net zero-energy building (NZEB) concept has recently gained prominence worldwide. Large scale adoption and implementation of NZEBs would potentially contribute greatly to greening of the building sector. However, it is still at a nascent stage of niche formation. This paper aims to assess the governance context for adoption and uptake of NZEBs through niche formation in India by addressing the research question: What is the state of governance in New Delhi regarding NZEB niche development? A case study research design is used to answer this question. The Governance Assessment Tool (GAT) and Strategic Niche Management (SNM) are used to analyze the New Delhi case. Data collection involved in-depth interviews with fourteen key stakeholders. Data were analyzed using the qualitative data analysis software (ATLAS.ti). The results reveal that the governance context is only marginally supportive towards NZEB niche formation due to qualities of moderate extent, flexibility and intensity. Actor network formation was identified as an important driver which influences other elements of governance, as well as factors stimulating strategic niche management.

**Siva, V., Hoppe, T., and Jain, M., 2017, Green buildings in Singapore; Analyzing a Frontrunner's sectoral innovation system, *Sustainability*, 9 (6), 919**

The building sector in Singapore consumes up to half of the nation's total energy. The government has therefore been urging the transformation of the industry by targeting 80% of all buildings to be green-certified by 2030. Thus far, Singapore has done relatively well, and is widely viewed as frontrunner in this respect. This paper addresses the question: what are the benefits and limitations of Singapore's sectoral innovation system in spurring energy transition in the building sector, in particular by up-scaling the use of green building technology? The Sectoral Innovation Systems (SIS) theoretical framework was used to analyze the Singapore case. Four SIS components were assessed: technological regime, market demand, actor interactions and networks, and institutional framework. The benefits of Singapore's sectoral innovation system identified in the analysis basically concern aspects of all of the four elements of SIS. Particular success factors concerned the launching of an integrated strategy to support green building innovations (i.e., the Green Mark policy scheme), implementing support policies, and setting up test beds. Furthermore, a master plan to engage and educate end-users was implemented, knowledge exchange platforms were set up, regulations on the use of efficient equipment in buildings were issued, and standards and a certification system were adopted. The results also shed light on key barriers, namely, the reluctance of building users to change their habits, ineffective stakeholder collaboration, and green buildings innovation support coming from the government only. Measures in place have been moderately effective.

**Akizu, O., Urkidi, L., Bueno, G., Lago, R., Barcena, I., Mantxo, M., Basurko, I., Lopez-Guede, J.M., 2017, Tracing the emerging energy transitions in the Global North and the Global South, *International Journal of Hydrogen Energy*, 42(8), 18045-18063**

During recent centuries, in the Global North, every energy crisis has been overcome, sooner or later, with a transition that has led to an increase in the average per capita energy consumption. Currently, due to the environmental and social impacts of the dominant high-consumption and fossil-fuels based energy model, we are seeing some initiatives that

pursue a transition towards a democratic, low-carbon and low-energy consumption level energy system. This work analyses some of the socio-cultural, technological, economic and political factors that are leading to different multi-scale transitions towards low-energy societies around the world. It examines several different cases of transition and proposals from the Global South and Global North. Furthermore, given the limitations of the local or partial nature of these case studies, we also analyse their national energy contexts taking into account the hidden energy flows. These data integrate the total energy needed to provide the goods and services consumed by citizens and indicate the sectors that should be targeted to bring about genuine change, which sometimes differ from the transition paths signposted by national governments. The specific lessons extracted from the case studies in this research may contribute to a social learning process, promoting democratic and sustainable energy models in different regions of the world: peak oil could be an opportunity; energy needs to be equitable, not only renewable; there should be more sincerity and transparency in public energy data communication; energy should be controlled in a public or cooperative way; citizens should take control of their own investments in the energy sector; energy should be a right, not a commodity; community based consumption could reduce energy consumption; and sustainable urban development should be applied in cities and towns, where energy consumers could also become producers.

**Wieczorek, A.J., 2017, Sustainability transitions in developing countries: Major insights and their implications for research and policy, *Environmental Science & Policy*, in press**

Sustainability transitions literature is a rapidly growing and influential field of research. It argues for a radical change of systems providing human needs. Being triggered by the negative implications of the Western post-war model of development, major transition frameworks such as multilevel perspective, strategic niche management or transition management have been widely used to clarify and motivate socio-technical transformations in mainly more economically developed world. Because of their sustainability appeal, however, transition perspectives began to be applied in developing countries. This paper takes stock of and systematises the theoretical insights from this application. Using systematic review method of 115 publications released in the last decade, the paper discusses novel methodological and conceptual lessons around: experimentation and upscaling; stability, change and power; regime uniformity; contextual forces; path-dependence; transnational linkages; normative orientation and other aspects. Although the identified insights confirm the middle range character of the transition theory, they force some reflexivity and raise new research questions for both contexts. The paper also identifies a few policy implication for international organisations, donors, governments and civil society organisations.

**Simpson, G., 2017, Network operators and the transition to decentralised electricity: An Australian socio-technical case study, *Energy Policy*, 110, 422-433**

A socio-technical transitions theory approach is used to consider the extent to which network operators in Western Australia are perceived as facilitating, or blocking, a transition towards a distributed generation-based network. A total of 48 semi-structured, in-depth interviews with community, industry and government representatives were performed in 2015. This research finds that network operators are perceived as 'pushing back' on distributed generation by increasing the complexity, cost and unreliability of connection applications, by restricting further connection of distributed generation to the network, and by requiring consumers to invest in technology for grid protection. Interview respondents suggest network operators do this because: distributed generation creates technical issues at the distribution-scale of the network; distributed generation can reduce financial revenue for the network operator; as a response to a lack of strategic direction on how network operators should respond to distributed generation; and due to a 'risk averse' engineering culture that rejects the unknown. Government intervention may be required to direct network operators to address technical implications of increased distributed generation and redevelop tariff

models to allow fair cost recovery of network assets. However, government intervention may lead to adverse outcomes, including in relation to the cost-recovery of state-owned assets.

**Vlahos, G., Karanikolas, P. and Koutsouris, A., 2017, Integrated farming in Greece: A transition-to-sustainability perspective, *International Journal of Agricultural Resources, Governance and Ecology*, in press**

The aim of this paper is to explore the linking process between a niche and the regime in the context of an emergent transition, using the concepts of 'anchoring' and 'translation' embedded in the broader multi-level perspective. The case study concerns the transition of an intensive farming system, from subsidy oriented productivism, towards an integrated farming (IF) system focusing on the market, in the canned peach sector in Imathia, Northern Greece. The study revealed an anchored regime-triggered innovation, which resulted in the creation of a market niche within the incumbent regime. In this transition, all forms of anchoring are involved, and various forms of translation were encountered while a hybrid forum was identified, serving as the 'fertile ground' upon which all subsequent networking and translation activities took place. Research findings question a clear-cut analytical separation between the three levels of the multi-level perspective, as well as the relevance of a bottom-up procedure as a prerequisite for niche emergence vis-à-vis policy induced change.

**Foong, D., Mitchell, P., Wagstaff, N., Duncan, E. and McManus, P., 2017, Transitioning to a more sustainable residential built environment in Sydney?, *Geography and Environment*, 4(1), doi 10.1002/geo2.33**

This article applies socio-technical transitions theory (STTT), with the aim of identifying how the barriers and opportunities that exist to implementing sustainable building are socio-spatially embedded at a residential scale in Sydney, NSW. This is done through a series of semi-structured interviews conducted with a range of professionals in relevant industries. The research concludes that barriers and opportunities to sustainable residential buildings in Sydney exist within a landscape context of housing provision in developed countries. However, the conceptual application of these barriers to Sydney, through the multi-level perspective of STTT with a geographical conceptualisation of the socio-spatial embeddedness of transitions, highlights the necessity of working within the Sydney and NSW context to facilitate genuine and meaningful transitions. Furthermore, a key finding of this article was the necessity of including socio-economic factors in a STTT analysis in order to transition to a residential built environment which is both sustainable and affordable.

**Stephenson, J., Spector, S., Hopkins, D., and McCarthy, A., 2017, Deep interventions for a sustainable transport future. *Transportation Research Part D: Transport and Environment*, in press**

The dominance of automobility is giving rise to unsustainable outcomes, not least of which is its contribution to climate change. At the same time, business-as-usual transport systems are entering a period of turbulence as a result of influences such as new and disruptive technologies, intelligent systems, new business models, changing consumer expectations, population growth, suburban sprawl, and national commitments to reduce greenhouse gas emissions. An optimal trajectory towards sustainable transport is unlikely to be achieved in a laissez-faire policy environment, and nor is it likely that it will be resolved by any single solution. Rather, it is likely to require carefully crafted interventions that have a good fit with unique national circumstances, and which will work in an integrated way to achieve change consistently throughout the transport system. The research reported in this paper draws on the situated knowledge and experience of New Zealand transport experts to develop a suite of potential interventions for a sustainable transport future for New Zealand. Drawing on the findings of a four-stage Delphi study, which solicited experts' views on interventions that could lead to better outcomes than were being achieved by the current policy environment. The paper concludes that a consistent and integrated commitment is required at all levels of

governance and across all parts of the transport system to transition away from automobility and towards sustainable mobility.

**Kompella, L., 2017, E-Governance systems as socio-technical transitions using multi-level perspective with case studies, *Technological Forecasting and Social Change*,** E-Governance systems are socio-technical systems. The change affects socio-technical systems by shifting assemblies of constituent sub-systems. Using Multi-Level Perspective, MLP, technology transition literature has numerous instances explaining shifting of assemblies for socio-technical systems from stability, change, and transitions based on neo-Schumpeterian approach. Two approaches mainly characterize evolution and are 1) neo-Schumpeterian - variation, selection, and retention, and 2) naturalistic - novelty, emergence, and dissemination. Unique characteristic exists between society and E-Governance where one influences the other and acted upon by the other. E-Governance literature has relatively little attention as transition studies analyzing the interplay of developments at macro, meso and micro levels. Therefore, the author extended MLP to E-Governance systems by considering both approaches of evolution. It is essential to understand the context in which the interplay of developments takes place; moreover, transitions can have several trajectories or pathways. Therefore, the author selected case study with multiple E-Governance cases to represent various trajectories. The selected cases were from Central and state governments of India and represented domains citizen services, workflow automation of different magnitudes, and integration of departments. The case selection considered all three government scenarios. Governments implement E-Governance with a participating organization, the author during case selection ensured diverse participating organizations. In doing so, did analyze the interplay of developments in E-Governance and developed a multi-scalar MLP for E-Governance. Structuration and temporal dimensions along with spatial explain interoperations in E-Governance. By improving spatial dimension, actors can develop organizational capabilities to share information and increase knowledge management resulting in better interoperations within and among themselves. In doing so, actors can improve processes by developing activities that help in the better cumulation of the radical innovations as stable designs. In other words, process innovations assist to stabilize product innovations. The author from the selected cases noted a technology deterministic approach with the latest ICT innovations and traditional forms of organizing, with cases that exhibit new forms of organizing it is possible to obtain more insights to improve interoperability.

**Van den Heiligenberg, H.A.R.M., Heimeriks, G.J., Hekkert M.P. and van Oort, F.G., 2017, A habitat for sustainability experiments: Success factors for innovations in their local and regional contexts. *Journal of Cleaner Production*, in press**

The sustainability challenge requires various forms of experimentation with inventions, which may lead to an upscaling process in which the invention and its applications will spread to other users and regions in the world. However, many experiments fail. In this paper, we explore the success factors for sustainability experiments in their contribution to a longer-term regime change. These factors are related to the experiment itself as well as to the habitat in which the experiment takes place. A habitat is regarded as a configuration of contextual factors, which are mainly locally or regionally embedded. We introduce complementary insights from transition management literature and regional innovation systems literature to hypothesise that various types of experiments have distinctive favourite habitats, each with their specific success factors. Our exploratory survey among 56 sustainability experiments throughout Europe in the area of food, mobility and energy innovation suggests that user involvement is the most important success factor. Other important factors are the cooperation in local and regional networks, the policy instruments from the local and regional government, the dissemination of learning experiences, and the existence of a local or regional vision of the future. We conclude that entrepreneurs, users, local and regional governments as well as other regional partners should collaborate actively to make sustainability experiments more successful.

**De Boer, M.A.H.M., Caprotti, F., 2017, Getting Londoners on two wheels: A comparative approach analysing London's potential pathways to a cycling transition, *Sustainable Cities and Society*, 32, 613-626**

This article compares the current state of cycling in London to the Amsterdam cycling transition of the 1970s, applying the Multi-Level Perspective to identify potential pathways and obstacles to the wider adoption of the cycling niche in London. Our approach is two-pronged, consisting of a historical perspective to analyse the cycling transition in Amsterdam, and a policy analysis in contemporary London, based on semi-structured interviews with respondents involved in London's cycling policy. We identify factors that reinforce cycling's niche status in London, thus making the wider adoption of cycling more challenging than it was in Amsterdam. Based on our comparison, we also highlight policy, infrastructure and cultural changes that will aid in promoting a cycling transition in London.

**Hoffman, S., Weyer, J. and Longen, J., 2017, Discontinuation of the automobility regime? An integrated approach to multi-level governance, *Transportation Research Part A*, 103, 391-408**

The case study at hand investigates a largely neglected phenomenon: the discontinuation of incumbent socio-technical regimes by means of deliberate governance. Comparing actor constellations and policy measures in four different countries (the UK, Germany, France and the Netherlands) and on the EU level, we identify strategies and measures that have been applied to challenge the automobility regime. Instead of creating a new analytical framework for studying the governance of discontinuation, we propose to use three existing concepts, namely the multi-level perspective (MLP), multi-level governance (MLG) as well as actor-centred approaches, combining them into one integrated concept labelled "multi-level governance of socio-technical regimes". From this perspective, the European Union is the most active actor in attempts to restrict automobility, especially exerting pressure at the landscape level. However, in spite of various challenges, the automobility regime still remains considerably stable.

**Shum, K.L., 2017, Renewable energy deployment policy: A transition management perspective, *Renewable and Sustainable Energy Reviews*, 73, 1380-1388**

This paper analyzes major categories of renewable policy instruments in light of the framework of Transition Management. We leveraged the concept of levelized cost of electricity (LCOE) to unify the discussion of these instruments by elaborating the differing effects such instruments have on the formation of the socio-technological regime. Regimes are sets of grammar, logics and contexts which enable and constrain the interaction of actors associated with a physical technology. We compare these instruments by assuming the normative organization objective of a regime to be that of enhancing the cost-effectiveness of respective instruments. In other words, the socio-technological regime is to be organized and optimized to improve the LCOE of the energy technology. Our main contribution is to propose the rationalization of the regime objective and the implications to regime management and development strategy. This in turn would facilitate a much needed synthesis of normative and evolutionary deliberation in the framework of Transition Management.

**Hess, D.J. and Brown, K.P., 2017, Water and the politics of sustainability transitions: from regime actor conflicts to system governance organizations, *Environmental Policy and Planning*, in press**

This study contributes to the analysis of the politics of sustainability transitions by developing a focus on regime actor conflicts and a processual model for how these conflicts develop and are resolved. In a comparison of water-supply systems in four U.S. cities, we show how conflicts among regime actors and political jurisdictions lead to the formation of system governance organizations (SGOs) that bridge jurisdictional boundaries to manage conflicts over a technological system (TS). SGOs coordinate relations among water utilities and diverse stakeholders to reduce pervasive conflicts, but they can also serve as drivers of

improved sustainability. We analyze resistance that can emerge, such as from urban growth coalitions, which limit the capacity of SGOs to drive changes. We develop a four-stage processual model (first-order regime conflicts, SGO formation, sustainability transition expansion, and second-order regime conflicts) that opens research in the politics of transitions to the dynamic of regime actor conflicts and provides the basis for generalizations about the causes of SGO formation and their effects on the governance of TSs such as water-supply infrastructure. Policy implications regarding how to improve political support for SGO sustainability efforts are also discussed.

**Krick, E., 2017, Ensuring social acceptance of the energy transition. The German government's 'consensus management' strategy, *Environmental Policy and Planning*, in press**

This study deals with the German Federal Government's approach of ensuring public support for its 'Energiewende', the swift and complete transition to an energy system based on renewable sources. First, the government's 'consensus management' strategy is described as consisting of four elements: the setup of stakeholder deliberation fora; the funding of organisations dedicated to the public promotion of the energy transition; public campaigns that appeal to people's commitment and the support of research on energy technologies. The study then traces the need for a strong social mandate of the energy transition back to the scope of the regulatory challenge and the recently growing conflicts around implementation, to institutional constraints of a consensus democracy and to the narrative of 'Energiewende' as the 'grand national task'.

**Ulli-Beer, S., Kubli, M., Zapata, J., Wurzinger, M., Musiolik, J., Furrer, B., 2017, Participative modelling of socio-technical transitions: Why and how should we look beyond the case-specific energy transition challenge?, *Systems Research and Behavioural Science*, 34(4), 469-488**

Participative modelling (PM) is a promising approach to mutual learning about causal mechanisms and dynamics in socio-technical transitions. However, case-specific PM initiatives often fail to generate insights that inform related cases. We address this methodical limitation in a case study on the Swiss energy transition. The central question is as follows: How can a PM workshop series be designed to create insights that go beyond the single socio-technical transition case? Based on theorizing literature, we develop a process framework for generic PM based on system dynamics modelling and socio-technical transition frameworks. The framework differentiates the steps in theorizing and explains how to integrate different levels of theorizing into the PM process. We illustrate how we applied the framework in our PM workshop series. Our experiences show that workshop participants employ various conceptual tools (e.g. socio-technical frameworks or causal loop diagrams) to classify and clarify their own experience in general terms.

**Wesseling, J.H., Lechtenböhmer, S., Åhman, M., Nilsson, L.J., Worrell, E., Coenen, L., 2017, The transition of energy intensive processing industries towards deep decarbonization: Characteristics and implications for future research, *Renewable & Sustainable Energy Reviews*, 79, 1303-1313**

Energy-intensive processing industries (EPIs) produce iron and steel, aluminum, chemicals, cement, glass, and paper and pulp and are responsible for a large share of global greenhouse gas emissions. To meet 2050 emission targets, an accelerated transition towards deep decarbonization is required in these industries. Insights from sociotechnical and innovation systems perspectives are needed to better understand how to steer and facilitate this transition process. The transitions literature has so far, however, not featured EPIs. This paper positions EPIs within the transitions literature by characterizing their sociotechnical and innovation systems in terms of industry structure, innovation strategies, networks, markets and governmental interventions. We subsequently explore how these characteristics may influence the transition to deep decarbonization and identify gaps in the literature from which we formulate an agenda for further transitions research on EPIs and

consider policy implications. Furthering this research field would not only enrich discussions on policy for achieving deep decarbonization, but would also develop transitions theory since the distinctive EPI characteristics are likely to yield new patterns in transition dynamics.

**Meadowcroft, K., Stephens, J.C., Wilson, E.J., Rowlands, I.H., 2017, Social dimensions of smart grid: Regional analysis in Canada and the United States. Introduction to special issue of Renewable and Sustainable Energy Reviews, *Renewable and Sustainable Energy Reviews*, in press**

This special issue of Sustainable and Renewable Energy Reviews is focused on the social and policy dimensions of smart grids, an emerging set of technologies and practices which have the potential to transform dramatically electricity systems around the world. The six related articles explore social and political dynamics associated with smart grid deployment in the United States of America (USA) and Canada. Aspects examined in this special issue include the evolution of smart grid policy in Ontario, media coverage of smart grid experiences in Canada and smart grid approaches being taken in Québec. Other aspects covered include an analysis of smart grid systems planning post-Superstorm Sandy (that hit the Northeastern coast of the USA in 2012), the environmental framing of socio-political acceptance of the smart grid in British Columbia, and news coverage of the smart grid in the USA and Canada. These articles were supported by collaborative research from the National Science Foundation in the USA and the Social Sciences and Humanities Research Council in Canada which involved three expert workshops held in Canada in 2013, 2014 and 2015. The six articles were accepted after a vigorous review process overseen by the guest editors of this special issue. The contents are in keeping with the aims and scope of the journal which is to bring together under one roof the current advances in the ever broadening field of renewable and sustainable energy

**Warbroek, B., and Hoppe, T., 2017, Modes of governing and policy of local and regional governments supporting local low-carbon energy initiatives; exploring the cases of the Dutch regions of Overijssel and Fryslân. *Sustainability*, 9(1), 75.**

Recent scholarly attention shows increasing involvement of local low-carbon energy initiatives (LLCEIs) in governance and policy, in particular in relation to innovations regarding low-carbon energy and energy efficiency. The future perspective of active citizenship in the production of locally generated low-carbon energy is largely dependent on the existing institutional and policy frameworks and settings. Subnational governments, in particular, can have a prominent role in this process by engaging in institutional adaptation and policy innovation. The central research question of this paper is: *In what ways do local and regional governments innovate in governing to respond to the emergence of LLCEIs?* The research question is answered by comparing two case studies: the Dutch regions of Overijssel and Fryslân. We have conceptualized a meta-governing approach of experimentation, characterizing the innovations in governing that emerge when governments respond to the emergence of LLCEIs. We specifically focus on two capacities that subnational governments can use to enhance their governing capacity vis-à-vis LLCEIs and which substantiate the experimental meta-governance mode: institutional adaptation and policy innovation. We then formulated hypotheses that specify the expected policy innovations and institutional adaptations employed vis-à-vis LLCEIs. Data collection involved in-depth interviews and use of secondary data. The results show that a balancing process of authoritative and enabling modes of governing particularly characterized the type of policy innovations that were developed and the institutional adaptations that took place. Both provinces govern LLCEIs at arm's length and issue significant capacity-building strategies that vary in terms of their conditions. Municipalities, however, incline towards impromptu and opportunistic responses, some of them having lasting effects by patching up existing institutional settings, others having more of an episodic character. The results will further the understanding of subnational low-carbon policy and governance innovation processes vis-à-vis the role of LLCEIs.

**Moallemi, E.A., Aye, L., de Haan, F.J., Webb, J.M., 2017, A dual narrative-modelling approach for evaluating socio-technical transitions in electricity sectors, *Journal of Cleaner Production*, 162, 1210-1224**

The sustainability transition of electricity sectors is a matter of competition between multiple emerging renewable systems and dominant, established conventional systems. These transitions are multi-dimensional and are featured with non-linear and causal interactions between social, technical, economic and political components. Understanding the dynamic of transitions, i.e. how transitions unfold, can inform effective policy interventions. This paper aims to present a narrative-modelling approach to improve the understanding and description of transition dynamics in electricity sectors. The central ideas of the paper are: (1) the use of qualitative transition narratives helps to capture the co-evolving nature of society and technology which are simplified in modelling approaches; (2) narratives, with concepts from the sustainability transitions field, also guide the development of a model structure; and (3) computational models, in return, reproduce the complexity of transition dynamics, i.e. feedback loops, non-linearity, and time delays—the features which are impracticable to analyse with transition narratives alone. We use the historical transition of India's electricity sector to demonstrate the implementation of our proposed approach. First, an overview of the transition narratives is presented and the model structure, developed based on the narratives, is explained. Then, it is argued how the coupling of the narratives and model improves our understating of the positive impacts as well as the side-effects of stable feed-in tariffs and accelerated depreciation on the penetration levels of wind and solar electricity.

**Moallemi, E.A., de Haan, F., Kwakkel, J. and Aye, L., 2017, Narrative-informed exploratory analysis of energy transition pathways: A case study of India's electricity sector, *Energy Policy*, 110, 271-287**

Energy transitions unfold under the influence of socio-technical, political and economic uncertainties. This paper introduces a narrative-informed exploratory approach for analysing future energy transition pathways under these uncertainty conditions. In this approach, exploratory modelling is used to explore the impact of various uncertainties, such as potential installed capacity and supporting policies for different energy options, on the unfolding of transition pathways. The approach produces several sets of scenarios. We complement this quantitative exploration of the future with narratives (storylines) generated based on the concepts in the sustainability transitions field. Narratives are used (i) as a supporting framework for model structure; (ii) to guide the exploration of the future; and (iii) to interpret the ensemble of quantitative scenarios. We describe how synergies between narratives and exploratory modelling inform both the framed and open-ended exploration of future transition pathways. The approach is demonstrated with a case study of the transition in India's electricity sector. We show that the realisation of the 100 GW solar electricity target by 2022 is unlikely, and that the development of solar electricity is highly dependent on the active role of government.

**Naber, R., Raven, R., Kouw, M. and Dassen, T., 2017, Scaling up sustainable energy innovations, *Energy Policy*, 110, 342-354**

Current electricity grids do not fit the needs and challenges of the 21st century, such as the need to transition to renewable energy sources and the variability in power supply concomitant with such energy sources. In this context, smart electricity grids have been proposed as a solution. A large number of pilots and experiments have been set up, but a key challenge remains how to upscale them. Upscaling is critically important to enable a wide-scale integration of renewable energy sources. This paper mobilises literature on the strategic management of experimental niches to explore the upscaling of smart grids in the Netherlands. On the basis of existing literature, a typology of four different patterns of upscaling is proposed: growing, replication, accumulation, and transformation. The relevance of this typology to understanding upscaling of smart grids is explored in a comparative qualitative case study design. On this basis we argue that the building of broad

and deep social networks is important for growing and replication; articulating and sharing expectations is important for replication; and broad and reflexive learning processes are critical to transformation and replication. The paper concludes by arguing that these findings can provide important guidelines for future energy innovation policies.

**Lockwood, M., Mitchell, C., Hoggett, R. and Kuzemko, C., 2017, The governance of industry rules and energy system innovation: The case of codes in Great Britain, *Utilities Policy*, 47, 41-49**

Detailed energy industry rules are crucial to realising policy goals, but typically overlooked. Governance arrangements determine ease of rule change for policy goals. Delegation is a widespread institutional design principle but has risks of capture and inertia. The case of code governance in Britain gives a demonstration of these risks. A reform agenda is outlined and wider lessons drawn out.

**Bugge, M., Coenen, L., Marques, P., & Morgan, K., 2017, Governing system innovation: assisted living experiments in the UK and Norway. *European Planning Studies*, in press**

Debates on how to address societal challenges have moved to the forefront of academic and policy concerns. Of particular importance is the growing awareness that to deal with issues such as ageing, it will be necessary to implement concerted efforts on technological, social, institutional or political fronts. Drawing on a number of theoretical perspectives – including socio-technical transitions and embedded state theory – the aim of this paper is to identify and understand different approaches to the governance of such system innovations by comparing state responses to assisted living in two contrasting national systems of care, namely that of the UK and Norway. Its findings highlight that state-supported and funded experimentation projects have been instrumental in designing and implementing system innovation: through their emphasis on co-design and co-creation, these projects demonstrated the value of early implementation pilots to explore the ‘fit’ between novel technologies and prevailing practices and institutional structures in national systems of care. Still, competition, biases or conflicting interests should not be ignored between well-established agents and institutions and experimental solutions whose efficacy remains relatively untested and which involve a combination of new technical, social, organizational and institutional solutions.

**Valentine, S.V., Sovacool, B.K. and Brown, M.A., 2017, Frame envy in energy policy ideology: A social constructivist framework for wicked energy problems, *Energy Policy*, 110, 623-630**

This article deals with the nexus between energy policymaking and ideology. The article builds and expands upon a theoretical social constructivist analytical strategy, or framework, put forth for the purposes of conducting energy policy analysis. It then addresses criticism that this strategy constitutes “postmodern mush” that has no place in energy analysis before concluding with a review of why social constructivism has a significant role to play in building consensus and enhancing understanding between competing energy policy perspectives. The main contribution made by this paper stems from application of this ontological construct to the analysis of policies targeting wicked energy problems. The study cuts to the core about how energy problems are defined, interpreted, communicated, planned for, and potentially implemented via policy. Put another way, our study offers a timely critique or a call for reconceptualizing the process and practice of energy policy itself.

**Eyre, N., Darby, S.J., Grünewald, P., McKenna, E. and Ford, R., 2017, Reaching a 1.5C target: Socio-technical challenges for a rapid transition to low carbon electricity systems, *Philosophical Transactions of the Royal Society A*, in press**

A 1.5C global average target implies that we should no longer focus on merely incremental emissions reductions from the electricity system, but rather on fundamentally re-envisioning a system that, sooner rather than later, becomes carbon free. Many low carbon technologies

are surpassing mainstream predictions for both uptake and cost reduction. Their deployment is beginning to be disruptive within established systems. ‘Smart technologies’ are being developed to address emerging challenges of system integration, but their rates of future deployment remain uncertain. We argue that transition towards a system that can fully displace carbon generation sources will require expanding the focus of our efforts beyond technical solutions. Recognising that change has social as well as technical dimensions, and that these interact strongly, we set out a socio-technical review that covers electricity infrastructure, citizens, business models and governance. It describes some of the socio-technical challenges that need to be addressed for the successful transition of existing electricity systems. We conclude that a socio-technical understanding of electricity system transitions offers new and better insights into the potential and challenges for rapid decarbonisation.

**Nygaard, I. and Bolwig, S., 2017, The rise and fall of foreign private investment in the jatropha biofuel value chain in Ghana, *Environmental Science and Policy*, in press**

The article draws on the multi-level perspective (MLP) and global value chain (GVC) frameworks to analyse the drivers and trajectories of foreign private investment in biofuel production in Ghana. It is based on a narrative of the evolution of a niche for jatropha production in Ghana in the period 1995–2016 including company case studies. The factors analysed relating to MLP are alignment of expectations, network formation, and learning and knowledge sharing, and those relating to GVC are chain structure, governance, ownership, and access to land and capital. High entry barriers for creating a new agriculture-based value chain for global biofuel markets, i.e. high volume requirements, high capital needs, and market risks contributed to the collapse of the jatropha sector in Ghana. A low level of learning and knowledge sharing between jatropha actors in Ghana, alongside weak public R&D support, reduced access to technical and managerial information. Confirming previous GVC research on biofuels, policy and NGOs had a stronger influence on the jatropha value chain than in typical agricultural chains. Moreover, global drivers and the strategies and capabilities of foreign investors can strongly influence the development of a new biofuel value chain in a developing country. The latter points complement previous research on jatropha, which highlights politico- economic factors such as land tenure, regional and local power relations, and the interests of donors and NGOs. The study exemplifies a non-evolutionary niche development that goes beyond the European experiences of industrial niche development on which the MLP framework was first established. The importance of investors and policy at different levels of the value chain illustrate the synergies in combining the MLP and GVC frameworks in research on energy transitions in developing countries.

**Gaziulusoy, A.I. and Ryan, C., 2017, Roles of design in sustainability transitions projects: A case study of Visions and Pathways 2040 project from Australia, *Journal of Cleaner Production*, 162, 1297 - 1307**

Sustainability transitions require structural and systemic changes. Transitions research poses creative as well as analytical challenges due to high complexity and uncertainty associated with these projects. In this article we present an initial and exploratory investigation of roles design plays in transition projects focusing on Visions and Pathways 2040 (VP2040) project as a case study. VP2040 aims to develop visions, scenarios and pathways for low-carbon resilient futures in Australian cities. The project adopts a design-led approach, linking research and engagement in design-led future visioning. Our findings indicate that the roles design can play in sustainability transitions projects is various covering very tangible, technical, skills-based roles, to very intangible roles, relating to how information is received, processed and synthesised. Our findings also imply that, increasingly more, design practitioners will need to bring in skills and knowledge that have not been part of conventional design education, and therefore, institutions providing design education need to start developing and implementing curriculums that will equip graduates with these new professional capacities.

**Mah, D. N-Y., Wu, Y-Y., and Hills, P.R., 2017, Explaining the role of incumbent utilities in sustainable energy transitions: A case study of the smart grid development in China, *Energy Policy*, 109, 794-806**

Smart grids (SGs) have been widely recognized as an enabling technology for delivering sustainable energy transitions. Such transitions have given rise to more complex government-utility-consumer relationships. However, these stakeholder relationships remain largely under-researched. This paper critically examines and explains the role of incumbent utilities in sustainable energy transitions, using SG developments in China as a case study. We have three major findings. First, China has developed an incumbent-led model for deploying SGs. Second, two incumbents, the major-state-owned grid companies, act as enablers of SG deployment. They are strategic first-movers and infrastructure builders of SGs. They have also developed five types of networks as they increasingly reach out to other state actors, businesses, and electricity consumers. Thirdly, these two grid companies also act as a fundamental block to structural changes in socio-technical regimes. Disincentives to these large existing grid companies coupled with excessive reliance on them to provide public goods have resulted in major weaknesses in China's incumbent-led model. Our findings have clear policy implications. Innovation in regulating incumbents is needed in order to provide sufficient regulatory incentives for advancing SG developments in China.

**Ortiz, W., Vilsmaier, U., and Osorio, A.A., 2017, The diffusion of sustainable family farming practices in Colombia: an emerging sociotechnical niche?, *Sustainability Science*, s11625-017-0493-6**

There is significant potential for family farming to contribute to several dimensions of the Sustainable Development Goals adopted by the United Nations General Assembly in 2015. Our research aims to provide insights to help strengthen sustainable family farming. We focus on initiatives that have advanced sustainable family farming innovations in Colombia and analyse the factors and dynamics that have led to the limited penetration of those innovations across the country. To that aim, a transformative methodology is applied involving representatives of farmers' associations, supporting organisations and researchers from various disciplinary fields. We analyse the network of initiatives against the conceptual background of sociotechnical niches and identify a stable niche where generic lessons are being systematically identified and used to establish replication projects. However, this niche is still limited in its breadth, which results in a low capacity for expansion and a strong dependency on international donors for reproducing experiences. Specific recommendations are outlined for broadening the type of actors involved in the interpretation and dissemination of lessons from the niche. Moreover, we outline suggestions for further research and conceptualisation in two directions: for exploring effective ways of broadening the niche and translating niche lessons to state policies and for deepening the understanding of interactions between the niche and other levels.

**Avelino, F., Wittmayer, J.M., Pel, B., Weaver, P., Dumitru, A., Haxeltine, A., Kemp, R., Jørgensen, M.S., Bauler, T., Ruijsink, S., O'Riordan, T., 2017, Transformative social innovation and (dis)empowerment, *Technological Forecasting and Social Change*, in press**

This article responds to increasing public and academic discourses on social innovation, which often rest on the assumption that social innovation can drive societal change and empower actors to deal with societal challenges and a retreating welfare state. In order to scrutinise this assumption, this article proposes a set of concepts to study the dynamics of *transformative social innovation* and underlying processes of multi-actor (dis)empowerment. First, the concept of transformative social innovation is unpacked by proposing four foundational concepts to help distinguish between different pertinent 'shades' of change and innovation: 1) social innovation, (2) system innovation, (3) game-changers, and (4) narratives of change. These concepts, invoking insights from transitions studies and social innovations literature, are used to construct a conceptual account of how transformative

social innovation emerges as a co-evolutionary interaction between diverse shades of change and innovation. Second, the paper critically discusses the dialectic nature of multi-actor (dis)empowerment that underlies such processes of change and innovation. The paper then demonstrates how the conceptualisations are applied to three empirical case-studies of transformative social innovation: Impact Hub, Time Banks and Credit Unions. In the conclusion we synthesise how the concepts and the empirical examples help to understand contemporary shifts in societal power relations and the changing role of the welfare state.

**Valkering, P., Yücel, G., Gebetsroither-Geringer, E., Markvica, K., Meynaerts, E. and Frantzeskaki, N., 2017, Accelerating transition dynamics in city regions: A qualitative modeling perspective, *Sustainability*, 9(7), 1254**

In this article, we take stock of the findings from conceptual and empirical work on the role of transition initiatives for accelerating transitions as input for modeling acceleration dynamics. We applied the qualitative modeling approach of causal loop diagrams to capture the dynamics of a single transition initiative evolving within its regional context. In doing so, we aim to address two key challenges in transition modeling, namely conceptualization, and the framing of empirical insights obtained for various case study regions in a consistent modeling framework. Our results show that through this systematic approach one can translate conceptual and qualitative empirical work into a transition model design. Moreover, the causal loop diagrams can be used as discussion tools to support dialogue among researchers and stakeholders, and may support a comparison of transition dynamics across case-study regions. We reflect on main limitations related to empirical model validation (lack of data) and to model structure (high level of aggregation), and describe next steps for moving from a qualitative single transition initiative to a quantitative multiple transition initiatives model.

**Kivimaa, P; Martiskainen, M (2017). Innovation, low-energy buildings and intermediaries in Europe: Systematic case study review. *Energy Efficiency*, in press.**

As buildings throughout their life cycle account for circa 40% of total energy use in Europe, reducing energy use of the building stock is a key task. This task is, however, complicated by a range of factors, including slow renewal and renovation rates of buildings, multiple non-coordinated actors, conservative building practices and limited competence to innovate. Drawing from academic literature published during 2005–2015, this article carries out a systematic review of case studies on low energy innovations in the European residential building sector, analysing their drivers. Specific attention is paid to intermediary actors in facilitating innovation processes and creating new opportunities. The study finds that qualitative case study literature on low energy building innovation has been limited, particularly regarding the existing building stock. Environmental concerns, EU and national and local policies have been the key drivers; financial, knowledge and social sustainability and equity drivers have been of modest importance; while design, health and comfort and market drivers have played a minor role. Intermediary organisations and individuals have been important through five processes: (1) facilitating individual building projects, (2) creating niche markets, (3) implementing new practices in social housing stock, (4) supporting new business model creation and (5) facilitating building use post-construction. The intermediaries have included both public and private actors, while local authority agents have acted as intermediaries in several cases.

**Wegner, M-S., Hall, S., Hardy, J., Workman, M., 2017, Valuing energy futures; a comparative analysis of value pools across UK energy system scenarios, *Applied Energy*, 206, 815-828**

Electricity markets in liberalised nations are composed primarily of private firms that make strategic decisions about how to secure competitive advantage. Energy transitions, driven by decarbonisation targets and technological innovation, will create new markets and destroy old ones in a re-configuration of the power sector. This research suggests that by 2050 up to 21 bnGBP per year of new financial value is available in the UK electricity system, and that

depending on scenario, these new values represent up to 31% of the entire electricity sector. To service these markets business model innovation and new firm strategies are needed in electric power provision. Energy scenarios can inform strategic decisions over business model adaptation, but to date scenario modelling has not directly addressed firm strategy and behaviour. This is due in part to neo-classical assumptions of firm rationality and perfect foresight. This research adopts a resource based view of the firm rooted in evolutionary economics to argue that quantifying the relative size of the markets created and destroyed by energy transitions can provide useful insight into firm behaviour and innovation policy.

**Friedmann, H., 2017, Paradox of transition: Two reports on how to move towards sustainable food systems, *Development and Change*, 48, 1210-1226**

The paradox of intentional transitions is how incremental changes — or small transitions — can lead to a fundamental transition — a change of states from unsustainability to sustainability. To make the question precise enough to be useful depends on several things. First, it is crucial how one identifies the present situation, that is, how one defines sustainability and measures unsustainability; second, it matters how one identifies key actors and their interests. Most important, in my view, is *history*. This means interpreting the origins of the present situation — what interests, ideas and institutions emerged at different moments, and how they converged, diverged and conflicted to create layers of inherited structures. The present moment includes both institutions and practices, and dominant and contested ideas; these include *growth* and *efficiency* and how to *measure* them, what and whose *knowledge* is valued, and how *nature and technology* are related. That history must include the policies that have consciously or unconsciously shaped historical actions. Finally, these can determine whether a shared intention exists among actors, or alternatively, how opposition and power might be addressed in order to move towards sustainability. Only then can it be specified how social actors might choose short-term actions that promise to lead towards the desirable state, rather than perverse outcomes.

**Bakker, S. and Konings, R., 2017, The transition to zero-emission buses in public transport – The need for institutional innovation, *Transportation Research Part D: Transport and Environment*, in press**

Zero-emission buses (ZEBs) are considered a vital element in the transition to a more sustainable (urban) transport system. Both battery-electric and hydrogen fuel cell buses do however face significant barriers to large-scale implementation. These barriers, e.g. high investment costs and limited driving range, are generally regarded as exogenous technological barriers which are beyond the sphere of influence of actors in the public transport sector. In this paper we question this assumption and therefore we look at the role of institutions in public bus transport. Based on a series of interviews with stakeholders in the Dutch public transport sector we argue that various regulative, normative, and cognitive institutions discourage the use of zero-emission buses in public transport. We conclude with several suggestions for institutional innovation to increase the chances for these buses.

**Faller, F. and Schulz, C., 2017, Sustainable practices of the energy transition: Evidence from the biogas and building industries in Luxembourg, *Applied Geography*, in press**

Research on the mechanisms and articulation of sustainability transitions has gained considerable momentum in human geography over the last decade. In this context, the efficient production and utilization of renewable energies is widely considered as one crucial aspect of ongoing adaptations to new environmental imperatives. Our paper examines geographical dimensions of this so-called energy transition. It illuminates the interplay of various agents and how their practices change over time. First, we discuss the potentials of practice oriented transition studies. Second, we examine methodological approaches for investigating sustainable practices of energy transitions, including tools that foster the co-production of knowledge (e.g. World Cafés). Third, we utilize the introduced concepts and methods to provide qualitative empirical evidence. We present two facets of an ongoing

transition: the combined-heat-and- power-production and the green building industry in Luxembourg. The first case shows the interrelated and changing practices of bio-energy actors that led to the formation of a biogas sector. The second case illustrates the specific dynamics of an emerging market and the central role of public and civic agency. Finally, we discuss how practice sensitive approaches can enrich transition studies and thereby contribute to the further development of sustainable policies.

**Van Leeuwen, R.P., De Witt, J.B., and Smit, G.J.M., 2017, Review of urban energy transition in the Netherlands and the role of smart energy management, *Energy Conversion and Management*, in press**

This paper gives a review of the most important backgrounds and trends of the present energy supply system in the Netherlands. Options are discussed for the integration of renewable energy and the present policies are reviewed that stimulate the energy transition. Last, the role of smart energy management as part of the integration of renewable energy into existing infrastructures is discussed.

**Cloke, J., Mohr, A. and Brown, E., 2017, Imagining renewable energy: Towards a Social Energy Systems approach to community renewable energy projects in the Global South, *Energy Research & Social Science*, in press**

Rural community energy projects in the Global South have too frequently been framed within a top-down technologically-driven framework that limits their ability to provide sustainable solutions to energy poverty and improving livelihoods. This framing is linked to how energy interventions are being imagined and constructed by key actors in the sector, via particular sociotechnical imaginaries through which a set of increasingly universalised energy futures for rural communities is prescribed. Projects are too frequently reverse-engineered through the lens of particular combinations of technologies, financial models and delivery mechanisms, rather than by attending to the particular energy needs/aspirations of individual communities. Assumptions over the association between energy access and livelihood enhancement have also reinforced a technocratic determination of appropriate system scale and a search for universalised 'scaleable' delivery models. There is, however, no necessary causation between scaleability and outcomes – appropriate implementation scales are not purely determined by technical or financial considerations, rather it is the social scale via which optimum forms of local participation and ownership can be achieved. To operationalise this concern for social space we propose a Social Energy Systems (SES) approach that is advanced via exploration of the interactions between three distinct but mutually edifying variants of energy literacy – energy systems literacy, project community literacy and political literacy.

**Johnstone, P. and Hielscher, S., 2017, Phasing out coal, sustaining coal communities? Living with technological decline in sustainability pathways, *The Extractive Industries and Societies*, in press**

Discusses the hitherto under examined area of phase out policies in sustainability transitions literatures. Gives background to the UK coal phase out in context of energy policy. Highlights issues related to community impact neglected in coal consultation. Discusses perspectives of just transition and deindustrialisation in making these issues more visible.

**Wanner, M., Hilger, A., Westerkowski, J., Rose, M., Stelzer, F., & Schöpke, N. (2017). Towards a cyclical concept of Real-World Laboratories: a transdisciplinary research practice for sustainability transitions. *DisP - The Planning Review*, in press**

The transformative research approach of Real-World Laboratories (RWL) has recently attracted attention in German sustainability science. Some definitions and understandings have been published, but guidelines and procedural quality criteria for establishing and running a RWL are still missing. To address this gap, this article has two aims. First it aims to derive key components of RWLs from the current discourse on RWLs and similar, yet more elaborated research approaches. Second, it aims to transfer these key components

into a comprehensive research practice. This practice is illustrated by a RWL process in the project "Well-being Transformation Wuppertal" (WTW). Methodologically, the article builds on a review of RWL-related approaches for collaborative, intervention-oriented research. This includes transition management, transdisciplinary process models and action research. Based on this review, eight key components for RWLs are proposed. They position RWLs as a normatively framed approach that aims to contribute to local action for sustainable development and the empowerment of change agents. The approach uses transdisciplinary methods of knowledge integration and engages in cyclical real-world interventions within certain spatial and content-related boundaries. The components are transferred into a flowchart, detailing process steps, aims, responsibilities and overall principles for putting RWLs into practice. Thus, a hitherto missing tool for designing and running RWLs is provided. Then, the RWL in district *Mirke*, Wuppertal, is used as an empirical example to illustrate the application of the flowchart and related key components. Consecutive discussions centre on the different roles of researchers and practitioners in the research process, as well as the relevance of an underlying theory of change for effective interventions. Finally, critical reflection, application and amendment of the proposed flowchart are encouraged.

**Healy, N. and Barry, J., 2017, Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition", *Energy Policy*, 108, 451-459**

The burgeoning energy justice scholarship highlights the importance of justice and equity concerns in the context of global decarbonization and the transition to a green economy. This paper seeks to extend current conceptualizations of energy justice across entire energy lifecycles, from extraction to final use, to offer an analytically richer and more accurate picture of the (in)justice impacts of energy policy decisions. We identify two key areas that require greater attention and scrutiny in order to enact energy justice within a more democratized energy system. First, we call for greater recognition of the politics, power dynamics and political economy of socio-technical energy transitions. We use the example of the fossil fuel divestment movement as a way to shift energy justice policy attention upstream to focus on the under-researched injustices relating to supply-side climate policy analysis and decisions. Second, the idea of a "just transition" and the distributional impacts on "and the role of" labor in low-carbon transitions must be addressed more systematically. This focus produces a more directly political and politicizing framing of energy (in)justice and a just energy transition.

**Avelino, F., 2017, Power in sustainability transitions: Analysing power and (dis)empowerment in transformative change towards sustainability, *Environmental Policy and Governance*, in press**

This paper conceptualizes power and empowerment in the context of sustainability transitions and transition governance. The field of transition studies has been critically interrogated for undermining the role of power, which has inspired various endeavours to theorize power and agency in transitions. This paper presents the POver-IN-Transition framework (POINT), which is developed as a conceptual framework to analyse power and (dis)empowerment in transformative social change, integrating transition concepts and multiple power and empowerment theories. The first section introduces transitions studies and discusses its state-of-the-art regarding power. This is followed by a typology of power relations and different types of power (reinforcive, innovative, transformative). These notions are then used to reframe transition concepts, in particular the multi-level perspective, in terms of power dynamics. The critical challenges of (dis)empowerment and unintended power implications of discourses on and policies for 'sustainability transitions' are discussed. The paper concludes with a synthesis of the arguments and challenges for future research.

**Marberg, A., Van Kranenburg, H. and Korzilius, H., 2017, The big bug: The legitimization of the edible insect sector in the Netherlands, *Food Policy*, 71, 111-123**

This study analyzes the legitimization process of an emerging novel food sector in the European Union (EU). Current EU policies are cautious with regard to new food sources and new food technology, and we aim to determine how the sector is addressing both this caution as well as a general public that may be skeptical of its products. By utilizing a legitimacy strategy framework and conducting 19 semi-structured interviews with actors and experts in the Dutch edible insect sector, we assess the sector's progress and limitations with regard to its legitimacy journey. The findings show that sector focus has thus far been on organization, intraindustry, and interindustry legitimacy strategies, and that additional emphasis on institutional strategies will be imperative to securing more accommodating legislation. In addition, the lack of a common vision, a strategic communication plan, and interfirm linkages may also be hindering sector legitimization. The framework and conclusions presented here may prove useful to other sectors introducing novel foods.

**Akizu, O., Urkidi, L., Bueno, G. and Lopez-Guede, J.M., 2017, Tracing the emerging energy transitions in the Global North and the Global South, *International Journal of Hydrogen Energy*, in press**

During recent centuries, in the Global North, every energy crisis has been overcome, sooner or later, with a transition that has led to an increase in the average per capita energy consumption. Currently, due to the environmental and social impacts of the dominant high-consumption and fossil-fuels based energy model, we are seeing some initiatives that pursue a transition towards a democratic, low-carbon and low-energy consumption level energy system. This work analyses some of the socio-cultural, technological, economic and political factors that are leading to different multi-scale transitions towards low-energy societies around the world. It examines several different cases of transition and proposals from the Global South and Global North. Furthermore, given the limitations of the local or partial nature of these case studies, we also analyse their national energy contexts taking into account the hidden energy flows. These data integrate the total energy needed to provide the goods and services consumed by citizens and indicate the sectors that should be targeted to bring about genuine change, which sometimes differ from the transition paths signposted by national governments. The specific lessons extracted from the case studies in this research may contribute to a social learning process, promoting democratic and sustainable energy models in different regions of the world: peak oil could be an opportunity; energy needs to be equitable, not only renewable; there should be more sincerity and transparency in public energy data communication; energy should be controlled in a public or cooperative way; citizens should take control of their own investments in the energy sector; energy should be a right, not a commodity; community based consumption could reduce energy consumption; and sustainable urban development should be applied in cities and towns, where energy consumers could also become producers.

**Longhurst, N., Avelino, F., Wittmayer, J., Weaver, P., Dumitru, A., Heilscher, S., Cipolla, C., Afonso, R., Kunze, I. and Elle, M. (2016), Experimenting with alternative economies: four emergent counter-narratives of urban economic development, *Current Opinion in Environmental Sustainability*, 22, 69-74**

Neoliberalism is a powerful narrative that has shaped processes of urban economic development across the globe. This paper reports on four nascent 'new economic' narratives which represent fundamentally different imaginaries of the urban economy. Experiments informed by these narratives challenge the dominant neoliberal logic in four key dimensions: What is the purpose of economic development? What are the preferred distributive mechanisms? Who governs the economy? What is the preferred form of economic organisation? The emergence of these experiments illustrates that cities are spaces where counter-narratives can emerge and circulate. Acknowledging the existence of these alternative visions opens up a wider set of possibilities for future urban transitions.

**Van den Heiligenberg, H.A.R.M., Heimeriks, G.J., Hekkert, M.P. and Van Oort, F.G., 2017, A habitat for sustainability experiments: Success factors for innovations in their local and regional contexts, *Journal of Cleaner Production*, in press**

The sustainability challenge requires various forms of experimentation with inventions, which may lead to an upscaling process in which the invention and its applications will spread to other users and regions in the world. However, many experiments fail. In this paper, we explore the success factors for sustainability experiments in their contribution to a longer-term regime change. These factors are related to the experiment itself as well as to the habitat in which the experiment takes place. A habitat is regarded as a configuration of contextual factors, which are mainly locally or regionally embedded. We introduce complementary insights from transition management literature and regional innovation systems literature to hypothesise that various types of experiments have distinctive favourite habitats, each with their specific success factors. Our exploratory survey among 56 sustainability experiments throughout Europe in the area of food, mobility and energy innovation suggests that user involvement is the most important success factor. Other important factors are the cooperation in local and regional networks, the policy instruments from the local and regional government, the dissemination of learning experiences, and the existence of a local or regional vision of the future. We conclude that entrepreneurs, users, local and regional governments as well as other regional partners should collaborate actively to make sustainability experiments more successful.

**Antikainen, R., Alhola, K. and Jääskeläinen, T., 2017, Experiments as a means towards sustainable societies – lessons learnt and future outlooks from a Finnish perspective, *Journal of Cleaner Production*, in press**

Experimentation has been introduced as a potential means to overcome gaps between top-down led climate change policies and challenges related to the upscaling of grassroots innovations. In Finland, the current government programme emphasises the role of experimentation in sustainability transition and as a source for new growth. We carried out an exploratory study into the conditions that support experimentation and analysed the role of experiments in creating change, and the critical factors that determine the success of the experiments and their possibilities for upscaling. We drew our analyses from a selection of ten experiments aimed at mitigating climate change and improving resource efficiency. Experimentation scholars have identified similar success factors and barriers across different types of experiments, including economic viability, public funding, technological development, impact assessments, public policies and regulation as well as social aspects. Our results are in line with these findings, especially highlighting the significance of the social aspects as a crucial enabling factor. The monitoring of the sustainability performance of both successful and ended or failed experiments and communication about the impact of such experiments are important from a learning point of view. We conclude that the development of governance structures for experimentation requires further attention.

**Weiland, S., Bleicher, A., Polzin, C., Rauschmayer, F. and Rode, J., 2017, The nature of experiments for sustainability transformation: a search for common ground, *Journal of Cleaner Production*, in press**

This article contributes to an understanding of the nature of sustainability transformation experiments. We compare these experiments with classical experiments in the natural and social sciences along three central dimensions: 1) aims related to knowledge production, 2) roles of experimenters and participants, and 3) unpredictability of outcomes. We look at how experiments are understood in transition management and reflexive governance – two influential theories in current thinking about sustainability transformations that highlight the importance of experimentation. We shed light on implicit assumptions within experimentation for sustainability, especially regarding normativity, unintended outcomes and the roles of different actors. The analysis points towards a need to better understand experiments that directly deal with the (multi-level) governance set-up to enable sustainability transformations. Overall, we argue that being aware of the nature of experiments allows specifying

experimental processes, distinguishing them from other types of learning, and helps develop strategies to apply experimentation in meaningful ways in sustainability transformations.

**Young, J. and Brans, M., 2017, Analysis of factors affecting a shift in a local energy system towards 100% renewable energy community, *Journal of Cleaner Production*, in press**

We explore what factors play a critical role in a shift of a local energy system towards 100% renewable energy community by examining the case using a framework that highlights the role of key state and non state actors (investors, local officials, citizens and policy entrepreneurs) and the role of governance mode (horizontal “self steering”, partnership, participation, inclusiveness of energy decision-making, co-ownership of the process) for the actual outcome. The framework is based on recent transition literature that has focused on the dynamics of change. The case study provides the evidence of the important role of participation of local community in the open decision making process from the onset, their partnership in the local energy system solutions, sense of ownership, as well as the role of mayor as a policy entrepreneur.

**Bergman, N., Schwanen, T. and Sovacool, B.K., 2017, Imagined people, behaviour and future mobility: Insights from visions of electric vehicles and car clubs in the United Kingdom, *Transport Policy*, 59, 165-173**

This study focuses on imagined futures of personal mobility in the United Kingdom in the context of the need to reduce greenhouse gas emissions from transport. Focusing on two innovations, electric vehicles and car clubs, the study investigates how people, behaviour and mobility are imagined in a range of visioning documents about the future up to 2050, a timeline that is critically important for emission reduction targets. We find that people are imagined primarily as consumers in line with the rational actor paradigm, with many visions focusing on low-carbon vehicles as a sustainability solution. This simple technological substitution vision does not play to the strengths of electric vehicles, and diminishes their transformative potential. There are fewer car club visions; these show less car ownership, but retain high mobility and an economic growth perspective. Our findings support the idea that much future mobility visioning is used to support the status quo, rather than to explore a variety of futures with diverse portrayal of people, behaviour and mobility.

**Gillard, R., Gouldson, A., Paavola, J. and Van Alstine, J., 2017, Can national policy blockages accelerate the development of polycentric governance? Evidence from climate change policy in the United Kingdom, *Global Environmental Change*, 45, 174-182**

Many factors can conspire to limit the scope for policy development at the national level. In this paper, we consider whether blockages in national policy processes – resulting for example from austerity or small state political philosophies – might be overcome by the development of more polycentric governance arrangements. Drawing on evidence from three stakeholder workshops and fifteen interviews, we address this question by exploring the United Kingdom’s recent retrenchment in the area of climate change policy, and the ways in which its policy community have responded. We identify two broad strategies based on polycentric principles: ‘working with gatekeepers’ to unlock political capital and ‘collaborate to innovate’ to develop policy outputs. We then empirically examine the advantages that these actions bring, analysing coordination across overlapping sites of authority, such as those associated with international regimes, devolved administrations and civic and private initiatives that operate in conjunction with, and sometimes independently of, the state. Despite constraining political and economic factors, which are by no means unique to the UK, we find that a polycentric climate policy network can create opportunities for overcoming central government blockages. However, we also argue that the ambiguous role of the state in empowering but also in constraining such a network will determine whether a polycentric approach to climate policy and governance is genuinely additional and

innovative, or whether it is merely a temporary 'sticking plaster' for the retreat of the state and policy retrenchment during austere times.

**Malone, E.L., Hultman, N.E., Anderson, K. and Romero, V., 2017, Stories about ourselves: How national narratives influence the diffusion of large-scale energy technologies, *Energy Research & Social Science*, 31, 70-76**

Examining past examples of rapid, transformational changes in energy technologies could help governments understand the factors associated with such transitions. We used an existing dataset to assess government strategies to connect new energy technologies with national narratives. Analyzing the diffusion stories told by experts, we demonstrate how governments connected the new technologies with their national narratives. The United States government supported the development of nuclear power after World War II with the national narrative that the United States was destined to improve creation, increasing the potential of raw materials exponentially for the nation's good ("atoms for peace," electricity "too cheap to meter"). In Brazil, the development of sugar cane ethanol was supported by the government's invoking the national narrative of suffering leading to knowledge and redemption, coupled with the quest for improved societal well-being (technological development to produce ethanol and employment for farmers). In Sweden, biomass energy was tied to the national narrative of local control, as well as love of nature and tradition (the use of natural products). We found strong evidence that the pairing of technological transformations with national narratives facilitated the successful development and implementation of these major energy technologies in the three cases analyzed here.

**Lazarevic, D., and Valve, H., 2017, Narrating expectations for the circular economy: Towards a common and contested European transition, *Energy Research & Social Science*, 31, 60-69,**

The European Union (EU) has set its sights on becoming a circular economy, envisaging a transition that implies systemic changes in natural resource transformations and material flows; and offering a response to what is commonly labelled as the 'take-make-dispose' conventional economic model. What does the transition toward a circular economy entail and what can it do? This paper analyses the emergence and mobilisation of expectations that are shaping the EU transition to a circular economy. It traces the narrative elements through which the circular economy is configured through an analysis of position papers presented to inform the debate on the European Commission's circular economy package. Expectations for the circular economy are articulated as: (1) a perfect circle of slow material flows; (2) a shift from consumer to user; (3) growth through circularity and decoupling; and (4) a solution to European renewal. Extending boundaries of what is 'in' benefits actors driving the circular economy as, in the short-term, they can actively support a deliberately vague, but uncontroversial, circular economy. On the one hand, the expectations present a strong sense of a collective 'we', on the other hand we are yet to see the contentions and contestations being full playing out.

**Gosens J., Hellsmark H., Kåberger T., Liu L., Sandén B.A., Wang S., and Zhao L., 2018, The limits of academic entrepreneurship: Conflicting expectations about commercialization and innovation in China's nascent sector for advanced bio-energy technologies, *Energy Research & Social Science*, 37, 1-11.**

Despite many years of substantial government research funding, advanced bio-energy technologies in China have seen limited commercial application. Chinese policy makers are increasingly critical of academic organizations for neglecting their role in the transfer of scientific results into industrial applications. We interviewed a selection of Chinese research groups working on bio-energy technologies, and asked them to describe their efforts at commercialization. We found that they focus their research on technological pathways with commercial potential, they patent and attempt to license their technologies, they are highly involved in large scale demonstration plants, and have created a number of new firms. Industry and government may have unrealistic expectations on the maturity and scale of

technologies that academia can develop, however. These findings contrast with many earlier analyses of early commercialization stages of novel technologies, which have commonly identified lacking academic entrepreneurship as a root cause in stalling development.

**Kiefer, C.P., Carrillo-Hermosilla, J., Del Río, P. & Callealta F.J., 2017. Diversity of eco-innovations: A quantitative approach. *Journal of Cleaner Production* 166: 1494-1506**

Eco-innovations, or innovations which reduce the environmental impact of production and consumption activities, are generally considered key in the transition towards more sustainable economies and societies and help mitigate the traditional dichotomy between competitiveness and sustainability. In short, they improve “sustainability performance”. Previous studies have advanced our understanding of these sustainability transitions regarding niche and systemic transformation; linear and closed-loop/circular economy models and industrial and business model lock-in/drop-in/breakout. Sustainability performance has been studied against absolute and relative contributions to sustainability (eco-efficiency and eco-effectiveness), value creation, competition and its integration in (new) business models. However, despite the aforementioned general and abstract definition of eco-innovation and abundant research, a precise conceptualization of eco-innovation is missing, probably due to its multifaceted character. Existing research on this topic is still mostly qualitative, fragmented, difficult to compare or aggregate and generally specialised on certain aspects. Quantitative research is deemed necessary to improve the knowledge base and measurement of essential aspects regarding the characteristics of eco-innovation. The aim of this study is to quantitatively explore the underlying structure of the eco-innovation concept based on the current knowledge of those characteristics and to advance on the quantification of a four-dimensional framework proposed in the past (Carrillo-Hermosilla et al., 2010). Industrial small and medium-size enterprises in Spain were asked to quantify a set of variables according to the perceived relevance for the firm of a realized eco-innovation. Factor Analyses were conducted on 197 collected data sets. Our statistical results reveal how the identified characteristics shape an underlying structure of eco-innovations along the four dimensions (design, user, product-service and governance) proposed in that article. The analysis identifies the factors which make up these dimensions, allowing a characterization of eco-innovations with considerably less complexity. The final impact of eco-innovation on the environment goes in tandem with and is usually mediated by considerable impacts at the company level (including internal management and organizational practices) which lead to changes in products and processes. Furthermore, our results stress the critical role played by users and clients' engagement and acceptance and cooperation with other stakeholders in the eco-innovation process. The eco-innovation may entail radical, path-breaking changes in existing relations between the firm and its production network. This article contributes to advance the understanding of the phenomenon by providing a comprehensive view and a common perspective.

**Sekulova, F., Anguelovski, I., Argüelles, L. and Conill, J., 2017. A ‘fertile soil’ for sustainability-related community initiatives: A new analytical framework. *Environment and Planning A*, in press**

One of the unique and emerging responses to the current ecological, social, political and economic crises has been the emergence of community initiatives in a range of formulas and geographical contexts. We explore their emergence and evolution beyond the analysis of a single fixed set of factors that are expected to contribute to their initiation and growth. Upon reviewing the trajectories of various initiatives in the region of Barcelona (Spain), we argue that the metaphor of the fertile soil provides a useful framework to describe or explain the messy process of emergence and evolution of grassroots and community projects. Fertile soil is understood here as a particular quality of the social texture, characterized by richness, diversity, unknowns but also – by multiple tensions and contradictions. Yet it is not only the diversity of factors but the quality of their mutual relatedness that ‘makes’ the soil fertile for the emergence of new groups and the continuation of existing ones. Importantly, the seemingly messy social base in which community initiatives emerge is nourished by their

inner and outer contradictions. Likewise, the space opened by dealing with conflicting rationalities creates the conditions for new and more resilient strategies and structures to emerge. As community initiatives get established, the 'fertile dilemmas' they frequently face become a key driver of their evolutionary context, contributing to the emergence of new social imaginaries and ways of producing social change.

**Argüelles, L., Anguelovski, I. and Dinnie, E., 2017. Power and privilege in alternative civic practices: Examining imaginaries of change and embedded rationalities in community economies. *Geoforum*, 86, 30-41.**

Community economies can be considered as examples of the diverse economies growing outside common capitalist logics of private accumulation and profit, seeking to bypass or reconfigure dominant global trends of societal and economic organization. Yet, these communities seem to fit quite well under a neoliberal program in which responsibilities are shifting downwards, favoring multi-level governance over State intervention and accountability. This binary character makes imperative an open and critical discussion on the development of community initiatives, including on the motivations and visions of citizens practicing alternative ethical consumption. This article explores the neoliberal rationalities embraced by community members within the imaginaries of change they frame and examines how these rationalities contribute to (re)producing neoliberal conditions and forms of governance. Our analysis builds on semi-structured interviews conducted among the members of 11 initiatives in 5 EU countries and on participant observation. We argue here that communities articulate an "alternative imaginary" of change that appears imprinted by core neoliberal rationalities around questions of individual responsibility, the role of the State, and civic participation and equity. It is an imaginary related to the construction of CBEs to by-pass existing socio-political and economic configurations. This imaginary more often than not responds to neoliberal promises of individual freedom and autonomy and seems to undermine CBEs' more radical possibilities at the same time obscuring more diverse voices of transformation.

**Fischer, A., Holstead, K., Hendrickson, C.Y., Virkkula, O. and Prampolini, A., 2017, Community-led initiatives' everyday politics for sustainability – Conflicting rationalities and aspirations for change? . *Environment and Planning A*, 49, 1986-2006.**

Community-based initiatives are widely seen to play an essential role in a societal move towards a low carbon, sustainable future. As part of this, there is often an assumption that such initiatives share expectations (i.e., a guiding vision) of large-scale change, and that their activities contribute to this change. Here, we ask to what extent this assumption reflects members' own perspectives on and interpretations of the visions, aims and ambitions of their community initiative, and what this implies for a larger vision of sustainability transitions. In doing so, we respond to calls for a better understanding of the "everyday politics" of what could be seen as processes of societal transitions in practice. We conducted qualitative interviews with members of five community initiatives in Italy, Finland and the UK. In each of these initiatives, we found a range of aspirations (i.e., outcome-related aims) and rationalities (i.e., procedural guiding principles). While some of these aims and ways of working were compatible with each other, we identified three major tensions that could be found across our study initiatives. These tensions centred on (i) the degree of politicisation of the initiative, (ii) the extent to which financial aims should take priority, and (iii) questions of organisational form. We interpret these tensions as conflicting expressions of larger, societal-level discourses, and argue that this diversity and resulting conflicts need to be acknowledged – both in transition research and at the practical level – to avoid co-optation and disenfranchisement.