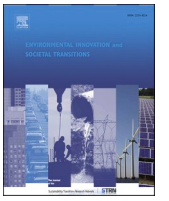
Environmental Innovation and Societal Transitions 46 (2023) 100690

Contents lists available at ScienceDirect

Environmental Innovation and Societal Transitions

journal homepage: www.elsevier.com/locate/eist



Historical industrial transitions influence local sustainability planning, capability, and performance

Yuhao Ba [a,*], Christopher S. Galik [b]

[a] Lee Kuan Yew School of Public Policy, National University of Singapore, 21 Lower Kent Ridge Rd, 259772, Singapore
[b] Department of Public Administration, North Carolina State University, Raleigh, NC 27695, USA

ARTICLE INFO

Keywords:
Sustainability transitions
Subnational governance
Manufacturing
County government
Historical institutionalism

ABSTRACT

We evaluate the influence of long-term industrial transitions on local sustainability action. We construct two aspects of historical industrial transitions—direction and magnitude—along with three aspects of local government sustainability action: planning, capabilities, and performance. Using a national survey of local sustainability practice and nearly five decades of historical manufacturing employment data in the U.S., we find local communities with more substantial swings in manufacturing jobs to be less likely to engage in sustainability planning, cultivate sustainability-related capabilities, and make progress towards meeting sustainability-related objectives, underscoring the potential challenges associated with top-down programs and the importance of decentralized solutions.

1. Introduction

In an effort to forestall catastrophic warming, COP26 emphasized near-term emissions reductions in addition to longer-term net-zero trajectories (Kyte, 2021). Top-down, nationally-driven solutions remain challenging, however, given pervasive domestic partisan gridlock, constrained finances, and lack of technological expertise (Hsueh, 2020). At the same time, non-state and subnational actors across the globe (e.g. businesses, nonprofits, and local and regional communities and governments) have emerged as possible alterative and complementary venues for climate action (Hale et al., 2021). Following the withdrawal of the U.S. from the Paris Agreement during the Trump Administration, for instance, business- and nonprofit-led initiatives such as *We Are Still In* and *America's Pledge* sought to uphold U.S. commitments through mobilization of sub-national and private sector actors (Ba, 2022a; Hsu et al., 2019).

Local government actions are of particular importance to meeting global climate targets. Globally, cities are a substantial contributor to climate change, and likewise represent a critical solution set to the climate crisis (Colau, 2021; Kennedy et al., 2009; Sethi et al., 2020). In their survey of mitigation efforts undertaken by cities, Sethi et al., (2020) specifically find "rich evidence of techno-policy choices that together enlarge the urban solutions space and augment actions currently considered in global assessments of climate mitigation". For their part, Wei et al., (2021) observe emissions reductions in sampled U.S. cities, but note that the magnitude of reductions are influenced by broader transitions from coal to natural gas power and the offshoring of polluting industry, reinforcing the need for further empirical work to understand the true contributions of local climate efforts (Hsu et al., 2019).

Questions however remain as to the motivations for local environmental action in the first place. While climate mitigation has taken precedence in global and national policy dialogues in recent years, it is but one of several environmental, social, and economic

* Corresponding author.
E-mail address: yba@nus.edu.sg (Y. Ba).

https://doi.org/10.1016/j.eist.2022.100690
Received 2 June 2022; Received in revised form 12 December 2022; Accepted 26 December 2022
Available online 3 January 2023

challenges that can collectively be categorized under the umbrella of sustainability. In this respect, much can be learned from the expansive literature on sustainability transitions on how and why a given community might choose to embark on environmental and sustainability efforts. Scholars of sustainability transitions have, for example, studied factors such as political context, economic conditions, management strategies, institutional characteristics, and demographic attributes (e.g., Deslatte and Stokan, 2020; Kousky and Schneider, 2003; Yi et al., 2017; Narassimhan and Johnson, 2018) as well as performance assessment and evaluation (e.g., Hsu et al., 2020; Roelfsema et al., 2018), among others. Though such research has been informative as to the factors associated with sustainability action at the local level, an important dimension often neglected is the influence of otherwise-unobservable historical or long-term transitions (see Lockwood et al., 2016; Kuzemko et al., 2016). In practice, sustainability action can be hampered or eased by dominant institutions (Galik and Chelbi, 2021). For instance, connections may in fact exist between long-term manufacturing volatility and local contemporary sustainability commitments (Ba and Galik, 2022), reinforcing the links between labor availability, cultural identity, and sustainability programming in a given place (e.g., Penrod, 2021).

Here, we seek to evaluate the influence of long-term transitions in the realm of subnational sustainability action. Specifically, we examine the relationship between present-day local sustainability practices and performance and historical industrial transitions, defined here as the change in the percentage of manufacturing jobs in a given locality over time. In doing so, we construct two key aspects of historical industrial transitions—direction and magnitude—along with three important aspects depicting local governments' sustainability action: planning, capabilities (both general-purpose and specialized), and performance. While these aspects may not fully characterize the complexity of historical industrial transitions and local governments' sustainability action, they nevertheless capture the essence of sustainability transitions and have been widely used in pertinent studies (see Hess, 2014; Deslatte and Stokan, 2020; Kern and Rogge, 2016).

In particular, we ask two questions: (1) if and to what extent do historical industrial transitions relate to local governments' sustainability planning, capabilities, and performance; and (2) after accounting for potential influence of historical industrial transitions, if and to what extent do efforts devoted to planning and capacity building relate to local governments' present-day sustainability performance. We address these questions using a recursive path model with bootstrapped standard errors as well as data from numerous sources including historical regional economic accounts data (1969-2016) and a national survey of local sustainability practice in the U.S. This is, to our knowledge, the first empirical analysis of the connections between historical industrial transitions and local governments' present-day sustainability practices and performance. Our study advances debates on paces of sustainability transitions and overall success (see Kern and Rogge, 2016) and provides implications for scholars, practitioners, and policymakers working on developing and facilitating subnational sustainability solutions.

2. A local government perspective on sustainability transitions

Sustainability as a concept has myriad and contextually dependent interpretations. A commonly referenced conceptualization of 'sustainability' employs three fundamental 'pillars'–environmental quality, economic prosperity, and social equity (Purvis et al., 2019). A finer-grained understanding of sustainability connects to the ideas of sustainable development, which is broadly defined as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs' (UN, 1987). In practice, sustainability challenges tend to be multi-domain (e.g., energy and technology) and extend across sectoral, geographical, and political boundaries (Köhler et al., 2019). The expansive scope and depth of these challenges implies that transitioning towards sustainability entails a long-term, society-wide fundamental transformation of existing modes of production and consumption (Markard et al., 2012).

Research on sustainability transitions seeks to conceptualize, explain, evaluate, and facilitate changes towards a more sustainable economy and society (Köhler et al., 2019). The focal unit of analysis has been situated at the 'meso'-level, delineating socio-technical system reconfigurations that deviate from established structures and practices (Magnusson & Werner, 2022). A major line of inquiry centers on interventions and transitions governance (see e.g., Bolton and Hannon, 2016; Nieminen et al., 2021; Voß and Bornemann, 2011), proposing an instrumental, practice-oriented approach to influencing transition pathways. In particular, this line of research (i.e., governing transitions) is premised on the idea that existing societal functions are complex, adaptive systems that interact with and can be influenced by institutions (Fuenfschilling and Truffer, 2016; Markard et al., 2012). An important characteristic of research on governing transitions is that it highlights the multi-level, multi-actor nature of sustainability transitions as well as its political and normative underpinnings and ambitions (Köhler et al., 2019).

The multi-level, multi-actor emphasis of research on governing transitions echoes the well-recognized inadequacy of top-down, nationally-driven solutions to advancing sustainability transitions as well as the groundswell of subnational and non-state sustainability efforts (see Bohnsack et al., 2016; Broto and Bulkeley, 2013; Hale et al., 2021; Törnberg, 2018). At the international level, current debate focuses on designing mechanisms for localizing the diverse range of Sustainable Development Goals (SDGs) under the United Nations (ElMassah & Mohieldin, 2020). In developed economies such as the United States and Europe, research has moved beyond practice adoption and shifted towards a more nuanced understanding of the process of sustainability transitions governance as well as its interplay with broader socio-political contexts (Ehnert et al., 2018; Hawkins et al., 2021; Hess, 2018). One notable line of research studies how local governments influence and facilitate sustainability transitions. Examples range from local governments' opportunities and challenges in navigating power dynamics within multi-level transitions governance systems (see Ehnert et al., 2018), to their role in developing niche innovations and regional innovation systems (see Köhler et al., 2019), and to their experimentation with catalyzing sustainability pathways (Tozer et al., 2022).

Studying local governments' sustainability practice and performance connects to the research on the geography of sustainability transitions, which seeks to understand the distributional variation of transition processes across space (Bridge et al., 2013). In

particular, a geographical perspective on sustainability transitions emphasizes two aspects: place specificity and inter-organisational relations. Place specificity highlights the role of contextual variations in explaining the geographical heterogeneity of transitions progress whereas inter-organisational relations focus on the possible synergistic and/or counteractive effect of cross-scale interactions on sustainability transitions (Hansen & Coenen, 2015). An important implication of a geographical perspective on sustainability transitions is that historical/pre-existing technological and industrial specialization can help explain the formation of a locality's strategic niches and new industries, and by extension, its transitions (see Ferloni, 2022; Hansen & Coenen, 2015; Losacker & Liefner, 2020). Such insight connects to the concept of locational advantages (e.g., knowledge spillovers and specialized labor markets) emphasized in the framework of technological innovation systems (TIS; Ulmanen & Bergek, 2021). A more balanced perspective on local pre-existing industrial specialisation attends to its full range of possible effects on sustainability transitions (i.e., positive effect driven by positive externalities; no effect, and negative effect due to potential lock-ins) and underlines the role of local actors and institutions (Ferloni, 2022). Local governments, due to their policy capacity in important issue areas such as land use planning, community and social facilities and services, and economic development, constitute a key group of local actors in sustainability transitions (Bush, 2020).

When focusing on local governments, synergies between transitions studies and public management research are of potential to generate a more systematic understanding of local governments' role in sustainability transitions. For instance, understanding local governments' sustainability reporting and planning is conducive to documenting and assessing local-level transitions progress (see Hossain, 2018; Liao et al., 2020). Likewise, a closer look into local governments' strategies and collaboration on pursuing sustainability aids in explaining their political priorities and the politics of transitions more broadly (Ji and Darnall, 2018; Pinz et al., 2018). Moving forward, as transitions scale up and accelerate, continued efforts are needed to further inform transitions studies with insights from diverse perspectives (Köhler et al., 2019). Building on existing research at the intersection of transition scholarship and public management research, for example, local governments' sustainability performance (transition outcomes) merits further attention given that existing efforts are predominately focused on practices and processes. Along this line, mechanisms that secure and sustain competitive advantages offered by sustainability transitions are worth investigating to further the momentum of local governments advancing sustainability transitions (Deslatte and Stokan, 2020).

A particular strength of transitions research is its emphasis on long-term stability and change as well as the varied possible transition trajectories (Köhler et al., 2019). Situating local governments' sustainability practice and performance in long-term societal shifts is thus of theoretical and empirical value to further our understanding of local governments' role in sustainability transitions. Within transitions research, scholars have proposed historical institutionalism as a complementary approach to socio-technical systems analysis to understanding the effects of long-term institutional change on transition trajectories and outcomes (see Lockwood et al., 2016). Historical Institutionalism theorizes institutional evolution and action within institutional constraints (Thelen, 1999). An emphasis of Historical Institutionalism is path dependency, the potential influence of prior "institutional, economic, political, social, and cultural" features (Greif, 1998, P.82) on current and future preferences and action. In this analysis, Historical Institutionalism, together with transitions studies and public management research, will provide promising avenues for studying local governments' sustainability practice and performance against the background of long-term macro shifts such as industrial transitions.

3. Historical industrial transitions and contemporary sustainability practice and progress

In this section, we elaborate several theoretical mechanisms through which historical industrial transitions may influence local governments' sustainability planning, capabilities, and performance. We derive our hypotheses broadly from sustainability transitions scholarship, historical institutionalism, and public management research.

Industrial transitions, along with socio-technical systems innovations, contribute to sustainability transitions (Schot & Kanger, 2018). In developed economies, industrial transitions have largely followed a path of shifting away from manufacturing-oriented industrial functions towards service- and technology-based ones (Buera & Kaboski, 2012). In developing economies, a double challenge remains as to promoting lower-carbon, cleaner industrial functions while simultaneously supporting rapid industrial development, leading policy makers to focus on opportunities to advance niche cleantech industries (Yap & Truffer, 2019). In either developed or developing context, shifts in industrial functions can play an important role in sustainability transitions, spanning economic, environmental, and social dimensions. Economically, industrial development drives economic growth and shapes the structural transformation of an economy. From an environmental perspective, internalizing environmental externalities has been one of the goals of industrial transitions (i.e., industrial decarbonization). Lastly, industrial transitions influence the social aspect of sustainability transitions by promoting social integration and empowering marginalized communities via employment and community-building (Luken & Castellanos-Silveria, 2011).

The literature on sustainability transitions and historical institutionalism has posited that past industrial transitions in a given locality can have a profound impact on its present-day sustainability policymaking (Ba and Galik, 2022; Hossain, 2018; Lockwood et al., 2016). The rationale is three-fold. First, from a sociological perspective, industrial development is a co-evolving, dynamic macro-selection environment (Nettleingham, 2019; Schot and Kanger, 2018). That means, for a given locality, industrial identity constitutes part of a community's broader institutional, social, and cultural identities that are recognized in the literature to be influential in transition trajectory and outcomes (see Janssen et al., 2022; Runhaar et al., 2020). Here, we define a locality's industrial identity, which is largely shaped by its past industrial movements and experience, as the shared understandings of its residents and external audiences about the suitability of this locality for particular kinds of industrial functions (Romanelli & Khessina, 2005).

The influence local industrial identity on sustainability transition trajectories and outcomes can come from both internal and external sources. Internally, individuals and/or collectives may develop attachment to a certain type of industrial functions and

transition trajectories (see Janssen et al., 2022; Masterson et al., 2017). Externally, cross-regional flows of resources may likewise be shaped by distinctive local industrial identities (Romanelli & Khessina, 2005). In the case of shifts in manufacturing industrial concentrations, it is thus logical to expect localities that have been historically more reliant on manufacturing-related industrial functions to be less likely to undergo sustainability transitions.

Second and relatedly, past industrial transitions can result in political coalitions that align either for or against transitions policies. These coalitions, and indeed the power dynamics between incumbent and emerging regimes, can complicate transitions progress (Geels, 2011; Hess, 2014; Magnusson and Werner, 2022). On the one hand, incumbent industrial regimes, oftentimes in the form of organized agents in the political field, tend to resist proposed changes as they perceive transitions as threats to their short-term profitability and long-term survival (Hess, 2014). Such a perception can be explained and reinforced by routinized organisational skills and practices that eventually lead to lock-ins within organizations (Magnusson and Werner, 2022) as well as by shared narratives and commitments across organizations with coalitions (Runhaar et al., 2020). Examples include resistance of incumbent actors in the automotive, power, and farming industries (see Lowes et al., 2020; Runhaar et al., 2020; Wells & Nieuwenhuis, 2012). On the other hand, incumbent industrial regimes, in certain circumstances, can also facilitate sustainability transitions (Magnusson and Werner, 2022), largely by creating new technologies and businesses for long-term competitiveness (e.g., niche creation; Valta et al., 2022) and reorienting towards radical transitions trajectories (Geels et al., 2016). Examples can be found in pulp and paper, shipping, and energy sectors (see Ottosson & Magnusson, 2013; Stalmokaitė & Hassler, 2020; Valta et al., 2022). In either case, research suggests that heterogeneity in capabilities (e.g., strategic management) can lead to the varied industry responses to transitions policies (Magnusson and Werner, 2022).

Characterizing past industrial transitions, research on transitions studies and development economics has emphasized two dimensions: direction and magnitude. Direction depicts the trajectory/course along which manufacturing industrial concentration moves in a given locality. Developed economies have largely experienced a downward shift in their manufacturing industrial concentrations whereas both downward and upward shifts can be identified in developing economies (e.g., premature deindustrialization in low- and middle-income economies; see Rodrik, 2016). Magnitude describes the pace of industrial transitions. In other words, magnitude focuses on the observable volatility within a given time period in a locality's manufacturing industrial concentration (Ba and Galik, 2022). Due to the relatively long period of time to observe changes in directions of industrial transitions (e.g., potential effect of path dependency and economic volatility on directions), pace of industrial transitions has been highlighted to offer policy implications. In particular, the literature on sustainability transitions suggests that rapidity in industrial transitions may not always be favorable given the time needed for adjustments in social practices and institutional infrastructures to mitigate potential disruptions and side effects (see Hess, 2014). For instance, in the just transitions literature, empirical evidence from the sectors such as food, housing, and energy (see e.g., Martiskainen et al., 2021; Kaljonen et al., 2021; Stevis & Felli, 2015; Tschersich & Kok, 2022) shows that inattention to social inequalities during transitions can exacerbate existing problems such as unemployment in traditional industrial bases and food and energy poverty and vulnerability in low-income and/or minority households. Such evidence further highlights the need to focus on transitions magnitude in our study.

To advance sustainability at the local level, research on public management has highlighted the role of local governments' strategic management given that local governments must work with limited resources and competing priorities (Yi et al., 2017). In particular, strategic planning and managerial capabilities have been identified as key factors influencing sustainability performance (Deslatte and Stokan, 2020; Hawkins et al., 2021). Strategic planning entails a systematic process that a local government undertakes periodically to recognize the various future conditions in which its communities will thrive and establish consensus about the actions that are mostly likely to result in its most desired vision—all within the boundaries of anticipated available financial and human resources (Gordon, 2013). In this case, the extent to which a local government's strategic planning emphasizes sustainability will likely be linked to its transition trajectory and outcomes (Deslatte and Stokan, 2020). Managerial capabilities including natural, material, and fiscal resources as well as human-based expertise represent a local government's unique set of "problem-solving patterns" or competencies on which it can rely when pursuing key goals (Andrews et al., 2016; Feldman and Pentland, 2003). Managerial capabilities reflect a resource-based understanding of local governments and can be further differentiated into specialized and general-purpose capabilities depending on the level of specific resource commitment that developing or possessing a capability demands (Levinthal & Wu, 2010).

Conceptually, local governments' managerial capabilities connect to the concept of urban transformative capacity in the sustainability transitions scholarship, defined as urban development stakeholders' collective capacity to envision, plan for, initiate, and carry out path-deviant transitions toward sustainability within and across the multiple complex systems that comprise the cities to which they are connected (see Wolfram et al., 2016). Although designed to focus on city-level transitions, the theoretical underpinnings for urban transformative capacity are informative for transitions studies at any level owing to the concept's emphasis on place specificity as well as its systematic theorization of the multi-dimensional and multi-sectoral reality of sustainability transitions (see Borgström, 2019; Shahani et al., 2022; Peris-Blanes et al., 2022).

Connecting long-term industrial transitions to local governments' current-day sustainability practices and progress, both direction and magnitude are likely to influence local governments' sustainability planning, capabilities, and performance. Yet as reviewed previously, their influence tends to be direct on local governments' sustainability planning and capabilities and indirect on sustainability performance (see Ottosson & Magnusson, 2013; Magnusson and Werner, 2022; Stalmokaitė & Hassler, 2020). In other words, local governments' sustainability planning and capabilities intervene in the relationship between long-term industrial transitions and local governments' sustainability performance. This is because, from an organizational perspective, planning and capabilities represent a local government's commitment and resource boundaries that can shape its sustainability performance (Magnusson and Werner, 2022). From a system perspective, local governments' planning and capabilities can reflect the interactive dynamics of key stakeholders from all sectors whose participation and engagement are crucial to successful transitions (see Wolfram et al., 2019;

Peris-Blanes et al., 2022). Such a rationale also aligns with the previously reviewed literature on public management (see Deslatte and Stokan, 2020; Hawkins et al., 2021).

With regard to the two measures of long-term industrial transitions (i.e., direction and magnitude), as demonstrated previously, variation in magnitude is more likely to be of interest in developed countries such as the U.S. given a downward trend in manufacturing employment over the long run. Previous research has indicated that rapidity in industrial transitions could negatively influence sustainability commitment at the local level (Ba and Galik, 2022). Research has also warned that rapidity may sacrifice the time needed for adjusting social practices and institutional arrangements to reduce the risk of disruptions and side effects (see Hess, 2014). This impact of rapidity is particularly relevant for local governments given that they typically work within fiscal constraints and face competing priorities and that communities may have long-lasting emotional and cultural connections with lost industrial bases (Linkon, 2018). Accordingly, we hypothesize that magnitude of past industrial transitions—specifically larger and more rapid changes in manufacturing employment—may negatively influence local governments' sustainability planning, capabilities, and performance. Additionally, we hypothesize that local governments' sustainability planning and capabilities mediate the relationship between past industrial transitions and sustainability performance.

4. Data and methods

4.1. Unit of analysis

Our sample focuses on county-level observations in the U.S. The motivation for this is threefold. First, counties represent the largest possible geographical scope with clearly and consistently defined boundaries that encapsulates most residential, commuting, and work-related activities, and likewise are responsible for a variety of development policies and intergovernmental programs (Lobao et al., 2012; Partridge and Rickman, 2006). This makes counties a useful unit to study labor market movements and associated transitions. Second, county-level observations are more inclusive in terms of many demographic dynamics and transitioning patterns such as rural and urban communities as well as shrinking and growing manufacturing employment (Desmet & Fafchamps, 2005). This enables us to develop a more holistic understanding of local sustainability action. Lastly, the emphasis of the current literature on local climate and sustainability action has been predominantly on the city and municipal level (e.g., Bulkeley and Betsill, 2005; Burch, 2010; Deslatte and Stokan, 2020; Hsu et al., 2020; Krause et al., 2016). The lack of attention likewise suggests the need to study county-level efforts.

4.2. Representation of historical industrial transitions

We obtain county-level historical industrial transition data from the Regional Economic Accounts dataset at the U.S. Bureau of Economic Analysis (BEA; Employment by County, Metro, and Other Areas). We use variation in the share of manufacturing employment of local workforce (i.e., percentage of manufacturing jobs) to assess county-level historical industrial transitions (1969 - 2016), which fits the general transition pattern from labor-intensive goods to capital-intensive goods such as information and services (Sachs et al., 1995). As noted previously, we focus on two key dimensions of historical industrial transitions: *direction* and *magnitude*. *Direction* is quantified as a categorical variable using a nonparametric approach, the Mann-Kendall Statistic (MKS; Mann, 1945; Kendall, 1948), which is a commonly used trend detection method that takes advantage of the correlation between numeric observations and their order in time (Hamed & Rao, 1998). We use a nonparametric approach because only 15.94% (51/320) of the sampled counties are identified to have normally distributed shares of manufacturing employment across the sampled years (1969 – 2016; Shapiro–Wilk test, $\alpha = 0.05$; Shapiro and Wilk, 1965). According to the MKSs ($\alpha = 0.05$), from 1969 to 2016, 13.44% (43/320) of the sample counties are identified with growing manufacturing employment (directed upward, coded 2); 80.31% (257/320) with shrinking manufacturing employment (directed downward, coded 1); and 0.06% (20/320) with stable manufacturing employment (no direction, coded 0). *Magnitude* is quantified by the standard deviation of the shares of manufacturing employment across the sampled years to measure the pace of historical industrial transition in a county.

4.3. Representation of sustainability-related actions

To construct our sustainability action variables, we rely on the Local Government Sustainability Practices (LGSP) survey conducted by the International City/County Management Association (ICMA) in 2015. This national survey captures a wide range of U.S. local governments' climate and sustainability efforts and performance on topics such as water, energy, recycling, and transportation (ICMA, 2015). To provide a more holistic understanding of local governments' sustainability action, inspired by Deslatte and Stokan (2020), we use an item response theory (IRT) approach to developing composite measures for three important aspects of local governments' sustainability action: planning, capability, and performance. IRT is a commonly used set of mathematical modeling techniques to construct measurements for multi-dimensional and/or unobservable, latent variables such as capability and competence based on item performance (i.e., response data; Zanon et al., 2016). An advantage of IRT is that it accounts for the difference among survey items by creating distinct statistical properties (e.g., discrimination and difficulty) for each collection of items (Deslatte and Stokan, 2020). This will make sure subjects' IRT measurements are independent of the particular items that were administered (Zanon et al., 2016).

In our study, each of the sustainability action variables (i.e., planning, capability, and performance) is measured using responses to a variety of items (i.e., survey questions). As indicated previously, sustainability planning represents a local government's commitment to sustainability-related policymaking and is key to local-level transitions (Tozer, 2018). Building on Deslatte and Stokan (2020), our

study measures local governments' sustainability planning, which denotes efforts to incorporate objectives for sustainability related matters such as energy efficiency and mixed-use development into existing organizational goals (Alibašić, 2018) via responses to eight items, including elements on equity, energy conservation, climate change, economic development, disaster mitigation, public health, community resiliency, and green energy production. We believe our multi-dimensional measure helps address two challenges that have been identified in the literature regarding measuring sustainability planning at the local level: (1) the ambiguous and complex nature of the concept itself, and (2) its overemphasis on environmental action that is common in practice (see Finn & McCormick, 2011; Tozer, 2018).

Regarding local governments' sustainability action capabilities: we differentiate two types of capabilities: specialized and general-purpose capabilities. The differentiation is based on the level of specific resource commitment that developing or possessing a capability demands. This is driven by the logic that local governments work with limited resources and competing priorities (Yi et al., 2017). For instance, dedicated budget items for sustainability might need a higher level of resource commitment than adding a sustainability-related task to an existing staff member's job description. Here, specialized capabilities are measured via 22 items covering a myriad of local governments' dedicated investment in GHG reduction and green energy such as dedicated line items in budgets for sustainability, conducting energy efficiency retrofits and upgrades, and certifying renovation and new construction projects (e.g., LEED, Energy Star). Along this line, general-purpose capabilities are measured with 18 items capturing those that can be more easily achieved by redirecting and expanding existing capabilities such as staffing and programs with minimal dedicated resource commitment. Such items include, for instance, if a local government supports residents and businesses' energy efficiency programs and enables or incentivizes higher density development close to public transit nodes or existing infrastructure.

Lastly, local governments' sustainability performance, which captures progress and accomplishments on sustainability related matters, is measured by responses to five items that track progress of four key sustainability programs/policies: energy conservation (both in community and by government); green buildings; water conservation; and recycling. Again, we argue that our measure of sustainability performance is an advancement in the literature given the lack of multi-criteria measurements in extant studies (Büyüközkan & Karabulut, 2018). Despite our effort to use IRT and responses to multiple survey questions to develop composite measures of each of the key aspects of local governments' sustainability action—planning, capability, and performance—the complex and multifaceted nature of these three concepts suggests that other important dimensions might have been neglected. For example, although we have responses on social equity, economic development, and community resilience, some of the key sustainability targets such as quality education and strong institutions are not included, at least explicitly, in our measure of sustainability planning due to limited data availability. Subsequent studies, relying on more comprehensive data, could consider further improve these measures. For descriptive statistics for the variables and a list of the items used, please see Appendix A-B.

4.4. Analysis

We use path analysis to connect the variables constructed in the previous section and examine the relationship between historical industrial transitions and present-day local sustainability action. Path analysis denotes a statistical modeling approach that goes beyond conventional multiple regression and allows for the analysis of more complicated models (Streiner, 2005). Path analysis is particularly useful for mapping out structural relationships (both direct and indirect) among a set of interdependent variables, enabling researchers to develop more precise and realistic hypotheses. This is helpful in our study because, in addition to the relationship of interest between historical industrial transitions and present-day local sustainability action, the different aspects/dimensions that make up these two concepts are likely to be interdependent themselves (e.g., sustainability planning, capability, and

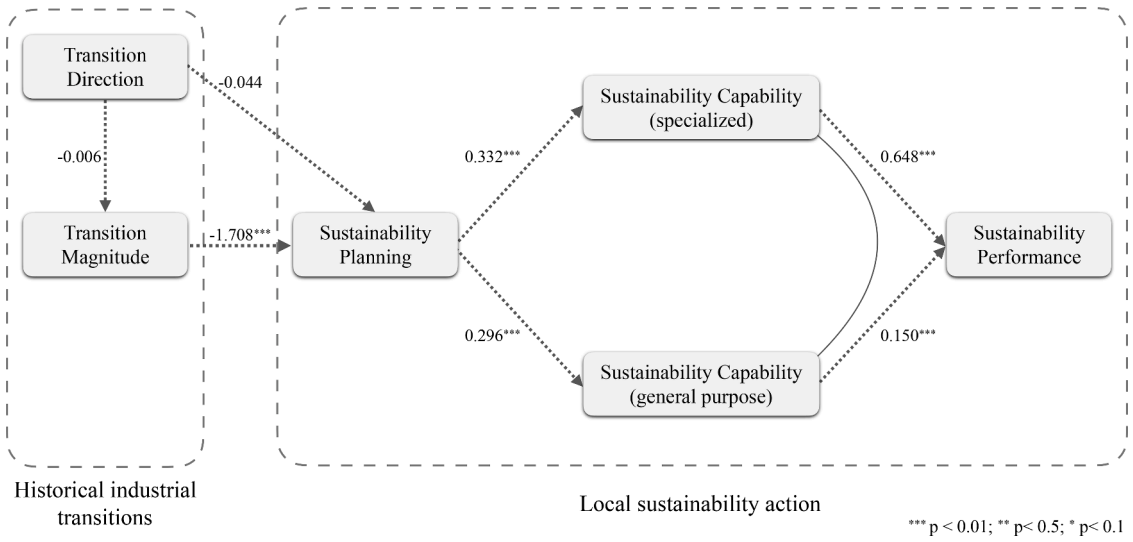


Fig. 1. Path model coefficients for historical industrial transitions and local sustainability action.

performance). Path analysis thus helps us better accommodate these relations. Specifically, we use a recursive path model with bootstrapped standard errors given our interest in linking historical industrial transitions to present-day local sustainability practices and performance (i.e., unidirectional flows). The structure of our model and the estimated path coefficients are displayed in Fig. 1.

Here, while path analysis aids in our examination of the relationship between historical industrial transitions and present-day local sustainability action, we wish to transparently note that our research design, primarily due to the lack of time-series cross-sectional data on local sustainability action, may prevent us from providing causal inferences. Yet given the importance of the topic, the paucity of pertinent studies, as well as on account of limited data availability, we believe our choice of path analysis is a reasonable approach. More broadly, we would like to acknowledge that, despite the importance of local governments, it is but one of several sectoral forces that collectively constitute non-state and subnational efforts towards sustainability transitions. In other words, and as indicated previously, non-state stakeholders such as businesses and nonprofit and civil society organizations are likewise instrumental to transitions success (see e.g., Ba, 2022b; Bolton and Hannon, 2016; Chambers et al., 2021; Magnusson & Werner, 2022; Peris-Blanes et al., 2022). Yet given the limited space, and in order to provide more in-depth insights, our study focuses on local governments. Subsequent research could consider testing the relationship between long-term industrial transitions and non-state sustainability action.

5. Results

Our results provide suggestive evidence that local communities with more substantial swings in industrial transitions may be less likely to engage in sustainability planning, to cultivate sustainability-related capabilities, and to make greater progress towards meeting sustainability-related objectives such as sustainable buildings, water conservation, and recycling. Our results likewise show that, after controlling for the potential influence of historical industrial transitions, local governments' sustainability planning is conducive to developing sustainability related capabilities, and sustainability capabilities are likewise contributory to enhancing performance. Specifically, as shown in Fig. 1, our hypothesized path model assumes the two variables (i.e., direction and magnitude) depicting local historical industrial transitions are directly associated with sustainability planning and indirectly with sustainability capability and performance. In other words, it assumes sustainability planning and capability variables mediate the relationship between past transitions and sustainability performance. This is because the planning activities identified in the LGSP survey such as adopting mitigation and adaptation plans are likely to predate the development of the identified capabilities, and such capabilities may likewise predate the development of performance (Deslatte and Stokan, 2020). Such an assumption also aligns with the research on local governments' sustainability management in which planning and capability are considered key determinants of performance (Zeemering, 2018).

As most local communities in developed economies such as the U.S. have been experiencing shrinking manufacturing employment (i.e., the same direction), it is perhaps more suitable to focus on the magnitude/pace of past transitions (see Kern and Rogge, 2016). As such, we construct a moderated mediation (Preacher et al., 2007) in which the path between magnitude of past transitions and sustainability planning is conditioned by transition direction (Fig. 1). Lastly, our goodness-of-fit indices suggest that our fitted model adequately reproduces the characteristics of our sample (comparative fit index (CFI) = 0.98; root mean square error of approximation (RMSEA) = 0.06). Specifically, about 48 percent of the variance in our local governments' sustainability performance variable has been accounted for by our model.

With regard to the relationship between local historical industrial transitions and sustainability planning, we find that both direction (β = -0.044, p = 0.156) and magnitude (β = -1.708, p = 0.001) are negatively associated with sustainability planning but with varied levels of statistical significance. Such a result likewise helps confirm what the sustainability transitions literature has suggested, that when it comes to the imprinting effects of the historical industrial transitions on present-day local sustainability action, it is the pace and magnitude of transitions that perhaps matters more (Ba and Galik, 2022; Kern and Rogge, 2016). In our model, the negative association between magnitude and planning suggests a need to consider the pace of industrial transitions to inform the development of sustainability planning related activities. That is, when planning for sustainability transitions, local decisionmakers should be aware of that rapidity of industrial transformations may sometimes be counterproductive due to the lack of time necessary for adaptations in social norms and practices to avoid potential negative effects (see Hess, 2014). This is important since the negative effects such as food and energy insecurity are oftentimes borne by low-income and/or minority households during transitions (see Martiskainen et al., 2021; Kaljonen et al., 2021; Stevis & Felli, 2015; Tschersich & Kok, 2022).

Next, we calculate the total indirect effects using the respective connecting paths between past industrial transitions and sustainability capabilities and performance. Similar to our findings on sustainability planning, transitions magnitude is negatively associated with sustainability capabilities (specialized capabilities: β = -0.567, p = 0.003; general-purpose capabilities: β = -0.506, p = 0.005) and with sustainability performance (β = -0.444, p = 0.004). In other words, counties with more rapid manufacturing job loss are less likely to cultivate sustainability-related capabilities and to perform well in sustainability transitions. This is important as these relationships, together with our findings on sustainability planning, point to the complexity of sustainability transitions. That is, rapid transition away from manufacturing may counterintuitively complicate local governments' sustainability efforts. On the other hand, our study further reinforces previous research (e.g., Zeemering, 2018) suggesting that sustainability planning can promote the development of sustainability related capabilities (planning to specialized capabilities: β = 0.332, p = 0.000; planning to general-purpose capabilities: β = 0.296, p = 0.000). We likewise find that sustainability capabilities contribute to improved sustainability performance (specialized capabilities to performance: β = 0.648, p = 0.000; general-purpose capabilities to performance: β = 0.150, p = 0.002).

To assess the robustness of our findings, we re-estimated our path model by focusing on counties with shrinking manufacturing

employment (directed downward). The design of the check fits our sample composition in which the majority are identified with shrinking manufacturing employment (80.31%; 257/320) and aligns with the general transition trajectory in developed economies. The results are consistent with the ones presented previously (Fig. 1), showing negative associations between transition magnitude and sustainability planning, capabilities, and performance, respectively. See Appendix C for regression coefficients.

6. Discussion and conclusion

Non-state and subnational actors such as businesses, nonprofits, and local and regional communities represent a complementary pathway to national governments for achieving existing climate and sustainability policy goals as well as setting higher targets (Hsu et al., 2019). Of particular importance to near-term climate and sustainability policy goals are the actions taken by local governments (Colau, 2021; Kennedy et al., 2009; Sethi et al., 2020). While transitioning towards low-carbon and more sustainable societies has been increasingly emphasized in local governments' pertinent policy design and implementation, empirical evidence remains scarce to connect long-term transitions and present-day policy practices and performance. In this study, we provide, to our knowledge, the first empirical analysis of the connection between historical industrial transitions and local governments' present-day local sustainability practices and performance. Drawing on historical regional economic accounts data (1969-2016) and a national local sustainability practice survey, we use a path analysis and find that counties with more substantial swings in manufacturing employment may be less likely to engage in sustainability planning and struggle to cultivate sustainability related capabilities (both general-purpose and specialized) and achieve better performance. Along this line, our study also helps extend previous understandings that sustainability planning is conducive to developing sustainability related capabilities, and that sustainability capabilities are contributory to enhancing sustainability performance at the local level, even after accounting for the potential influence of historical industrial transitions.

Our findings point to the complexity of local sustainability transitions and offers several implications for policymakers and local administrators. First, while designing and implementing transitions policies and programs, simply focusing on accelerating transitions away from traditional industrial bases may counterintuitively complicate local sustainability efforts owing to local industrial heritage, community identity, and the presence of powerful incumbents (Byrne, 2002; Geels, 2014; Linkon, 2018). While rapid transitions have happened historically and may again be possible in the future, policymakers and administrators from the federal to local levels should nonetheless carefully assess local transitioning patterns and trajectories as well as the existence of possible societal tradeoffs (e.g., lack of public support, workforce retraining and equality; see Fanning et al., 2022; Hess, 2014; Kern & Rogge, 2016; Leong & Howlett, 2022). The corollary to this is that there may be unseen challenges associated with blanket, top-down programs to encourage sustainable transitions at the community level, highlighting the role played by bottom-up, community-driven efforts.

A second implication is that the development of management capacity to meet sustainability transitions demand—particularly at the local level—has potential benefits for both sustainability capabilities and performance. As limited resources and competing priorities at the local level tend to contribute to both administrative and managerial silos (Deslatte and Stokan, 2020; Yi et al., 2017), efforts to enhance local sustainability related capabilities and performance should differentiate between specialized and general-purpose capabilities. That is, instead of promoting generic and one-size-fits-all strategic management guidelines, tailored capacity building schemes to local governments' resource availability and heterogeneity as well as their community characteristics may be better suited to enhance local sustainability related capabilities and performance (e.g., Baker et al., 2012). This is particularly the case considering the diversity of tools available to pursue sustainability (Chambers et al., 2021), as well as differences in tool applicability and flexibility (Di Lucia et al., 2021). This finding again reinforces our earlier conclusion of the need to consider bottom-up community context and conditions when developing policy to encourage sustainable transitions at the local level.

Along this line, it is important to acknowledge that, part of the dilemmas between local governments' sustainability action and their limited resources and competing priorities (i.e., opportunity costs of sustainability action) are constructed and can be re-constructed. In other words, synergies may in fact exist between seemingly counteractive priorities such as socio-economic development and sustainability transitions (e.g., Peris-Blanes et al., 2022). Indeed, in certain cases, especially when sustainability is viewed exclusively from an environmental perspective and/or when framing of sustainability is politically contested, pushback to sustainability action has occurred and will likely happen again (e.g., Cavicchi, 2016). Yet if sustainability is understood from a more holistic and inclusive perspective (e.g., triple-bottom-line sustainability; Hacking & Guthrie, 2008), additional opportunities can be created for local synergies. For instance, connecting adoption of renewable energies to existing public values such as political or religious beliefs and the economic opportunities in "green jobs" has been identified to positively affect energy transitions in the U.S. (Jett & Raymond, 2021). Likewise, framing inclusive innovation as an approach to enhancing market readiness and participation is proved to have a transformative impact on accelerating transitions in rural communities in India (Pansera & Owen, 2018). Lastly, the effect of reconstructing these dilemmas on meaningful transitions relies on local cooperation and mindset change of local stakeholders (see Peris-Blanes et al., 2022).

The above conclusions are particularly salient given present efforts in the U.S. to address multiple social, economic, and environmental objectives under the auspices of the recently enacted Infrastructure Investment and Jobs Act (P.L. 117–58) and Inflation Reduction Act (P.L. 117-169). Collectively, these pieces of legislation include among their various programs efforts to encourage clean energy deployment, improve local infrastructure, and invest in clean technology manufacturing while also providing resources to decarbonize highly-emitting industries. The sheer size of investment being made by legislation already signed into law (The Infrastructure Investment and Jobs Act, $1.2 Trillion; Infrastructure Reduction Act, $740 Billion, of which $369 Billion is targeted specifically to climate) presents a unique opportunity to assist communities and industry in making the transitions necessary to meet climate and other environmental objectives. Understanding the potential barriers and opportunities associated with uptake and

implementation at the local level is important to ensure that investments are appropriately made given the magnitude of challenges these packages purport to address.

More broadly, while our study is focused on the U.S., we argue that our findings are of potential to be generalizable to other contexts as well. This is because, drawing on the suggestions of extant transitions research on moving beyond singular case studies (see e.g., Andersen et al., 2020; Heiberg et al., 2022), we carefully built a national sample of counties of heterogenous industrial transitions patterns, in terms of both direction and magnitude, of varied sustainability actions and performance, and of different levels of socio-technical development. Based on this sample, we believe other contexts, at least those such as developed economies that share a certain set of socio-economic characteristics of the U.S., can find our findings applicable to their sustainability cases. For instance, in Europe and part of Asia (e.g., Japan and Korea) in which socio-economic development has moved beyond manufacturing-oriented industrial functions, complementing national policies with bottom-up, community-specific, and less rapid transitions programs might be of potential to achieve meaningful transitions. In developing economies that are currently going through rapid industrialization, our findings are likewise informative since policies can be designed to (1) better attend to system-wide trade-offs between immediate economic development and long-term sustainability and seek advancements in cleaner industries via technological innovations; and (2) proactively cultivate pro-transitions community identities via behavioural nudges and interventions. Lastly, although we are confident in the generalizability of our findings, we do encourage future research to examine similar research questions in other contexts and/or comparative settings to add to the validity of our findings and the theoretical building of the sustainability transitions scholarship.

As for the theoretical contributions to the sustainability transitions scholarship, we believe our study's bridging of the sustainability transitions—public management research is of great value and offers promising avenues for future research. First, studies in the sustainability transitions field have been mostly located at the meso level. The micro and organizational foci of the public management scholarship thus can help open up the black box of managerial rationales and practices so that more actionable policy recommendations can be developed to facilitate transitions. For instance, at the micro level, research on public service motivation—defined as an individual's disposition to respond to motives grounded in public institutions (Perry & Wise, 1990)—can help identify strategies to cultivate and sustain government officials' pro-transitions behaviour and leadership styles (see Hameduddin & Engbers, 2022). At the organizational level, research on agency design and administrative reform is of promise for facilitating inter- and intra-agency collaboration towards more effective socio-technical innovations (see Deslatte & Stokan, 2020; Yi & Cui, 2019). Second, public management research encompasses the governance of inter-sectoral dynamics among government, non-profit, and for-profit organisations in the provision of public services. Insights of public management research on cross-sector interactions such as mechanisms of informal and formal collaborations (see e.g., Bauer et al., 2022) as well as trust and accountability across sectors (see e.g., Guarneros-Meza & Martin, 2016) can help inform the sustainability transitions scholarship on identifying innovative ways to scaleup niche experimentation to wider socio-technical adoption and change (see Bögel et al., 2022).

Declaration of Competing Interest

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Data availability

Data will be made available on request.

Appendix A. Descriptive statistics for IRT-generated and transition variables (N = 320)

Variable	Mean	S.D.	Min.	Max.
Sustainability Planning	0.200	0.292	0.000	1.000
Sustainability Capability (Specialized)	0.325	0.222	0.000	1.000
Sustainability Capability (General-Purpose)	0.170	0.234	0.000	1.000
Sustainability Performance	0.217	0.238	0.000	1.000
Transition Direction	1.072	0.439	0	2
Transition Magnitude	0.045	0.031	0.003	0.184

Appendix B. Items used for IRT-generated variables

Variable	Items	N
Sustainability Planning		8

(continued on next page)

(*continued*)

Variable	Items	N
	Please indicate if your local sustainability plan contains goals or strategies for (1) Social equity; (2) Energy conservation; (3) Climate change; (4) Economic development; (5) Disaster mitigation; (6) Public health; (7) Community resilience; and (8) Green energy production?	
Sustainability Capability (Specialized)	Which of the following sustainability actions has your government undertaken? (1) Dedicated a budget line item specifically for sustainability or environmental protection; (2)Adopted a climate mitigation plan; (3) Adopted a climate adaptation plan; (4) Conducted a greenhouse gas inventory of local government operations; (5) Conducted a greenhouse gas inventory of the community; (6) Set greenhouse gas reduction targets for local government operations; (7) Set greenhouse gas reduction targets for the community; and Which of the following energy actions has your jurisdiction taken in the last five years? (8) Established a fuel efficiency target for the government fleet of vehicles; (9) Increased the purchase of hybrid, plug-in hybrid, electric, or other fuel-efficient vehicles; (10) Installed charging stations for electric vehicles; (11) Conducted energy audits of government buildings; (12) Established a policy to only purchase energy star equipment when available; (13) Upgraded or retrofitted government facilities to higher energy efficiency of office lighting; (14) Upgraded or retrofitted traffic signals to increase efficiency; (15) Upgraded or retrofitted streetlights or other exterior lighting to improve efficiency; (16) Upgraded or retrofitted government facilities to more energy efficient heating or air conditioning systems; (17) Upgraded or retrofitted facilities to higher efficiency pumps in the water or sewer systems; (18) Installed solar panels on a government facility; (19) Installed a geo-thermal system in a government facility; (20) Generated electricity through refuse disposal, wastewater treatment or landfill operations; (21) Required all new government construction projects be certified green (e.g., LEED, Energy Star, etc.); (22) Required all government renovation projects be certified green (e.g., LEED, Energy Star, etc.).	22
Sustainability Capability (General-Purpose)	Does your government provide or support any of the following programs to the community? (1) Energy audits for individual residences; (2) Weatherization for individual residences; (3) Heating/ air conditioning upgrades for individual residences; (4) Purchase of energy efficient appliances in individual residences; (5) Installation of solar equipment on individual residences; (6) Energy audits for businesses; (7) Weatherization for businesses; (8) Heating/ air conditioning upgrades for businesses; (9) Purchase of energy efficient appliances for businesses; (10) Installation of solar equipment on businesses; and Do your regulations incentivize the following in any part of your jurisdiction. (11) Higher density development near public transit nodes; (12) Higher density development in areas with existing infrastructure; (13) Accessory dwelling units, such as granny flats, basement units, etc.; (14) Mixed use development; (15) Sidewalks in new developments; (16) Clustered (conservation) subdivision design; (17) Low-impact design/green infrastructure (e.g., bioswales, rain gardens, etc.); (18) Sustainable or green residential or commercial building standards.	18
Sustainability Performance	(1) Do you track the impact of conservation programs on energy usage by your government? (2) Do you track the impact of conservation programs on energy usage in the community? (3) If you have sustainable building policies, have they resulted in more green buildings? (4) Do you track the impact of water conservation programs on water usage? (5) Do you track the impact of recycling programs on recycling rates?	5

Appendix C. Path coefficients for robustness check

Regressions	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
Capability (Specialized) ~ Planning	0.332	0.042	8.002	0.000	0.332	0.438
Capability (Gen. Purpose) ~ Planning	0.296	0.047	6.256	0.000	0.296	0.370
Performance ~ Capability (Specialized)	0.648	0.047	13.732	0.000	0.648	0.604
Capability (Gen. Purpose)	0.150	0.051	2.930	0.003	0.15o	0.148
Planning ~ Transition Magnitude	-1.658	0.487	-3.405	0.001	-1.658	-0.176

References

Alibašić, H., 2018. Defining, initiating, and reviewing sustainability and resilience planning. In: Alibašić, H. (Ed.), Sustainability and Resilience Planning for Local Governments: the Quadruple Bottom Line Strategy. Springer International Publishing, pp. 1–16. https://doi.org/10.1007/978-3-319-72568-0_1.

Andersen, A.D., Steen, M., Mäkitie, T., Hanson, J., Thune, T.M., Soppe, B., 2020. The role of inter-sectoral dynamics in sustainability transitions: a comment on the transitions research agenda. Environ. Innov. Soc. Transit. 34, 348–351. https://doi.org/10.1016/j.eist.2019.11.009.

Andrews, R., Beynon, M.J., McDermott, A.M., 2016. Organizational capability in the public sector: a configurational approach. J. Public Adm. Res. Theory 26 (2), 239–258. https://doi.org/10.1093/jopart/muv005.

Ba, Y., 2022a. Power dynamics and corporate power in governance processes: evidence from U.S. environmental governance systems. Am. Rev. Public Adm. 52 (3), 206–220. https://doi.org/10.1177/02750740211055221.

Ba, Y., 2022b. Non-state climate governance, corporate leadership, and governance performance: evidence from the US electric utility sector. Environ. Res. Lett. 17 (8), 084014 https://doi.org/10.1088/1748-9326/ac7fa8.

Ba, Y., Galik, C.S., 2022. Historical manufacturing volatility and local sustainability efforts: a link to the past. Glob. Environ. Change 72, 102421. https://doi.org/10.1016/j.gloenvcha.2021.102421.

Baker, I., Peterson, A., Brown, G., McAlpine, C., 2012. Local government response to the impacts of climate change: an evaluation of local climate adaptation plans. Landsc. Urban Plan. 107 (2), 127–136. https://doi.org/10.1016/j.landurbplan.2012.05.009.

Bauer, Z., AbouAssi, K., Johnston, J., 2022. Cross-sector collaboration formality: the effects of institutions and organizational leaders. Public Manag. Rev. 24 (2), 159–181. https://doi.org/10.1080/14719037.2020.1798709.
Bögel, P.M., Augenstein, K., Levin-Keitel, M., Upham, P., 2022. An interdisciplinary perspective on scaling in transitions: connecting actors and space. Environ. Innov. Soc. Transit. 42, 170–183. https://doi.org/10.1016/j.eist.2021.12.009.
Bohnsack, R., Pinkse, J., Waelpoel, A., 2016. The institutional evolution process of the global solar industry: the role of public and private actors in creating institutional shifts. Environ. Innov. Soc. Transit. 20, 16–32. https://doi.org/10.1016/j.eist.2015.10.006.
Bolton, R., Hannon, M., 2016. Governing sustainability transitions through business model innovation: towards a systems understanding. Res. Policy 45 (9), 1731–1742. https://doi.org/10.1016/j.respol.2016.05.003.
Borgström, S., 2019. Balancing diversity and connectivity in multi-level governance settings for urban transformative capacity. AMBIO 48 (5), 463–477. https://doi.org/10.1007/s13280-018-01142-1.
Bridge, G., Bouzarovski, S., Bradshaw, M., Eyre, N., 2013. Geographies of energy transition: space, place and the low-carbon economy. Energy Policy 53, 331–340. https://doi.org/10.1016/j.enpol.2012.10.066.
Broto, V.C., Bulkeley, H., 2013. A survey of urban climate change experiments in 100 cities. Glob. Environ. Change 23 (1), 92–102. https://doi.org/10.1016/j.gloenvcha.2012.07.005.
Buera, F.J., Kaboski, J.P., 2012. The rise of the service economy. Am. Econ. Rev. 102 (6), 2540–2569. https://doi.org/10.1257/aer.102.6.2540.
Bulkeley, H., Betsill, M., 2005. Rethinking sustainable cities: multilevel governance and the'urban'politics of climate change. Environ. Polit. 14 (1), 42–63.
Burch, S., 2010. Transforming barriers into enablers of action on climate change: insights from three municipal case studies in British Columbia, Canada. Glob. Environ. Change 20 (2), 287–297. https://doi.org/10.1016/j.gloenvcha.2009.11.009.
Bush, J., 2020. The role of local government greening policies in the transition towards nature-based cities. Environ. Innov. Soc. Transit. 35, 35–44. https://doi.org/10.1016/j.eist.2020.01.015.
Büyüközkan, G., Karabulut, Y., 2018. Sustainability performance evaluation: literature review and future directions. J. Environ. Manag. 217, 253–267. https://doi.org/10.1016/j.jenvman.2018.03.064.
Byrne, D., 2002. Industrial culture in a post-industrial world: the case of the North East of England. City 6 (3), 279–289. https://doi.org/10.1080/1360481022000037733.
Cavicchi, B., 2016. Sustainability that backfires: the case of biogas in Emilia Romagna. Environ. Innov. Soc. Transit. 21, 13–27. https://doi.org/10.1016/j.eist.2016.02.001.
Chambers, J.M., Wyborn, C., Ryan, M.E., Reid, R.S., Riechers, M., Serban, A., Bennett, N.J., Cvitanovic, C., Fernández-Giménez, M.E., Galvin, K.A., Goldstein, B.E., Klenk, N.L., Tengö, M., Brennan, R., Cockburn, J.J., Hill, R., Munera, C., Nel, J.L., Österblom, H., …, Pickering, T., 2021. Six modes of co-production for sustainability. Nat. Sustain. 4 (11), 983–996. https://doi.org/10.1038/s41893-021-00755-x.
Colau, A. (2021, October 11). Why Cities Must 'Race to Zero.' THOUGHT LEADERSHIP. https://www.c40.org/news/why-cities-must-race-to-zero/.
Deslatte, A., Stokan, E., 2020. Sustainability synergies or silos? The opportunity costs of local government organizational capabilities. Public Adm. Rev. 80 (6), 1024–1034. https://doi.org/10.1111/puar.13237.
Desmet, K., Fafchamps, M., 2005. Changes in the spatial concentration of employment across US counties: a sectoral analysis 1972–2000. J. Econ. Geogr. 5 (3), 261–284. JSTOR.
Di Lucia, L., Slade, R., Khan, J., 2021. Decision-making fitness of methods to understand sustainable development goal interactions. Nat. Sustain. https://doi.org/10.1038/s41893-021-00819-y.
Ehnert, F., Kern, F., Borgström, S., Gorissen, L., Maschmeyer, S., Egermann, M., 2018. Urban sustainability transitions in a context of multi-level governance: a comparison of four European states. Environ. Innov. Soc. Transit. 26, 101–116. https://doi.org/10.1016/j.eist.2017.05.002.
ElMassah, S., Mohieldin, M., 2020. Digital transformation and localizing the Sustainable Development Goals (SDGs). Ecol. Econ. 169, 106490 https://doi.org/10.1016/j.ecolecon.2019.106490.
Fanning, A.L., O'Neill, D.W., Hickel, J., Roux, N, 2022. The social shortfall and ecological overshoot of nations. Nat. Sustain. 5 (1), 26–36. https://doi.org/10.1038/s41893-021-00799-z.
Feldman, M.S., Pentland, B.T., 2003. Reconceptualizing organizational routines as a source of flexibility and change. Adm. Sci. Q. 48 (1), 94–118. https://doi.org/10.2307/3556620.
Ferloni, A., 2022. Transitions as a coevolutionary process: the urban emergence of electric vehicle inventions. Environ. Innov. Soc. Transit. 44, 205–225. https://doi.org/10.1016/j.eist.2022.08.003.
Finn, D., and McCormick, L. (2011). Urban climate change plans: how holistic? Embrittlement Localized Crack Environ., Proc. Int. Symp. Fall Meet. Metall. Soc., 16 (4), 397–416. 10.1080/13549839.2011.579091.
Fuenfschilling, L., Truffer, B., 2016. The interplay of institutions, actors and technologies in socio-technical systems—an analysis of transformations in the Australian urban water sector. Technol. Forecast. Soc. Change 103, 298–312. https://doi.org/10.1016/j.techfore.2015.11.023.
Galik, C.S., Chelbi, L., 2021. Revisiting institutional stability: A systematic review and distillations of dominant modes. Environ. Policy Gov. 31 (5), 463–473. https://doi.org/10.1002/eet.1941.
Geels, F.W., 2011. The multi-level perspective on sustainability transitions: responses to seven criticisms. Environ. Innov. Soc. Transit. 1 (1), 24–40. https://doi.org/10.1016/j.eist.2011.02.002.
Geels, F.W., 2014. Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. Theory Cult. Soc. 31 (5), 21–40. https://doi.org/10.1177/0263276414531627.
Geels, F.W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., Neukirch, M., Wassermann, S., 2016. The enactment of socio-technical transition pathways: a reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014). Res. Policy 45 (4), 896–913. https://doi.org/10.1016/j.respol.2016.01.015.
Gordon, G.L., 2013. Strategic Planning for Local Government. ICMA Publishing.
Greif, A., 1998. Historical and comparative institutional analysis. Am. Econ. Rev. 88 (2), 80–84.
Guarneros-Meza, V., Martin, S., 2016. Boundary spanning in local public service partnerships: coaches, advocates or enforcers? Public Manag. Rev. 18 (2), 238–257. https://doi.org/10.1080/14719037.2014.969761.
Hacking, T., Guthrie, P., 2008. A framework for clarifying the meaning of triple bottom-line, integrated, and sustainability assessment. Environ. Impact Assess. Rev. 28 (2), 73–89. https://doi.org/10.1016/j.eiar.2007.03.002.
Hale, T.N., Chan, S., Hsu, A., Clapper, A., Elliott, C., Faria, P., Kuramochi, T., McDaniel, S., Morgado, M., Roelfsema, M., Santaella, M., Singh, N., Tout, I., Weber, C., Weinfurter, A., Widerberg, O., 2021. Sub- and non-state climate action: a framework to assess progress, implementation and impact. Clim. Policy 21 (3), 406–420. https://doi.org/10.1080/14693062.2020.1828796.
Hamed, K.H., Rao, R.A., 1998. A modified Mann-Kendall trend test for autocorrelated data. J. Hydrol. 204 (1), 182–196. https://doi.org/10.1016/S0022-1694(97)00125-X.
Hameduddin, T., Engbers, T., 2022. Leadership and public service motivation: a systematic synthesis. Int. Public Manag. J. 25 (1), 86–119. https://doi.org/10.1080/10967494.2021.1884150.
Hansen, T., Coenen, L., 2015. The geography of sustainability transitions: review, synthesis and reflections on an emergent research field. Environ. Innov. Soc. Transit. 17, 92–109. https://doi.org/10.1016/j.eist.2014.11.001.
Hawkins, C.V., Krause, R.M., Deslatte, A., 2021. Staff support and administrative capacity in strategic planning for local sustainability. Public Manag. Rev. 1–22. https://doi.org/10.1080/14719037.2021.1999667.
Heiberg, J., Truffer, B., Binz, C., 2022. Assessing transitions through socio-technical configuration analysis – a methodological framework and a case study in the water sector. Res. Policy 51 (1), 104363. https://doi.org/10.1016/j.respol.2021.104363.
Hess, D.J., 2014. Sustainability transitions: a political coalition perspective. Res. Policy 43 (2), 278–283. https://doi.org/10.1016/j.respol.2013.10.008.

Hess, D.J., 2018. Energy democracy and social movements: a multi-coalition perspective on the politics of sustainability transitions. Energy Res. Soc. Sci. 40, 177–189. https://doi.org/10.1016/j.erss.2018.01.003.
Hossain, M.M., 2018. Sustainability reporting by Australian local government authorities. Local Gov. Stud. 44 (4), 577–600. https://doi.org/10.1080/03003930.2018.1471397.
Hsu, A., Höhne, N., Kuramochi, T., Roelfsema, M., Weinfurter, A., Xie, Y., Lütkehermöller, K., Chan, S., Corfee-Morlot, J., Drost, P., Faria, P., Gardiner, A., Gordon, D. J., Hale, T., Hultman, N.E., Moorhead, J., Reuvers, S., Setzer, J., Singh, N., …, Widerberg, O., 2019. A research roadmap for quantifying non-state and subnational climate mitigation action. Nat. Clim. Change 9 (1), 11–17. https://doi.org/10.1038/s41558-018-0338-z.
Hsu, A., Tan, J., Ng, Y.M., Toh, W., Vanda, R., Goyal, N., 2020. Performance determinants show European cities are delivering on climate mitigation. Nat. Clim. Change 10 (11), 1015–1022. https://doi.org/10.1038/s41558-020-0879-9.
Hsueh, L., 2020. Calling all volunteers: industry self-regulation on the environment. Handbook of U.S. Environmental Policy. Edward Elgar Publishing. https://www.elgaronline.com/view/edcoll/9781788972833/9781788972833.00026.xml.
ICMA. (2015). Sustainability in Local Government 2015. https://bookstore.icma.org/sustainability-in-local-government-2015-full-dataset-p80.aspx.
Janssen, A., Beers, P., van Mierlo, B., 2022. Identity in sustainability transitions: the crucial role of landscape in the Green Heart. Environ. Innov. Soc. Transit. 42, 362–373. https://doi.org/10.1016/j.eist.2022.01.008.
Jett, J., Raymond, L., 2021. Issue framing and U.S. state energy and climate policy choice. Rev. Policy Res. 38 (3), 278–299. https://doi.org/10.1111/ropr.12427.
Ji, H., Darnall, N., 2018. All are not created equal: assessing local governments' strategic approaches towards sustainability. Public Manag. Rev. 20 (1), 154–175. https://doi.org/10.1080/14719037.2017.1293147.
Kaljonen, M., Kortetmäki, T., Tribaldos, T., Huttunen, S., Karttunen, K., Maluf, R.S., Niemi, J., Saarinen, M., Salminen, J., Vaalavuo, M., Valsta, L., 2021. Justice in transitions: widening considerations of justice in dietary transition. Environ. Innov. Soc. Transit. 40, 474–485. https://doi.org/10.1016/j.eist.2021.10.007.
Kendall, M.G., 1948. Rank Correlation Methods. C. Griffin.
Kennedy, C., Steinberger, J., Gasson, B., Hansen, Y., Hillman, T., Havránek, M., Pataki, D., Phdungsilp, A., Ramaswami, A., Mendez, G.V., 2009. Greenhouse gas emissions from global cities. Environ. Sci. Technol. 43 (19), 7297–7302. https://doi.org/10.1021/es900213p.
Kern, F., Rogge, K.S., 2016. The pace of governed energy transitions: agency, international dynamics and the global Paris agreement accelerating decarbonisation processes? Energy Res. Soc. Sci. 22, 13–17. https://doi.org/10.1016/j.erss.2016.08.016.
Köhler, J., Geels, F.W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, M.S., …, Wells, P., 2019. An agenda for sustainability transitions research: state of the art and future directions. Environ. Innov. Soc. Transit. 31, 1–32. https://doi.org/10.1016/j.eist.2019.01.004.
Kousky, C., Schneider, S.H., 2003. Global climate policy: will cities lead the way? Clim. Policy 3 (4), 359–372. https://doi.org/10.1016/j.clipol.2003.08.002.
Krause, R.M., Yi, H., Feiock, R.C., 2016. Applying policy termination theory to the abandonment of climate protection initiatives by U.S. local governments. Policy Stud. J. 44 (2), 176–195. https://doi.org/10.1111/psj.12117.
Kuzemko, C., Lockwood, M., Mitchell, C., Hoggett, R., 2016. Governing for sustainable energy system change: politics, contexts and contingency. Energy Res. Soc. Sci. 12, 96–105. https://doi.org/10.1016/j.erss.2015.12.022.
Kyte, R. (2021, November 9). An insider's look at the Glasgow climate summit – talks intensify, amid grandstanding and anger outside. The Conversation. https://theconversation.com/an-insiders-look-at-the-glasgow-climate-summit-talks-intensify-amid-grandstanding-and-anger-outside-171382.
Leong, C., Howlett, M., 2022. Policy learning, policy failure, and the mitigation of policy risks: re-thinking the lessons of policy success and failure. Adm. Soc. 54 (7), 1379–1401. https://doi.org/10.1177/00953997211065344.
Levinthal, D.A., Wu, B., 2010. Opportunity costs and non-scale free capabilities: profit maximization, corporate scope, and profit margins. Strateg. Manag. J. 31 (7), 780–801. https://doi.org/10.1002/smj.845.
Liao, L., Warner, M.E., Homsy, G.C., 2020. When do plans matter? J. Am. Plan. Assoc. 86 (1), 60–74. https://doi.org/10.1080/01944363.2019.1667262.
Linkon, S.L., 2018. The Half-Life of Deindustrialization. University of Michigan Press; JSTOR. https://doi.org/10.3998/mpub.8432351.
Lobao, L., Jeanty, P.W., Partridge, M., Kraybill, D., 2012. Poverty and place across the United States: do county governments matter to the distribution of economic disparities? Int. Reg. Sci. Rev. 35 (2), 158–187. https://doi.org/10.1177/0160017611435356.
Lockwood, M., Kuzemko, C., Mitchell, C., Hoggett, R., 2016. Historical institutionalism and the politics of sustainable energy transitions: a research agenda. Environ. Plan. C 35 (2), 312–333. https://doi.org/10.1177/0263774X16660561.
Losacker, S., Liefner, I., 2020. Regional lead markets for environmental innovation. Environ. Innov. Soc. Transit. 37, 120–139. https://doi.org/10.1016/j.eist.2020.08.003.
Lowes, R., Woodman, B., Speirs, J., 2020. Heating in Great Britain: an incumbent discourse coalition resists an electrifying future. Environ. Innov. Soc. Transit. 37, 1–17. https://doi.org/10.1016/j.eist.2020.07.007.
Luken, R., Castellanos-Silveria, F., 2011. Industrial transformation and sustainable development in developing countries. Sustain. Dev. 19 (3), 167–175. https://doi.org/10.1002/sd.434.
Magnusson, T., Werner, V., 2022. Conceptualisations of incumbent firms in sustainability transitions: insights from organisation theory and a systematic literature review. Bus. Strategy Environ. https://doi.org/10.1002/bse.3081 n/a(n/a).
Mann, H.B., 1945. Nonparametric tests against trend. Econometrica 245–259.
Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. Spec. Sect. Sustain. Transit. 41 (6), 955–967. https://doi.org/10.1016/j.respol.2012.02.013.
Martiskainen, M., Sovacool, B.K., Lacey-Barnacle, M., Hopkins, D., Jenkins, K.E.H., Simcock, N., Mattioli, G., Bouzarovski, S., 2021. New dimensions of vulnerability to energy and transport poverty. Joule 5 (1), 3–7. https://doi.org/10.1016/j.joule.2020.11.016.
Masterson, V.A., Stedman, R.C., Enqvist, J., Tengö, M., Giusti, M., Wahl, D., Svedin, U., 2017. The contribution of sense of place to social-ecological systems research: a review and research agenda. Ecol. Soc. 22 (1) https://doi.org/10.5751/ES-08872-220149.
Narassimhan, E., Johnson, C., 2018. The role of demand-side incentives and charging infrastructure on plug-in electric vehicle adoption: analysis of US States. Environ. Res. Lett. 13 (7), 074032 https://doi.org/10.1088/1748-9326/aad0f8.
Nettleingham, D., 2019. Beyond the heartlands: deindustrialization, naturalization and the meaning of an 'industrial' tradition. Br. J. Sociol. 70 (2), 610–626. https://doi.org/10.1111/1468-4446.12365.
Nieminen, J., Salomaa, A., Juhola, S., 2021. Governing urban sustainability transitions: urban planning regime and modes of governance. J. Environ. Plan. Manag. 64 (4), 559–580. https://doi.org/10.1080/09640568.2020.1776690.
Ottosson, M., Magnusson, T., 2013. Socio-technical regimes and heterogeneous capabilities: the Swedish pulp and paper industry's response to energy policies. Technol. Anal. Strateg. Manag. 25 (4), 355–368. https://doi.org/10.1080/09537325.2013.774349.
Pansera, M., Owen, R., 2018. Framing inclusive innovation within the discourse of development: insights from case studies in India. Res. Policy 47 (1), 23–34. https://doi.org/10.1016/j.respol.2017.09.007.
Partridge, M. D., and Rickman, D. S. (2006). The geography of American poverty: is there a need for place-based policies? W.E. Upjohn Institute for Employment Research 10.17848/9781429454872.
Penrod, E. (2021, November 5). Unlocking the Transition: politicians tout renewable energy jobs for ex-fossil fuel workers, but it's not so simple. https://www.utilitydive.com/news/unlocking-the-transition-politicians-tout-renewable-energy-jobs-for-ex-fos/609335/.
Peris-Blanes, J., Segura-Calero, S., Sarabia, N., Ribó-Pérez, D., 2022. The role of place in shaping urban transformative capacity. The case of València (Spain). Environ. Innov. Soc. Transit. 42, 124–137. https://doi.org/10.1016/j.eist.2021.12.006.
Perry, J.L., Wise, L.R., 1990. The motivational bases of public service. Public Adm. Rev. 367–373.
Pinz, A., Roudyani, N., Thaler, J., 2018. Public–private partnerships as instruments to achieve sustainability-related objectives: the state of the art and a research agenda. Public Manag. Rev. 20 (1), 1–22. https://doi.org/10.1080/14719037.2017.1293143.

Preacher, K.J., Rucker, D.D., Hayes, A.F., 2007. Addressing moderated mediation hypotheses: theory, methods, and prescriptions. Multivar. Behav. Res. 42 (1), 185–227. https://doi.org/10.1080/00273170701341316.
Purvis, B., Mao, Y., Robinson, D., 2019. Three pillars of sustainability: in search of conceptual origins. Sustain. Sci. 14 (3), 681–695. https://doi.org/10.1007/s11625-018-0627-5.
Rodrik, D., 2016. Premature deindustrialization. J. Econ. Growth 21 (1), 1–33. https://doi.org/10.1007/s10887-015-9122-3.
Roelfsema, M., Harmsen, M., Olivier, J.J.G., Hof, A.F., van Vuuren, D.P., 2018. Integrated assessment of international climate mitigation commitments outside the UNFCCC. Glob. Environ. Change 48, 67–75. https://doi.org/10.1016/j.gloenvcha.2017.11.001.
Romanelli, E., Khessina, O.M., 2005. Regional industrial identity: cluster configurations and economic development. Organ. Sci. 16 (4), 344–358. https://doi.org/10.1287/orsc.1050.0131.
Runhaar, H., Fünfschilling, L., van den Pol-Van Dasselaar, A., Moors, E.H.M., Temmink, R., Hekkert, M., 2020. Endogenous regime change: lessons from transition pathways in Dutch dairy farming. Environ. Innov. Soc. Transit. 36, 137–150. https://doi.org/10.1016/j.eist.2020.06.001.
Sachs, J.D., Warner, A., Åslund, A., Fischer, S., 1995. Economic reform and the process of global integration. Brook. Pap. Econ. Act. 1995 (1), 1–118. https://doi.org/10.2307/2534573. JSTOR.
Schot, J., Kanger, L., 2018. Deep transitions: emergence, acceleration, stabilization and directionality. Res. Policy 47 (6), 1045–1059. https://doi.org/10.1016/j.respol.2018.03.009.
Sethi, M., Lamb, W., Minx, J., Creutzig, F., 2020. Climate change mitigation in cities: a systematic scoping of case studies. Environ. Res. Lett. 15 (9), 093008 https://doi.org/10.1088/1748-9326/ab99ff.
Shahani, F., Pineda-Pinto, M., Frantzeskaki, N., 2022. Transformative low-carbon urban innovations: operationalizing transformative capacity for urban planning. AMBIO 51 (5), 1179–1198. https://doi.org/10.1007/s13280-021-01653-4.
Shapiro, S.S., Wilk, M.B., 1965. An analysis of variance test for normality (complete samples). Biometrika 52 (3/4), 591–611.
Stalmokaitė, I., Hassler, B., 2020. Dynamic capabilities and strategic reorientation towards decarbonisation in Baltic Sea shipping. Environ. Innov. Soc. Transit. 37, 187–202. https://doi.org/10.1016/j.eist.2020.09.002.
Stevis, D., Felli, R., 2015. Global labour unions and just transition to a green economy. Int. Environ. Agreem. 15 (1), 29–43. https://doi.org/10.1007/s10784-014-9266-1.
Streiner, D.L., 2005. Finding our way: an introduction to path analysis. Can. J. Psychiatry 50 (2), 115–122. https://doi.org/10.1177/070674370505000207.
Thelen, K., 1999. Historical institutionalism in comparative politics. Annu. Rev. Pol. Sci. 2 (1), 369–404. https://doi.org/10.1146/annurev.polisci.2.1.369.
Törnberg, A., 2018. Combining transition studies and social movement theory: towards a new research agenda. Theory Soc. 47 (3), 381–408. https://doi.org/10.1007/s11186-018-9318-6.
Tozer, L., 2018. Urban climate change and sustainability planning: an analysis of sustainability and climate change discourses in local government plans in Canada. J. Environ. Plan. Manag. 61 (1), 176–194. https://doi.org/10.1080/09640568.2017.1297699.
Tozer, L., Bulkeley, H., van der Jagt, A., Toxopeus, H., Xie, L., Runhaar, H., 2022. Catalyzing sustainability pathways: navigating urban nature based solutions in Europe. Glob. Environ. Change 74, 102521. https://doi.org/10.1016/j.gloenvcha.2022.102521.
Tschersich, J., Kok, K.P.W., 2022. Deepening democracy for the governance toward just transitions in agri-food systems. Environ. Innov. Soc. Transit. 43, 358–374. https://doi.org/10.1016/j.eist.2022.04.012.
Ulmanen, J., Bergek, A., 2021. Influences of technological and sectoral contexts on technological innovation systems. Environ. Innov. Soc. Transit. 40, 20–39. https://doi.org/10.1016/j.eist.2021.04.007.
UN, 1987. Report of the World Commission on Environment and Development: Our Common Future. Oxford University Press. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.
Valta, J., Mäkinen, S.J., Kirjavainen, J., 2022. Dialectic tensions driving niche creation—a case study of a local energy system. Environ. Innov. Soc. Transit. 42, 99–111. https://doi.org/10.1016/j.eist.2021.12.001.
Voß, J.-P., Bornemann, B., 2011. The politics of reflexive governance. Ecol. Soc. 16 (2). JSTOR. http://www.jstor.org/stable/26268901.
Wei, T., Wu, J., Chen, S., 2021. Keeping track of greenhouse gas emission reduction progress and targets in 167 cities worldwide. Front. Sustain. Cities 3, 64. https://doi.org/10.3389/frsc.2021.696381.
Wells, P., Nieuwenhuis, P., 2012. Transition failure: understanding continuity in the automotive industry. Technol. Forecast. Soc. Change 79 (9), 1681–1692. https://doi.org/10.1016/j.techfore.2012.06.008.
Wolfram, M., Borgström, S., Farrelly, M., 2019. Urban transformative capacity: from concept to practice. AMBIO 48 (5), 437–448. https://doi.org/10.1007/s13280-019-01169-y.
Wolfram, M., Frantzeskaki, N., Maschmeyer, S., 2016. Cities, systems and sustainability: status and perspectives of research on urban transformations. Syst. Dyn. Sustain. 22, 18–25. https://doi.org/10.1016/j.cosust.2017.01.014.
Yap, X.-S., and Truffer, B. (2019). Shaping selection environments for industrial catch-up and sustainability transitions: a systemic perspective on endogenizing windows of opportunity. New Frontiers in Science, Technology and Innovation Research from SPRU's 50th Anniversary Conference, 48(4), 1030–1047. 10.1016/j.respol.2018.10.002.
Yi, H., Cui, C., 2019. Coping with functional collective action dilemma: functional fragmentation and administrative integration. Public Manag. Rev. 21 (7), 1052–1075. https://doi.org/10.1080/14719037.2018.1544271.
Yi, H., Feiock, R.C., Berry, F.S., 2017. Overcoming collective action barriers to energy sustainability: a longitudinal study of climate protection accord adoption by local governments. Renew. Sustain. Energy Rev. 79, 339–346. https://doi.org/10.1016/j.rser.2017.05.071.
Zanon, C., Hutz, C.S., Yoo, H.(Henry), Hambleton, R.K., 2016. An application of item response theory to psychological test development. Psicol. Reflex. Crit. 29 (1), 18. https://doi.org/10.1186/s41155-016-0040-x.
Zeemering, E.S., 2018. Sustainability management, strategy and reform in local government. Public Manag. Rev. 20 (1), 136–153. https://doi.org/10.1080/14719037.2017.1293148.