

Newsletter 28: June 2018

This is the 28th 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,

The 9th International Sustainability Transitions conference in Manchester (12-14 June, 2018) was a great success, both academically and socially. The keynotes were stimulating, the alternation of formats (papers, speed talks, dialogue sessions) worked well, the breaks were long, and the party was good. Two contributions under 'event reviews' provide further thoughts and reflections.

Next year's 10th International Sustainability Transitions conference will be held from 23-26 June 2019 at Carleton University (Ottawa, Canada). The conference theme is: "Accelerating sustainability transitions: Building visions, unlocking pathways, navigating conflicts". The organizers (including James Meadowcroft, Daniel Rosenbloom, Alexandra Mallett) have already created a website that will be filled with more information over the coming months. <https://carleton.ca/istconference/>. This conference is a bit of an experiment, because it's the first one outside of Europe. I hope many of you will attend (even if this involves a long-haul flight), because STRN does want to internationalize further.

The STRN Steering Group has changed as you can read under 'network news'. I want to welcome Jonas Torrens and Julius Wesche as new members. And thank Paula Kivimaa and Kathy Araujo, who have left the SG, for their service over the past few years.

The newsletter's publication list is getting longer and longer, as scholars publish on sustainability transitions not only in the 'usual suspects' (like EIST, TFSC, RP, ERSS, Sustainability, JCP, Energy Policy), but also in top journals (like Nature Energy, Nature Climate Change, Global Environmental Change) and specialists journals (like Potato Research; Energies; Agricultural Systems; International Journal of Technoentrepreneurship). This combination of consolidation, deepening and diversification is highly promising and indicative of the importance and quality of our research.

I hope you'll enjoy the newsletter and wish you all a good summer break.

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

Environmental Innovation and Societal Transitions

Volume 27 of *Environmental Innovation and Societal Transitions* has just been published. It contains one viewpoint and 11 articles reporting original research:

- Viewpoint: Transition versus transformation: What's the difference? by Katharina Hölscher, Julia M. Wittmayer and Derk Loorbach
- Religious agency in sustainability transitions: Between experimentation, upscaling, and regime support, by Jens Koehrsen
- Integrating a business model perspective into transition theory: The example of new mobility services, by Steven Sarasini and Marcus Linder
- Contribution of transition theory to the study of geographical indications, by Raphael Belmin, François Casabianca and Jean-Marc Meynard
- Scale limits to sustainability: Transdisciplinary evidence from three Danish cases, by Alex Ramiller and Patrick Schmidt
- Curating complexity: An artful approach for real-world system transitions, by Stephan Kampelmann, Michael Kaethler and Adrian Vickery Hill
- Sustainability transitions and the state, by Phil Johnstone and Peter Newell
- Crossing the biorefinery valley of death? Actor roles and networks in overcoming barriers to a sustainability transition, by Johanna Mossberg, Patrik Söderholm, Hans Hellsmark and Sofia Nordqvist
- Harnessing theories of the policy process for analysing the politics of sustainability transitions: A critical survey, by Florian Kern and Karoline S. Rogge
- On the verge of change: Maverick innovation with mobility scooters, by Thomas Birtchnell, Theresa Harada and Gordon Waitt
- Framing low-carbon pathways: A discursive analysis of contending storylines surrounding the phase-out of coal-fired power in Ontario, by Daniel Rosenbloom
- A struggle for change—The formation of a green-transition advocacy coalition in Finland, by Teresa Haukkala

As always, we look forward to receive your submissions and comments. Please don't forget to read, and if relevant cite, EIST. **Jeroen van den Bergh, Editor-in-Chief**
[jeroen.bergh@uab.es]

Network News

Any news related to ongoing activities of STRN

Update on STRN Steering Group (photo below)

In May, the SG issued a call for new and existing members to apply. We received 22 applications of highly promising candidates. Two early career researchers, Jonas Torrens (SPRU) and Julius Wesche (Fraunhofer ISI, Utrecht University) were elected as new members. Lea Fünfschilling, Florian Kern and Bruno Turnheim were re-elected as senior members of the Steering Group. Daniel Rosenbloom (Carleton University) will represent the IST 2019 conference organizers. Our intention is to regularly renew the SG with both senior and junior members. In the coming months, we will work on and revise the existing governance guidelines towards this goal.

Jochen Markard (jmarkard@ethz.ch)



Event Reviews

Review of events interesting to the STRN community

9th International Sustainability Transitions conference

The IST-2018, held in Manchester 12-14 June, was yet again a great success and showcase of our field's vibrant development. The particular theme for this year (reconfiguring production and consumption systems) encouraged all of us to think beyond individual disruptive technologies and engage with how system reconfigurations unfold in different domains. This renewed emphasis on 'big picture' issues is in my view a welcome sign of maturation of our field and a reflection of progress with transitions on the ground. Right from the start, Frank Geels invited us to challenge the usefulness of established frameworks for the topic of 'whole system' reconfiguration, provocatively suggesting that the canonical MLP-figure (with the S-curve representing *singular* bottom-up disruption) may need to be adjusted to analyse whole system change. Throughout the conference, I was thrilled by presentations of 'non-standard' cases that do not entirely fit our heuristics and invite us to stretch and transform implicit assumptions and boundaries. Innovation Systems approaches also received a thorough examination, with dedicated paper tracks and dialogue sessions questioning its fitness-for-purpose, particularly as progress with transitions on the ground present us with new phenomenological attributes to make sense of. Jochen Markard talked of Transitions 2.0, Bernhard Truffer emphasised the need to engage with 'splintered regimes', and so on. This conceptual renewal is exciting! The keynotes and paper presentations reflected this engagement of transitions studies with wider communities, including concrete transformative policy, consumption and practice theory, as well as cross-fertilisation enabled by thinking transversally about reconfiguration challenges across domains. The social events and the curated attention to making space for informal conversation (the luxury of 30min breaks!) were very effective. The unusually open format of the closing session reflected the spirit of engaged research and camaraderie that runs through our community. To sum up, the 2018 vintage of IST was a high point of this academic year, and I look forward to IST2019 in Ottawa next year. **Bruno Turnheim** (bruno.turnheim@kcl.ac.uk)

Global South research at IST-2018

There was a good representation of Global South sessions and papers during the 9th IST Conference. As a thematic network of the STRN we organised two dialogue sessions. One was on new research frontiers and the second one on the future of the network.

A couple of themes that we discussed during the new frontier session included, for example, care and reflexivity in applying transition concepts and approaches to studying change in the developing world. Using rigid definitions of a regime or a landscape often does not work, we should rather treat them as research questions or define them through the eyes of the actors. We should also pay more attention to what is already there and think of ways to preserve it. In mainstream transition research there is much attention to newness, to replacing of the old with the new. In developing countries, with scarce resources, both old and new is badly needed. The malfunctioning systems require diversity of strategies on the part of the users and justify the coexistence of the technological variety. We also need to realise that if there is no infrastructure in some places, does not mean there is no lock-in. Developing countries struggle with historical colonialism, injustice, poverty, social inequalities and corruption that persist. We cannot forget about the power of informal institutions that often dominate over the written rules and regulations in the Global South. All these create strong path dependencies and define what is possible and what not. We therefore need more flexibility in building the systems and understanding their transformation. Approaching change in a different way may also lead to the definition of entirely new journeys. Furthermore, in our optimism about radical change and about the power of socio-technical experimentation, we tend to forget that transitions are about winners and losers. Many people are left behind in the process of change. Being a looser in the developing country is painful. Mobilisation of insights from other fields such as the social justice theory can help us pay more attention to designing the processes in a much more inclusive manner. Finally the issue of normativity, directionality and in particular sustainability, is too often taken for granted in our studies of change. Attendees of the sessions felt that more attention is needed to stimulating new ways of thinking rather than considering how the future should look like. Discussion on some of the considerations can be found in [Wieczorek, 2018](#).

Aims of the second session were to harness the current momentum in the network and provide this new community with an opportunity to engage in a strategic discussion on mobilising the network in a way that is most useful for the community and building an identity of the network as an independent research group, within the wider transitions community. To this end, participants performed a strength-weakness-opportunities-threats (SWOT) analysis. Participants agreed that the network provides a platform for sharing and learning from each other about issues specific to transitions in global south on how to best mobilise existing transition theories and develop new theories based on experiences in these contexts. A dedicated network like ours also provides the opportunity to connect to other ongoing activities and networks dedicated to sustainability challenges in global south beyond transitions network. Currently, the global south network needs more capacitation, travel grants for scholars from global south to attend future ISTs, perhaps create regional groups and use virtual platforms like researchgate for intellectual exchange within the community. Looking into the future, we welcome scholars from the global south to participate in these activities and propose new ideas for future activities of the network. In the past year, we have successfully organised webinars where junior and senior scholars presented their research, which was followed by a discussion on specific themes related to transitions research in the global south. If you are interested to organise such webinars in future, please drop us an email at transitions.globalsouth@gmail.com. If you would like to be a member of our [emailing list](#) and stay up-to-date about publications, conferences and other activities relevant to this community, please email and let us know.

We are looking forward to continuing these dialogues and hoping to see many of you in Canada next year. Contact: a.j.wieczorek@tue.nl, b.ghosh@sussex.ac.uk

New research projects

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

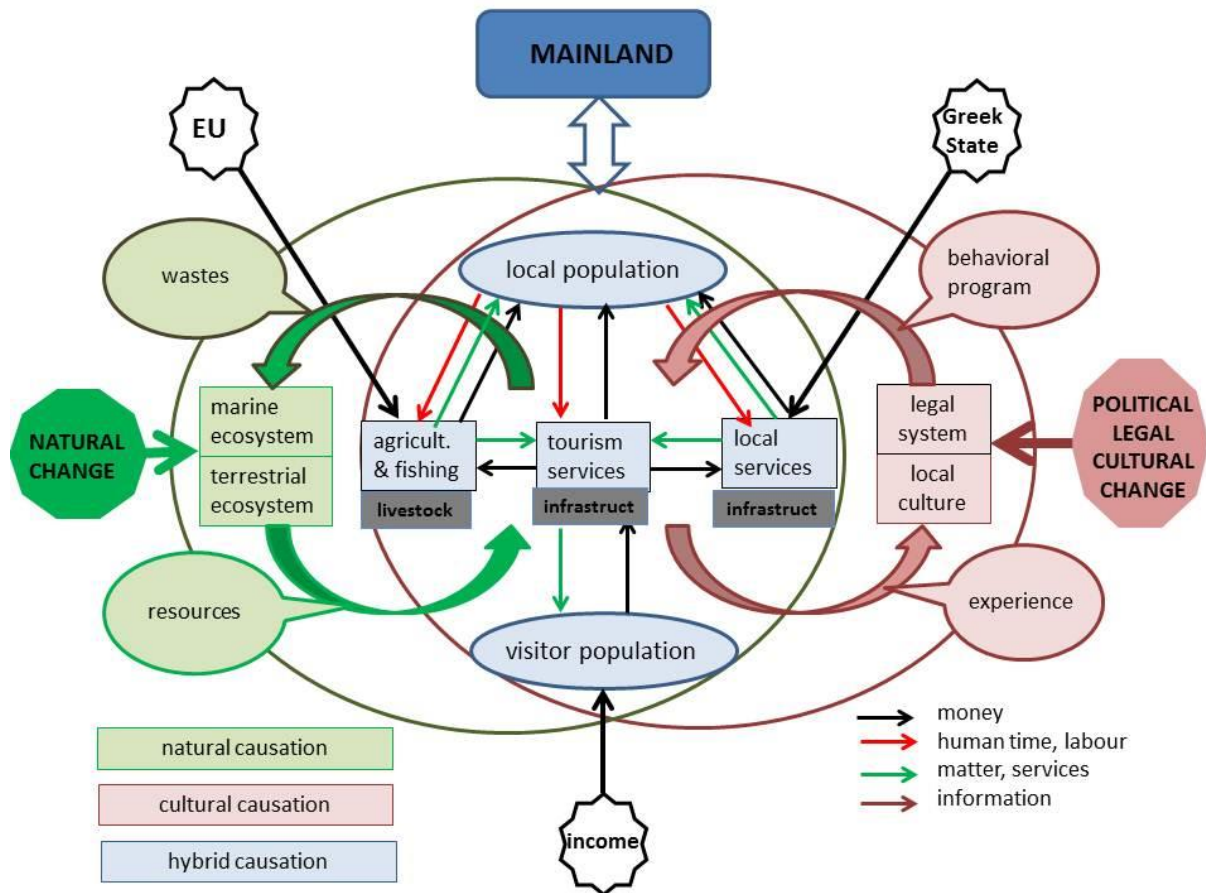
TRAZEPO: Transition towards zero emission ports.

This project departs from the idea that ports can take on increasingly important roles in the shift towards more sustainable energy and transport systems. As such the project aims to provide relevant private and public decision-makers with knowledge of technologies and opportunities on how ports can be transformed into zero-emission energy hubs. This involves understanding prerequisites on and between the micro level (specific ports, with particular sets of operations, activities and actor constituents) and the macro level (the broader energy and transport system). The idea of ports as energy hubs refers to their potential for providing low- and zero-carbon energy to different end users both at the port and beyond. We thus conceptualize an energy hub as a central point in a region as well as a central node in a network where multiple energy distribution systems intercept and wherein energy sources and carries can be (potentially) produced, distributed and converted. However, this will require complex adaptation processes involving multiple actors and stakeholders, implying that there is a need for coordination of initiatives and efforts. Also adaptation and development of old and new energy infrastructure and solutions will require that both technological and non-technological factors (institutions, practices, operational procedures etc.) are addressed. TRAZEPO draws on insights from various strands of sustainability transitions research in this cross-disciplinary project that aims to both provide specific recommendations for three Norwegian ports (Oslo, Kristiansand and Narvik) as to how they could develop onwards, and new knowledge of general interest to various practitioners and stakeholders, as well as the academic community. TRAZEPO is a three-year "knowledge-building project" funded by user partners and the Research Council of Norway (2018-2020) over the Energix programme. For more information contact project manager Markus Steen, markus.steen@sintef.no

Samothraki: A Greek island as a real-world laboratory

In the middle of the disastrous economic crisis in Greece, and the emergence of wide spread local ecosystem degradation triggered by misguided development strategies, an island community now fosters the idea of a sustainability transition. Upon several years of research from the Institute of Social Ecology, Vienna, and a number of Greek research institutions (such as the Hellenic Centre of Marina Research in Athens), the local municipality has applied to UNESCO to become a so-called Biosphere Reserve. The island of Samothraki used to have a typical agrarian socio-metabolic profile until the 1970s, with biomass as the primary energy source. In the recent decades, increased (but still moderate) tourism and EU subsidies for farmers have driven the local system into a rapid transformation, characterized by an expansion of infrastructure, fossil fuel based energy use and a fourfold increase in the number of goats and sheep, triggering overgrazing, soil erosion and biodiversity loss which puts the conservation goals of the protected area (Natura 2000) covering two thirds of the mountainous island at risk. Guided by a model of social metabolism (see below), researchers and local initiatives collaborate in trying to establish a new more balanced development process for agriculture, tourism and social services on the island; annual summer schools attract dozens of students from all over the world to involve in stakeholder focus groups with farmers, fishermen, young parents and others to mobilize and strengthen

local collaboration for a sustainability transition and develop models of viable pathways.



Currently, top down plans for disproportionately large windfarms on top of the mountains, in the centre of the nature conservation area, constitute a new challenge for the island's ecological and social balance. See [www: sustainable-samothraki.net](http://www.sustainable-samothraki.net). For more information please contact: **Marina Fischer-Kowalski** (marina.fischer-kowalski@boku.ac.at)

SCALINGS

Co-creation—the practice of bringing together diverse actors in a joint innovation activity to mutual benefit—has emerged as a widely desired key resource in current attempts to enhance innovation. It answers to recent calls for greater responsiveness and responsibility in innovation practice, and broader trends to organize innovation more openly, democratically, and with a view towards concrete local needs and contexts. The European Research Consortium SCALINGS (short for “Scaling Up Co-creation: Avenues and Limits for Integrating Society in Science and Innovation H2020”) explores the avenues and limits for the wider use of co-creation across Europe. SCALINGS aims to investigate and reflexively shape the implementation of co-creation practices in two technology domains (robotics and urban energy systems). SCALINGS follows a comparative, embedded, and experimental research approach that studies three co-creation instruments (innovation procurement, living labs, and co-creation facilities) across 10 partner countries. SCALINGS aims to strengthen opportunities for “best practice” transfer and a socially robust upscaling of co-creation in Europe, while improving our understanding of how co-creation practices relate to the social, cultural, economic, and institutional environments in which they are implemented. The consortium brings together members from the following institutions, including the four EuroTech universities: TUM (DE), TU/e (NL), BOKU (AT), DTU (DK), EPFL (CH), ESADE (ES), MINES ParisTech/ARMINES (FR), SIX (UK), UCL (UK), UEW (PL). Contact: g.bombaerts@tue.nl, a.j.wieczorek@tue.nl

Deliberative participation, trust, and social learning for sustainable energy transitions (SETs): A comparative study of Japan and South Korea

Global climate change, energy security, and post-Fukushima nuclear concerns have heightened the urgency of the transition to a more sustainable energy future. However, public opposition to new nuclear plants, “not-in-my-backyard” responses to wind farms, and consumer backlashes against smart grid technologies around the world suggest that public acceptance of energy technologies will be critically important to shaping the transition and that conventional government-led, expert-oriented policymaking is not effective. How to engage the public effectively during any transition period remains an under-researched area. This project aims to provide insights into the way in which new approaches of deliberative governance evolve and influence sustainable energy transitions (SETs) in Asia. Deliberative approaches – innovative forms of public participation that emphasize the empowerment of a more informed citizenry to discuss, debate, and reflect on energy issues – have the potential to facilitate the processes of SETs. These governing approaches are being increasingly adopted worldwide (including in the US, Germany, Japan, and South Korea) in order to engage the public in policymaking and to better address complex energy issues, particularly following the 2011 Fukushima nuclear accident. This project will conduct a comparative case study of two Asian countries: Japan and South Korea, and develop a model of SETs that will help to guide comparative investigation of the variety, mechanisms, processes, and outcomes of participative and deliberative approaches to energy policymaking. Two critical dimensions of these deliberative processes – trust building and social learning – and their impacts on public acceptance in the transition context will be examined and analyzed. We will draw on comparisons between Asian countries to identify conditions under which normative processes and outcomes of deliberative policymaking can be realized. This project is funded by the General Research Fund of the Hong Kong Research Grants Council for three years starting October 2017. The research team comprises Dr. Daphne Ngar-yin Mah (Hong Kong Baptist University, Hong Kong); Prof. Richard Balme (Sciences Po, France); Dr. Benjamin McLellan (Kyoto University, Japan); Dr. Taedong Li (Yonsei University, South Korea); Dr. Robert Ting-Yiu Chung and Prof. Peter Ronald Hills (Hong Kong University, Hong Kong). For more information, please contact Dr. Daphne Mah at daphnemah@hkbu.edu.hk.

Publications

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

Book: Chou, K-T. (ed.), 2018, *Energy Transition in East Asia: A Social Science Perspective*, Routledge

The Fukushima disaster of 2011 shook the globe, arousing warm debate and new research within the academic fields of countries in both the West and the East on issues related to nuclear security, public trust, government governance, risk governance and risk perception along with technological and social aspects. The Fukushima incident not only revealed the importance of risk governance in the East Asian region, but also became an important turning point in the restructuring of energy in several East Asian nations. However, the regulatory culture in East Asian countries is by nature different from that of their western counterparts; the history and culture of East Asia has formed East Asian countries' unique regulatory characteristics. This book aims to establish a risk governance structure for the East Asian region, providing a completely new perspective for both practical implementation and the academic field. It focuses on the problems of risk governance in East Asia. Through a discussion of the risk related issues raised by contemporary globalization, this book outlines the unique form of East Asia's risk governance architecture. It brings together the work of top academics from Japan, South Korea and Taiwan to provide a common picture of how these three countries' governments are dealing with the energy transition brought on by the climate change crisis. The various aspects of East Asia's unique regulatory culture and

governance models are placed into context, while East Asia's risk governance theoretical framework is outlined.

Book: Sicam E., 2018, *Firms, Finance and Sustainable Transitions: The Financial Constraints of Eco-Innovation Companies*, Edward Elgar

This thought-provoking book introduces a financial economics perspective to the topic of eco-innovations and, more generally, sociotechnical transitions. It develops a model that illustrates how financial constraints can prevent the development of eco-innovations within companies and hinder the transition process towards a more sustainable regime. Edgardo Sica presents a review of the state of the art, as well as new data from original surveys aimed at testing the impact of financial constraints on eco-innovative decisions at radical and niche levels. Edgardo Sica presents a review of the state of the art, as well as new data from original surveys aimed at testing the impact of financial constraints on eco-innovative decisions at radical and niche levels. He proposes a definitive conceptualisation of eco-innovations while stressing the relevance of the environmental performance of innovations, rather than the environmental motivation of the innovators. Through the use of a unique multilevel perspective model, the book critically analyses the extent to which financial constraints can hinder eco-innovative decisions, thereby crucially filling a gap in the current literature on eco-innovations.

Book: Affolderbach, J. and Schulz, C. (eds.), 2018, *Green Building Transitions: Regional Trajectories of Innovation in Europe, Canada and Australia*, Springer

This volume analyzes sustainability-related innovations in the building sector and discusses how regional contexts articulate transition trajectories toward green building. It presents 'biographies' of drivers and processes of green building innovation in four case studies: Brisbane (AUS), Freiburg (GER), Luxembourg (LU), and Vancouver (CA). Two of them are relatively well known for their initiatives to mitigate climate change – particularly in the building sector, whereas the other two have only recently become more active in promoting green building. The volume places emphasis on development paths, learning processes, and innovations. The focus of the case studies is not restricted to purely technological aspects but also integrates regulatory, procedural, institutional, and other processes and routines and their influence on the variations of the building sector. The diversity of the selected case studies offer the reader the opportunity to gain a thorough understanding of how sustainability developments have unfolded in different city regions. Case study-specific catalogues of transition paths provide insights to inform policy debates and planning processes. The catalogues identify crucial innovations (technological, regulatory, etc.) and explain the factors and circumstances that have led to their success and broader acceptance in Freiburg, Vancouver, Luxembourg, and Brisbane. With the help of a number of micro case studies within each of the four city regions, the case studies also offer ground for comparison and identification of differences

Book: Labussière, O., and Nadai, A., 2018, *Energy Transitions: A Socio-technical Inquiry*, Springer

This book elucidates what it means to transition to alternative sources of energy and discusses the potential for this energy transition to be a more democratic process. The book dynamically describes a recent sociotechnical study of a number of energy transitions occurring in several countries - France, Germany and Tunisia, and involving different energy technologies - including solar, on/off-shore wind, smart grids, biomass, low-energy buildings, and carbon capture and storage. Drawing on a pragmatist tradition of social inquiry, the authors examine the consequences of energy transition processes for the actors and entities that are affected by them, as well as the spaces for political participation they offer. This critical inquiry is organised according to foundational categories that have defined the energy transition - 'renewable' energy resources, markets, economic instruments, technological demonstration, spatiality ('scale') and temporality ('horizon(s)').

Using a set of select case studies, this book systematically investigates the role these categories play in the current developments in energy transitions.

Book: Debor, S., 2018, *Multiplying Mighty Davids? The Influence of Energy Cooperatives on Germany's Energy Transition*, Basel: Springer International Publishing.

This book systematically describes and evaluates the impact of energy cooperatives as a key driving force in the German energy transition toward a sustainability-oriented energy sector. Based on a comprehensive survey and three case studies, it provides an instructive overview of the overall dimensions and scope of energy cooperatives in Germany, and of their history, structure and current investment projects. The book not only contributes to the energy policy discourse in Germany, but also highlights the role of energy cooperatives to enable an international readership to explore their potential in other countries. Further, it makes a theoretical contribution toward substantially supplementing actor research in general, and enterprise research in particular, in the field of sustainability transitions science.

Book: Williams, Logan D. A. 2019. *Eradicating Blindness: Global Health Innovation from South Asia*. Palgrave Macmillan

My new book combines the multi-level perspective with a feminist and postcolonial perspective to illustrate socio-technical change in the global field of ophthalmology. I introduce a new theoretical framework, the dual-regime thesis, to explain two regimes which solve the problem of avoidable blindness. The sections of the book are as follows: 1. Introduction; 2. Origins of an Autonomous Global Network to Eradicate Blindness; 3. Balancing the Scales: Appropriate Technology and Social Entrepreneurship; 4. Witnessing Rural Blindness: Standardizing Benchmarks from Eye Camps; 5. A Lab of Our Own: Technology Diffusion from Incumbent Regime; 6. The Hard Case Of White Cataracts: Appropriation of Surgical Science; 7. Training The New Cadre: Translation of Interlocking Innovations; 8. Evidence-Based Medicine: Contesting the Phaco-Regime; 9. Conclusion: Innovation from Below; 10. Appendix A: The Extended Case Method and Global Ethnography; 11. Appendix B: The Robin Hood Model; Organizational Charts for Four Community Ophthalmology Units; Glossary of Common Ophthalmology Surgical Terms

Book: Howaldt, J.; Kaletka, C.; Schröder, A.; Zirngiebl, M. (Eds.) 2018, *Atlas of Social Innovation – New Practices for a Better Future*

As a lived practice, social innovations explore new ways to deal with complex challenges such as climate change, demographic change or poverty in all parts of the world. Thereby, they play a vital role in complementing technology in driving sustainability transitions. Initiatives, from local groups to international networks, have become success stories by “doing things differently”. Against this background, the 62 articles collected in *Atlas of Social Innovation – New Practices for a Better Future* for the first time provide a comprehensive overview of social innovation initiatives from around the globe. Leading experts such as Frances Westley, Frank Moulaert, Kriss Deiglmeier, Geoff Mulgan, Anne de Bruin, Agnès Hubert, Juan-Luis Klein, Alex Nicholls, Frank Pot, Louise Pulford, and Tonya Surman contributed article sharing new insights in social innovation research and presenting role-model approaches in different socio-cultural environments. The Atlas takes a unique approach in portraying experiences, theoretical considerations, and lessons learnt worldwide and across disciplines. It serves as a knowledge repository for the growing community of practitioners, policy makers and researchers and opens up new avenues to unfold the potential of social innovation to create new practices for a better future.

Special issue: Understanding sustainable food system transitions: Practice, assessment and governance, *Sociologia Ruralis*, 2017, 57(3)

Maye, D., and Duncan, K., 2017, Understanding sustainable food system Transitions: practice, assessment and governance, *Sociologia Ruralis*, 57(3), 267-273

- Petr Jehlička and Petr Daněk, 2017, Rendering the actually existing sharing economy visible: Home-grown food and the pleasure of sharing, *Sociologia Ruralis*, 57(3), 274-296
- Marlène Feyereisen, Pierre M. Stassart and François Mélard, 2017, Fair trade milk initiative in Belgium: Bricolage as an empowering strategy for change, *Sociologia Ruralis*, 57(3), 297-315
- Jessica Duncan and Stefano Pascucci, 2017, Mapping the organisational forms of networks of alternative food networks: Implications for transition, *Sociologia Ruralis*, 57(3), 316-339
- Mikelis Grivins, Daniel Keech, Ilona Kunda and Talis Tisenkopfs, 2017, Bricolage for self-sufficiency: An analysis of alternative food networks, *Sociologia Ruralis*, 57(3), 340-356
- James Kirwan, Damian Maye and Gianluca Brunori, 2018, Reflexive governance, incorporating ethics and changing understandings of food chain performance, *Sociologia Ruralis*, 57(3), 357-377
- Elin Slätmo, Klara Fischer, Elin Rööös, 2017, The framing of sustainability in sustainability assessment frameworks for agriculture, *Sociologia Ruralis*, 57(3), 378-395
- Lucie Dupré, Claire Lamine, Mireille Navarrete, 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
- Pieter J. Beers and Barbara van Mierlo, 2017, Reflexivity and learning in system innovation processes, *Sociologia Ruralis*, 57(3), 415-436

Karakaya, E., Nuur, C., Assbring, L., 2018, Potential transitions in the iron and steel industry in Sweden: Towards a hydrogen-based future?, *Journal of Cleaner Production*, in press

The iron and steel industry accounts for one third of global industrial CO₂ emissions, putting pressure on the industry to shift towards more sustainable modes of production. However, for an industry characterised by path dependency and technological lock-ins, sustainability transitions are not straightforward. In this study, we aim to explore the potential pathways for sustainability transitions in the iron and steel industry. To do so, we have conducted a case study in Sweden where there are policy and industry commitments towards fossil-free steel production. Our theoretical points of departure are the technological innovation system (TIS) approach and the multi-level perspective (MLP), and our paper presents the dynamics behind an emerging case of transition towards a hydrogen-based future. The paper has two major contributions to the literature on sustainability transitions. First, it empirically presents an in-depth case study of the iron and steel industry – an understudied context in the field of sustainability transitions. Second, it attempts to borrow some concepts from the MLP and integrate them with the TIS approach. By doing so, it sheds some light on the dynamics between an emerging TIS and potential transition pathways of a regime.

Byrne, R., Mbeva, K. and Ockwell, D., 2018, A political economy of niche-building: Neoliberal-developmental encounters in photovoltaic electrification in Kenya, *Energy Research and Social Science*, 44, 6-16

International agreements on energy access and climate change, formulated according to neoliberal orthodoxy, will drive significant finance to developing countries for clean technology investments. But critics call for more active state intervention – a developmental approach – arguing that free markets alone will not deliver what is required. This creates the potential for confrontation between contradictory ideologies in national policymaking and implementation: neoliberalism in global agreements versus developmentalism in national policy. The Kenyan photovoltaics (PV) market has long-experienced neoliberal-developmental policy interactions, reflecting on which can illuminate how such encounters might unfold in the future. We construct a new 'niche political economy' theoretical framework to analyse these past interactions, constituting one of three contributions we offer. The second is empirical, showing how PV practitioners, national policymakers and

global development actors have negotiated their policymaking encounters over time. Our third contribution offers reflections on the issues explored, discussing what this might mean for future neoliberal-developmental encounters. We find that action on the ground will emerge from messy negotiated interactions between competing ideologies rather than be determined by powerful neoliberal actors. As such, realising global energy and climate ambitions becomes even more uncertain unless long-term active niche-building resources are secured in international agreements.

Törnberg, A., 2018, Combining transition studies and social movement theory: towards a new research agenda, *Theory and Society*, in press

This article addresses two central—yet insufficiently explored—characteristics of some social movements: i.) abrupt and rapid social mobilizations leading to ii.) the construction of novel political processes and structures. The article takes a novel approach to these issues by combining social movement literature and the notion of free social spaces with transition studies, which focuses on large-scale socio-technical transitions. This theoretical integration highlights the co-evolution between free spaces and societal transitions, and it is based upon complexity-thinking, which is essential to deal with non-linear dynamics. A key insight is that to enable bottom-up societal transitions, radical social movements need to proactively develop solid alternatives to existing societal structures, to be ready once a window of opportunity opens. This theoretical approach is empirically illustrated using the APPO-movement in Mexico in 2006.

Roberts, C., Geels, F.W., Lockwood, M., Newell, P., Schmitz, H., Turnheim, B., Jordan, A., 2018, The politics of accelerating low-carbon transitions: Towards a new research agenda, *Energy Research and Social Science*, 44, 304–311

Meeting the climate change targets in the Paris Agreement implies a substantial and rapid acceleration of low-carbon transitions. Combining insights from political science, policy analysis and socio-technical transition studies, this paper addresses the politics of deliberate acceleration by taking stock of emerging examples, mobilizing relevant theoretical approaches, and articulating a new research agenda. Going beyond routine appeals for more 'political will', it organises ideas and examples under three themes: 1) the role of *coalitions* in supporting and hindering acceleration; 2) the role of *feedbacks*, through which policies may shape actor preferences which, in turn, create stronger policies; and 3) the role of broader *contexts* (political economies, institutions, cultural norms, and technical systems) in creating more (or less) favourable conditions for deliberate acceleration. We discuss the importance of each theme, briefly review previous research and articulate new research questions. Our concluding section discusses the current and potential future relationship between transitions theory and political science.

Isaksson, K. and Heikkinen, S., 2018, Sustainability transitions at the frontline. Lock-in and potential for change in the local planning arena, *Sustainability*, 10(3), 840.

This paper explores challenges and possibilities for integrating goals of long-term sustainable development into urban planning practice, with a specific focus on local institutional conditions for sustainability transitions. The analysis is based on a qualitative single case study of a large urban development process: the development of a new city district in Hyllie in the city of Malmö, Sweden. Hyllie was branded as a flagship project for sustainable urban development, with particularly high ambitions on climate neutrality and sustainable energy consumption. Several innovative elements were initiated in the development process, for instance the "climate contract" between the municipality and large energy companies. In the paper, this climate contract is discussed as an initiative with a promising potential for sustainability transitions. In practice, however, the outcome of the development in Hyllie in terms of sustainable development is ambiguous, since the district is also framed around luxury shopping, entertainment, and an ambition to attract visitors from a long distance. The Hyllie development illustrates pre-requisites for work on sustainable development in a decentralized and market-oriented planning context. Theoretically, the

analysis is inspired by the multi-level perspective (MLP) and institutional theory. The results illustrate how the development process was shaped by a complex interplay between actors with differing agendas and targets at different stages in the process. These results are applied in a general discussion of challenges and possibilities for urban planning to contribute substantially to a transition to long-term sustainable development. Overall, the analysis demonstrates the importance of considering specific local institutional conditions in strategic work for long-term sustainability.

Roesler, T., 2018, Community resources for energy transition: Implementing bioenergy villages in Germany, *Area*, in press

Innovations in energy transitions are diverse. Community-led innovations have only recently gained more attention. In the German energy transition, the community-led approach has resulted in a growing number of innovative renewable energy projects, with prominent examples including bioenergy villages. Although community-led innovations only constitute a niche within the German energy regime, through the example of bioenergy villages we can see how this approach is able to significantly change the energy regime on a local scale. This paper explores the role of community-led actions and resources in the implementation process of bioenergy villages in Germany, using the example of the county of Marburg-Biedenkopf in Hesse. The conceptual background of this paper is based on the analytical frameworks of the multi-level perspective and strategic niche management. Specifically, it addresses the two recent critiques on the neglect of space and place as well as the neglect of the analysis of community-based actions. Using this perspective, the paper analyses the spatial and scalar linkages between local community-driven actions and extra-local resources.

Ryghaug, M., Skjølsvold, T. M., and Heidenreich, S., 2018. Creating energy citizenship through material participation. *Social Studies of Science*, 48(2), 283-303.

Transitions towards low-carbon energy systems will be comprehensive and demanding, requiring substantial public support. One important contribution from STS is to highlight the roles of citizens and public engagement. Until recently, energy users have often been treated as customers and passive market actors, or as recipients of technology at the margins of centralized systems. With respect to the latter role, critical or hesitant public action has been explained in terms of NIMBYism and knowledge deficits. This article focuses on the production of energy citizenship when considering public participation in low-carbon energy transitions. We draw upon the theory of 'material participation' to highlight how introducing and using emergent energy technologies may create new energy practices. We analyze an ongoing introduction of new material objects, highlighting the way these technologies can be seen as material interventions co-constructing temporalities of new and sustainable practices. We argue that artefacts such as the electric car, the smart meter and photovoltaic panels may become objects of participation and engagement, and that the introduction of such technologies may foster material participation and energy citizenship. The paper concludes with a discussion about the role of policies for low-carbon energy transitions on the making of energy citizenship, as well as limits of introducing a materially based energy citizenship.

Greene, M., 2018, Socio-technical transitions and dynamics in everyday consumption practice, *Global Environmental Change*, 52, 1-9

Understanding how social change has intersected with transformations in key resource-intensive domestic consumption practices that comprise part of the fabric and experience of daily living is of central relevance to questions of sustainable development. Despite recent advances in contextual approaches to consumption, little is known about how wider socio-technical transitions have been experienced in the context of lived lives and everyday performances. As a result, sustainable development policies have been largely removed from the lived challenges and experiences people face in their daily lives. This paper

explores the value of a human-centred, contextual approach to energy transitions research for revealing the intersections of lives, practices and contexts in energy systems change. Investigating the question of how everyday practices have intersected with processes of social-technical change, it reports on findings from a recent Irish-based qualitative biographic investigation of dynamics in domestic consumption. Analysis reveals that a complex web of contextual processes, including technological change, economic transitions and planning policies, have shaped consumption in the home. Furthermore, social differentiation in the lived experience of socio-technical change along dimensions of gender, social class and geography was observed. The paper concludes with reflections on the international relevance and implications of these findings for sustainable development policy, suggesting sustainable consumption requires a much more fundamental challenge to social contexts than is recognised by dominant approaches. Here it is argued that human-centred, contextual approaches to sustainability transitions that consider social differentiation in complex lived experiences are necessary to design more integrated and resilient energy futures.

Markard, J., 2018, The next phase of the energy transition and its implications for research and policy, *Nature Energy*, in press

In many places, the electricity sector is transitioning towards greater share of renewable energy technologies. In the initial phase of the transition, a primary concern for research and policy was to establish renewables as technically and economically viable options. Today, the situation is different: renewables are diffusing rapidly in many electricity grids, thereby generating major changes for existing technologies, organizations and infrastructures. In this new phase of the energy transition, we do not just witness an acceleration of earlier transition dynamics, but also qualitatively new phenomena. These include a complex interaction of multiple technologies, the decline of established business models and technologies, intensified economic and political struggles of key actors such as utility companies and industry associations, and major challenges for the overall functioning and performance of the electricity sector (for example, when integrating renewables). Drawing on a transition studies perspective, this paper compares the two phases and discusses implications for research and policymaking.

Sergi, B., Babcock, M., Williams, N.J., Thornburg, J., Loew, A. and Ciez, R.E., 2018, Institutional influence on power sector investments: A case study of on- and off-grid energy in Kenya and Tanzania, *Energy Research and Social Science*, in press

With the recent decline of renewable energy technology costs—most notably solar photovoltaics—off-grid energy systems are becoming increasingly attractive alternatives to grid extension for advancing rural electrification in Africa. However, there are institutional challenges to wider adoption of off-grid solutions. Combining a multi-level perspective with project funding data from the Kenyan and Tanzanian energy sectors, we assess the extent to which these new off-grid technologies have been incorporated into the existing energy regimes in both countries. Using a qualitative assessment of academic literature and official documents, and a quantitative assessment of energy investments, we find that although international development agencies have provided financial support for niche, off-grid companies, both global donors and the regime electricity sector operators in Kenya and Tanzania continue to favor on-grid and grid extension activities. While landscape influences on both countries are similar, we find that differences within the institutional regimes result in different development pathways for off-grid niches. In Kenya, unbundling and privatization efforts have attracted private investment in both on- and off-grid projects. Tanzania has more relaxed regulations for off-grid power producers, and a clearer regulatory framework for allowing off-grid operators to impose cost-reflective tariffs, which creates a supportive environment for niche innovation.

Wilson, C., Pettifor, H., Cassar, E., Kerr, L., Wilson, M., 2018, The potential contribution of disruptive low-carbon innovations to 1.5 °C climate mitigation, *Energy Efficiency*, in press

This paper investigates the potential for consumer-facing innovations to contribute emission reductions for limiting warming to 1.5 °C. First, we show that global integrated assessment models which characterise transformation pathways consistent with 1.5 °C mitigation are limited in their ability to analyse the emergence of novelty in energy end-use. Second, we introduce concepts of disruptive innovation which can be usefully applied to the challenge of 1.5 °C mitigation. Disruptive *low-carbon* innovations offer novel value propositions to consumers and can transform markets for energy-related goods and services while reducing emissions. Third, we identify 99 potentially disruptive low-carbon innovations relating to mobility, food, buildings and cities, and energy supply and distribution. Examples at the fringes of current markets include car clubs, mobility-as-a-service, prefabricated high-efficiency retrofits, internet of things, and urban farming. Each of these offers an alternative to mainstream consumer practices. Fourth, we assess the potential emission reductions from subsets of these disruptive low-carbon innovations using two methods: a survey eliciting experts' perceptions and a quantitative scaling-up of evidence from early-adopting niches to matched segments of the UK population. We conclude that disruptive low-carbon innovations which appeal to consumers can help efforts to limit warming to 1.5 °C.

Rodriguez-Manotas, J., Bhamidipati, P.L. and Haselip, J., 2018, Getting on the ground: Exploring the determinants of utility-scale solar PV in Rwanda, *Energy Research & Social Science*, 42, 70-79

Solar PV is gaining ground in low and middle-income countries, especially in sub-Saharan Africa where a change from donor to more market-driven investments has been observed. This article contributes to energy transition research in low-income countries, taking Rwanda as a case study and focusing on the factors that determined the implementation of what was the largest on-grid solar project, upon completion in 2014. The multi-level perspective (MLP) is used to structure our analysis of the various socio-technical levels, and their interaction, to better understand the conditions that are enabling this transition. Our analysis reveals the central importance of bureaucratic and regulatory support for investment in low-carbon energy technologies, within a political economy influenced by processes of neo-liberalisation, while creating significant space for private contract negotiation. In particular, the provision of legal and financial guarantees was crucial to reduce risk for foreign capital investment, revealing contradictory forces that both promoted market rule, while limiting private capital's exposure to competitive pressures. We also focus our analysis on the aspect of control and driving forces, in particular the role of development partners and private sector project champions.

Mqadi, L.J., Musango, J.K. and Brent, A.C., 2018. Rethinking strategic sustainability planning for the electricity sector in South Africa. *The South African Journal of Industrial Engineering*, 29(1):63-73

A series of processes is now converging to force the issue of sustainability to drive South Africa's low-carbon energy transitions. This raises the question of how a 'sustainability transition' framework can be conceptualised to address the challenge of low-carbon electricity transitions in South Africa. This paper, therefore, critically reviews the strategic electricity planning process in South Africa within an established sustainability transitions theoretical framework. From the literature, it is observed that the challenges facing South Africa's strategic electricity planning resulted from the related politics, from differing views owing to different stakeholder preferences and lack of transparency in terms of electricity planning, and from a lack of, or misalignment between, development policies and objectives. All these theoretical and practical gaps reveal that South Africa must rethink its current strategic electricity planning practice, especially considering the country's political economy. This paper, therefore, proposes a conceptual complexity-planning framework to ensure that

the complex sustainability policy objectives are aligned within the electricity planning process.

Elmustapha, H., Hoppe, T. and Bressers, H., 2018, Comparing two pathways of strategic niche management in a developing economy; the cases of solar photovoltaic and solar thermal energy market development in Lebanon, *Journal of Cleaner Production*, 186, 155-167

There is abundant solar potential in the Middle East North Africa region. Yet access to sustainable energy is still a fundamental challenge in many countries of this region. In this paper we seek to understand the success and failure of the development and the diffusion of solar energy technologies by analysing using a Strategic Niche Management framework to compare the niche development of solar thermal energy and solar photovoltaics in Lebanon. This paper has two main questions: (1) How have the solar thermal niche and the solar photovoltaic niche developed in Lebanon, and how do they compare? (2) In which ways does the Strategic Niche Management framework help us to understand the development of solar energy niches in a developing country context? To answer these questions, a cross case analysis of solar thermal and solar photovoltaic systems was conducted. Due to the absence of research using Strategic Niche Management in Middle Eastern developing countries, this study uses an illustrative case from a country in this region to contribute new insights. Moreover, unlike the Strategic Niche Management research that only focuses on single case studies, this paper presents the results of a comparative study of two niches. The main Strategic Niche Management propositions were grouped and compared per item (i.e. on voicing and shaping expectations, social networks, and learning). The results show that the solar thermal niche affected the solar photovoltaic niche to a large extent. This was especially in relation to the learning and coordination processes. This has gradually contributed to establishing a clear vision. However, both niches lacked a niche manager who was able to coordinate, manage and maintain the dynamics of the niche processes. It also lacked horizontal collaboration between key actors involved (i.e. ministries). International donors were found to play a crucial role in initiating and shaping the market with certain constraints of prioritization in the region. The paper ends with conclusions and ideas for future research on solar energy niche development in the context of developing countries.

Den Hartog, H., Sengers, F., Xu, Y., Xie, L., Jiang, P. and de Jong, M., 2018, Low-carbon promises and realities: Lessons from three socio-technical experiments in Shanghai, *Journal of Cleaner Production*, 181:692-702

China's ongoing transition to a modern urban-centered economy is accompanied by ambitions of sustained economic growth as well as promises of environmentally sustainable futures for its cities. In this paper we critically assess how these two ideas are combined and translated into realities on the ground by examining three low-carbon development projects in Shanghai: Anting New Town, Dongtan Eco-City, and Hongqiao CBD's low-carbon transportation hub. By mobilizing insights from the academic field of Sustainability Transitions – specifically on expectations, experimentation and innovation journeys – we show how the original plans derailed and why until now there has been limited success in living up to the promises of sustainability. To realize the promises more fully in future projects we identify three broad lessons for the actors involved: they should nurture a set of parallel pathways, foster a more experimentalist mindset, and learn to embrace uncertainty.

Mercure, J.-F., Pollitt, H., Viñuales, J.E., Edwards, N.R., Holden, P.B., Chewprecha, U., Salas, P., Sognaes, I., Lam, A., and Knobloch, F., 2018, Macroeconomic impact of stranded fossil fuel assets, *Nature Climate Change*, in press

Several major economies rely heavily on fossil fuel production and exports, yet current low-carbon technology diffusion, energy efficiency and climate policy may be substantially reducing global demand for fossil fuels. This trend is inconsistent with observed investment in new fossil fuel ventures, which could become stranded as a result. Here, we use an integrated global economy–environment simulation model to study the macroeconomic

impact of stranded fossil fuel assets (SFFA). Our analysis suggests that part of the SFFA would occur as a result of an already ongoing technological trajectory, irrespective of whether or not new climate policies are adopted; the loss would be amplified if new climate policies to reach the 2 °C target of the Paris Agreement are adopted and/or if low-cost producers (some OPEC countries) maintain their level of production ('sell out') despite declining demand; the magnitude of the loss from SFFA may amount to a discounted global wealth loss of US\$1–4 trillion; and there are clear distributional impacts, with winners (for example, net importers such as China or the EU) and losers (for example, Russia, the United States or Canada, which could see their fossil fuel industries nearly shut down), although the two effects would largely offset each other at the level of aggregate global GDP.

Pellicer-Sifres, V., Belda-Miquel, S., Cuesta-Fernandez, I. and Boni, A., 2018, Learning, transformative action, and grassroots innovation: Insights from the Spanish energy cooperative Som Energia, *Energy Research & Social Science*, 42, 100-111

Grassroots innovations for sustainability are attracting increasing attention in academic, activist and policy debate. Although there is a recognition of their transformative potential, very little research has specifically been conducted on how transformative perspectives, strategies and actions emerge. This paper explores the role of learning in promoting transformative strategies towards sustainability. We develop a heuristic framework connecting ideas from social learning literature and Strategic Niche Management and address the case of Som Energia, the first renewable energy cooperative in Spain. Our results found that micropolitical and macropolitical factors are drivers that influence the emergence of first- and second-order learning. In turn, this learning moulds three different strategies proposed by this grassroots initiative, namely: commercial, social, and empowering strategies. Our results give insights to illustrate that, in order to develop radical transformative changes towards sustainability it is not enough to merely scale-up the regime (commercial strategy) or make sustainable and social proposals (social strategy), unless these aims are achieved through an empowering process that transforms our current values and relations (empowering strategy).

Knuth, S., 2018, "Breakthroughs" for a green economy? Financialization and clean energy transition, *Energy Research & Social Science*, 41, 220-229

Reimagining energy infrastructures for the 21st century increasingly means choosing between competing economic futures, a dilemma that is now provoking conflicts across many places and realms. In the United States, one critical clash is unfolding among tech sector advocates for a clean energy transition, as U.S. cleantech has worked to regroup from Silicon Valley's failed clean energy manufacturing push of the late 2000s and to navigate an ongoing solar trade war with China: about what that transition might look like, how it might be achieved, and, critically, what economic sectors and rents might emerge from it. One set of entrepreneurs and venture capitalists argues that "breakthrough" clean energy technologies are needed to produce an energy transition and to bolster U.S. economic power into the 21st century. Meanwhile, a competing set prioritizes deploying existing technologies and infrastructures at scale. The latter argues that new kinds of innovation can accomplish this task, and in the process defend embattled U.S. hegemony: notably, so-called financial innovation, and new articulations between finance and high tech. This debate has major implications for the nature and global politics of a green economy

Kennedy, S.F., 2018, Indonesia's energy transition and its contradictions: Emerging geographies of energy and finance, *Energy Research & Social Science*, 41, 230-237

Since 2015, the Indonesian solar electricity sector has witnessed unprecedented attention from international investors and developers, with planned solar photovoltaic (PV) projects announced in 2017 set to increase existing installed capacity from 9 megawatts (MW) to over 240 MW. This article examines the emerging geographies of renewable energy generation resulting from the rapid influx of foreign investment into Indonesia's solar PV

sector. While foreign investment may prove successful in increasing the country's solar PV capacity, it may also produce several contradictory outcomes for Indonesia's energy transition. Efforts to reconcile demands of risk-averse, profit-driven investors and developers with the needs of the approximately 25 million Indonesians who currently lack access to electricity has resulted in a geography of renewable energy generation characterized by large-scale centralized generation facilities that constrain opportunities for local ownership and control over the energy system. The result – a major contradiction when viewed through the lens of Indonesia's energy transition development objectives – is not only a flow of economic benefits out of the country and limited improvement in energy access for much of the country, but a missed opportunity in terms of maximizing the socially and politically transformative potential a broader energy transition may entail.

Van Waes, A., Farla, J., Frenken, K., De Jong, J.P.J. and Raven, R., 2018, Business model innovation and socio-technical transitions. A new prospective framework with an application to bike sharing, *Journal of Cleaner Production*, 195, 1300-1312

Most transition studies are historical in nature and fail to arrive at prospective conclusions about future potential. In this paper we develop a new prospective transition framework, which revolves around the interplay between business models and socio-technical contexts. By looking at the dynamics of increasing returns, industry structure and the role of institutions, we analyze the upscaling potential of innovative bike sharing business models as introduced in Dutch cities over the past ten years (two-way station-based, one-way station-based, one-way free floating, and peer-to-peer sharing). We find that station-based business models are well institutionalized but harder to scale up, while the recent one-way free-floating model has the greatest scaling potential if institutional adaptations and geo-fencing technologies are successfully implemented. Peer-to-peer sharing is likely to remain a niche with special purpose bikes.

Hoekstra, A., Steinbuch, M. and Verbong, G.P.J., 2017, Creating agent-based energy transition management models that can uncover profitable pathways to climate change mitigation, *Complexity*, 17(2):1-23

The energy domain is still dominated by equilibrium models that underestimate both the dangers and opportunities related to climate change. In reality, climate and energy systems contain tipping points, feedback loops, and exponential developments. This paper describes how to create realistic energy transition management models: quantitative models that can discover profitable pathways from fossil fuels to renewable energy. We review the literature regarding agent-based economics, disruptive innovation, and transition management and determine the following requirements. Actors must be detailed, heterogeneous, interacting, learning, and strategizing. Technology should be represented as a detailed and heterogeneous portfolio that can develop in a bottom-up manner, using endogenous feedback loops. Assumptions about discount rates and the social cost of carbon should be configurable. The model should contain interactions between the global, national, local, and individual level. A review of modelling techniques shows that equilibrium models are unsuitable and that system dynamics and discrete event simulation are too limited. The agent-based approach is found to be uniquely suited for the complex adaptive sociotechnical systems that must be modelled. But the choice for agent-based models does not mean a rejection of other approaches because they can be accommodated within the agent-based framework. We conclude with practical guidelines.

Hopkins, D. and Schwanen, T., 2018, Automated mobility transitions: Governing processes in the UK, *Sustainability*, 10(4), 956

Contemporary systems of mobility are undergoing a transition towards automation. In the UK, this transition is being led by (often new) partnerships between incumbent manufacturers and new entrants, in collaboration with national governments, local/regional councils, and research institutions. This paper first offers a framework for analyzing the governance of the transition, adapting ideas from the Transition Management (TM)

perspective, and then applies the framework to ongoing automated vehicle transition dynamics in the UK. The empirical analysis suggests that the UK has adopted a reasonably comprehensive approach to the governing of automated vehicle innovation but that this approach cannot be characterized as sufficiently inclusive, democratic, diverse and open. The lack of inclusivity, democracy, diversity and openness is symptomatic of the post-political character of how the UK's automated mobility transition is being governed. The paper ends with a call for a reconfiguration of the automated vehicle transition in the UK and beyond, so that much more space is created for dissent and for reflexive and comprehensive big picture thinking on (automated) mobility futures.

Gismondi, M., 2018, Historicizing transitions: The value of historical theory to energy transition research, *Energy Research & Social Science*, 38, 193-198

Can history and historical thinking help us to strategize key transition challenges ahead? Most transition thinkers make use of historical perspectives, sometimes obliquely, to frame their energy and society research. Yet, specific socio-historical forces driving accelerated energy use, climate warming, biodiversity loss and systemic inequities are often left to speak for themselves; summoned, there they hover, ghost-like and haunting this transition thinker. In particular, we give wide berth to questions of historiography; that is, different theories and disputes over the interpretation of historical change. In this discussion piece, I introduce four perspectives on the history and theory of long-term structural social change and argue how they could advance our transition work: environmental history, historicizing the Anthropocene, history from below, and plural time. My intent is to encourage greater engagement with historical thinking as a form of knowledge about transitions, as we work towards accelerating alternative, low carbon and just futures.

Hillman, J., Axon, S. and Morrissey, J., 2018, Social enterprise as a potential niche innovation breakout for low carbon transition, *Energy Policy*, 117, 445–456

While there is growing consensus that human behaviours need to change to a more sustainable paradigm, community driven approaches, such as social enterprise, have yet to be explored as serious instruments of sustainability transition. Social enterprises sit within the third sector of the economy, typically where market or governmental failures exist in the provision of social welfare, and have increasingly become a key driver of social progress. The autonomous nature of the social-economic model applied by such organisations can represent a viable means to reduce state social welfare dependence, and is a proven model for social change. The capability of social enterprises to create both social and economic value is considered a 'win-win'. Yet there are clear potentials for social enterprise models to be more extensively applied to address contemporary ecological challenges of neo-liberal market economies, moving towards 'win-win-win' outcomes across social, economic and ecological domains. This paper investigates the value of social enterprises as drivers of low-carbon transition at the community level, with an emphasis on the energy sector. Evidence from seven organisations in the UK is presented and a socio-technical transitions conceptual framework is applied to analyse these social enterprise operations as a form of social innovation.

Hyysalo, S., Juntunen, J.K. and Martiskainen, M., 2018, Energy Internet forums as acceleration phase transition intermediaries, *Research Policy*, in press

Citizen users play important roles in the acceleration phase of energy transitions, during which small-scale renewable energy technologies (S-RET) become taken up more widely. From users' perspective, turning the early, and typically slow, proliferation into a more rapid and widespread diffusion requires not only the adoption of S-RET but also the adaptation, adjustment, intermediation and advocacy of S-RETs. These activities become necessary because S-RET face a variety of market, institutional, cultural and environmental conditions in different countries. New Internet-based energy communities have emerged and acted as key user-side transition intermediaries that catalyse these activities by qualifying market information, articulating demand and helping citizen users to reconfigure the standard

technology to meet the specificities of different local contexts. In doing so, Internet communities foster an appreciatively critical discourse on technology. Such user intermediation is important in expanding the markets for S-RET beyond that of enthusiasts, environmentalists and other early adopters, to the early majority of adopters who demand more exposure, clearer information and less uncertainty about new technology options.

Pallesen, T. and Jenle, R.P., 2018, Organizing consumers for a decarbonized electricity system: Calculative agencies and user scripts in a Danish demonstration project, *Energy Research & Social Science*, 38, 102-109

This paper studies a Danish smart grid experiment, EcoGrid EU, designed to sustain the increase of wind power in the electricity system. EcoGrid EU is designed as a real-time market, through which engineers seek to realize price responsive electricity consumers through the introduction of smart meters, variable short-term price signals and training users. Based on observations and interviews with scientist, consumers and technicians, this paper analyses the attempt to produce a new kind of electricity consumer. Drawing on social studies of markets, we argue that the project entails constructing a new form of calculative agency. We illustrate the extensive work put into the creation of a new, reconfigured electricity consumer, as well as the challenges associated with the construction of consumers willing and able to act in accordance with the EcoGrid script. On one hand, this study adds to the growing critique raised by practice scholars, most prominently, regarding technically trained system designers' 'reductionist' approach to users. On the other hand, the paper argues that the social sciences must move beyond a mere identification of complexity and 'messiness' to provide constructive contributions to the ongoing work of designing and producing new well-functioning sociotechnical systems, including new types of 'sustainable' users.

Juwet, G. and Ryckewaert, M., 2018, Energy transition in the nebular city: Connecting transition Thinking, metabolism studies, and urban design, *Sustainability*, 10(4), 955

Transforming urban infrastructures is an essential part of creating more sustainable urban regions. But rethinking these complex systems requires a better understanding of their spatial dimensions and their relation with urban morphology and spatial structure. This paper addresses that gap by examining different conceptualizations of technical infrastructure and space in science, technology and society studies (STS), transition thinking, urban metabolism studies, and urban political ecology, and draws connections with the spatial perspective of urban planning and design. It illustrates and tests these concepts through the case of energy transition in the Flemish region of Belgium. Transport and supply networks have played a crucial role in facilitating, structuring, and reproducing the region's characteristic dispersed and energy-intensive urban landscape. Bringing different disciplinary perspectives together, the research broadens the conceptualization of the spatial dimension in transition thinking, and identifies useful concepts and design parameters for urban design to engage with the technical and socio-political complexity of transforming urban infrastructure. It reveals the energy transition as an inherently spatial project, and explores the spatially and socio-politically transformative potential of the transition towards a new energy system.

Raven, R.P.J.M. and Walrave, B., 2018, Overcoming transformational failures through policy mixes in the dynamics of technological innovation systems, *Technological Forecasting and Social Change*, in press

The need for challenge-led innovation policies to address grand societal challenges is increasingly recognised at various policy levels. This raises questions how to overcome a variety of 'failures' prohibiting innovations to flourish. A key-line of thought in theory and policy emerged since the late 1990s on the role of system failures, next to more conventional market-failure thinking. More recently, scholarly work introduced the notion of 'transformational failures', which implies an even broader perspective on innovation failures as resting in challenges related to transforming entire systems of production and

consumption. This paper combines the literature on Technological Innovation Systems (TIS) with literature on multi-level approaches to sustainability transitions to make a contribution to this debate. In particular, this paper argues that the current literature, so far, has failed to explore how different kinds of policies, or policy mixes, can overcome transformational failures. The paper uses a simulation model (i.e. a system dynamics model) and illustrative examples on electric vehicles to explore relations between transformational failures and (mixes of) policy interventions. A key conclusion is that, in particular in the case where an emerging TIS is in a competitive relation with an incumbent system, overcoming transformational failures can be realised either by directly addressing the incumbent system, for instance by taking away its resources (which may be political challenging). Alternatively, the model results show that a clever mix of policy interventions elsewhere in the system may lead to sufficient performance improvements of the emerging TIS so that it can challenge the incumbent system on its own – albeit with a need for substantial additional resources.

Van den Heiligenberg, H., Heimeriks, G., Hekkert, M., Raven, R. and Sol, J., 2018, Contrasting regional habitats for urban sustainability experimentation in Europe. *Sustainability*, 10(5), 1624

The sustainability challenge requires experimentation with innovations, followed by an upscaling process towards a broader regime change in the long term. In Europe we observe various regional hotspots for sustainability experimentation which suggests that there are favorable spatial contexts. Little is known about why different kinds of experiments flourish or fail in various spatial contexts. In this paper we explore these contexts by using the habitat concept. A habitat is regarded as the configuration of favorable local and regional context factors for experimentation. To capture the diversity of these habitats we have constructed archetypical experimentation patterns. These patterns are built up of five dimensions: knowledge, governance, informal institutions, regional innovation advantages, and social learning. In a comparative case study in four city regions in Europe we find a large contrast in habitats. Countercultures play an important role, as they shape a beneficial context for experimentation through alternative ideas and lifestyles. We also find indications that it is important that a combination of several habitat factors is present, and that these factors have aligned and evolved over several years of experimentation, thus leading to a more mature habitat. The research suggests that regional stakeholders can positively influence most of the habitat factors shaping future upscaling. However, there are also some important factors, such as regional knowledge and skills, which have a path-dependent nature and are more difficult to improve in the short term.

Goyal, N. and Howlett, M., 2018, Technology and instrument constituencies as agents of innovation: Sustainability transitions and the governance of urban transport, *Energies* 11(5):1198

Sustainable urban transport is a complex challenge requiring innovation in technologies, culture, and policies. Given the systemic nature of the issues involved, numerous studies have applied the transitions approach to urban transport. However, relatively weak conceptualization of agency in the transitions literature limits the usefulness of this approach for the governance of urban transport. The objective of this study is to contribute to the conceptualization of agency in the multilevel perspective to sustainability transitions. We propose that two types of actors exercise agency to foster innovation: technology constituencies, who promote the adoption of specific technologies by citizens, businesses, or governments; and instrument constituencies, who promote the adoption of specific policy instruments. In focusing predominantly on technological innovation, the transitions literature has generally juxtaposed these constituencies or considered them to be the same. We posit that the two constitute distinct, albeit possibly overlapping, actors and that their relationship(s) help better understand and explain how transitions evolve. We discuss the implications of this distinction for the governance of urban transport and argue that the presence of instrument and technology constituencies, and their relationship(s), should be examined empirically in future research.

Brand, C., Anable, J.L. and Morton, C., 2018, Lifestyle, efficiency and limits: modelling transport energy and emissions using a socio-technical approach, *Energy Efficiency*, in press

The Paris climate change agreement and 'dieselgate' emissions scandal in the US have prompted policy makers, regulators and industry to re-evaluate strategies to meet climate change mitigation and air quality goals. While a wide range of supply and demand policies have been proposed at both national and subnational/local levels, implementation and even the supporting research evidence have been lagging ambition in many parts of the world. It is well known that societal transport energy consumption and related emissions are influenced by technical efficiency, the carbon/pollutant content of energy and by 'lifestyles' and socio-cultural factors. However, only a few attempts have been made to operationalise these insights into models of future transport energy demand or even scenario analysis. In particular, insights into human behaviour, lifestyle change and the important role of individual attitudes and perceptions are often overlooked by policy makers. This paper addresses this gap in research and practice by presenting a quantitative scenario exercise using an integrated transport-energy-environment systems model to explore four contrasting futures for Scotland that compare 'lifestyle' change and socio-cultural factors against a low carbon technology focussed transition pathway using a socio-technical approach. We found that radical demand and supply strategies can have important synergies (and potential trade-offs) between reducing life cycle greenhouse gas and air quality emissions. Lifestyle change alone (without an EV transition) has a similar effect on transport carbon and air quality emissions than a transition to EVs with no lifestyle change. Yet both have limits to meeting future targets, which may only be achieved with a combined strategy of radical change in travel patterns, mode choice, vehicle occupancy and on-road driving behaviour with high electrification and phasing out of conventional petrol and diesel road vehicles.

Mok, L. and Gaziulusoy, İ., 2018, Designing for sustainability transitions of aquaculture in Finland, *Journal of Cleaner Production*, in press

To facilitate transitions in socio-technical systems, it is necessary to adopt a strategic and systemic perspective. The dynamics of socio-technical systems are associated with uncertainty and may yield to critical problems as the systems change and may lead to adverse results without deliberate intervention. This case study research develops a new theoretical framework to support strategic design interventions that aim to anticipate and address problems in systemic transitions by integrating two areas of knowledge – strategic design and transitions theories. The theoretical framework is applied to a case study of facilitating salmon trout aquaculture in Finland that has been reaching stalemate. The resulting design demonstrates a new kind of strategic design intervention that is neither attached only to the present-day concerns to solve only present problems nor abstracted merely to the strategic level to project only long-term visions. Rather, the Strategic Ekofish Certification concept presents new strategic design with operational importance to mitigate foreseeable problems aligning with near-future goals.

Ollivier, G., Magda, D., Mazé, A., Plumecocq, G., and Lamine, C., 2018, Agroecological transitions: What can sustainability transition frameworks teach us? An ontological and empirical analysis, *Ecology and Society*, 23(2): 5, doi 10.5751/ES-9952-230205

Transitioning toward more sustainable agricultural development paths requires extensive change and not simply marginal technical adjustments, as suggested by a strong conception of agroecology. To deal with transition, we believe that agroecology can be enriched by a deep analysis of sustainability transition frameworks and, conversely, that preexisting theories can be questioned in light of the specificities of agroecological transitions (AET). We first examine some of the main sustainability transition frameworks (resilience of social-ecological systems, institutional analysis and development of social-ecological systems, and socio-technical transition). We identify their ontologies to question their ability to be combined without deep adjustments. In a second step, we analyze how these frameworks

have been used and questioned by researchers from the life sciences or social sciences in four AET studies. We find that each framework is relevant in its systemic and dynamic approach to change, but also that there are limits concerning the balance between the various dimensions. The scales and processes linked to AET must be taken into account, as well as the way to jointly consider ecological, socioeconomic, and technological aspects. Moreover, it is clear that problems in dealing with agency are common to these approaches, which influences the way to model change. More broadly, sustainability transition frameworks need to account better for ecological and technological materialities and processes, the importance of emergent organizations in singular situations, and learning processes and the diversity of knowledge dynamics. Doing so is challenging because it requires regrounding theories in empirical observations as well as questioning disciplinary frontiers and ontologies.

Baret, P.V., 2018, Acceptance of innovation and pathways to transition towards more sustainable food systems, *Potato Research*, in press, <https://doi.org/10.1007/s11540-018-9384-1>

The main driver of agricultural systems of the twentieth century was yield. Awareness of the limits of the planet and the impacts of agriculture triggered the realization that new objectives have to be part of the food systems agenda. The development of new models of agriculture including environmental and sustainability dimensions implies a new view on the process of innovation and a better balance between the paradigms of innovation. Systemic lock-ins are keeping the agricultural and food systems on less relevant pathways. Acknowledgement of the relevance of alternative systems of production such as organic farming and a shift from a linear model of innovation diffusion to the building up of new partnerships of innovation are key enablers of a transition.

Muhazo, C. and Johnson, O.W., 2018, Exploring household energy transitions in rural Zambia from the user perspective, *Energy Policy*, 121, 25-34

Renewable energy mini-grids are expected to play a major role in pursuit of universal access to modern energy services, particularly in rural Africa where grid extension is technically or financially unviable. In doing so, they will contribute greatly to a shift in household and community energy use from reliance on traditional fuels to more modern energy services. However, such a shift is a complex and uncertain process, with mini-grids often struggling to achieve sustainability after initial project funding ends. This paper draws on service design approaches to understand challenges associated with adoption of electricity services from the user perspective. By developing a user journey map, our study explores users' experience associated with connecting to and using electricity services from a 60 kW solar mini-grid in Mpanta, a small rural fishing community in northern Zambia. Our study finds that poor expectation management and limited integration of local socioeconomic dynamics in mini-grid service design, including their impact on affordability, has led to a slow and partial shift in household energy use. Better incorporation of the user perspective in the design, implementation and evaluation of mini-grids can help to identify potential barriers to adoption of electricity services and adapt it to the local context.

Baker, L. and Phillips, J., 2018, Tensions in the transition: the politics of electricity distribution in South Africa, *Environment and Planning C*, in press

This paper argues that the distribution of electricity represents an important yet neglected aspect of the politics of energy transitions. We analyse electricity in South Africa as a site of struggle which in recent years has seen the introduction of new actors and technologies, including the 'prosumer' (producer-consumer) of electricity and 'disruptive technologies' such as roof-top solar photovoltaics (PV). We analyse these recent developments in historical context and consider implications for contemporary planning, regulation and ownership of electricity. We find that the reconfiguration of electricity distribution faces significant political and economic challenges that are rooted in the country's socio-economic and racial inequalities and its heavy dependence on coal-fired power. First, disruptive technologies offer potential

opportunities for affordable, decentralised, low-carbon energy, yet disruption to the coal-powered electric grid and the monopoly of South Africa's electricity utility has been minimal to date. Second, distributed solar PV creates tensions between equitable and low carbon energy transitions and threatens critical revenue from the country's wealthy consumers that cross-subsidises electricity services for the poor and other municipal public services. Third, the South African experience queries common assumptions about the democratic potential of decentralised governance. Fourth, South Africa provides insights of global significance into how political institutions have responded to social and technological drivers of change, in a context where planning and regulation have followed rather than led infrastructural developments. While energy policy remains unresponsive or resistant to social and technological change, there remain significant political, economic, technical and regulatory challenges to a just and inclusive energy transition.

Welch, D. and Yates, L., 2018, The practices of collective action: Practice theory, sustainability transitions and social change, *Journal for the Theory of Social Behaviour*, in press

Developing theory for understanding social transformation is essential for environmental sustainability, yet mainstream accounts of collective action neglect the dynamics of daily life. Theories of practice have proved generative for the study of sustainable consumption but struggle to accommodate the roles of collective actors, strategic action and purposive collective projects in social change. In response, this paper develops a practice theoretical account of collective action pertinent to processes of large scale social change, with specific focus on transitions towards sustainability. We consider three ideal types of collective—bureaucratic organisations, groupings and latent networks—and, drawing on existing social theoretical resources that are ontologically compatible with a practice account, explore the kinds of practices and arrangements which compose them. Processes concerning strategy, bureaucracy, management, social worlds and collective identity are identified as important combinations of practices and arrangements. We suggest a key contribution of practice theory has been to identify a type of collective action we call dispersed collective activity, and we suggest how this type of activity may give rise to collectives. We conclude by suggesting further development for the realisation of the project's contribution to the analysis of sustainability transitions.

Sampa, H., Juntunen, J.K. and Martiskainen, M., 2018, Energy Internet forums as acceleration phase transition intermediaries, *Research Policy*, 47(5), 872-855

Citizen users play important roles in the acceleration phase of energy transitions, during which small-scale renewable energy technologies (S-RET) become taken up more widely. From users' perspective, turning the early, and typically slow, proliferation into a more rapid and widespread diffusion requires not only the adoption of S-RET but also the adaptation, adjustment, intermediation and advocacy of S-RETs. These activities become necessary because S-RET face a variety of market, institutional, cultural and environmental conditions in different countries. New Internet-based energy communities have emerged and acted as key user-side transition intermediaries that catalyse these activities by qualifying market information, articulating demand and helping citizen users to reconfigure the standard technology to meet the specificities of different local contexts. In doing so, Internet communities foster an appreciatively critical discourse on technology. Such user intermediation is important in expanding the markets for S-RET beyond that of enthusiasts, environmentalists and other early adopters, to the early majority of adopters who demand more exposure, clearer information and less uncertainty about new technology options.

Bento, N., Wilson, C. and Diaz-Anadon, L., 2018, Time to get ready: Conceptualizing the temporal and spatial dynamics of formative phases for energy technologies, *Energy Policy*, 119, 282-293

Implementing the Paris agreement to prevent dangerous climate change requires energy system transformation and rapid diffusion of low-carbon innovations. In this paper we

investigate both the temporal and spatial dynamics of formative phases by which energy technologies prepare for growth. Drawing on a review of diverse literatures, we offer a definition of the formative phase which clarifies its scope and duration, and identifies its main technological and economic determinants. We use parametric hazard models to assess the relative strengths of these determinants on formative phase durations for a sample of 15 energy technologies diffusing over time in their respective initial markets. We find that substitutability has stronger effects in accelerating the end of formative phases than installed capacity and prices. We extend our analysis using nonparametric models to analyze the spatial diffusion of formative phase durations from initial to follower markets. We find that formative phase durations are long outside initial markets as well, showing only signs of acceleration in latecomer regions. Our results imply risks for policies trying to accelerate the diffusion of large innovations without ready markets in both initial and follower markets.

Lopéz-García, D., Calvet-Mir, L., Di Masso, M., Espluga, J., 2018, Multi-actor networks and innovation niches: University training for local Agroecological Dynamization, *Agriculture and Human Values*, in press,

The global environmental and social-economic crises of industrialized agriculture have led to the emergence of agroecology as an alternative approach aiming to increase the ecological, social and economic sustainability of agri-food systems. The 'multi-level perspective' is now a widely used framework to understand and promote the upscaling of local innovation niches, such as agroecology, to broader scales (e.g., regional, national, international), thus reconfiguring the dominant socio-technical regimes. Additionally, emergent 'hybrid forums' can provide a space between niche and regime where niche innovators can become important actors in scaling up and out emergent innovations. In this paper, we examine a university training program (Postgraduate Diploma in Local Agroecological Dynamization at the Universitat Autònoma de Barcelona), to better understand its role as a 'hybrid forum'. Our analysis focuses especially on how the program, as an example of a hybrid forum, worked to reconfigure practices, concepts, and tools of local development practitioners. We also assess to what extent the program contributed to transitioning local development institutions toward agroecology. An online survey (n = 46) and in-depth interviews (n = 16) were carried out to determine how the training program has impacted the student's opinions and their respective institutions. The results show that most of the students consider that they have acquired new theoretical frameworks and useful methods to re-framing their local development projects, that new alliances with multi-actor networks have been perceived, and that some internal changes of the local development practices have taken place. We conclude that the training program, as a hybrid forum, is capable of outscaling niche innovations through linkages with different kind of actors both from the niche and the regime. Political changes in the socio-technical landscape level offer an opportunity to amplify the impact of the innovations which are being generated by those multi-actor networks, but with a limited multi-level impact as far as institutional regime-actors not aligned with agroecological transition keep the most of the competencies on agri-food systems.

Horne, R. and Moloney, S., 2018, Urban low carbon transitions: institution-building and prospects for interventions in social practice, *European Planning Studies*, in press

As we witness increasing numbers and range of low carbon experiments, attention inevitably turns to how they are sustained and whether they can generate more systemic change in carbon-related consumption. This paper responds to the 'spatial turn' in socio-technical transitions, and the 'practice turn' in social theory to consider the role of intermediary organizations in potential shifts from experiments to institutional arrangements favouring transitions. Through the example of Climate Change Alliances in Victoria, Australia, the paper examines how such intermediary organizations seek to experiment and in so doing contribute towards institution building. With a focus on the interstitial spaces between local authorities, regional firms, agencies, and state governments we speculate on the prospects

for systemic change given the resources, positioning and social strategies of the Alliances as intermediary institution builders.

Chilvers, J., Pallett, H., Hargreaves, T., 2018, Ecologies of participation in socio-technical change: The case of energy system transitions, *Energy Research & Social Science*, 42, 199–210

Studies of societal engagement with socio-technical change are undergoing a systemic turn. Rather than simply viewing public engagement in science, policy and behavioural change in terms of discrete cases, key social theories in deliberative democracy, practice theory, socio-technical transitions and co-productionist scholarship in science and technology studies (STS) are moving to consider how diverse forms of participation interrelate in wider systems. In this paper we take stock of these advances to develop a conceptual framework for understanding ecologies of participation in socio-technical and democratic systems, grounded in relational co-productionist theory in STS. The framework is illustrated through empirical analysis of a systematic mapping of participation in UK energy system transitions between 2010 and 2015. This provides the first insights into system-wide patternings, diversities and inequalities of energy participation, the significant types of interrelation between practices of public engagement within wider ecologies of participation, and their mutual construction with political cultures and constitutions. The value and implications of adopting an ecologies of participation approach are considered with respect to the theoretical, empirical and practical challenges of understanding and building more inclusive, responsible and just socio-technical (energy) transitions.

Ockwell, D., Byrne, R., Hansen, U.E., Haselip, J. and Nygaard, I., 2018, The uptake and diffusion of solar power in Africa: Socio-cultural and political insights on a rapidly emerging socio-technical transition, *Energy Research & Social Science*, 44, 122-129

This special issue focusses on the now rapidly growing solar photovoltaics markets across various geographies and scales in Africa. Herein we summarise the contributions of the component papers and position them within the context of the sustainable energy access literature. We argue that there is an urgent need for greater attention to the neglected socio-cultural and political dimensions of sustainable energy access, dimensions that are vital to understand if ambitious global commitments to sustainable energy for all by 2030 are to be achieved. Included in this special issue are papers on the systemic and socio-technical nature of energy access transitions; their politics and political economy; gendered dimensions; critiques of their technologically determinist framing and the implications for marginalising local actors; and, perhaps for the first time in the energy access literature, application of social practice perspectives to the energy access challenge. The result is a diverse range of empirically-grounded, theoretically and methodologically novel approaches, providing new insights into and understandings of the neglected socio-cultural and political dimensions of sustainable energy access.

Leibowicz, B.D., 2018, Policy recommendations for a transition to sustainable mobility based on historical diffusion dynamics of transport systems, *Energy Policy*, 119. 357-366

Emerging transportation technologies have the potential to surmount carbon lock-in and enable a transition to environmentally sustainable mobility. Promising options include biofuels; hybrid, plug-in hybrid, and battery electric vehicles; hydrogen fuel cell vehicles; maglev trains; and the Hyperloop. To varying degrees, widespread adoption of these technologies is complicated by the chicken-and-egg problem of infrastructure provision. Consumers are unlikely to adopt a technology in the absence of supporting infrastructure, but infrastructure provision is unprofitable without a critical mass of adopters. To derive policy recommendations for overcoming this problem, this study analyzes historical data on the diffusion dynamics of transport systems in the United States. The methodology systematically compares the relative timing of diffusion processes for infrastructure, vehicles, and travel. A striking regularity observed across transport systems is that the diffusion of

infrastructure precedes the adoption of vehicles, which precedes the expansion of travel. On the chicken-and-egg conundrum, findings thus support the view that infrastructure comes first. The analysis leads to three salient policy recommendations: support adequate infrastructure provision early in the technology life cycle, target suitable niche markets to maximize the impact of infrastructure investment, and leverage distributed technologies to reduce overall infrastructure requirements.

Kivimaa, P. and Martiskainen, M., 2018, Dynamics of policy change and intermediation: The arduous transition towards low-energy homes in the United Kingdom, *Energy Research & Social Science*, 44, 83-99

The transition towards low-energy buildings in the United Kingdom is challenging. Several policy changes have affected the actions and agency of actors. Drawing on the sustainability transitions literature, we analyse the development of the low-energy homes niche, focusing on the dynamics between intermediary organisations and policy development for low-energy homes. Based on rich interview and secondary data, we note how the existence and activities of transition intermediaries are enabled or curtailed by policy changes. We identify niche development phases along with the position and activities of intermediary organisations. In the predevelopment phase, non-state transition intermediaries have formed when government policy has been weak or market-based. During take-off, targeted policy initiatives have created protective spaces and stimulated the emergence of new intermediaries aiming to consolidate the niche. State-affiliated intermediaries have been established as part of active energy efficiency policy, but later ceased to exist or became privatised. Existing organisations have adopted intermediary functions to advance low-energy homes in response to policy. Furthermore, intermediaries have on occasion influenced policy development, often through cooperation among an ecology of intermediaries. In conclusion, we raise questions regarding intermediaries in the changing governance context.

Delina, L. and Sovacool, B.K., 2018, Of temporality and plurality: An epistemic and governance agenda for accelerating just transitions for energy access and sustainable development, *Current Opinion in Environmental Sustainability*, 34, 1-6.

The complementarity of sustainable energy transitions and energy access provision are one of the key characteristics of both the Sustainable Development Goals and the Paris Agreement on climate change. In this perspective piece, we offer an epistemic and governance agenda to advance the imperative of speed in meeting both ambitions and to acknowledge the plurality of disciplines, actors, and institutions involved. Recognizing that the processes required to achieve these global goals entail navigating tensions, we suggest that shifts in ways knowledge is produced and transitions are governed could be based on a justice framework.

Pesch, U., Spekkink, W. and Quist, J., 2018, Local sustainability initiatives: innovation and civic engagement in societal experiments, *European Planning Studies*, in press

Local sustainability initiatives are studied from two scholarly perspectives: the perspective of sociotechnical innovation, which relates to the capacity of bottom-up initiatives to contribute to the development of sociotechnical alternatives; and the perspective of civic engagement which relates to the capacity of citizens to organize themselves in order to pursue community goals. This paper argues that taking both these perspectives into account overcomes the problem of being too instrumental or the problem of neglecting the role of technology and innovation in local initiatives. The perspective of sociotechnical innovation presents different types of innovation pursued by local initiatives: the creation of new technology, the application of existing technology and the development of social innovation. Furthermore, innovations might diffuse over wider society by: replication, scaling up, and translation. In turn, civic engagement may take the shape of: the strengthening of social capital, the formation of social movements, and the substitution of functions and services.

The insights from literature are illustrated and qualified by applying them in the context of concrete local initiatives. Finally, local initiatives will be portrayed as social contexts that are successful in gathering actors with different motivations and world views and that may contribute to the democratization of innovation.

Llamosas, C., Upham, P. and Blanco, G., 2018, Multiple streams, resistance and energy policy change in Paraguay (2004–2014), *Energy Research & Social Science*, 42, 226–236

Most Latin-American countries have undergone policy reforms in their Energy Sector during the last 60 years. In Paraguay, despite several attempts at introducing policy innovations, the organisation of the sector has remained virtually unchanged. Why have attempts at introducing policy changes failed? While crucial for the country's development and the future of the regions' energy sector, there has been little academic study of Paraguay's energy policy-making processes. This paper presents an account of how the politics have influenced the current state of energy policy in Paraguay through the lens of Kingdon's multiple streams approach (MSA). The analysis suggests that battle for political power, as well as changes in government, have played a key role in hampering change during the period under study, weakening the efforts of policy entrepreneurs. The absence of Kingdon's conditions for policy change also offers a way of understanding sociotechnical 'regime resistance'. In terms of policy implications where institutional change is an objective, the case implies a need to empower policy entrepreneurs, here including the Vice Minister of Mines and Energy via the creation of a dedicated Ministry for Energy.

Sovacool, B.K., Lovell, K., Ting, M.B., 2018, Reconfiguration, contestation, and decline: Conceptualizing mature large technical systems, *Science, Technology & Human Values*, in press

Large technical systems (LTS) are integral to modern lifestyles but arduous to analyze. In this paper, we advance a conceptualization of LTS using the notion of mature "phases," drawing from insights into innovation studies, science and technology studies, political science, the sociology of infrastructure, history of technology, and governance. We begin by defining LTS as a unit of analysis and explaining its conceptual utility and novelty, situating it among other prominent sociotechnical theories. Next, we argue that after LTS have moved through the (overlapping) phases proposed by Thomas Hughes of invention, expansion, growth, momentum, and style, mature LTS undergo the additional (overlapping) phases of reconfiguration, contestation (subject to pressures such as drift and crisis), and eventually stagnation and decline. We illustrate these analytical phases with historical case studies and the conceptual literature, and close by suggesting future research to refine and develop the LTS framework, particularly related to more refined typologies, temporal dimensions, and a broadening of system users. We aim to contribute to theoretical debates about the coevolution of LTS as well as empirical discussions about system-related use, sociotechnical change, and policy-making.

Pigrod, A-A., Hickey, G. and Klerkx, L., 2018, Beyond agricultural innovation systems? Exploring an agricultural innovation ecosystems approach for niche design and development in sustainability transitions, *Agricultural Systems*, 164, DOI 10.1016/j.agsy.2018.04.007

Well-designed and supported innovation niches may facilitate transitions towards sustainable agricultural futures, which may follow different approaches and paradigms such as agroecology, local place-based food systems, vertical farming, bioeconomy, urban agriculture, and smart farming or digital farming. In this paper we consider how the existing agricultural innovation systems (AIS) approach might be opened up to better support the creation of innovation niches. We engage with Innovation Ecosystems thinking to consider the ways in which it might enhance efforts to create multi-actor, cross-sectoral innovation niches that are capable of supporting transitions to sustainable agricultural systems across multiple scales. While sharing many similarities with AIS thinking, Innovation Ecosystems

thinking has the potential to broaden AIS by: emphasizing the role of power in shaping directionality in innovation platforms or innovation communities that are connected to niches and their interaction with regimes; highlighting the plurality of actors and actants and the integral role of ecological actants in innovation; and offering an umbrella concept through which to cross scalar and paradigmatic or sector boundaries in order to engage with a variety of innovation systems affecting multifunctional agricultural landscapes and systems. To this end, an *Agricultural Innovation Ecosystems* approach may help design and support development of transboundary, inter-sectoral innovation niches that can realize more collective and integrated innovation in support of sustainability transitions, and help enact mission oriented agricultural innovation policy.

Cai, Y. and Aoyoma, Y., 2018, Fragmented authorities, institutional misalignments, and challenges to renewable energy transition: A case study of wind power curtailment in China, *Energy Research & Social Science*, in press

To date, challenges to renewable energy transition have been discussed largely based on the cases and experiences from the Global North. In this paper, we aim at broadening our understanding of this specific socio-technical transition by incorporating the case of wind power development in China. Based on the analysis of policy and legal documents, we examine how institutions are organized and incentives are distributed among relevant stakeholders. We argue that China's significant wind curtailment problem has been produced and exacerbated by multiple axes of institutional misalignments stemming from China's fragmented energy bureaucracy. Through the study of the Chinese approach to renewable energy transition, our goal is to demonstrate the institutional plurality of socio-technical transition and the context specificity of its challenges.

Andersson, J., Hellsmark, H. and Sandén, B., 2018, Shaping factors in the emergence of technological innovations: The case of tidal kite technology, *Technological Forecasting and Social Change*, 132, 191-208

The technological innovation systems (TIS) literature offers a detailed and dynamic understanding of factors that enable successful innovation. However, few studies analyze what determines where in space value chain elements are developed as a new technology is diffused on a large scale. The purpose of this paper is to show how the TIS approach can be used to identify and analyze factors that shape spatial trajectories of emerging technologies. It proposes an adapted analytical framework that expands the conventional focus on one-dimensional supporting and blocking factors, to shaping factors that incorporate the spatiality of innovation. The approach is illustrated by examining innovation in tidal kite technology. The analysis finds that a supportive local context in western Sweden during the infancy of tidal kite technology, together with the availability of competent engineers and business development professionals, promoted the formation of locally embedded knowledge and competence. This in turn created a spatial path dependency that made developments gravitate towards Sweden, although the lack of domestic markets has also increasingly driven an expansion of activity to other regions, in particular the UK. Moreover, the analysis shows that shaping, and not only stimulating, the growth of emerging TIS is an important challenge for regional policymakers, and highlights the need for international policy coordination. The paper concludes that analyzing shaping factors in the emergence of new TISs can yield important insights, some of which may be overlooked with a narrow analytical focus on supporting and blocking factors.

Tarasova, E., 2018, (Non-) Alternative energy transitions: Examining neoliberal rationality in official nuclear energy discourses of Russia and Poland, *Energy Research & Social Science*, in press

Neoliberal trends are a part of the sociopolitical contexts that shape present-day energy transitions. Economic arguments extensively used in nuclear energy discourses regarding the Nuclear Renaissance period may indicate that neoliberal trends have penetrated discussions about energy transitions. This article examines the presence of neoliberal

rationality in the official nuclear energy discourses coming from Russia and Poland. These countries are interesting in respect to their relatively recent changes towards a market economy. Neoliberal rationality is defined in the article as the combination of market rationality, limited role of state, political consensus, governance structures and securitization, following Foucault and Brown. Discourse analysis of the energy policies and speeches of politicians that contain statements about nuclear energy development is carried out. The analysis confirms the significant presence of these themes in nuclear energy discourses as well as discourses reflecting the specificities of the two countries. The combination of the defining features of neoliberal rationality in official nuclear energy discourses seem to leave limited space for challenging nuclear energy development and discussing alternative energy transitions.

Gabaldón-Estevan, D., Peñalvo-López, E., and Solar, D.A., 2018, The Spanish turn against renewable energy development, *Sustainability*, 10(4), 1208

In this study, we focus on the case of Spanish energy policy and its implications for sustainable energy development. In recent years, Spanish legislation has changed dramatically in its approach to sustainable energy sources. This change is despite EU and international efforts to increase energy efficiency, and to accelerate the transition to renewable energy sources (RES) in order to reduce greenhouse gas emissions. Based on the socio-technical transitions literature, this paper assesses the role of the new legislation in this altered scenario, and analyzes the evolution of energy production in Spain in the EU context. The results are triangulated with two expert assessments. We find that Spanish energy policy is responding to the energy lobby's demands for protection for both their investment and their dominant position. This has resulted in a reduction in the number of investors combined with a lack of trust in both local and foreign investors in the sustainable energy sector, affecting also social innovations in energy transitions. We conclude that Spain is a particular case of concomitance between the energy sector and political power which raises concern about the viability of a higher level of energy sovereignty and the achievement of international commitments regarding climate change.

Wanner, M., Hilger, A., Westerkowski, J., Rose, M., Stelzer, F., & Schöpke, N. (2018). Towards a cyclical concept of Real-World Laboratories: a transdisciplinary research practice for sustainability transitions. *DisP - The Planning Review*, 54(2), 94–114.

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, but more elaborated research approaches. Second, it aims to transfer these key components into a comprehensive research practice. This practice is illustrated by the 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 the district of 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.

Prinz, L. and Pegels, A., 2018, The role of labour power in sustainability transitions: Insights from comparative political economy on Germany's electricity transition, *Energy Research & Social Science*, in press

Greenhouse-gas-emission-reductions to prevent dangerous levels of climate change require a global transition away from fossil-fuel energies. Sustainability transitions of such scale present a major redistribution process, and pose severe challenges to national policy-making. While power and politics have recently been addressed by scholars of sustainability transition, the role of labour as a central political actor is still underexplored. This article aims to close this gap by engaging theories from Comparative Political Economy, asking: *How does labour power influence energy transitions?* Specifically, we introduce power resources theory to Kuzemko et al.'s (2016) "forces for continuity" of fossil-fuel regimes and "forces for sustainable change". We illustrate the resulting framework with the case of the German electricity transition. Our findings include a) the potential of organised labour to tip the scales in energy transition politics towards continuity or change, b) the relevance of unions' political access and their internal homogeneity of interests as power resources, c) the aspect of potential changes in unions' positions over time, and d) avenues for labour in green sectors to gain power resources by organising in small but homogeneous organisations, and/or by prevailing in the internal power struggles of larger but heterogeneous organisations.

Pedersen, M.B. and Nygaard, I., 2018, System building in the Kenyan electrification regime: The case of private solar mini-grid development, *Energy Research & Social Science*, 42, 211-223

Given the growing interest in the ability of the private sector to contribute to the goal of providing universal access to energy in developing countries, this study sets out to investigate the practices and business approaches of private actors in the emerging niche of private mini-grid development in Kenya. The paper's analytical focus is on how niche actors are influencing and creating change in the incumbent electrification regime of grid extension to strengthen and expand the niche for private mini-grids. The analysis shows that, in addition to internal niche processes like the alignment of expectations, learning and network building, niche actors actively engage in various forms of institutional work. The greatest emphasis here is on regulatory institutional work in order to influence legal and economic frameworks, but niche actors also engage in cognitive institutional work to enhance acceptance of the niche technology by constructing a shared world view between niche and regime actors. Interestingly, niche actors also engage in normative work to establish positive normative associations with the private-sector model, like equity and social justice. The research concludes that in this case institutional work is collective work drawing on different mandates and relying on different skills and resources.

Hoppmann J., Naegele F., Girod B., 2018, Boards as a source of inertia: Examining the internal challenges and dynamics of boards of directors in times of environmental discontinuities, *Academy of Management Journal*, in press

The literature on corporate governance indicates that, by engaging in strategy-related activities, boards of directors can help firms adapt to environmental discontinuities. So far, however, studies shed limited light on board-internal challenges and dynamics in such difficult times, thus providing few insights into the conditions under which boards may contribute to organizational inertia. We use a comparative case study of 10 major Swiss electric utility companies during the energy transition to show in detail how environmental and strategic change impair boards' ability to judge strategic issues, and how boards use self-evaluation and self-reconfiguration to renew this ability. Moreover, we offer original insights into the board-internal antecedents of board renewal, and show that environmental discontinuities pose a dilemma for boards, since self-evaluation and self-reconfiguration are critical for preventing organizational inertia yet may run counter to board members' self-

interest. By showing that board members, like managers, experience conflicts of interest that can harm firm performance, our study contributes to agency theory and an emerging micro-perspective on boards. Moreover, by highlighting boards as a source of organizational inertia, our study challenges existing findings in the field of strategic management and makes several more specific contributions to important debates in the corporate governance literature.

Frei, F., Sinsel, S., Hanafy, A., Hoppmann J., 2018, Leaders or laggards? The evolution of electric utilities' business portfolios during the energy transition, *Energy Policy*, in press.

Effectively mitigating climate change requires a fundamental and rapid transition in the way electricity is generated and used. The global electricity sector, however, is still dominated by large incumbent utility companies, which have historically been slow to embrace change. Given this seeming contradiction, in this paper we investigate whether and how 25 of the biggest electric utilities worldwide have adapted their business portfolios during the energy transition from 2003 to 2015. We observe three developments in utilities' business portfolios, namely an increase in (1) de-carbonization, (2) decentralization and servitization, and (3) system integration and balancing. Our results indicate that utilities have been more proactive in embracing de-carbonization as the core goal of the energy transition than the two successive challenges of decentralization and system integration. The lag in system integration is surprising, given that utilities traditionally possess considerable knowledge and assets that they could leverage to integrate decentralized low-carbon generation. We conclude that utilities can play a major role in integrating and balancing the components of a low-carbon electricity system, but that regulatory changes or additional policy incentives may be necessary to spur system integration as a critical part of the energy transition.

Urmetzer, S., Schlaile, M.P., Bogner, K.B., Mueller, M., and Pyka, A. 2017, Exploring the dedicated knowledge base of a transformation towards a sustainable bioeconomy, *Sustainability*, 10(6).

The transformation towards a knowledge-based bioeconomy has the potential to serve as a contribution to a more sustainable future. Yet, until now, bioeconomy policies have been only insufficiently linked to concepts of sustainability transformations. This article aims to create such link by combining insights from innovation systems (IS) research and transformative sustainability science. For a knowledge-based bioeconomy to successfully contribute to sustainability transformations, the IS' focus must be broadened beyond techno-economic knowledge. We propose to also include systems knowledge, normative knowledge, and transformative knowledge in research and policy frameworks for a sustainable knowledge-based bioeconomy (SKBBE). An exploration of the characteristics of this extended, "dedicated" knowledge will eventually aid policymakers in formulating more informed transformation strategies.

King, L.C. and Van den Bergh, J.C.M., 2018, Implications of net energy-return-on-investment for a low-carbon energy transition, *Nature Energy*, 1(3), 334-340

Low-carbon energy transitions aim to stay within a carbon budget that limits potential climate change to 2 °C—or well below—through a substantial growth in renewable energy sources alongside improved energy efficiency and carbon capture and storage. Current scenarios tend to overlook their low net energy returns compared to the existing fossil fuel infrastructure. Correcting from gross to net energy, we show that a low-carbon transition would probably lead to a 24–31% decline in net energy per capita by 2050, which implies a strong reversal of the recent rising trends of 0.5% per annum. Unless vast end-use efficiency savings can be achieved in the coming decades, current lifestyles might be impaired. To maintain the present net energy returns, solar and wind renewable power sources should grow two to three times faster than in other proposals. We suggest a new indicator, 'energy return on carbon', to assist in maximizing the net energy from the remaining carbon budget.

Martin, G., et al., 2018, How to address the sustainability transition of farming systems? A conceptual framework to organize research, *Sustainability*, 10(6), 2083

Stakeholders from academic, political, and social spheres encourage the development of more sustainable forms of agriculture. Given its scale and scope, the sustainability transition is a challenge to the entire agricultural sector. The main question is, how to support the transition process? In this article, we explore how agricultural science can address the sustainability transition of farming systems to understand and support transition processes. We discuss the potential for articulating three research approaches: comprehensive analysis, co-design, and simulation modeling. Comprehensive analysis of the sustainability transition provides perspectives on the interplay between resources, resource management, and related performances of farming systems on the one hand and technical, economic, and sociocultural dimensions of change on the other. Co-design of the sustainability transition stimulates local-scale transition experiments in the real world and identification of alternatives for change. Simulation modeling explores future-oriented scenarios of management at multiple levels and assesses their impacts. We illustrate the articulation of research approaches with two examples of research applied to agricultural water management and autonomy in crop-livestock systems. The resulting conceptual framework is the first one developed to organize research to understand and support the sustainability transition of farming systems

Van Vuuren, D.P., Stehfest, E., Gernaat, D.E.H.J., Van den Berg, M., Bijl, D.L., De Boer, H.S., Daioglou, V., Doelman, J.C., Edelenbosch, O.Y., Harmsen, M., Hof, A.F., and Van Sluisveld, M.A.E., Alternative pathways to the 1.5 °C target reduce the need for negative emission technologies, *Nature Climate Change*, in press,

Mitigation scenarios that achieve the ambitious targets included in the Paris Agreement typically rely on greenhouse gas emission reductions combined with net carbon dioxide removal (CDR) from the atmosphere, mostly accomplished through large-scale application of bioenergy with carbon capture and storage, and afforestation. However, CDR strategies face several difficulties such as reliance on underground CO₂ storage and competition for land with food production and biodiversity protection. The question arises whether alternative deep mitigation pathways exist. Here, using an integrated assessment model, we explore the impact of alternative pathways that include lifestyle change, additional reduction of non-CO₂ greenhouse gases and more rapid electrification of energy demand based on renewable energy. Although these alternatives also face specific difficulties, they are found to significantly reduce the need for CDR, but not fully eliminate it. The alternatives offer a means to diversify transition pathways to meet the Paris Agreement targets, while simultaneously benefiting other sustainability goals.

Van Sluisveld, M.A.E., Harmsen, M.J.H.M., Van Vuuren, D.P., Bosetti, V., Wilson, C., and Van der Zwaan, B., 2018 Comparing future patterns of energy system change in 2 °C scenarios to expert projections, *Global Environmental Change*, 50, 201-211

Integrated assessment models (IAMs) are computer-based instruments used to assess the implications of human activity on the human and earth system. They are simultaneously also used to explore possible response strategies to climate change. As IAMs operate simplified representations of real-world processes within their model structures, they have been frequently criticised to insufficiently represent the opportunities and challenges in future energy systems over time. To test whether projections by IAMs diverge in systematic ways from projections made by technology experts we elicited expert opinion on prospective change for two indicators and compared these with the outcomes of IAM studies. We specifically focused on five (energy) technology families (solar, wind, biomass, nuclear, and carbon capture and storage or CCS) and compared the considered implications of the presence or absence of climate policy on the growth and diffusion of these technologies over the short (2030) to medium (2050) term. IAMs and experts were found to be in relatively high agreement on system change in a business-as-usual scenario, albeit with significant differences in the estimated magnitude of technology deployment over time. Under stringent

climate policy assumptions, such as the internationally agreed upon objective to limit global mean temperature increase to no more than 2 °C, we found that the differences in estimated magnitudes became smaller for some technologies and larger for others. Compared to experts, IAM simulations projected a greater reliance on nuclear power and CCS to meet a 2 °C climate target. In contrast, experts projected a stronger growth in renewable energy technologies, particularly solar power. We close by discussing several factors that are considered influential to the alignment of the IAM and expert perspectives in this study.

Hooper, T., Austen, M.C., Beaumont, N., Heptonstall, P., Holland, R.A., Ketsopoulou, I., Taylor, G., Watson, J. and Winskel, M., 2018, Do energy scenarios pay sufficient attention to the environment? Lessons from the UK to support improved policy outcomes, *Energy Policy*, 115, 397-408

Scenario development is widely used to support the formation of energy policy, but many energy scenarios consider environmental interactions only in terms of climate change. We suggest that efforts to develop more holistic energy pathways, going beyond post hoc analysis of environmental and social implications, can usefully draw on environmental scenarios. A detailed content analysis of UK energy and environmental scenarios was therefore undertaken, with energy scenarios selected on the basis that they were recent, had a direct link to energy policy, and covered a range of scenario types. The energy scenarios rarely considered societal drivers beyond decarbonisation and focused on quantifiable parameters such as GDP, while the environmental scenarios provided a richer narrative on human behaviour and social change. As socio-economic issues remain fundamental to the success of energy policies, this is a key area which should be better addressed within energy scenarios. The environmental impacts of energy scenarios were rarely considered, but could have a significant bearing on the likelihood of pathway outcomes being realised. Fuller evaluation of the environmental interactions of energy systems is therefore required. Although the analysis focuses on the UK, some international scenarios show similar limitations, suggesting that the conclusions are more widely applicable.

Ulsrud, K., Rohracher, H., Winther, T., Muchunku, C. and Palit, D., 2018, Pathways to electricity for all: What makes village-scale solar power successful?, *Energy Research & Social Science*, 44, 32–40

This article presents new empirical research on what it takes to provide enduring access to affordable, reliable and useful electricity services for all. We analyze and synthesize the long-term experiences with three different systems for village-scale solar power supply in India, Senegal and Kenya. Since this scale of electricity provision forms part of village infrastructure, it requires particular types of knowledge, policies and support mechanisms. This research therefore investigates how village-scale solar systems can be designed, implemented, sustained and replicated in ways that make them accessible and useful for the community members. Drawing on a socio-technical and practice-oriented approach, we show that the electricity system's degree of adaptedness to its social context affects many important qualities of the system such as the relevance of the available electricity services for the people, the system's operational and economic sustainability and the potential for replication. Achieving such adaptation notably requires a flexible approach on the part of implementers, funders and local actors before, during and after implementation. We also show the need for institutionalization of decentralized electricity provision, discuss the current ambiguities in policies, regulations and funding mechanisms for village-scale solar power, and provide recommendations to policy makers and donors.

Köhrsen, J., 2018, Exogenous shocks, social skill, and power: Urban energy transitions as social fields, *Energy Policy*, 117-307-315

The constantly growing scholarship on urban energy transitions needs a framework to analyze these transitions. This article proposes the Field Perspective (FP) as an approach for the study of urban energy transitions. FP analyses how the interplay of actors, who are

dedicated to a similar purpose, and the structures guiding this interplay, co-evolve. By applying FP to the energy transition in the German city Emden, the article shows how the transition evolves through (a) alterations in the exogenous context of the city (e.g. national feed-in-tariffs for renewables), (b) the social skill and changing interplay of local actors engaged in the transition, and (c) the emergence of power-constellations and rules.

Fontes, M. and Sousa, C., 2018, The entry strategies of research-based firms in the transition to a sustainable energy system, *International Journal of Technoentrepreneurship*, 3(4), doi: 10.1504/IJTE.2017.091012

The paper discusses the entry strategies adopted by research-based firms introducing advanced renewable energy technologies (RET) in the electricity production sector and their interactions with regime incumbents. Drawing on the sustainability transitions and the strategic management of technology literatures we build an analytical framework and apply it, in an exploratory way, to firms operating in two very diverse energy niches – wind and wave energy – using in depth-case studies. The results suggest that new entrants tend to depend on complementary assets possessed by incumbents, but have conditions to protect their technologies from expropriation; and that the technologies are relevant for (at least some) incumbents, which show interest on them, or are directly involved in their development/use. This is, in most cases, conducive to 'cooperation' strategies, which assume different forms according to the stage of development of the technology and its proximity to incumbents' competences and assets.

Akizu, O., Bueno, G., Barcena, I., Kurt, E., Topaloğlu, N., and Lopez-Guede, J.M., 2018, Contributions of bottom-up energy transitions in Germany: A case study analysis, *Energies*, 11(4), 849

Within the context of an energy transition towards achieving a renewable low-impact energy consumption system, this study analyses how bottom-up initiatives can contribute to state driven top-down efforts to achieve the sustainability related goals of (1) reducing total primary energy consumption; (2) reducing residential electricity and heat consumption; and (3) increasing generated renewable energy and even attaining self-sufficiency. After identifying the three most cited German bottom-up energy transition cases, the initiatives have been qualitatively and quantitatively analysed. The case study methodology has been used and each initiative has been examined in order to assess and compare these with the German national panorama. The novel results of the analysis demonstrate the remarkable effects of communal living, cooperative investment and participatory processes on the creation of a new sustainable energy system. The study supports the claim that bottom-up initiatives could also contribute to energy sustainability goals together within the state driven plans. Furthermore, the research proves that the analysed bottom-up transitions are not only environmentally and socially beneficial but they can also be economically feasible, at least in a small scale, such as the current German national top-down energy policy panorama.

Dobre, C.C., Vinke-de-Kruijf, J., Moretto, L. and Ranzato, M., 2018, Stormwater management in transition: The influence of technical and governance attributes in the case of Brussels, Belgium, *Environmental Science & Policy*, 85, 1-10

Worldwide, conventional stormwater management policies and practices are under pressure due to the malfunctioning of existing urban drainage systems, population growth, urbanisation and climate change. In response to these developments, we have seen an increase in the development and uptake of alternative actions. These actions often involve physical infrastructure moving from the underground to the surface and an increase of stakeholder interactions and involvement. We draw upon the literature on transitions of socio-technical systems to understand these changes in stormwater management policies and practices in the case of a local municipality in Brussels, Belgium. Building upon previous research by Rijke et al. (2013), we assert that every transition stage (early, middle, late) can be linked to typical activities. We particularly aim to understand how a transition process is influenced by technical attributes of actions, i.e. whether they are soft, green or grey, and by

governance configurations, i.e. whether actions are more centralised or decentralised and more formal or informal. In doing so, we looked into the development, implementation as well as the diffusion of alternative actions. Our results show that in the early stage of transition, soft actions, such as manuals, legislation and economic incentives, prevail. In the diffusion of actions, decentralised processes and collaboration between formal institutions and informal networks play a key role. We further found that attention should be given to preventing the alienation of civil society during diffusion processes.

Petit-Boix, A., and Leipold, S., 2018, Circular economy in cities: Reviewing how environmental research aligns with local practices, *Journal of Cleaner Production*, 195, 1270-1281

Circular economy (CE) is gaining popularity at different levels with the promise of creating more sustainable processes. In this context, cities are implementing a number of initiatives that aim to turn them into sustainable circular systems. Whether these initiatives achieve their sustainability goals, however, is largely unknown. Nevertheless, as the application of CE strategies is actively encouraged by many policies across the globe, there is a need to quantify the environmental impacts and to identify the strategies that support urban sustainability. This paper analyses the extent to which research focuses on quantifying the environmental balance of CE initiatives promoted at the municipal level. To this end, the analysis scanned CE initiatives reported in cities around the globe and classified them into urban targets and CE strategies. In parallel, the paper conducted a review of the literature that uses industrial ecology tools to account for the environmental impacts of CE strategies. Results show a diverse geographical representation, as reported cities concentrated in Europe, whereas for environmental research, the main results came from China. In general, cities encourage strategies relating to urban infrastructure (47%), with an additional focus on social consumption aspects, such as repair and reuse actions. In comparison, research mainly addressed industrial and business practices (58%), but the approach to infrastructure was similar to that of cities, both with a special interest in waste management. Research has yet to assess social consumption and urban planning strategies, the latter essential for defining the impacts of other urban elements. Hence, there is a need to define the environmental impacts of the strategies that cities select in their quest for circularity. Research and practice can also benefit from working collaboratively so as to prioritize the CE strategies that best fit into the features of each urban area.

Fridahl, M. and Lehtveer, M., 2018, Bioenergy with carbon capture and storage (BECCS): Global potential, investment preferences, and deployment barriers, *Energy Research & Social Science*, 42, 155-165

Keeping global warming well below 2 °C entails radically transforming global energy production and use. However, one important mitigation option, the use of bioenergy with carbon capture and storage (BECCS), has so far received only limited attention as regards the sociopolitical preconditions for its deployment. Using questionnaire data from UN climate change conferences, this paper explores the influence of expertise, actor type, and origin on respondents' a) preferences for investing in BECCS, b) views of the role of BECCS as a mitigation technology, globally and domestically, and c) assessment of possible domestic barriers to BECCS deployment. Non-parametric statistical analysis reveals the low priority assigned to investments in BECCS, the anticipated high political and social constraints on deployment, and a gap between its low perceived domestic potential to contribute to mitigation and a slightly higher perceived global potential. The most important foreseen deployment constraints are sociopolitical, which in turn influence the economic feasibility of BECCS. However, these constraints (e.g. lack of policy incentives and social acceptance) are poorly captured in climate scenarios, a mismatch indicating a need for both complemented model scenarios and further research into sociopolitical preconditions for BECCS.

Rogge, K.S. and Dütschke, E., 2018, What makes them believe in the low-carbon energy transition? Exploring corporate perceptions of the credibility of climate policy mixes, *Environmental Science & Policy*, 87, 74-84

The credibility of climate policy has been identified as paramount factor for low-carbon investment and innovation and is thus key to achieving the decarbonization objectives set out in the Paris Agreement. Yet, despite its importance, we have only limited insights at present into how such policy credibility is formed. To address this gap, we explore whether and to what extent corporate perceptions of policy credibility depend on the current policy mix. We draw on the case of the German *Energiewende* and rely on data collected in 2014 in a survey of German manufacturers of renewable power generation technologies. We analyzed the answers of 390 companies using a linear regression model and found that corporate perceptions of policy credibility are mainly shaped by two characteristics of the policy mix: the coherence of policymaking and implementation, and the consistency of the policy mix. Changes in the design of the core demand-pull instrument (in Germany, the Renewable Energy Sources Act, EEG) and the nuclear phase-out policy are also important as are Germany's targets for the expansion of renewable energies. These insights enable us to derive broader policy and research implications concerning climate policy credibility.

Proka, A., Hisschermöller, M., and Loorbach, D., 2018, Transition without conflict? Renewable energy initiatives in the Dutch energy transition, *Sustainability*, 10(6), 1721

In the context of the slowly progressing energy transition, a number of renewable energy initiatives have been emerging in the Netherlands. These initiatives represent alternatives to the dominant functioning of the energy system, and as such, may come into conflict with it. Transitions involve system destabilisation and conflict between the incumbent regime and the initiatives originating in niches. In order to assess the transformative potential of such initiatives, this paper addresses the question: what kind of conflicts and tensions arise from renewable energy initiatives, and what strategies do they develop to overcome or avoid them? Combined with a business model perspective, transition thinking enabled a better understanding of how the initiatives organise themselves, and where the points of friction with their institutional context emerge. We suggest that the instances of conflict may function as an indication for the state of the energy transition and the transformative potential impact of such initiatives. The instances discussed in this contribution relate to existing support schemes, technology choices, and the overall organisational networks of the emerging sector.

Kammermann, L. and Dermont, C., 2018, How beliefs of the political elite and citizens on climate change influence support for Swiss energy transition policy, *Energy Research & Social Science*, in press

This paper analyzes factors that lead to opposition towards policies in Switzerland that promote a clean energy transition. During legislative processes, both the elite and general citizens can develop resistance towards such policies. The article considers those two perspectives and determines, on both levels, factors that explain opposition. We also specifically take into account whether climate change skepticism, i.e., questioning that climate change is real and human-induced, is a key factor that leads to opposition. Furthermore, we employ structural equation models to account for interactions between the elite and general citizens. The results show that political actors who reject the idea of man-made climate change also oppose the promotion of a clean energy transition, and more generally that elite actors influence how citizens think about the issue. At the citizen level, an increase in climate change skepticism has a negative impact on levels of support for clean energy policy. The link is mainly determined by party affiliation. We conclude that potential strategies for achieving a clean energy transition should focus on motivating citizens because they generally seem to be less polarized and partisan, and thus less opposed to new solutions, than the elite, who tend to be more constrained in their actions.

Wells, P. and Nieuwenhuis, P., 2018, Over the hill? Exploring the other side of the Rogers' innovation diffusion model from a consumer and business model perspective, *Journal of Cleaner Production*, 194, 444-451

The Rogers model of innovation diffusion, first proposed in 1962, has long featured in accounts of the penetration of new product technologies into society. The contention in this paper is that this model is in fact only half complete, for it deals exclusively with the uptake of new technologies rather than their retention or abandonment. Taking the Rogers model as a point of departure, this paper seeks to draw on the literature on nostalgia to characterize consumers who retain a specific technological artefact in the form of the car, then identify business models designed for those consumers. The paper therefore analyses the relatively neglected contribution of extended product lifetimes within circular economies and within the broader concept of socio-technical transitions for sustainability. The relevance of this contribution is that product longevity is one means by which lifestyles characterised by material affluence are reconciled with resource scarcity. Product longevity has the potential to contribute to slowing down the 'velocity' of material flows within the circular economy, and hence to the deferment of the investment of further energy (and materials) into the next cycle of consumption. Taking examples from the automotive industry and cars, the paper argues that the 'post-peak' (or post-production) retention of technologies may offer insights into both the viability and character of business opportunities, and a possible transition pathway into a post-consumer economy. The attraction of the post-production economy is in turn attributed to the concept of consumer nostalgia through which emotional engagement is translated into alternative forms of production and consumption.

Kuokkanen, A., Nurmi, A., Mikkilä, M., Kuisma, M., Kahiluoto, H. and Linnanen, L., 2018, Agency in regime destabilization through the selection environment: The Finnish food system's sustainability transition, *Research Policy*, 47(8), 1513-1522

The growing urgency of environmental threats combined with the slow pace of sustainability transitions has turned attention towards a better understanding of regime destabilization. Focusing excessively on niche innovations could be incumbent regimes' diversion and resistance strategy and could reinforce the 'business as usual' mindset instead of contributing to system-wide changes. Historical cases of system transition have most often been used to understand the dynamics of regime destabilization. However, these insights have limitations when the focus is on ongoing transitions. Moreover, it is argued that more attention should be paid to agency and actors. Herein, regime destabilization is understood through an internally structured selection environment, implying that agency is assumed not only in variation at the niche level but also in the selection processes: (1) the selection environment is shaped by active and strategic actors and actor networks; (2) the selection environment is shaped by diverse discursive framings; and (3) the selection environment is shaped by various actors beyond the regime and even beyond the system in question. The argument is empirically tested in the case of the Finnish food system by constructing prevailing storylines in the sustainability transition. Four contrasting but partially overlapping storylines and their associated actor networks are identified. The empirical case supports the view that actors across all levels aim to influence the selection environment's formulation with their framing of the problem and the strategic response. Thus, more attention must be paid to the content and diversity of different discursive framings in sustainability transitions.

MacArthur, J. and Matthewman, S., 2018, Populist resistance and alternative transitions: Indigenous ownership of energy infrastructure in Aotearoa New Zealand, *Energy Research & Social Science*, in press

The energy transitions necessary to address climate change mitigation and adaptation manifest unevenly, varying in nature, context, distribution of benefits and radical depth. While populist developments and economic protectionism are often viewed pejoratively, we argue that a critical reading reveals clear connections to progressive social struggles. Frustration with elite capture of political processes and economic assets manifests in a populist desire to redistribute political power via nationalist or localist economic policies.

Debates over the benefits of ownership by 'the people' and representation of marginalized actors are particularly acute in settler states. We examine Indigenous led energy transitions in Aotearoa New Zealand, via a critical reading of scholarship on populist resistance and protectionist responses to energy market liberalization, together with a distinctive Māori sustainability ethic as articulated by Māori scholars. Despite significant and ongoing challenges, we find that Māori principles and energy initiatives, particularly in geothermal heat, power and energy efficiency, hold unique and radical potential to lead the coming energy transition.