

The acceleration of transitions to urban sustainability: a case study of Brighton and Hove

Article (Accepted Version)

Durrant, Rachael, Barnes, Jacob, Kern, Florian and MacKerron, Gordon (2018) The acceleration of transitions to urban sustainability: a case study of Brighton and Hove. *European Planning Studies*, 26 (8). pp. 1537-1558. ISSN 0965-4313

This version is available from Sussex Research Online: <http://sro.sussex.ac.uk/id/eprint/77079/>

This document is made available in accordance with publisher policies and may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the URL above for details on accessing the published version.

Copyright and reuse:

Sussex Research Online is a digital repository of the research output of the University.

Copyright and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable, the material made available in SRO has been checked for eligibility before being made available.

Copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

The acceleration of transitions to urban sustainability: A case study of Brighton & Hove

Rachael Durrant¹, Jacob Barnes², Florian Kern*³ and Gordon Mackerron⁴
Science Policy Research Unit (SPRU), University of Sussex, UK
¹r.durrant@sussex.ac.uk, ²jake.barnes@sussex.ac.uk, ³f.kern@sussex.ac.uk, ⁴
gordon.mackerron@sussex.ac.uk

*** Corresponding author:**

Dr Florian Kern, Science Policy Research Unit (SPRU), School of Business, Management and Economics, Jubilee building, University of Sussex, Falmer, BN1 9SL, UK. f.kern@sussex.ac.uk.
Tel: +44 1273 872831.

Abstract

Cities raise major challenges and opportunities for achieving sustainability. Much literature on urban sustainability focuses on specific aspects such as planning practices, urban policy or the diffusion of more sustainable technologies or practices. However, attempts at understanding the mechanisms of structural change towards sustainability have resulted in the emergence of an interdisciplinary field of sustainability transitions research. Transitions research has developed a phase model of transitions in which predevelopment, take-off, acceleration and stabilization phases are distinguished. However, the acceleration phase has received limited attention so far. This is a crucial gap as policy makers are keen to accelerate transitions. This paper aims to enhance our understanding of how local actions contribute towards accelerating urban sustainability transitions. It does so by testing an acceleration mechanisms framework through exploring the collective agency of local initiatives in urban sustainability transitions. Drawing on a case study of the city of Brighton & Hove (UK), the paper finds that despite favourable local political conditions, there is a lack of evidence of acceleration apart from in individual domains such as food or mobility. Progress is found to depend on the agency of initiatives to both scale up sustainable practices and embed these practices into local governance arrangements.

Keywords: Sustainability transitions; acceleration; cities; collective agency

1. Introduction

In recent years, cities and their respective ‘regions’ have become important arenas for aspirations and action relating to sustainability (Castan Broto and Bulkeley 2013; Hodson and Marvin 2010; Hodson and Marvin 2012; van Wee et al. 2012). It is worth acknowledging that efforts to make cities more environmentally and socially sustainable are not entirely new as there is a long history of urban planning trying to address problems such as environmental degradation and urban sprawl (Joss, 2011). However, cities increasingly encompass the majority of humanity, and continue to be sites of high consumption and waste production and are responsible for significant quantities of global carbon emissions. To some, cities present the single most important cause of environmental unsustainability and the principal location for addressing it (Davis, 2010). Consequently, the role of cities as drivers of and spaces for bottom-up change has been investigated by scholars from a range of academic fields. Cities have also received increasing attention by policy makers and planners keen to promote environmental quality (Andersson, 2016; Joss 2011).

Vojnovic (2014, p. S36) has argued that “the central theme in the urban sustainability literature continues to be the search for, and understanding of, mechanisms for advancing sustainability” and has pointed out that while “there has been considerable global enthusiasm in implementing ‘sustainability policies’, the impact on environmental quality from the various initiatives is limited”. Much of the existing literature on urban sustainable development focuses on analysing specific aspects of achieving sustainability, such as (1) changing consumption patterns or lifestyles (e.g. see Moore (2015) who focuses on developing lifestyle archetypes coupled with ecological footprint analysis to develop urban consumption benchmarks), (2) urban planning practices (e.g. Malekpour, Brown and de Haan (2015) who look at how an incremental approach to infrastructure planning prevents progress), (3) introducing and implementing urban

sustainability policies (e.g. see Blanchet (2015) on how grassroots initiatives affect local energy policy-making) or (4) on diffusing green technologies at the urban scale (e.g. see van Wee, Maat and De Bont (2012) on urban policies to encourage the adoption of electric vehicles). Some research has also focussed on explaining the global diffusion of concepts and practices related to eco-cities and has found that the eco-city phenomenon is characterised by growing global proliferation of eco-city initiatives and policy mainstreaming, partly through increased international knowledge transfer activities (e.g. Joss 2011; Joss et al 2013).

While all of these aspects are important individually and while important insights about the nature of urban sustainability efforts have been gained by this literature, we argue that additional insights are required about how wholesale transformations of cities towards more sustainable configurations can occur and through which mechanisms this may happen. The key argument is that urban sustainability requires changes in all of these different aspects which are highly interconnected through so-called socio-technical regimes. In 2004, Geels introduced the notion of socio-technical regimes to capture the meta coordination between different aspects of socio-technical systems (the technological regime, the user and market regime, the policy regime, etc.) and to explain how, through close alignment of systems, socio-technical regimes fulfil societal functions, such as energy provision or mobility. In this understanding socio-technical regimes are “the ‘deep structure’ or grammar of ST-systems, and are carried by the social groups” (p. 905).

Transitions research subsequently builds on an understanding of what Childers et al (2014) have called multi-faceted inertias – institutional, infrastructural, social and others – that make existing ways of meeting societal needs such as mobility or nourishment very rigid, and develops frameworks to help understand under which conditions change to such existing societal systems is possible (e.g. see Grin, Rotmans and Schot 2010). Because of the importance of cities in achieving sustainable development, there has been a growing focus on urban sustainability transitions (e.g.

Hodson and Marvin, 2010; Coenen and Truffer 2012; Bulkeley, Castan Broto and Edwards, 2014, and Bulkeley et al., 2016).

We argue that the transitions perspective is promising and can lead to additional insights compared to the existing literature on urban sustainability policy and planning. For example, Joss (2011) distinguishes between three different types of eco-city developments: new developments (a city built from scratch), expansion of existing urban area (new district, new neighbourhood) or a 'retro-fit' development which he defines as "sustainable development innovation/adaptation within existing urban infrastructure" (p. 272). Since we are interested in transforming existing urban areas towards sustainability only the 'retrofit' type is potentially relevant. Nonetheless our interest goes beyond his definition since structural changes to existing infrastructures is a key feature of transition processes (for example the transformation of cities to become car-based cities, see Geels 2005). It is also interesting to note that according to Joss (2011, p. 278) most eco-cities emphasise technological innovation as the means of achieving eco-city development. Again, from a transitions angle our perspective is broader since technological innovation is seen as just one contributing factor to wider transition processes (alongside changes in culture, user practices, infrastructures, policy, regulation, market arrangements and industry structures).

However, existing research on (urban) sustainability transitions has mainly focused on the predevelopment phase of transitions. Less researched is how more sustainable alternatives accumulate and potentially result in an acceleration process in which new practices, ideas and cultures begin to replace mainstream, unsustainable ways of operating. This is curious since the phase model of transitions, and within it the idea of acceleration, has been a core concept from the start of this research field (e.g. Rotmans, Kemp and van asselt, 2001). This might partly be the case because, empirically, the development of sustainable alternatives in many places was in the early stages then. However, we argue that over the last 15 years much progress has been made with local

sustainability transitions (e.g. Blanchet, 2015; Späth and Rohracher, 2012; White and Stirling, 2013), which makes it crucial to further develop the conceptualisation of later stages of transition processes.

This paper contributes to the literature on urban sustainability transitions and urban planning by exploring the acceleration phase of transitions. We adopt a recently developed framework which proposes five potential acceleration mechanisms and we test this framework against a case study of developments in the city of Brighton and Hove. Instead of focusing on a single sector, or ‘domain’, as much of the existing urban sustainability literature does, we look across a range of functional domains relevant for sustainability (including food, mobility, waste, water and energy) within the city-region. The focus is on the agency of local sustainability-orientated initiatives to drive city-regional progress towards sustainability. We explore whether and in what ways the acceleration mechanism framework is useful in explaining progress towards sustainability within the city-region. The paper contributes to research on sustainability transitions and urban planning by testing the acceleration mechanism framework against an interesting empirical case and by contributing an urban scale analysis to the growing literature on agency in transition processes (Grin, Rotmans, and Schot, 2011; Pesch, 2015; Farla, Markard, Raven, and Coenen, 2012).

The remainder of the paper proceeds as follows: Section 2 first reviews the sustainability transitions literature and then derives the conceptual framework for the case study. Section 3 presents the methodology. Section 4 presents our case study analysis. Section 5 combines these results with expert opinion on sustainability progress within the case study region and reflects critically on the framework. Section 6 concludes.

2. Analysing acceleration in urban sustainability transitions

Over the last two decades a very productive, interdisciplinary research field has emerged (Markard, Raven and Truffer, 2012; Coenen and Truffer 2012) that seeks to understand how structural transformations towards more sustainable societal systems come about and whether they can be proactively governed. A transition is understood to have occurred when there have been fundamental changes to multiple components of the socio-technical systems which deliver societal functions. Such a transition involves changes to the structures of societal systems, as well as the culture and practices of actors (see Frantzeskaki and de Haan 2009). In this context, ‘practices’ refer to the behaviour of actors within the societal system. Practices are normally highly routinised and often follow unsustainable production and consumption trajectories. Novel, more sustainable practices (including using new technologies, developing different business or organisational models) are considered to play an important role in bringing about transitions. ‘Culture’ includes the values, norms and ethics of actors, which influence their patterns of behaviour. The formal institutions, rules and laws constitute the structures of the societal system and also shape the behaviour of actors.

To understand the mechanisms of sustainability transitions, scholars have often referred to different stylized phases (e.g. Geels, 2005; Geels, 2018; Frantzeskaki and de Haan, 2009; Rotmans and Loorbach, 2010). Four phases are typically distinguished: (1) a predevelopment phase, in which novel sustainable practices emerge, (2) a take-off phase where networks of actors coalesce around a new practice, whilst common expectations and visions emerge, (3) an acceleration phase where new practices accumulate momentum, and (4) a stabilization phase where new systems gradually replace old ones and a new dynamic equilibrium is reached (Figure 1).

[Figure 1 here]

According to Rotmans et al. (2001, 17-18) the acceleration phase is “the result of positive feedback mechanisms in the system that reinforce each other” and which results in structural

transformation through “collective learning processes, diffusion and embedding processes”. While a useful starting point, one limitation of this type of conceptualisation is a neglect of the role of agency. Only recently has agency for acceleration begun to receive attention, both conceptually and empirically (e.g. Brown, Farrelly and Loorbach, 2013).

Responding to this lacuna in terms of understanding the acceleration phase of transitions, the [EU-funded ARTS project](#) has recently proposed a novel conceptual framework for understanding acceleration dynamics (see Gorissen, Spira, Meynaerts, Valkering and Frantzeskaki, 2018; Ehnert et al. 2018a; Valkering et al 2017; Frantzeskaki, Borgström, Gorissen and Egermann, 2017). The framework builds on a range of different literatures, including sustainability transitions (Rotmans et al 2001; Van de Brugge and Van Raak 2007; Avelino and Rotmans 2011), as well as governance and transformative agency (Westley et al. 2013; Olsson, Glaaz and Boonstra, 2014; Cote and Nightingale 2012). It proposes five mechanisms (for a detailed account of the framework see Gorissen et al 2018; Frantzeskaki et al 2017):

Replication is the take up of new practices by an actor. Replication thereby diffuses novel practices through the transfer of knowledge and experience. The transition town movement has, for example, diffused rapidly within the western hemisphere by replicating its model of community-led initiatives through the use of handbooks, websites and events (Seyfang and Haxeltine, 2012).

Upscaling is the growth of new practices through for instance the growth of an organisation or initiative. Upscaling is evident in the development of solar collectors in Austria and wind turbines in Denmark, where early production and use by activists was rapidly scaled up by private industry (Ornetzeder and Rohracher, 2013).

Partnering is the pooling and/or complementing of resources and competences in order to exploit synergies and support novel practices. Such synergies can support actors' agency to realise sustainable practices and/or influence structural change (Frantzeskaki, Wittmayer and Loorbach, 2014).

Instrumentalising is the strategic utilisation of opportunities occurring in the multilevel governance context of the city-region. The utilization of national renewable support mechanisms by community groups and developers to deploy renewable technologies in the UK is a good example of this (Nolden, 2013).

Embedding is the alignment of new practices within city-regional governance patterns. Embedding thus captures agency to connect issues and solutions to local governance institutions. It institutionalises new rules supportive of sustainable practices, which in turn supports the further adoption of the practices.

These five mechanisms potentially help to shed light on actors' agency to accelerate transition processes because they clarify the types of actions needed to increase the pace of change. Within the ARTS project these mechanisms were conceived as working synergistically to produce acceleration. To further develop our understanding of acceleration processes and how actors can contribute to them, we build on Grin's (2010) understanding of agency in transition processes. To Grin (2010), agency is intimately linked to the notion of transitions as bringing about 'restructuring': "a re-oriented (towards sustainable development) co-evolution of mutually reinforcing novel practices (niche experiments) and structural changes (regime changes)" (265). This understanding is rooted in the duality of agency and structure. It also provides us with a means to refine our conceptualisation of acceleration. In essence, acceleration is an increase in the speed of change (see Figure 2). When applied to the idea of transition phases we understand acceleration

to be *the transition phase in which there is an increase in the pace of change (towards sustainability) resulting from mutually reinforcing, positive interactions between novel practices and structural changes over time.*

[Figure 2 here]

On the basis of this revised conceptualisation we posit that acceleration can be identified where structures change *and* sustainable practices are scaled up. This, in turn, singles out two of our mechanisms as potentially of being of more importance than the others: *upscaling* as the growth of new practices and *embedding*, as the alteration of existing structures. In the following we emphasise the role of strategic agency. This means focussing our analysis on actors' abilities to both increase the number of people involved in sustainable practices and to successfully stretch or transform institutional structures to favour novel, sustainable practices (Smith and Raven 2012).

We acknowledge that there is some overlap between individual mechanisms of the acceleration framework and similar conceptualisations and empirical findings of the environmental planning, sustainable urban development or multi-level/multi-scalar governance literatures.¹ For example, replication has been conceptualised as learning and sharing 'best practice' policies in the environmental planning literature and in discussions about policy transfer (e.g. see Bulkeley 2006). Partnering has similarities with existing debates on networking, collaboration and knowledge sharing as key aspects of sustainable urban development (e.g. see Frantzeskaki et al 2014). Instrumentalising in turn could be usefully analysed through multi-scalar governance and institutional contexts lenses (e.g. see Späth and Roharacher 2012).

¹ We are grateful to one of the reviewers for raising this observation with us.

However, we think the value of the acceleration framework described above is to bring together these different mechanisms, which are otherwise pursued in quite separate literatures, into one coherent framework. This allows insights, about potential interactions between the mechanisms and how they contribute to progress towards sustainability, to emerge. We also argue that the acceleration framework has additional value compared to these literatures because it is aimed at understanding broader transition processes, rather than for example changes in individual urban sustainability policies or policy transfer across locations which are interesting in their own right but often do not sufficiently explain why a transition is or is not progressing. Our ambition here is to test the utility of the framework by applying it to an empirical case study and relating the existence or absence of these mechanisms (and their interplay) to the progress made towards sustainability across a range of empirical domains.

3. Methodology

To explore agency during a potential acceleration phase of a transition, a case study design was used. Case studies are particularly suited to studying complex phenomena in depth since they provide a flexible boundary between the object of study (actors' agency in acceleration) and its context (the city-region). In choosing a case in which we are 'most likely' to observe city-regional acceleration we aim to make theoretical generalisations about the agency of actors following our proposed framework.

Within the case study we focus on the agency of a particular type of actor that we call 'transition initiatives'. In our understanding, transition initiatives are characterised by the collective action of multiple actors – including those operating within the public, private and third sectors – which are locally-based within the city-region and aim to drive transformative change towards

environmental sustainability (i.e. are ‘sustainability-oriented’). Our definition of transition initiatives, thus excluded single actors working on their own internal or external initiatives from our analysis (business greening activities and Council policies were excluded on this basis). Conceptually, we understand transition initiatives as being potentially shaped by other local initiatives as well as by city-regional governance patterns and their multi-level contexts (e.g. national, European, Global). We also view them as being able to exert their own agency to influence local governance processes and, to a much lesser extent, across wider contexts (e.g. national policy or regulation). Thus, we chose to focus attention on these initiatives as potentially important actors in sustainability transitions but recognise how other actors can also play an important role.

The city of Brighton and Hove was chosen as a suitable case study because it is a frontrunner in the UK context when it comes to political commitment to the environment and therefore a suitable ‘most likely’ case where some acceleration may be expected. Between 2011 and 2015 the city was home to the first Green-led local authority in the country and since 2010 has been home to the only Green MP. The city became the world’s first designated One Planet Living City in 2013, whilst the wider city-region became the world’s first designated UNESCO Biosphere Reserve to encompass a large urban area in 2014. The city has also won a variety of awards, including being named the CIVITAS European city of the year in 2014 for policies to promote sustainable transport. Furthermore, by choosing to study Brighton and Hove this paper contributes a case study of urban transition processes ‘outside the premium world cities’ (Hodson and Marvin, 2010), which have received most attention within the relevant literatures so far.

A variety of methods was used to gather information on city-regional progress towards sustainability with respect to the agency of particular sustainability-orientated transition initiatives. First, an inventory of active transition initiatives was developed using a mapping exercise. Mapping was achieved through five interviews with city-regional experts, desk-based exploration,

participation in local meetings and informal interviews with key informants. This allowed us to build an understanding of bottom-up activity in the city-region and of the diversity of initiatives. We identified 98 local transition initiatives in 2014. The majority of these initiatives were civil-society led, with only a handful of state or business-led initiatives². Where known, half of the initiatives had been set up since 2010, one third between 2000 and 2009, a little over a fifth during the 1990's and one dating from 1961. They also covered a fairly even spread of activity across functional domains (such as energy, water, transport, nature conservation, education) with many initiatives tackling multiple domains.

Second, an in-depth analysis of 11 local transition initiatives (see Table 1) was undertaken to explore their agency in progressing sustainability. Initiatives were chosen to maximise variation: the selection aimed to cover a range of domains and initiatives led by different types of actors (public, private or civil society). 23 semi-structured interviews were conducted across the 11 initiatives. A mixture of individuals from both 'inside' and 'outside' each initiative was sought to aid the triangulation of data. 10 additional expert interviews were also conducted and combined with evidence from document analysis to explore city-regional progress to sustainability. The expert interviewees were selected because their professional positions afford them an overview of relevant activities across domains. The interviews were then transcribed and coded using a standard set of theoretical and empirical codes, and codebooks created for each initiative were combined to reveal evidence for each of the mechanisms across the 11 initiatives.

[Table 1 here]

² A full list of initiatives can be found online on the ARTS [website](#).

In the next section we explore the agency of the 11 local transition initiatives and interpret their activities through the proposed acceleration mechanism framework.

4. Case Study Analysis

4.1 Replication

Our framework suggests actors may contribute towards acceleration through the replication of practices from one location to another. Within our detailed analysis of 11 transition initiatives we found some evidence to support this. For example, between 2009 and 2014 the Brighton and Hove Food Partnership (BHFP) supported 50 new local community food-growing projects to establish themselves by providing advice and resources. In this instance, Replication appears to have been followed as an active strategy and increased the number of food-growing projects in the city from 25 to 75 within five years. The BHFP has also helped expand community composting schemes within the city, resulting in the creation of 30 sites with over 1000 participants, again by providing a range of advice and resources. The Brighton Peace and Environment Centre (BPEC), on the other hand, has facilitated the local replication of ‘carbon conversations’, a programme of community-facilitated meetings in which participants explore strategies to reduce their carbon footprints. Originating in Oxford, the programme has a self-replicating logic through which community participants are encouraged to facilitate later meetings and thereby help further diffuse the programme.

As an actor strategy replication was also actively pursued as a means through which to establish several of initiatives, including the BHFP, BPEC, the Brighton Energy Coop (BEC), Hanover Action for Sustainable Living (HASL) and the Biosphere Partnership. Founders of BPEC, HASL and the Biosphere Partnership, sought to directly emulate existing initiatives from elsewhere in the UK and Europe. For BEC and the BHFP this took the form of advice on organisational

structure from established initiatives based outside the city. Both have gone on to mentor other initiatives outside the city-region.

Overall, we observe two forms of replication within the case study. Within the domain of food and education, sustainable practices have been replicated from one site to another *within* the city (via community gardening/composting and carbon conversations) and have thus resulted in an increase of those practices. Meanwhile, within the domains of energy, waste, nature conservation and the built environment, replication has involved the importing of ideas and practices from outside the city-region (a form of ‘green cosmopolitanisation’ according to Blok, 2012). This form of replication has been important for the creation of initiatives, to *establish* novel practices within the city-region rather than to *increase* the take-up of novel practices across the city-region.

4.2 Upscaling

Our second mechanism, upscaling, suggests that a growth in sustainable practices within an initiative (e.g. cycling or local food growing) may contribute to an increase in the pace of change. Evidence of initiatives increasing the number of participants within the city is mixed.

We observe some initiatives showing a consistent pattern of upscaling over time. For example, BEC emerged in 2010 as an idea pursued by three people with the help of six initial financial backers. By 2016 BEC had expanded through four consecutive share-offers to involve more than 400 people who had invested more than £1m in solar installations locally. The Sustainable Business Partnership (SBP) was established in 2009 and has since grown to more than 1,300 participants by 2016. Meanwhile, the BHFP has grown steadily in terms of members (now over 4,000). In these instances, upscaling was a conscious and deliberate actor tactic.

In some instances, we observe initial upscaling contributing to further upscaling. For example, the recruitment of early members to the Biosphere Partnership resulted in increased

legitimacy, which triggered a chain reaction of further members ‘buying-in’ to the initiative. In this example as well as others (BEC, BHFP) growth in the number of participants also led to greater local visibility and credibility, which in turn helped to bring in more participants. Hence, initial upscaling, it appears, can result in a positive feedback loop that supports further upscaling. For other initiatives, such as the Brighton Paper Round and HASL, it has been a challenge to simply maintain the number of participants.

Strategies for upscaling took different forms according to the initiatives’ approach and aims and included activities such as project development, developing partnerships (see below), marketing and awareness raising. However, upscaling was not a straightforward process for any of the initiatives; nor was it even desired by some. Instead we observe multiple challenges and barriers restricting initiatives’ ability to upscale. Commonly cited challenges included capacity issues, difficulties with delegation of control, internal power dynamics, unfavourable economic contexts, and difficulties in moving beyond the ‘usual suspects’. Above all, interviewees point to upscaling as being hard work. Upscaling of the initiative HASL, on the other hand, was eschewed for fear that it would lead to professionalisation, which, it was feared, would undermine the initiatives’ ‘volunteering spirit’. Finally, for one initiative (BPEC) involuntary downscaling also occurred when externally-obtained financial resources were removed.

Overall, we observe evidence of upscaling resulting from initiative activities within the domains of food, energy and mobility. However, despite being desired by most, upscaling was not achieved by all initiatives and in all domains.

4.3 Partnering

Our third mechanism, partnering, suggests initiatives may pool resources and competences in order to exploit synergies. Within the case study we found that individuals are often members of multiple initiatives and that a large number of local networks and ‘meet up’ groups have also resulted in

widespread connections between initiatives. Such connections exist more frequently within domains than between them and result in the creation of trust between initiatives.

Sharing office space has been an important strategy for BPEC, BHFP and SBP. In other instances, we observe initiatives partnering for project delivery, in order to pool expertise, skills and experience. For instance, BPEC has been working with HASL and others to deliver its carbon conversations programme and the BHFP often works with several local initiatives and other actors to deliver its projects. For example, in 2015 BHFP was working with BPEC as well as the Brighton Permaculture Trust, the South Downs National Park Authority and the Chamber of Commerce in a project that used storytelling to deliver education about sustainable food within schools in the city. In each of these instances the projects combined the strengths of different actors to deliver projects.

In a small number of other instances, we observe initiatives pooling resources in order to form a stronger network with which to lobby local governance actors. In one instance a short-term alliance between the Bike Hub and the local student union was formed in order to lobby local government for improved cycling infrastructure. This lobbying effort was successful in large part because of the breadth of actors mobilised in support. In a second instance, the BHFP convened a group of the city's largest catering contractors in order to develop a common understanding and then collectively lobby the local government for improved local food standards. Again, this effort was successful because all key stakeholders were brought together to speak with a common voice. Both instances made significant contributions to city-regional sustainability within the food and mobility domains (constituting 'embedding', see below) and both relied heavily on the joint effort of actors working in partnership to succeed. These instances also demonstrate how the pooling of resources and competencies can be important for successfully embedding sustainable practices.

Overall, we observe a variety of resource synergies supporting the realisation of sustainable practices in the domains of education, nature, mobility and food. As such we find, partnering that results in resources synergies may support the growth of sustainable practices (upscaling). We also find that partnering, undertaken in order to form networks with which to lobby local government are particularly important for actor strategies which seek to alter local structures (embedding). Such ‘governance synergies’ (Frantzeskaki et al 2014) were only observed in the domains of food and mobility. This suggests partnering can make important contributions to increasing the pace of change, where social synergies predominantly create a foundation for further partnerships, resource synergies predominantly help deliver projects, and governance synergies predominantly aid embedding.

4.4 Instrumentalising

Our fourth mechanism, instrumentalising, suggests initiatives may strategically utilise opportunities occurring in the multilevel governance context of the city region in order to support their aims and objectives. We find strong evidence of local initiatives strategically exploiting context developments in a variety of ways. Yet the form of instrumentalising varies, as does its results for increasing the pace of change towards sustainability.

The most common form of instrumentalising involved initiatives strategically exploiting particular policies or funding schemes originating beyond the local level in order to secure financial support for the development or extension of projects. This was observed across all domains but not within all initiatives. In most cases this can be understood as instrumentalising *in order to scale up or replicate* initiatives or projects. The majority of these instances make use of national policy and grant schemes. For example, BEC has relied on using national renewable energy deployment subsidies (Feed-in Tariffs) to create a viable solar PV business model and scale up their activities significantly. Only two initiatives (the SBP and BHFP) have been successful at drawing on

European level funding and only the BHFP – which is the largest initiative within the city-region and includes specialised staff resources such as project development and bid writing – has instrumentalised the full breadth of contexts. In all domains, initiatives’ primary strategy was bid writing, sometimes in partnership with others.

We also observe a variety of challenges associated with instrumentalising to obtain financial resources. Commonly cited issues included (1) financial dependency on grants or supportive policies with the potential for projects and practices to abruptly end as funding finishes or national policies are altered, and (2) the potential for ‘mission drift’, whereby initiatives seek funding for activities that are peripheral to their core aims simply to survive.

A related form of instrumentalising included more indirect ways of building on changing societal narratives and shifts in the policy landscape, also in order to secure funding for replication or upscaling of initiatives. For instance, BPEC capitalised on public interest in international development during the early part of the century to ‘sell’ their work to funders. Similarly, the BHFP utilised a national level agenda around protecting ‘vulnerable adults,’ which emerged in response to public sector funding cuts, as an opportunity to link food growing, cooking and other aspects of their existing community food work within new funding bids. The BHFP also used a national shift towards the commissioning of local services, first trialled within health during 2008, to secure new funding and expand its work.

Less used forms of instrumentalising included utilizing ad hoc events and arguing for new and progressive policies to be replicated in different contexts. Both forms of instrumentalising were used by initiatives in order to alter urban governance arrangements and can therefore be thought of as instrumentalising *in order to facilitate embedding*. In one instance, a fatal traffic accident opened up a ‘window of opportunity’ (cf. Elzen, Geels, Leeuwis and van Mierlo, 2011) for the Bike Hub to engage the City Council on the matter of improving cycling infrastructure, at a time when the

Council also recognised the need for change. Subsequent improvement works have helped to increase the number of people cycling along this route. In another instance, the BHFP strategically used a new Council policy in one area to argue for mandatory sustainability standards in another and succeeded in securing policy change.

Overall, we observe a variety of different ways initiatives seek to capitalise on changing governance context conditions. As a mechanism, we find instrumentalising plays a supportive role to upscaling, replicating and embedding. It also helps explain the agency of initiatives to achieve these mechanisms.

4.5 Embedding

Our final mechanism, embedding, suggests initiatives may increase the pace of change through the alignment of sustainable practices within city-regional governance patterns. In only a few instances do we observe initiatives successfully embedding sustainable practices into existing or new institutions (for example, but not limited to, the local Council and its operations) and only in a few domains (food, transport and waste).

First, the BHFP has over the preceding 10 years led the development of a city-wide sustainable food strategy (first launched in 2006 and then updated in 2012) and has successfully embedded sustainable food procurement standards within local government contracts through convening local stakeholders, collective lobbying, instrumentalising existing local policy frameworks and helping to draft new policy. Second, the Bike Hub has successfully embedded sustainable transport options within the local transport infrastructure, specifically new and improved cycling infrastructure, again through a combination of working with other local stakeholders, instrumentalising ad hoc events and active lobbying. Third, the BPR has persuaded the City Council to trial a food waste programme within local schools, which is likely to be turned into a new policy following its successful delivery. Of note is that the first two instances also

involve other mechanisms, specifically instrumentalising and partnering. More importantly, all three instances have resulted in or have the potential to result in the upscaling of sustainable practices within the city.

In the fourth and final instance of embedding, the CSP has been responsible for driving the development of the Council's One Planet Living (OPL) framework and its accreditation (achieved in 2013) and the Biosphere Partnership and its accreditation (achieved in 2014). Embedding in this instance takes a different form to the previous examples: it is less about integrating sustainable practices into existing or new governance institutions and is more concerned with establishing governance processes supportive of sustainability in general. The impact of these changes are harder to qualify as a result. For instance, the CSP was argued by the former chairperson to have "created an awareness and maybe even an expectation" around sustainability within local decision-making. Meanwhile, the OPL framework has on the one hand been criticised as "an aspirational plan", which has not been "translated into actual local policy or projects" (by a notable member of the local green business community). On the other hand it has been instrumentalised by the BHFP to embed sustainable food procurement standards within the Council. The establishment of new governance frameworks (i.e. the One Planet City status) and institutions (the Biosphere Partnership) should support progress towards sustainability but we argue, their impacts can only really be judged by the resulting policies they produce or the resulting impact on sustainable practices.

In summary, we only observe the embedding of sustainable practices into local governance arrangements within the domains of food (through BHFP), transport (through the Bike Hub) and possibly also resource management (through BPR). However, where it has occurred, it has resulted in a significant upscaling of sustainable practices locally.

5. Discussion

5.1 Assessing city -regional progress to sustainability

In the following we discuss city-regional acceleration in each domain by combining our detailed investigation of the 11-local transition initiatives outlined above with evidence from expert interviews and document analysis. In doing so we make an assessment of whether there has been an increase in the pace of change (acceleration) within each domain and why this might have occurred. Table 2 builds on the detailed investigation of 11 local initiatives (above) but summarises the evidence for each mechanism according to domain. In the following, we discuss, in turn, the evidence for acceleration in each domain. This leads us to substantiate interactions between the five mechanisms.

[Table 2 here]

The greatest progress has been made in the domain of food. In 2015, Brighton and Hove became the first city in the country to be awarded the Soil Association's silver award for sustainable food (Sustainable Food Cities, 2015). Interviews with city-regional experts argued the award and progress underpinning it had resulted from a long local tradition of activity and engagement with food within the city and from the activity of the BHFP. According to the former Head of Sustainability at the City Council, "[the BHFP is] about as good as it gets in terms of UK food policy action, it's a model of good practice, engagement and tackling social justice issues". Because of the award and expert interviewees, we conclude that acceleration is apparent in the domain of food. Progress is also supported by activity under all five mechanisms. We also observe a co-evolution of supportive local governance structures (i.e. local council food policy) and the spread of sustainable practices (i.e. production and consumption of sustainable food).

Evidence for progress in the domain of mobility is also strong. In 2014, Brighton and Hove was named CIVITAS city of the year for policies to promote sustainable transport (CIVITAS 2015). Annual bus usage has risen by 12.5% over the last five years whilst cycling has been steadily increasing by 10% per year over the last four years of recorded data (Brighton and Hove City Council 2015). Expert interviewees attributed this progress to a mix of factors, including: progressive Council policies (such as introducing 20 mph zones), external funding (obtained by a multi-stakeholder committee to undertake cycle infrastructure improvement works), the actions of an innovative local bus company and sustained engagement from the Bike Hub and other local initiatives, which received a proactive response from the Green Council. We conclude that acceleration is apparent within the domain of mobility. Evidence from our in-depth case studies suggests local transition initiatives contributed to this progress by scaling up practices, partnering, instrumentalising and embedding. We also observe a co-evolution between upscaling of sustainable practices and the embedding of supportive structures.

Progress within the domain of nature conservation is harder to gauge because, as the former Head of Sustainability at the Council argued, “it is not properly measured”. Despite this, our interviewees argued the formation of the Biosphere Partnership represented a significant development of local governance arrangements in favour of sustainable development. We conclude that the cumulative impact of these developments is yet to be concretely realised. From our analysis of local initiatives, we find evidence of all mechanisms apart from replication. In this instance, upscaling and instrumentalising both supported embedding. However, the form of embedding is qualitatively different from other domains, pertaining to sustainable development in general rather than specific sustainable practices. Although we view this form of embedding as conducive of progress towards sustainability, it cannot be linked to particular, sustainable practices and there upscaling.

Evidence of city-regional acceleration in the domain of energy is mixed. Expert interviewees argued that weak and changing national energy policies have undermined local progress. For instance, the introduction of feed-in tariffs for solar PV in April 2010 led to an enormous boom of PV installations across the UK (Smith et al 2014). It also enabled the setting up of the BEC, before subsequent policy changes challenged their business model and slowed down deployment. Internally, the City Council missed an opportunity to deploy solar PV on council-owned properties due to the Council's reluctance to invest into the scheme despite significant external support. Meanwhile our expert interviewees suggested a "risk averse" and "reluctant" Council has hindered the progress of local initiatives. One example of this includes the Council being unwilling to provide access to school roofs (for installing solar PV), for fear of being tied to long-term contracts with local initiatives, including BEC. Despite this, solar PV deployment has been relatively impressive across the city and the Council is still one of the largest installers (mainly on social housing). From this, we conclude that acceleration is not evidenced within the domain of energy. From our in-depth analysis we find evidence of three out of the five mechanisms (upscaling, partnering and instrumentalising).

Evidence of progress within the domains of resource management, education and the built environment is weaker. The city continues to generate more general household waste (non-recyclable) than compared to equivalent English cities (Brighton and Hove City Council, 2015). According to the Director of a local green business platform, the council has effectively 'locked in' poor resource management through a 25-year contract with a waste incinerator. Only small schemes, like community composting have been able to make some progress as a result. This outcome corresponds with limited evidence of our mechanisms, where we observe replication, partnering and some embedding. The results for education are less clear and require further investigation. Our experts reported numerous public engagement programmes, projects and initiatives but their outcomes are difficult to gauge. Overall, we find insufficient evidence to

conclude there has been acceleration. Initiative activities suggested evidence of replication, partnering and instrumentalising. From our analysis of initiative activity within the domain of the built environment we find evidence of only two mechanisms, partnering and instrumentalising,. The most notable initiatives working on the built environment include an eco-open house scheme and patchy attempts by HASL and the Council to support energy efficiency and retrofitting. No significant spreading of sustainable practices or embedding into local policies or planning rules has occurred.

There was very little evidence of progress in the domain of water. Our experts acknowledged the existence of pressing issues, such as a polluted aquifer and lack of a realistic coastal flood mitigation strategy in response to the likelihood of rising sea levels. They also noted that there is very little public awareness or concern about these issues and suggested this may explain the lack of targeted local action. This corresponded with no mechanisms being evidenced in the domain of water and very few initiatives tackling water-related issues in general.

Overall, these results show that despite apparently favourable local political conditions (with a green-led city council, a local Green MP and an active ‘alternative green scene’), city-regional acceleration towards sustainability has been highly uneven across domains. We find evidence from expert opinion and document analysis of significant progress towards sustainability within the domains of food and mobility only. This corresponds to evidence from our in-depth investigation of initiatives following our conceptual understanding of how initiatives may contribute to acceleration. From this, we conclude that the framework holds value for understanding the agency of local initiatives to accelerate progress to sustainability because it opens up a space in which to understand their actions and how they contribute to city-regional sustainability progress.

5.2 Interactions between mechanisms

Compared to the original framework, which presents the mechanisms as separate and distinct, our investigation of 11 initiatives suggested that in many instances activity ascribed to one mechanism was found to play a supporting role in activity attributed to another. For instance, initiative actions to replicate community composting schemes supported the upscaling of composting as a sustainable practice. Meanwhile instrumentalising governance dynamics supported the replication of projects and the scaling up of an initiative (and its sustainable practices) as well supporting initiative attempts to align sustainable practices within city-regional governance patterns (embedding). These interactions are visualised in Figure 3. In short, upscaling, understood as the growth of sustainable practices, was supported by the *replication* of initiative projects, through *partnering* with others to deliver projects, and through *instrumentalising* context developments in order to support the development and delivery of projects. In some instance the upscaling of practices was self-supporting, creating a feedback loop within the mechanism (dotted line in Figure 3). Where embedding took place, it was also supported through *instrumentalising* favourable context developments and *partnering* with others. In turn, we found the embedding of sustainable practices within the local governance context resulted in an upscaling of sustainable practices within the city and vice versa, upscaling of sustainable practices supporting initiative attempts to alter structures (embedding).

[Figure 3 here]

These interactions between mechanisms further support our conceptual understanding of acceleration, as an increase in the pace of change (towards sustainability) resulting from mutually reinforcing, positive interactions between novel, more sustainable practices (their realisation and upscaling) and structural change (that is, the embedding of these practices within governance structures) over time.

On this basis, we can provide a partial explanation of why acceleration has occurred in some domains and not others. In some domains, such as water and the built environment, there appear to be few initiatives exploring sustainable practices or undertaking activities that correspond to one of our proposed mechanisms. In other domains, such as energy and waste, we find initiatives undertaking activities that correspond to some mechanisms, but critically we find no evidence of initiatives being able to embed sustainable practices within local governance arrangements. So, whilst there appears to be some progress in scaling up sustainable practices, from a transitions perspective the pace of change remains gradual because both local and national governance processes and institutions remain unsupportive of the more sustainable practices. To frame this another way, we argue that the upscaling of practices in the domains of energy and waste is insufficient to amount to acceleration. Equally, altering structures through the embedding of sustainable practices into the local governance context, as in the domain of nature conservation, is insufficient to trigger acceleration on its own. Rather, our empirical evidence supports the claim that acceleration only occurs where structures change *and* sustainable practices are scaled up, as in the domains of food and mobility.

6. Conclusion

Given the importance of cities in addressing environmental sustainability from the bottom up, there is a burgeoning literature on urban sustainability policy and planning. As Vojnovic (2014) has pointed out one of the central aims of this literature is to search for and better understand mechanisms for advancing sustainability. He also argued that despite much global enthusiasm for sustainability policies, their impacts have been limited. Much of the existing literature on urban sustainability focuses on analysing specific aspects of achieving sustainability, such as new policies or the diffusion of new technologies. While such analyses are worthwhile, we argue that promising

insights are to be gained by adopting a broader analytical perspective drawing from the field of sustainability transitions, which has done much research to investigate the patterns and mechanisms through which transformations of socio-technical regimes come about. It also sheds light on why even with supportive policies being in place, transitions can be difficult to achieve. Primarily this is the case because policies are just one contributing factor to wider transition processes which also involve changes in culture, user practices, infrastructures, market arrangements and industry structures. We argue that turning to this literature can therefore help address both of Vojnovic's concerns.

One of the important insights derived from the transitions scholarship is that wider transformation processes tend to go through a number of phases. Given some progress on the ground in terms of achieving sustainability, but also a political desire to speed up transition processes, attention has recently turned to better conceptualising the acceleration phase of transitions. In this paper we have adopted a framework of five acceleration mechanisms proposed by Frantzeskaki et al 2017 and Gorissen et al 2018. We have refined it and tested it against a case study of the city of Brighton and Hove in the UK.

In terms of our conceptual contribution, we drew on additional insights about agency from Grin (2010) and thereby clarified the notion of acceleration as an increase in the pace of change brought about by mutually reinforcing, positive interactions between novel sustainable practices and structural changes in institutional contexts over time. The proposed mechanisms analytically capture how actors can potentially contribute to acceleration processes in a number of ways. We claim that this framework is an advance over current scholarship on urban sustainability, because it brings these different mechanisms (which have been studied in isolation in much of the existing urban sustainability literature) into one coherent framework and links them to a specific phase of a transition process (acceleration). By bringing together multiple but generally separate research

streams under one framework, we were able to outline interactions between the different mechanisms and to begin to qualify some as being more important to advancing sustainability than others. Our case study subsequently provided evidence of positive interactions between different mechanisms and showed that two of the mechanisms (upscaling and embedding) are of more importance to acceleration than the others, which play supporting and complementary roles.

Whilst this framework places emphasis on mechanisms for advancing sustainability, our approach also aimed to understand the actions of local actors in relation to each mechanism. Our case study subsequently took a socio-technical systems approach to understanding multiple system inertias and local actors engagement with them. In this sense the paper contributes to literature which explores the agency of local sustainability-orientated initiatives. The proposed acceleration mechanisms, in combination with the focus on local initiatives, have allowed us to identify both promising strategies, as well as limitations presented by the relevant governance contexts. Despite this the relative influence of local initiative agency versus geographical or domain-specific contextual limitations to acceleration is an important question that we cannot provide answers to in this paper. Moving forward there is ample scope for comparing the findings from this case with studies from other European city-regions to more systematically research the influence of different national and regional policy and institutional contexts and how they enable and constrain urban sustainability agency (e.g. see Ehnert et al 2018b).

The empirical contribution of the paper was to generate new knowledge about the progress with urban sustainability in a medium-sized city, outside of the frequently studied ‘premium world cities’ (Hodson and Marvin, 2010). The city of Brighton and Hove was selected as a ‘most likely’ case to observe some potential acceleration given its favourable local political conditions (with a green-led city council, a local Green MP and an active ‘alternative green scene’). Furthermore, by researching sustainability progress across a range of functional domains, we were able to take a

more holistic view of urban sustainability activities than previous research, which has tended to focus on single domains. As a result, we found that progress within different domains has been very uneven which raises interesting questions as to why that is the case. The proposed framework has been able to explain some of this variation through the proposed mechanisms. Progress is found to crucially depend on the collective agency of initiatives to both scale up sustainable practices and embed these practices into local governance arrangements, as was the case in the domains of food and mobility in the case study.

The analysis also points to some of the challenges local councils and stakeholders have to navigate to promote environmental sustainability. Such an analysis provides opportunities to reflect on the ways in which European, national, regional and urban policy and planning are both enabling as well as constraining the agency of local actors to promote sustainability. For example, the complexity of local planning processes and overlapping governance actors in our specific case makes a coherent approach to land management, transport planning and biodiversity protection hard to achieve. Our analysis points to how this complicated (and evolving) city-regional governance context makes embedding more sustainable practices very challenging. While national policies can provide much needed funding for local sustainability activities, such funding also may come ‘with strings attached’ and has risks and vagaries of its own. Overall, our analysis shows that even in a progressive city like Brighton and Hove with a supportive local political environment and an active ‘green scene’ of dedicated sustainability initiatives, accelerating transitions towards sustainability is hard work and remains difficult to achieve. Early signs of acceleration dynamics in food and mobility systems, however, also provide some insights into how acceleration of transitions towards sustainability can be achieved and the mechanisms through which this occurs. These insights can provide directions for future research in various ways and much is to be gained from comparisons across different cities as well as across domains within a given city.

References

- Andersson, I. (2016). Green cities' going greener? Local environmental policy-making and place branding in the 'Greenest City in Europe'. *European Planning Studies*, 24(6), 1197-1215.
- Avelino, F., & Rotmans, J. (2011). A dynamic conceptualization of power for sustainability research. *Journal of Cleaner Production*, 19(8), 796–804.
- Blanchet T (2015) Struggle over energy transition in Berlin: How do grassroots initiatives affect local energy policy-making? *Energy Policy* 78 246–254.
- Blok A (2012) Greening cosmopolitan urbanism? On the transnational mobility of low-carbon formats in Northern European and East Asian cities. *Environment and Planning A* 44(10) 2327-2343.
- Boyer RHW (2015) Grassroots innovation for urban sustainability: comparing the diffusion pathways of three ecovillage projects. *Environment and Planning A* 47(2) 320–337.
- Brighton and Hove City Council (2015) [Brighton and Hove City Council, Key Performance Indicators Report for 2014-2015](#).
- Brown RR, Farrelly MA and Loorbach DA (2013) Actors working the institutions in sustainability transitions: The case of Melbourne's stormwater management. *Global Environmental Change* 23(4) 701–718.
- Bulkeley, H., Coenen, L., Frantzeskaki, N., Hartmann, C., Kronsell, A., Mai, L., Marvin, S., McCormick, K., van Steenbergen, F. and Voytenko Palgan, Y. (2016). Urban living labs: governing urban sustainability transitions. *Current Opinion in Environmental Sustainability*, 22, 13–17.
- Bulkeley HA, Castan Broto V and Edwards GA (2014) An urban politics of climate change: experimentation and the governing of socio-technical transitions. Routledge. Abingdon, UK.
- Bulkeley, H. (2006). Urban sustainability: learning from best practice?. *Environment and planning A*, 38(6), 1029-1044.
- Castan Broto V, and Bulkeley HA (2013) A survey of urban climate change experiments in 100 cities. *Global Environmental Change* 23(1) 92–102.
- Childers, D. L., Pickett, S. T. a, Grove, J. M., Ogden, L., & Whitmer, A. (2014). Landscape and Urban Planning Advancing urban sustainability theory and action: Challenges and opportunities. *Landscape and Urban Planning*, 125, 320–328.
- CIVITAS (2015) [Urban mobility and social inclusion - Planning accessibility for more sustainable cities - Awards 2014](#).
- Coenen, L. and B. Truffer (2012). "Places and Spaces of Sustainability Transitions: Geographical Contributions to an Emerging Research and Policy Field." *European Planning Studies* 20(3): 367-374.

- Cote, M., & Nightingale, A. J. (2012). Resilience thinking meets social theory: Situating social change in socio-ecological systems (SES) research. *Progress in Human Geography*, 36(4), 475–489.
- Davis M (2010) Who will build the ark? *New Left Review* 61(1947), 29–46.
- Deuten J, Rip A and Jelsma J (1997) Societal embedding and product creation management. *Technology Analysis & Strategic Management* 9(2) 131–148.
- Dewald U and Truffer B (2011) Market Formation in Technological Innovation Systems—Diffusion of Photovoltaic Applications in Germany. *Industry & Innovation* 18(3) 285–300.
- Dewald, U., & Truffer, B. (2012). The local sources of market formation: explaining regional growth differentials in German photovoltaic markets. *European Planning Studies*, 20(3), 397-420.
- Durrant RA (2014) *Civil society roles in transition: towards sustainable food?* PhD Thesis, University of Sussex.
- Ehnert, F., Frantzeskaki, N., Barnes, J., Borgström, S., Gorissen, L., Kern, F., ... Egermann, M. (2018a). The Acceleration of Urban Sustainability Transitions: a Comparison of Brighton, Budapest, Dresden, Genk, and Stockholm. *Sustainability*, 10(3), 612.
- Ehnert, F., Kern, F., Borgström, S., Gorissen, L., Maschmeyer, S., & Egermann, M. (2018b). Urban sustainability transitions in a context of multi-level governance: A comparison of four European states. *Environmental Innovation and Societal Transitions*, 26, 101–116.
- Gorissen, L., Spira, F., Meynaerts, E., Valkering, P., & Frantzeskaki, N. (2018). Moving towards systemic change? Investigating acceleration dynamics of urban sustainability transitions in the Belgian City of Genk. *Journal of Cleaner Production*, 173, 171–185.
- Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to Sustainable Development. New Directions in the Study of Long Term Transformative Change*. New York, Milton Park: Routledge.
- Elzen B, Geels FW, Leeuwis C, & van Mierlo B (2011). Normative contestation in transitions ‘in the making’: Animal welfare concerns and system innovation in pig husbandry. *Research Policy*, 40(2), 263-275.
- Evans J, Karvonen A and Raven R (Eds.) (2016) *The Experimental City*. Routledge. Abingdon, UK.
- Farla J, Markard J, Raven R, and Coenen L (2012) Sustainability transitions in the making: A closer look at actors, strategies and resources. *Technological forecasting and social change* 79(6) 991-998.
- Frantzeskaki N, & de Haan H (2009) Transitions: Two steps from theory to policy. *Futures* 41(9) 593–606.
- Frantzeskaki N, Wittmayer J, and Loorbach D (2014) The role of partnerships in “realising” urban sustainability in Rotterdam’s City Ports Area, The Netherlands. *Journal of Cleaner Production* 65 406–417.

- Frantzeskaki, N., Borgström, S., Gorissen, L., & Egermann, M. (2017). Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice. In *Nature-based solutions to Climate Change Adaptation in Urban Areas* (p. 337).
- Geels FW (2005) *Technological Transitions and System Innovations*. Edward Elgar, Cheltenham, UK.
- Geels, F. W. (2018). Disruption and low-carbon system transformation: Progress and new challenges in socio-technical transitions research and the Multi-Level Perspective. *Energy Research and Social Science*, 37, 224–231.
- Grin J (2010) ‘The governance of transitions, an agency perspective. In: Grin J, Rotmans J and Schot J (eds) *Transitions to sustainable development*. Abingdon: Routledge, pp.223-319.
- Grin J, Rotmans J, and Schot J (2011) On patterns and agency in transition dynamics: Some key insights from the KSI programme. *Environmental Innovation and Societal Transitions* 1(1) 76-81.
- Hamilton J, Mayne R, Parag Y, and Bergman N (2015) Scaling up local carbon action: the role of partnerships, networks and policy. *Carbon Management* 37–41.
- Hodson M and Marvin S (2010) Can cities shape socio-technical transitions and how would we know if they were? *Research Policy* 39(4) 477–485.
- Hodson, M. and S. Marvin (2012). "Mediating Low-Carbon Urban Transitions? Forms of Organization, Knowledge and Action." *European Planning Studies* 20(3): 421-439.
- Hughes TP (1987) The evolution of large technological systems. In: Bijker W, Hughes T and Pinch T (eds) *The Social Construction of Technological Systems*. Cambridge: The MIT Press, pp.51-82.
- Joss, S. (2011). "Eco-cities: The mainstreaming of urban sustainability—key characteristics and driving factors." *International Journal of Sustainable Development and Planning* 6(3): 268-285.
- Joss, S., R. Cowley and D. Tomozeiu (2013). "Towards the ‘ubiquitous eco-city’: An analysis of the internationalisation of eco-city policy and practice." *Urban Research & Practice* 6(1): 54-74.
- Latour B (1996) *Aramis or the Love of Technology*. Cambridge: Harvard University Press.
- Malekpour, S., Brown, R. R., & de Haan, F. J. (2015). Strategic planning of urban infrastructure for environmental sustainability: Understanding the past to intervene for the future. *Cities*, 46, 67–75.
- Markard J, Raven R and Truffer B (2012) Sustainability transitions: An emerging field of research and its prospects. *Research Policy* 41(6) 955-967.
- Meadowcroft J (2009) What about the politics? Sustainable development, transition management and long term energy transitions *Policy Sciences* 42(4) 323–340.
- Moore, J. (2015). Ecological footprints and lifestyle archetypes: Exploring dimensions of consumption and the transformation needed to achieve urban sustainability. *Sustainability*, 7(4), 4747–4763.

- Nevens F, Frantzeskaki N, Gorissen L and Loorbach D (2013) Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production* 50 111-122.
- Nolden C (2013) Governing community energy—Feed-in tariffs and the development of community wind energy schemes in the United Kingdom and Germany. *Energy Policy* 63 543–552.
- Olsson, P., V. Galaz, and W. J. Boonstra. 2014. Sustainability transformations: a resilience perspective. *Ecology and Society* 19(4): 1.
- Ornetzeder M and Rohrer H (2013) Of solar collectors, wind power, and car sharing: Comparing and understanding successful cases of grassroots innovations. *Global Environmental Change* 23(5) 856–867.
- Pesch U (2015) Tracing discursive space: Agency and change in sustainability transitions. *Technological Forecasting and Social Change* 90 379-388.
- Rolfs P, Ockwell D and Byrne R (2015). Beyond technology and finance: pay-as-you-go sustainable energy access and theories of social change. *Environment and Planning A*, 47(12), 2609-2627.
- Rotmans J and Loorbach D (2010) Conceptual framework for studying transitions. In: Grin J, Rotmans J and Schot J (eds) *Transitions to sustainable development*. Abingdon: Routledge, pp.105-222.
- Rotmans J, Kemp R and van asselt M (2001) More evolution than revolution: transition management in public policy. *Foresight* 3(September) 1–5.
- Schot J and Geels FW (2008) Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management* 20(5) 537–554.
- Seyfang G and Haxeltine A (2012) Growing grassroots innovations: Exploring the role of community-based initiatives in governing sustainable energy transitions. *Environment and Planning C: Government and Policy* 30(3) 381–400.
- Seyfang G and Longhurst N (2013) Desperately seeking niches: Grassroots innovations and niche development in the community currency field. *Global Environmental Change* 23(5) 881–891.
- Shove E and Walker G (2007) CAUTION! Transitions ahead: Politics, practice, and sustainable transition management. *Environment and Planning A* 39(4) 763–770.
- Smith A and Raven R (2012) What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy* 41(6) 1025–1036.
- Smith A, Hargreaves T, Hielscher S, Martiskainen M and Seyfang G (2016) Making the most of community energies: Three perspectives on grassroots innovation. *Environment and Planning A*, 48(2) 407–432.
- Smith A, Kern F, Raven R and Verhees, B (2014) Spaces for sustainable innovation: Solar photovoltaic electricity in the UK. *Technological Forecasting and Social Change* 81, 115–130.
- Späth P and Rohrer H (2012) Local Demonstrations for Global Transitions—Dynamics across Governance Levels Fostering Socio-Technical Regime Change Towards Sustainability. *European Planning Studies* 20(3) 461–479.

- Sustainable Food Cities (2015) Current Sustainable Food Cities Award Winners.
<http://sustainablefoodcities.org/awards/awardwinners>.
- Truffer B (2003) User-led Innovation Processes: The Development of Professional Car Sharing by Environmentally Concerned Citizens. *Innovation: The European Journal of Social Science Research* 16(2) 139–154.
- Valkering, P., Yücel, G., Gebetsroither-Geringer, E., Markvica, K., Meynaerts, E., & Frantzeskaki, N. (2017). Accelerating Transition Dynamics in City Regions: A Qualitative Modeling Perspective. *Sustainability*, 9(7), 1254.
- van der Brugge, R., & van Raak, R. (2007). Facing the adaptive management challenge: Insights from transition management. *Ecology and Society*, 12(2).
- Van der Brugge R and Rotmans J (2007) Towards transition management of European water resources. *Water Resources Management* 21(1) 249–267.
- van Wee, B., Maat, K. De Bont, C. (2012). "Improving Sustainability in Urban Areas: Discussing the Potential for Transforming Conventional Car-based Travel into Electric Mobility." *European Planning Studies* 20(1): 95-110.
- von Oelreich, J. and R. Milestad (2017). "Sustainability transformations in the balance: exploring Swedish initiatives challenging the corporate food regime." *European Planning Studies* 25(7): 1129-1146.
- Vojnovic, I., 2014. Urban sustainability: Research, politics, policy and practice. *Cities*, 41, pp.S30-S44.
- Wamsler C, Luederitz C, Brink E (2014) Local levers for change: Mainstreaming ecosystem-based adaptation into municipal planning to foster sustainability transitions, *Global Environmental Change* 29, 189-201.
- Westley, F. R., O. Tjornbo, L. Schultz, P. Olsson, C. Folke, B. Crona and Ö. Bodin. 2013. A theory of transformative agency in linked social-ecological systems. *Ecology and Society* 18(3): 27.
- White R and Stirling A (2013) Sustaining trajectories towards Sustainability: Dynamics and diversity in UK communal growing activities. *Global Environmental Change* 23(5) 838–846.
- Yin KR (2009) *Case Study Research, Design and Methods* London: SAGE Publications.