

TIK4021 S26 Innovation and Global Challenges

Course Code: UE_185_TIK4021_1_2026_VÅR_1 **Course Name:** TIK4021 V26 Innovation and Global Challenges **Course Year:** 2026

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Introduction to the course and recap of building blocks in innovation studies

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[An agenda for sustainability transitions research: State of the art and future directions](#)

[Environmental innovation and societal transitions](#)

Author: Köhler, Jonathan ; Geels, Frank W. ; Kern, Florian ; Markard, Jochen ; Onsongo, Elsie ; Wieczorek, Anna ; Alkemade, Floortje ; Avelino, Flor ; Bergek, Anna ; Boons, Frank ; Fünfschilling, Lea ; Hess, David ; Holtz, Georg ; Hyysalo, Sampsa ; Jenkins, Kirsten ; Kivimaa, Paula ; Martiskainen, Mari ; McMeekin, Andrew ; Mühlemeier, Marie Susan ; Nykvist, Bjorn ; Pel, Bonno ; Raven, Rob ; Rohrer, Harald ; Sandén, Björn ; Schot, Johan ; Sovacool, Benjamin ; Turnheim, Bruno ; Welch, Dan ; Wells, Peter **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2019-06-01 **Total Pages:** 1-32 **Pages:** 1-32 **Volume:** 31 **DOI:** 10.1016/j.eist.2019.01.004 **Notes:** •An updated research agenda of the Sustainability Transitions Research Network is presented. •The literature is growing rapidly, although research on transitions in practice and everyday life is still limited. •How to best interact with other relevant disciplines remains a challenge for transitions scholars. •The broader questions of limits to growth or alternative economic systems are open areas for transitions research. Research on sustainability transitions has expanded rapidly in the last ten years, diversified in terms of topics and geographical applications, and deepened with respect to theories and methods. This article provides an extensive review and an updated research agenda for the field, classified into nine main themes: understanding transitions; power,

agency and politics; governing transitions; civil society, culture and social movements; businesses and industries; transitions in practice and everyday life; geography of transitions; ethical aspects; and methodologies. The review shows that the scope of sustainability transitions research has broadened and connections to established disciplines have grown stronger. At the same time, we see that the grand challenges related to sustainability remain unsolved, calling for continued efforts and an acceleration of ongoing transitions. Transition studies can play a key role in this regard by creating new perspectives, approaches and understanding and helping to move society in the direction of sustainability.

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[Artificial intelligence in innovation research: A systematic review, conceptual framework, and future research directions](#)

[Technovation](#)

Author: Mariani, Marcello M. ; Machado, Isa ; Magrelli, Vittoria ; Dwivedi, Yogesh K. **Type:** Article **ISSN:** 01664972 **Publisher:** Elsevier Ltd **Place of Publication:** AMSTERDAM **Publication Date:** 2023-04 **Total Pages:** 102623- **Pages:** 102623- **Volume:** 122 **DOI:** 10.1016/j.technovation.2022.102623 **Notes:** Artificial Intelligence (AI) is increasingly adopted by organizations to innovate, and this is ever more reflected in scholarly work. To illustrate, assess and map research at the intersection of AI and innovation, we performed a Systematic Literature Review (SLR) of published work indexed in the Clarivate Web of Science (WOS) and Elsevier Scopus databases (the final sample includes 1448 articles). A bibliometric analysis was deployed to map the focal field in terms of dominant topics and their evolution over time. By deploying keyword co-occurrences, and bibliographic coupling techniques, we generate insights on the literature at the intersection of AI and innovation research. We leverage the SLR findings to provide an updated synopsis of extant scientific work on the focal research area and to develop an interpretive framework which sheds light on the drivers and outcomes of AI adoption for innovation. We identify economic, technological, and social factors of AI adoption in firms willing to innovate. We also uncover firms' economic, competitive and organizational, and innovation factors as key outcomes of AI deployment. We conclude this paper by developing an agenda for future research. •Systematic Literature Review of research at intersection of AI and innovation. •Illustrates the major theoretical

lenses adopted in the studies. • Identified economic, technological, and social factors as drivers of AI adoption. • Identified economic, competitive, organizational, innovation factors as outcomes. • Developed a rich research agenda including over 70 research questions.

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Additional reading (Introduction to the course)

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Innovation studies—The emerging structure of a new scientific field

Research policy

Author: Fagerberg, Jan ; Verspagen, Bart **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier BV **Publication**

Date: 2009-03 **Total Pages:** 218-233 **Pages:** 218-233 **Volume:** 38 **Issue:** 2 **DOI:**

10.1016/j.respol.2008.12.006 **Notes:** 0048-7333

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Module 1: Sustainability transitions

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Conceptualisations of incumbent firms in sustainability transitions: Insights from
organisation theory and a systematic literature review

Business strategy and the environment

Author: Magnusson, Thomas ; Werner, Viktor **Type:** Article **ISSN:** 09644733 **Publisher:** Wiley **Place of**

Publication: HOBOKEN **Publication Date:** 2022-04-22 **DOI:** 10.1002/bse.3081 **Notes:** Following the tradition of using opposing concepts as a basis for organisational analysis, this article advances a theory-based understanding of incumbent firms in sustainability transitions. Building on seminal transition studies, we propose innovating/defending and collaborating/competing as two useful spectra to describe organisational behaviours in transitions. Presenting the automotive industry as an explanatory case, we show results from a systematic literature review that reveal motives for diverging

behaviours. Combining the spectra into a 2 x 2 matrix, we then introduce four conceptualisations to explain the observed motives and behaviours. The conceptualisations are associated with different streams of organisation theory: dynamic capabilities and the resource-based view, resource-dependence theory, neo-institutional theory and theories on organisational learning and path dependence. Referring to organisational ambidexterity, value configurations and political arenas, we conclude that transitions research can reach a more multifaceted understanding by challenging the prevailing notion of the firm as a coherent actor.

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[Navigators through the storm: A review of organization theories and the behavior of incumbent firms during transitions](#)

[Environmental innovation and societal transitions](#)

Author: van Mossel, Allard ; van Rijnsoever, Frank J. ; Hekkert, Marko P. **Type:** Article **ISSN:** 22104224

Publisher: Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2018-03 **Total Pages:** 44-63

Pages: 44-63 **Volume:** 26 **DOI:** 10.1016/j.eist.2017.07.001 **Notes:** •Five reviewed organization theories

shed light on incumbent behavior during transitions. •We identify four typical modes of incumbent firm

behavior during transitions. •Each mode of behavior is related to particular firm characteristics. •An

incumbent's likelihood of survival is related to particular firm characteristics. •Transition pathways likely

depend on the historical stability of a socio-technical system. The literature on socio-technical

transitions pays increasing attention to the role of incumbent firms during transitions. These firms have

been found to variably further, delay, or to ignore transitions towards a more sustainable society. Yet, it

remains unclear which factors cause incumbents to display different modes of behavior during

transitions, and which factors affect the transition's impact on an incumbent's survival. We engage this

issue by reviewing five prominent organization theories. We first discuss how the transitions literature

conceptualizes incumbent behavior and relate the open questions to major debates in the

organizational literature. We systematically summarize each organization theory's assumptions and

expectations about incumbent behavior, and derive typical modes of behavior. Lastly, we discuss how

an incumbent's characteristics influence its behavior and survival. Overall, our review provides stable

footing for researchers seeking to conscientiously judge which theories are most appropriate to

understand incumbent behavior in the transition process at hand.

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Revival of wind-powered shipping: Comparing the early-stage innovation process
of an incumbent and a newcomer firm
Business strategy and the environment

Author: Stalmokaite, Igne ; Segerlind, Tommy Larsson ; Yliskyla-Peuralahti, Johanna **Type:** Article **ISSN:** 09644733 **Publisher:** Wiley **Place of Publication:** HOBOKEN **Publication Date:** 2022-05-06 **Total Pages:** 1-
Pages: 1- **DOI:** 10.1002/bse.3084 **Notes:** Despite the urgency of decarbonising, the shipping sector has demonstrated a slow-paced response to climate change challenges. Some frontrunner firms are engaged in sustainability-oriented innovation processes. However, there is limited knowledge of how such processes emerge and contribute to societal sustainability transitions and what the role of technology is in companies' (re)orientation towards sustainable business models. This study contributes to filling these gaps through a comparative case study of the ongoing innovation process within an incumbent and a newcomer firm developing wind-powered energy solutions for deep-sea transportation. The study's findings bear implications for theory and practice. This paper's combination of a dynamic capabilities approach and a multi-level perspective from sustainability transitions research is a conceptual novelty, enabling an understanding of the activities involved in the (re)orientation process towards sustainable business from a company's perspective, as well as broader societal and sustainability needs.

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Destabilisation, decline and phase-out in transitions research

Type: Book Chapter **Chapter Author:** Turnheim, Bruno **Book Title:** Technologies in Decline : Socio-Technical Approaches to Discontinuation and Destabilisation **ISBN:** 1032101024 **Publisher:** Routledge **Publication Date:** 2023 **Total Pages:** 43-77 **Pages:** 43-77 **Editor:** Koretsky, Zahar ; Turnheim, Bruno ; Stegmaier, Peter ; van Lente, Harro **Edition:** 1 **DOI:** 10.4324/9781003213642-3 **Notes:** Research about the destabilisation, decline discontinuation and phase-out of existing systems in the scope of socio-technical transitions has developed significantly over recent years. A number of research orientations can be identified, addressing conceptual, empirical, policy and societal challenges in different ways. This chapter seeks to explore this variety, as a means to reflect on current and future research directions. It contributes to this recent development but also seeks to open up new

perspectives. After clarification and disambiguation of related terms (destabilisation, decline, phase-out), the paper extensively reviews contributions to destabilisation research within transitions studies, structured around six salient themes as entry points for destabilisation research: lock-in, sources of change, incumbent actors, processes and mechanisms, governance, and vulnerability and politics. For each of these themes, the chapter discusses distinct research questions, conceptual elaboration and empirical strategies, as well as ongoing research puzzles. A discussion section formulates conceptual propositions for each theme. The chapter concludes by formulating unanswered questions as avenues for future research endeavours.

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Frameworks for multi-system innovation analysis from a sociotechnical
perspective: A systematic literature review
Technological forecasting & social change

Author: Bakhuis, Jerico ; Kamp, Linda Manon ; Barbour, Natalia ; Chappin, Émile Jean Louis **Type:** Article **ISSN:** 00401625 **Publisher:** Elsevier Inc **Publication Date:** 2024-04 **Total Pages:** 123266- **Pages:** 123266- **Volume:** 201 **DOI:** 10.1016/j.techfore.2024.123266 **Notes:** This paper systematically reviews the literature on sociotechnical multi-system innovation frameworks that broaden the usual focus on one sociotechnical system to encompass influences from multiple systems. The review includes 75 peer-reviewed papers that span a broad range of energy-demanding systems and mainly build upon the core frameworks of the Multi-level Perspective (MLP) and Technological Innovation Systems (TIS). The analysis identifies three key aspects to consider in multi-system frameworks. The first aspect is the importance of considering the overarching directionality of multiple sociotechnical systems and how they influence each other. The second is to explicitly analyse the phase of each transitioning system. The third aspect is a need for explicit system configuration analysis. This includes analysing the value chain and the number and types of sectors linked to it, typifying the distinct characteristics of sectors internally and how they interact, and analysing complementary or competitive technologies. The paper concludes by providing recommendations for future research, with a particular focus on the further development of new multi-system frameworks that include one or more of the prior-mentioned three key takeaways. Firstly, focusing on dynamics within multi-system niches. Secondly, performing

actor-level analysis, including demand-side analysis. Finally, applying quantitative methods, such as computer simulation modelling. •The systematic review of 75 multi-system transition studies presents three key takeaways. •Considering system interactions in macro-level transition pathways is necessary. •It is important to consider the overarching directionality of multiple sociotechnical systems. •The phase in which each system in transition is should be considered. •System configuration analysis, including value chains and their interactions, is key.

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[Challenges in accelerating net-zero transitions: insights from transport electrification in Germany and California](#)
[Environmental research letters](#)

Author: Rogge, Karoline S ; Goedeking, Nicholas **Type:** Article **ISSN:** 17489326 **Publisher:** IOP Publishing
Place of Publication: Bristol **Publication Date:** 2024-04-01 **Total Pages:** 44007- **Pages:** 44007- **Volume:** 19
Issue: 4 **DOI:** 10.1088/1748-9326/ad2d84 **Notes:** Abstract Addressing the climate crisis necessitates accelerating transitions towards climate-neutral systems of production and consumption, with electrification emerging as a crucial decarbonisation strategy. The acceleration of such net-zero transitions across multiple systems faces significant resistance and contestation. In this paper, we propose an extended list of challenges unique to the acceleration phase of socio-technical transitions: we introduce ‘expansion and contestation’, ‘justice’, and ‘international dynamics’ as additional challenge types to complement the already acknowledged challenge types of ‘whole systems change’, ‘interaction between multiple systems’, ‘decline and resistance’, ‘consumers and social practices’, and ‘governance’. We apply this extended analytical framework to the electrification of private-passenger vehicles and investigate the unfolding transition to e-mobility with evidence from 35 expert interviews in Germany and California. We uncover over 50 real-world challenges associated with these net-zero transitions at the beginning of the acceleration phase. Most challenges fall within the categories of ‘expansion and contestation’ and ‘governance’. While Germany and California share many real-world challenges, we also find significant variation between both jurisdictions, which we attribute to differences in their automotive incumbency, transition governance approaches, and institutional contexts. We discuss implications for future research, arguing for greater attention to the dual politics of

acceleration during net-zero transitions: political conflict not only centres around the decline of old industries and future losses, but also around the expansion of the new system and associated future gains.

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The geography of sustainability transitions: Contours of an emerging theme

Environmental innovation and societal transitions

Author: Truffer, Bernhard ; Murphy, James T. ; Raven, Rob **Type:** Article **ISSN:** 22104224 **Publisher:**

Elsevier B.V **Publication Date:** 2015-12-01 **Total Pages:** 63-72 **Pages:** 63-72 **Volume:** 17 **DOI:**

10.1016/j.eist.2015.07.004 **Notes:** •The paper introduces the special issue on the geography of

sustainability transitions. •It provides an introduction to a recently growing body of literature. •Identifies shared lines of a geography of transitions agenda and shows how each paper contributes to this.

Transition research has recently been criticized to lack of geographically sensitive concepts to address sustainability transitions and environmental innovation processes. This has generated a number of suggestions how space, place and scale can be better incorporated into transitions studies. Moreover, it has led to a quickly growing number of empirical studies that explicitly deal with geographical aspects of transition processes. This special issue takes stock of these recent developments by assembling a set of eight exemplary papers that illustrate the added value of an explicitly geographical perspective on sustainability transitions. The contributions include a conceptual paper, a literature review and six empirical papers that offer representative examples of recent work. Taken together, these contributions testify to the vitality of the emerging research on the geography of sustainability transitions. This introduction to the special issue provides an overview of the special issue and offers suggestions for future research.

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Technological transitions as evolutionary reconfiguration processes: a multi-level

perspective and a case-study

Research policy

Author: Geels, Frank W. **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2002-12-01 **Total Pages:** 1257-1274 **Pages:** 1257-1274 **Volume:** 31 **Issue:** 8 **DOI:** 10.1016/S0048-7333(02)00062-8 **Notes:** This paper addresses the question of how technological transitions (TT) come about? Are there particular patterns and mechanisms in transition processes? TT are defined as major, long-term technological changes in the way societal functions are fulfilled. TT do not only involve changes in technology, but also changes in user practices, regulation, industrial networks, infrastructure, and symbolic meaning or culture. This paper practices 'appreciative theory' [R.R. Nelson, S.G. Winter, An Evolutionary Theory of Economic Change, Bellknap Press, Cambridge, MA, 1982] and brings together insights from evolutionary economics and technology studies. This results in a multi-level perspective on TT where two views of the evolution are combined: (i) evolution as a process of variation, selection and retention, (ii) evolution as a process of unfolding and reconfiguration. The perspective is empirically illustrated with a qualitative longitudinal case-study, the transition from sailing ships to steamships, 1780–1900. Three particular mechanisms in TT are described: niche-cumulation, technological add-on and hybridisation, riding along with market growth.

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Sustainability transitions: An emerging field of research and its prospects

Research policy

Author: Markard, Jochen ; Raven, Rob ; Truffer, Bernhard **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2012-07-01 **Total Pages:** 955-967 **Pages:** 955-967 **Volume:** 41 **Issue:** 6 **DOI:** 10.1016/j.respol.2012.02.013 **Notes:** ► Research on sustainability transitions receives increasing attention in the literature. ► We identify an emerging research community with specific conferences and journals. ► The established concepts and frameworks require further refinement. ► Transition studies can benefit from creating stronger linkages to established strands of research. ► The papers in this special section represent examples for future research in the field. Sustainability oriented innovation and technology studies have received increasing attention over the past 10–15 years. In particular, a new field dealing with “sustainability transitions” has gained ground and reached an output of 60–100 academic papers per year. In this article, we aim to identify the intellectual contours of this emerging field by conducting a review of basic conceptual

frameworks, together with bibliographical analysis of 540 journal articles in the field. It is against this background that we position the six papers assembled in a special section in Research Policy. These papers pave the way for new conceptual developments and serve as stepping-stones in the maturation of sustainability transition studies, by linking with the scholarly literatures of management studies, sociology, policy studies, economic geography, and modeling.

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Analyzing the functional dynamics of technological innovation systems: A scheme of analysis

Research policy

Author: Bergek, Anna ; Jacobsson, Staffan ; Carlsson, Bo ; Lindmark, Sven ; Rickne, Annika **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2008-04-01 **Total Pages:** 407-429 **Pages:** 407-429 **Volume:** 37 **Issue:** 3 **DOI:** 10.1016/j.respol.2007.12.003 **Notes:** Various researchers and policy analysts have made empirical studies of innovation systems in order to understand their current structure and trace their dynamics. However, policy makers often experience difficulties in extracting practical guidelines from studies of this kind. In this paper, we operationalize our previous work on a functional approach to analyzing innovation system dynamics into a practical scheme of analysis for policy makers. The scheme is based on previous literature and our own experience in developing and applying functional thinking. It can be used by policy makers not only to identify the key policy issues but also to set policy goals.

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Deep transitions: Theorizing the long-term patterns of socio-technical change

Environmental innovation and societal transitions

Author: Kanger, Laur ; Schot, Johan **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2019-09 **Total Pages:** 7-21 **Pages:** 7-21 **Volume:** 32 **DOI:** 10.1016/j.eist.2018.07.006 **Notes:** •Deep Transitions are built through successive Great Surges of Development. •This process leads to the creation of a macro-level selection environment called

industrial modernity. •DDT entails the formation of a portfolio of directionality: dominant directions, discontinuous shifts, ever-present variety. •The 2nd DT requires new niches, transitions in single systems, new surge and a transformation of industrial modernity. The contemporary world is confronted by a double challenge: environmental degradation and social inequality. This challenge is linked to the dynamics of the First Deep Transition (Schot, 2016): the creation and expansion of a wide range of socio-technical systems in a similar direction over the past 200–250 years. Extending the theoretical framework of Schot and Kanger (2018), this paper proposes that the First Deep Transition has been built up through successive Great Surges of Development (Perez, 2002), leading to the emergence of a macro-level selection environment called industrial modernity. This has resulted in the formation of a portfolio of directionality, characterized by dominant and durable directions and occasional discontinuous shifts in addition to a continuous variety of alternatives sustained in niches or single systems. This historically-informed view on the co-evolution of single socio-technical systems, complexes of systems and industrial modernity has distinctive implications for policy-making targeted at resolving the current challenges.

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Three frames for innovation policy: R&D, systems of innovation and transformative change

Research policy

Author: Schot, Johan ; Steinmueller, W. Edward **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V

Place of Publication: AMSTERDAM **Publication Date:** 2018-11-01 **Total Pages:** 1554-1567 **Pages:**

1554-1567 **Volume:** 47 **Issue:** 9 **DOI:** 10.1016/j.respol.2018.08.011 **Notes:** •An emergent third framing of transformative innovation policy is distinguished from two earlier framings (R&D; national systems of innovation). •Key features of the third frame are a need for socio-technical system change. •Public policy should focus on anticipation, experimentation, participation, and directionality. •It is argued that it is impossible to address the Sustainable Development Goals through the existing frames. •Transformative innovation policy has practical implications for policy that deserve wider consideration by the innovation studies community. Science, technology and innovation (STI) policy is shaped by persistent framings that arise from historical context. Two established frames are identified as co-existing and dominant in

contemporary innovation policy discussions. The first frame is identified as beginning with a Post-World War II institutionalisation of government support for science and R&D with the presumption that this would contribute to growth and address market failure in private provision of new knowledge. The second frame emerged in the 1980s globalising world and its emphasis on competitiveness which is shaped by the national systems of innovation for knowledge creation and commercialisation. STI policy focuses on building links, clusters and networks, and on stimulating learning between elements in the systems, and enabling entrepreneurship. A third frame linked to contemporary social and environmental challenges such as the Sustainable Development Goals and calling for transformative change is identified and distinguished from the two earlier frames. Transformation refers to socio-technical system change as conceptualised in the sustainability transitions literature. The nature of this third framing is examined with the aim of identifying its key features and its potential for provoking a re-examination of the earlier two frames. One key feature is its focus on experimentation, and the argument that the Global South does not need to play catch-up to follow the transformation model of the Global North. It is argued that all three frames are relevant for policymaking, but exploring options for transformative innovation policy should be a priority.

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[Trends and Directions in Environmental Justice: From Inequity to Everyday Life,
Community, and Just Sustainabilities
Annual Review of Environment and Resources](#)

Author: Agyeman, Julian ; Schlosberg, David ; Craven, Luke ; Matthews, Caitlin **Additional Person Name:** Gadgil, TP ; Gadgil, A **Type:** Article **ISSN:** 15435938 **Publisher:** Annual Reviews **Place of Publication:** PALO ALTO **Publication Date:** 2016-10-17 **Total Pages:** 321-340 **Pages:** 321-340 **Volume:** 41 **Issue:** 1 **DOI:** 10.1146/annurev-environ-110615-090052 **Notes:** This article begins with a review and synthesis of some of the key theories, scholars, case examples, debates, methods, and (multiple) interpretations of environmental justice (EJ), as well as its expansion and globalization. We then look to some newly emerging themes, actions, and strategies for EJ and just sustainabilities. First, we look at the practices and materials of everyday life, illustrated by food and energy movements; second, the ongoing work on community and the importance of identity and attachment, informed by urban planning, food, and

climate concerns; third, the growing interest in the relationship between human practices and communities and nonhuman nature. We also expand on the longstanding interest in just sustainabilities within this movement, illustrated by a wide range of concerns with food, energy, and climate justice. These new areas of work illustrate both recent developments and a set of paths forward for both the theory and practice of EJ.

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Conceptualisations of incumbent firms in sustainability transitions: Insights from
organisation theory and a systematic literature review

Business strategy and the environment

Author: Magnusson, Thomas ; Werner, Viktor **Type:** Article **ISSN:** 09644733 **Publisher:** Wiley **Place of Publication:** HOBOKEN **Publication Date:** 2023-02 **Total Pages:** 903-919 **Pages:** 903-919 **Volume:** 32 **Issue:** 2 **DOI:** 10.1002/bse.3081 **Notes:** Following the tradition of using opposing concepts as a basis for organisational analysis, this article advances a theory-based understanding of incumbent firms in sustainability transitions. Building on seminal transition studies, we propose innovating/defending and collaborating/competing as two useful spectra to describe organisational behaviours in transitions. Presenting the automotive industry as an explanatory case, we show results from a systematic literature review that reveal motives for diverging behaviours. Combining the spectra into a 2 × 2 matrix, we then introduce four conceptualisations to explain the observed motives and behaviours. The conceptualisations are associated with different streams of organisation theory: dynamic capabilities and the resource-based view, resource-dependence theory, neo-institutional theory and theories on organisational learning and path dependence. Referring to organisational ambidexterity, value configurations and political arenas, we conclude that transitions research can reach a more multifaceted understanding by challenging the prevailing notion of the firm as a coherent actor.

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Geographies of transition—From topical concerns to theoretical engagement: A
comment on the transitions research agenda

Environmental innovation and societal transitions

Author: Binz, Christian ; Coenen, Lars ; Murphy, James T. ; Truffer, Bernhard **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2020-03 **Total Pages:** 1-3 **Pages:** 1-3 **Volume:** 34 **DOI:** 10.1016/j.eist.2019.11.002 **Notes:** •The transition research agenda lacks an elaborate theoretical research agenda on the geographies of transition. •We sketch a theoretical agenda around the scales, places and spaces of transitions. •Transition concepts should explicitly embrace multi-scalar relationships. •Place-making theories could explain how place frames affect transitions. •The spatiality of transitions could be assessed with theories from (evolutionary) economic geography. This viewpoint takes stock with the 'geography of sustainability transitions' (GOST) as it is presented in the transitions research agenda. GOST has been a relatively recent addition to transition theorizing, addressing the need for greater sensitivity and attention to the scales, spatialities, and context-specific factors that shape transitions. In our view, the agenda represents a rather narrow perspective on GOST, which is geared to two empirical themes, namely urban transitions and transitions in developing countries. While these are relevant and topical issues, the section lacks sufficient acknowledgement of the increasing engagement of geographers with transitions studies and the theoretical approaches they have brought to bear on the field. This short commentary thus aims at complementing the agenda paper by outlining a theoretical research agenda that is emerging in this field, framed around the conceptualization of scales, places and spaces in which transitions unfold.

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[Just transition: Integrating climate, energy and environmental justice](#)

[Energy policy](#)

Author: McCauley, Darren ; Heffron, Raphael **Type:** Article **ISSN:** 03014215 **Publisher:** Elsevier Ltd **Place of Publication:** OXFORD **Publication Date:** 2018-08-01 **Total Pages:** 1-7 **Pages:** 1-7 **Volume:** 119 **DOI:** 10.1016/j.enpol.2018.04.014 **Notes:** Just transition is a new framework of analysis that brings together climate, energy and environmental justice scholarships. It was originally coined as a term that was designed to link the promotion of clean technology with the assurance of green jobs. The Paris climate change agreement marks a global acceptance that a more rapid transition is needed to avert disastrous consequences. In response, climate, energy and environmental justice scholarships must unite in assessing where injustices will emerge and how they should be tackled. Just transition offers a

new space for developing an interdisciplinary transition sensitive approach to exploring and promoting (1) distributional, (2) procedural and (3) restorative justice, termed here as a new triumvirate of tenets. •Just transition brings together energy with climate and environmental justice. •Just transition must include but also move beyond the jobs argument. •Energy policy imperatives are reframed within both climate and environmental concerns. •Restorative justice is introduced as too often overlooked as a critical framework.

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[The geography of sustainability transitions: Review, synthesis and reflections on an emergent research field](#)

[Environmental innovation and societal transitions](#)

Author: Hansen, Teis ; Coenen, Lars **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2015-12-01 **Total Pages:** 92-109 **Pages:** 92-109 **Volume:** 17 **DOI:** 10.1016/j.eist.2014.11.001 **Notes:** •Synthesises insights on the importance of place specificity for sustainability transitions. •Highlights different perspectives on the role of the geography of inter-organisational relations. •Points to important future research areas within the field of the geography of sustainability transitions. This review covers the recent literature on the geography of sustainability transitions and takes stock with achieved theoretical and empirical insights. The review synthesises and reflects upon insights of relevance for sustainability transitions following from analyses of the importance of place specificity and the geography of inter-organisational relations. It is found that these contributions focus on the geography of niche development rather than regime dynamics, and that there is an emphasis on understanding the importance of place-specificity at the local level. While there is a wide consensus that place-specificity matters there is still little generalisable knowledge about how place-specificity matters for transitions. Most contributions add spatial sensitivity to frameworks from the transitions literature, but few studies suggest alternative frameworks to study sustainability transitions. To address this, the review suggests promising avenues for future research on the geography of sustainability transitions, drawing on recent theoretical advancements in economic geography.

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Dispossessed by decarbonisation: Reducing vulnerability, injustice, and inequality

in the lived experience of low-carbon pathways

World development

Author: Sovacool, Benjamin K. ; Turnheim, Bruno ; Hook, Andrew ; Brock, Andrea ; Martiskainen, Mari

Type: Article **ISSN:** 0305750X **Publisher:** Elsevier Ltd **Place of Publication:** OXFORD **Publication Date:**

2021-01 **Total Pages:** 105116- **Pages:** 105116- **Volume:** 137 **DOI:** 10.1016/j.worlddev.2020.105116 **Notes:**

•Links four decarbonisation pathways to negative impacts and injustices within communities across Africa and Europe. •Shows how these transitions exacerbate vulnerability and inequality. •Research and policy communities need to account for, and seek to minimize, a broader range of injustices. •Sustainability transitions and decarbonisation pathways must become more egalitarian, fair, and just. This study examines the justice and equity implications of four low-carbon transitions, and it reveals the “lived experiences” of decarbonisation as manifested across Africa and Europe. Based on extensive, original mixed methods empirical research – including expert interviews, focus groups, internet forums, community interviews, and extended site visits and naturalistic observation – it asks: How are four specific decarbonisation pathways linked to negative impacts within specific communities? Relatedly, what vulnerabilities do these transitions exacerbate in these communities? Lastly, how can such vulnerabilities be better addressed with policy? The paper documents a troublesome cohabitation between French wineries and nuclear power, the negative effects on labor groups and workers in Eastern Germany by a transition to solar energy, the stark embodied externalities in electronic waste (e-waste) flows from smart meters accumulating in Ghana, and the precarious exploitation of children involved in cobalt mining for electric vehicle batteries in the Democratic Republic of the Congo. The aims and objectives of the study are threefold: (1) to showcase how four very different vulnerable communities have been affected by the negative impacts of decarbonisation; (2) to reveal tensions and tradeoffs between European transitions and local and global justice concerns; and (3) to inform energy and climate policy. In identifying these objectives, our goal is not to stop or slow down all low-carbon transitions. Rather, the study suggests that the research and policy communities ought to account for, and seek to minimize, a broader range of social and environmental sustainability risks. Sustainability transitions and decarbonisation pathways must become more egalitarian, fair, and just.

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Regioning mission-oriented innovation policy: The articulation of directionality
between federal and regional arenas in the German High-Tech Strategy
Environmental innovation and societal transitions

Author: Priebe, Max ; Herberg, Jeremias **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2024-09 **Total Pages:** 100899- **Pages:** 100899- **Volume:** 52 **DOI:** 10.1016/j.eist.2024.100899 **Notes:** •Innovation policymakers refer to regions as sites of dialogue and learning. •'Regioning' practices move missions between federal and regional arenas. •Regioning creates an interactional space for learning and articulation of directionality. •German innovation policy experiments with regioning practices. •Innovation directions can pluralize, but loose ends may also emerge. Mission-oriented innovation policies (MOIP) do not operate in a vacuum. How missions align with innovation actors, infrastructures and discourses in regional contexts is an ongoing discussion. In this paper, we draw on the case of regional dialogues that aspired to facilitate exchange and learning for the missions of Germany's High-Tech Strategy (HTS). We examine the interactional process of 'regioning' MOIP that draws in diverse publics and concerns, ultimately aiming to create institutional arenas where actors from different levels and scales come together to make sense of missions. More than being explicit objects of innovation policy, regions understood through regioning are an implicit practice of policy. By moving missions between federal and regional arenas, involved actors shape a political space for articulating the directionality of innovation policy.

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Additional reading (module 1)

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Places and Spaces of Sustainability Transitions: Geographical Contributions to an
Emerging Research and Policy Field
European planning studies

Author: Coenen, Lars ; Truffer, Bernhard **Type:** Article **ISSN:** 09654313 **Publisher:** Routledge **Place of Publication:** ABINGDON **Publication Date:** 2012-03 **Total Pages:** 367-374 **Pages:** 367-374 **Volume:** 20 **Issue:** 3 **DOI:** 10.1080/09654313.2012.651802

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[Nature-based solutions for sustainable, resilient, and equitable cities](#)

Type: Book Chapter **Chapter Author:** McPhearson, Timon ; Kabisch, Nadja ; Frantzeskaki, Niki **Book Title:** Edward Elgar Publishing eBooks **ISBN:** 1800376758 **OCLC Number:** 1373015991 **Publisher:** Edward Elgar Publishing Limited **Place of Publication:** United Kingdom **Publication Date:** 2023 **Total Pages:** 1-11 **Pages:** 1-11 **Editor:** Kabisch, Nadja ; Frantzeskaki, Niki ; McPhearson, Timon **DOI:** 10.4337/9781800376762.00008 **Notes:** Nature-based Solutions for Cities brings diverse perspectives from across the globe together to describe the state of the art in advancing nature-based solutions (NBS) for cities. Our goal is to provide a handbook for graduate students, early-career professionals, and emerging and advanced scholars to begin working with NBS in ways that consider multiple perspectives, disciplines, and ways of knowing. Together, the chapters in this book aim at understanding how NBS can be better managed, planned, and engaged with, and to center questions of NBS for whom and for what NBS are planned and implemented in cities. Through chapters led by experts in both global south and north contexts, we describe key knowledge and learning for advancing the interdisciplinary science of NBS in, for, and with cities and discuss the frontiers for next-generation NBS.

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[Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions](#)

[Research policy](#)

Author: Kivimaa, Paula ; Kern, Florian **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2016-02 **Total Pages:** 205-217 **Pages:** 205-217 **Volume:** 45 **Issue:** 1 **DOI:** 10.1016/j.respol.2015.09.008 **Notes:** •The concept 'creative destruction' is applied to study policy mixes for transitions. •The novel analytical framework combines niche support with regime destabilisation. •Destabilising policies imply replacement of rules, actors and technology support. •Low energy policy mixes in Finland and the UK have few destabilising policies. •The positive accumulation of creative and destructive policies could act as a motor. Recently, there has been an increasing interest in policy mixes in innovation studies. While it has long been acknowledged that the stimulation of innovation and technological change involves different types of policy instruments, how such

instruments form policy mixes has only recently become of interest. We argue that an area in which policy mixes are particularly important is the field of sustainability transitions. Transitions imply not only the development of disruptive innovations but also of policies aiming for wider change in socio-technical systems. We propose that ideally policy mixes for transitions include elements of 'creative destruction', involving both policies aiming for the 'creation' of new and for 'destabilising' the old. We develop a novel analytical framework including the two policy mix dimensions ('creation' and 'destruction') by broadening the technological innovation system functions approach, and specifically by expanding the concept of 'motors of innovation' to 'motors of creative destruction'. We test this framework by analysing 'low energy' policy mixes in Finland and the UK. We find that both countries have diverse policy mixes to support energy efficiency and reduce energy demand with instruments to cover all functions on the creation side. Despite the demonstrated need for such policies, unsurprisingly, destabilising functions are addressed by fewer policies, but there are empirical examples of such policies in both countries. The concept of 'motors of creative destruction' is introduced to expand innovation and technology policy debates to go beyond policy mixes consisting of technology push and demand pull instruments, and to consider a wider range of policy instruments combined in a suitable mix which may contribute to sustainability transitions.

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[Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions](#)

[Research policy](#)

Author: Kivimaa, Paula ; Kern, Florian **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2016-02-01 **Total Pages:** 205-217 **Pages:** 205-217 **Volume:** 45 **Issue:** 1 **DOI:** 10.1016/j.respol.2015.09.008 **Notes:** •The concept 'creative destruction' is applied to study policy mixes for transitions. •The novel analytical framework combines niche support with regime destabilisation. •Destabilising policies imply replacement of rules, actors and technology support. •Low energy policy mixes in Finland and the UK have few destabilising policies. •The positive accumulation of creative and destructive policies could act as a motor. Recently, there has been an increasing interest in policy mixes in innovation studies. While it has long been acknowledged that the stimulation of

innovation and technological change involves different types of policy instruments, how such instruments form policy mixes has only recently become of interest. We argue that an area in which policy mixes are particularly important is the field of sustainability transitions. Transitions imply not only the development of disruptive innovations but also of policies aiming for wider change in socio-technical systems. We propose that ideally policy mixes for transitions include elements of 'creative destruction', involving both policies aiming for the 'creation' of new and for 'destabilising' the old. We develop a novel analytical framework including the two policy mix dimensions ('creation' and 'destruction') by broadening the technological innovation system functions approach, and specifically by expanding the concept of 'motors of innovation' to 'motors of creative destruction'. We test this framework by analysing 'low energy' policy mixes in Finland and the UK. We find that both countries have diverse policy mixes to support energy efficiency and reduce energy demand with instruments to cover all functions on the creation side. Despite the demonstrated need for such policies, unsurprisingly, destabilising functions are addressed by fewer policies, but there are empirical examples of such policies in both countries. The concept of 'motors of creative destruction' is introduced to expand innovation and technology policy debates to go beyond policy mixes consisting of technology push and demand pull instruments, and to consider a wider range of policy instruments combined in a suitable mix which may contribute to sustainability transitions.

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[The destabilisation of existing regimes: Confronting a multi-dimensional framework with a case study of the British coal industry \(1913–1967\)](#)

[Research policy](#)

Author: Turnheim, Bruno ; Geels, Frank W. **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2013-12 **Total Pages:** 1749-1767 **Pages:** 1749-1767 **Volume:** 42 **Issue:** 10 **DOI:** 10.1016/j.respol.2013.04.009 **Notes:** Because innovation studies are oriented towards novelty, scholars in this field have paid less attention to the destabilisation of existing regimes. This paper discusses four views on industry destabilisation and presents an encompassing conceptual framework, which addresses interactions between the build-up of external pressures, industry response strategies, and the gradual weakening of commitment to existing regime elements. We

confront the framework with an in-depth longitudinal case study of the British coal industry (1913–1967). Specific conclusions are developed about different degrees of regime inertia, the ebb and flow of external pressures, the relative importance of economic and socio-political pressures, and interactions between them.

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The condition of urban climate experimentation

Sustainability : science, practice, & policy

Author: Bulkeley, Harriet **Type:** Article **ISSN:** 15487733 **Publisher:** Taylor & Francis **Place of Publication:**

Philadelphia **Publication Date:** 2023-12-08 **Volume:** 19 **Issue:** 1 **DOI:** 10.1080/15487733.2023.2188726

Notes: As the trend of urban climate experimentation continues, many accounts now seek to identify how it can be harnessed toward responses of sufficient scale and magnitude for the crises at hand. The imperative is to move beyond experimentation. Yet some authors now suggest that this may not be so straightforward for, they argue, we increasingly inhabit a condition of permanent experimentation. Taking its cue from this premise, this article explores where the condition of experimentation may have emerged from. I trace these roots to the limit points now encountered within ecologically modernist governance-the shifting dynamics of governing authority, the relation between knowledge and policy, how to address indeterminacy, and what progress or improvement looks like in the condition of a climate-changed socio-natural world. Viewed in this light, experimentation, I want to suggest, represents a significant and potentially paradigm-shifting break with established norms and practices concerning the nature of the climate problem. Fundamentally, this line of thought means that it may neither be possible nor even desirable to abandon experimentation and to return to more centralized, controlled, and certain responses for it is from within the difficulties of governing a climate-changing world through this paradigm that experimentation has arisen in the first place. The vital task is instead to understand the politics and possibilities of experimentation for progressive and just urban sustainability.

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Multi-system dynamics and the speed of net-zero transitions: Identifying causal processes related to technologies, actors, and institutions
Energy research & social science

Author: Andersen, Allan Dahl ; Geels, Frank W. **Type:** Article **ISSN:** 22146296 **Publisher:** Elsevier Ltd **Place of Publication:** AMSTERDAM **Publication Date:** 2023-08 **Total Pages:** 103178- **Pages:** 103178- **Volume:** 102 **DOI:** 10.1016/j.erss.2023.103178 **Notes:** Reaching net-zero GHG emission targets will require transitions in all socio-technical systems, including electricity, mobility, heating, and agri-food. While most research focuses on transitions in single systems, it is essential to also investigate multi-system interactions since innovations like electric vehicles, heat pumps, or circular economy initiatives will require interactions between multiple systems. Although extant research acknowledges this topic to some extent, it offers limited understandings of the causal processes underpinning multi-system interaction. Building on multi-system research in the sustainability transitions literature, the paper therefore aims to develop a first inventory of causal processes of multi-system interactions in net-zero transitions, focused on technological, actor, and institutional dimensions. To elaborate and substantiate this contribution, the paper applies a narrative review methodology to identify six causal processes based on integration of insights from relevant social science theories with a multi-system dynamics approach based on the Multi-level Perspective. We illustrate causal processes with examples from the net-zero transition and articulate their implications for the speed of change.

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Managing entrepreneurial and corporate contributions to sustainability transitions
Business strategy and the environment

Author: Schaltegger, Stefan ; Loorbach, Derk ; Horisch, Jacob **Type:** Article **ISSN:** 09644733 **Publisher:** Wiley **Place of Publication:** HOBOKEN **Publication Date:** 2022-04-17 **DOI:** 10.1002/bse.3080

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Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective
Current opinion in environmental sustainability

Author: Geels, Frank W **Type:** Article **ISSN:** 18773435 **Publisher:** Elsevier B.V **Place of Publication:**

OXFORD **Publication Date:** 2019-08-01 **Total Pages:** 187-201 **Pages:** 187-201 **Volume:** 39 **DOI:**

10.1016/j.cosust.2019.06.009 **Notes:** •Socio-technical transitions research is a distinctive approach within the sustainability transformations debate. •Socio-technical transitions involve multi-dimensional struggles between radical niche-innovations and incumbent systems. •The paper reviews criticisms of the Multi-Level Perspective from the sustainability transformation literature and beyond. •It also reviews recent elaborations with regard to seven topics, including politics, culture, incumbent firms, and policy. This article discusses the socio-technical transition literature, particularly the Multi-Level Perspective, which investigates the fundamental changes in (energy, transport, housing, agro-food) systems that are needed to address persistent sustainability problems. The article positions the MLP within the wider academic debate on sustainability transformations, and reviews criticisms and seven recent elaborations of the MLP with regard to: (1) politics and power, (2) cultural discourse and framing struggles, (3) grassroots innovation, (4) multiple transition pathways, (5) incumbent firm resistance and reorientation, (6) destabilization and decline, (7) policy analysis. Mobilizing insights from the wider social sciences, these elaborations have nuanced and differentiated the understanding of socio-technical transitions to sustainability and made the MLP the central pillar of a multi-faceted, cumulative research programme with a broad empirical evidence base.

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[Faster, broader, and deeper! Suggested directions for research on net-zero transitions](#)

[Oxford Open Energy](#)

Author: Andersen, Allan Dahl ; Geels, Frank W ; Coenen, Lars ; Hanson, Jens ; Korsnes, Marius ; Linnerud, Kristin ; Makitie, Tuukka ; Nordholm, Amber ; Ryghaug, Marianne ; Skjolsvold, Tomas ; Steen, Markus ; Wiebe, Kirsten **Type:** Article **ISSN:** 27525082 **Publisher:** Oxford University Press

Publication Date: 2023 **Volume:** 2 **DOI:** 10.1093/ooenergy/oiad007 **Notes:** Abstract The growing attention to the political goal of achieving net-zero emissions by mid-century reflects past failures to alter the trajectory of increasing greenhouse gas (GHG) emissions. As a consequence, the world now needs to decarbonize all systems and sectors at an unprecedented pace. This commentary discusses how the

net-zero challenge presents transition scholarship with four enhanced research challenges that merit more attention: (1) the speed, (2) breadth and (3) depth of transitions as well as (4) tensions and interactions between these. Graphical Abstract Graphical Abstract Governments, cities and companies are increasingly adopting goals of reducing GHG emissions to net-zero by mid-century to limit global warming, but concrete and credible plans to achieve these goals are largely absent. This commentary article suggests directions for research on net-zero transitions that can ultimately inform and support formulation of concrete net-zero plans. We discuss several research topics including how transitions can move faster with attention to both new technology and new social practices and ways of living the variety of systems and sectors, the interactions between them, and the social tensions that can emerge in the face of rapid change.

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Sequence and alignment of external pressures in industry destabilisation:

Understanding the downfall of incumbent utilities in the German energy transition

(1998–2015)

Environmental innovation and societal transitions

Author: Kungl, Gregor ; Geels, Frank W. **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of**

Publication: AMSTERDAM **Publication Date:** 2018-03 **Total Pages:** 78-100 **Pages:** 78-100 **Volume:** 26 **DOI:**

10.1016/j.eist.2017.05.003 **Notes:** •We analyse the destabilisation of the German electricity industry

(1998–2015).•We replicate a multi-dimensional framework that focuses on (techno-economic and

socio-political) pressures and firm-level responses.•We elaborate the role of sequence and alignment of

multiple pressures in industry destabilisation.•We identify specific patterns in the destabilisation

process. This article makes two contributions to the emerging research stream on regime and industry

destabilisation in the transition literature. First, we replicate the multi-dimensional framework developed

by Turnheim and Geels with a more contemporary study that has closer links to sustainability

transitions. Drawing on a wide range of primary and secondary sources, we analyse the destabilisation

of the German electricity industry, which faced multiple external pressures: renewable energy

technologies, nuclear phase-out policy, the financial-economic crisis, and negative public debates.

Second, we elaborate the role of multiple pressures in industry destabilisation, focusing in particular on

their sequence and alignment. We inductively identify patterns such as the 'masking effect' of highly visible macro-shocks, 'perfect storm' pattern, a 'killer blow' effect, and spillover dynamics between external environments.

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[Geographies of mission-oriented innovation policy](#)

[Environmental innovation and societal transitions](#)

Author: Uyarra, Elvira ; Bugge, Markus M. ; Coenen, Lars ; Flanagan, Kieron ; Wanzenböck, Iris **Type:**

Article ISSN: 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:**

2025-09 **Total Pages:** 100970- **Pages:** 100970- **Volume:** 56 **DOI:** 10.1016/j.eist.2025.100970 **Notes:**

•Missions are often framed as spatially blind endeavours, disconnected from the intricate geographies of innovation and the socio-spatial contexts in which they unfold. •Anchoring of missions to place requires the active framing, translation and re-framing of global challenges into locally relevant goals, strategies and actions, and building legitimacy through place-based leadership. •Contextualization of missions in space highlights how place-specific capacities, political processes, and innovation cultures shape implementation. •The politics and scaling of missions demands careful navigation between different spatial levels. The last two decades have seen a rise of mission-oriented innovation policy with greater focus on sustainability challenges and problems as drivers for innovation and industrial policy and building prominently on transition research. Missions are often framed as spatially blind endeavors, disconnected from the intricate geographies of innovation and the socio-spatial contexts in which they unfold. This lack of spatial considerations not only devalues the role of cities and regions as designated sites for policy experimentation and implementation but also limits the societal and democratic legitimacy of missions by insufficiently engaging citizens and local communities. How can a place-based approach to mission policies help identify and tackle wicked problems while promoting transitions? Reflecting on this question, this editorial summarizes and synthesizes the results and key themes emerging from the different contributions that constitute this special issue. It discusses how a more explicit geographical perspective that acknowledges scale, place, and space could address shortcomings of contemporary mission-oriented innovation policies. It concludes, first, that anchoring of missions to place requires the active framing, translation and re-framing of global challenges into locally

relevant goals, strategies and actions, and building legitimacy through place-based leadership. Second, the contextualization of missions in space highlights how place-specific capacities, political processes, and innovation cultures shape implementation. Third, the politics and scaling of missions demands careful navigation between different spatial levels.

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The geography of sustainability transitions: Contours of an emerging theme

Environmental innovation and societal transitions

Author: Truffer, Bernhard ; Murphy, James T. ; Raven, Rob **Type:** Article **ISSN:** 22104224 **Publisher:**

Elsevier B.V **Publication Date:** 2015-12 **Total Pages:** 63-72 **Pages:** 63-72 **Volume:** 17 **DOI:**

10.1016/j.eist.2015.07.004 **Notes:** •The paper introduces the special issue on the geography of

sustainability transitions. •It provides an introduction to a recently growing body of literature. •Identifies shared lines of a geography of transitions agenda and shows how each paper contributes to this.

Transition research has recently been criticized to lack of geographically sensitive concepts to address sustainability transitions and environmental innovation processes. This has generated a number of suggestions how space, place and scale can be better incorporated into transitions studies. Moreover, it has led to a quickly growing number of empirical studies that explicitly deal with geographical aspects of transition processes. This special issue takes stock of these recent developments by assembling a set of eight exemplary papers that illustrate the added value of an explicitly geographical perspective on sustainability transitions. The contributions include a conceptual paper, a literature review and six empirical papers that offer representative examples of recent work. Taken together, these contributions testify to the vitality of the emerging research on the geography of sustainability transitions. This introduction to the special issue provides an overview of the special issue and offers suggestions for future research.

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Innovation and social welfare: A new research agenda

Journal of economic surveys

Author: Castellacci, Fulvio **Type:** Article **ISSN:** 09500804 **Publisher:** Wiley **Place of Publication:** HOBOKEN
Publication Date: 2023-09 **Total Pages:** 1156-1191 **Pages:** 1156-1191 **Volume:** 37 **Issue:** 4 **DOI:**
10.1111/joes.12537 **Notes:** Innovation research is motivated by the understanding that new technologies contribute to address societal challenges and foster welfare. Extant research in the economics of innovation has, however, adopted a narrow definition of social welfare, which focuses on economic performance and material well-being, and that mostly disregards distributional impacts of innovation. This paper critically reviews the concept of social welfare in the economics of innovation literature, and it outlines a new research agenda that will investigate the impacts of innovation on individuals' well-being and aggregate social welfare. The new research program has two major pillars. First, it adopts a broader notion of agents' well-being that comprises also non-economic factors and capabilities alongside income and material wealth. Second, it argues that welfare analyses of innovation must explicitly take into account equity and social justice in addition to efficiency and economic performance. This new research agenda opens up several novel questions for future innovation research and policy-making, pointing to the existence of trade-offs and dilemmas between efficiency and equity, and between short- and long-run impacts of innovation on social welfare.

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[Just transitions for industrial decarbonisation: A framework for innovation, participation, and justice](#)

[Renewable & sustainable energy reviews](#)

Author: Upham, Dr Paul ; Sovacool, Prof Benjamin ; Ghosh, Dr Bipashyee **Type:** Article **ISSN:** 13640321
Publisher: Elsevier **Place of Publication:** OXFORD **Publication Date:** 2022-10-01 **Total Pages:** 112699-
Pages: 112699- **Volume:** 167 **DOI:** 10.1016/j.rser.2022.112699 **Notes:** Here we propose a framework for considering the justice issues of industrial cluster decarbonisation, a pressing challenge confronting many industrialised economies. Industrial clusters are large, multi-point source emitters, users of energy and employers of regional and national significance. In the UK, establishing low carbon industrial clusters is one of several grand challenges of industrial strategy. Theorising the just transition of industrial clusters requires concepts from multiple literatures. We abstract relevant themes from the intersections of the literatures of just transitions, innovation studies and sociotechnical transitions, and

public participation in spatial planning, and illustrate their empirical relevance. The broad themes of our framework are (i) politics, space and institutions, with sub-themes of justice, democracy, financialization; (ii) new processes and procedures, with sub-themes of legal recognition of public concerns, community-based planning, community capacity enhancement and life cycle impact assessment; and (iii) correlates of acceptance and resistance, with sub-themes of environmental values, perceived loss of amenity, pre-existing politics, perceptions of just process and trust in the developer. The framework is intended to both guide the design of just transition processes ex-ante and evaluate these post-hoc.

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Module 2: Digitalization and AI

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[Reframing platform power](#)

[Internet policy review](#)

Author: van Dijck, José ; Nieborg, David ; Poell, Thomas **Type:** Article **ISSN:** 21976775 **Publisher:** Alexander von Humboldt Institute for Internet and Society **Place of Publication:** Berlin **Publication Date:** 2019-06-01 **Total Pages:** 1-18 **Pages:** 1-18 **Volume:** 8 **Issue:** 2 **DOI:** 10.14763/2019.2.1414 **Notes:** This article addresses the problem of platform power by probing current regulatory frameworks' basic assumptions about how tech firms operate in digital ecosystems. Platform power is generally assessed in terms of economic markets in which individual corporate actors harness technological innovations to compete fairly, thereby maximising consumer welfare. We propose three paradigmatic shifts in the conceptualisation of platform power. First, we suggest to expand the notion of consumer welfare to citizen wellbeing, hence addressing a broader scope of platform services' beneficiaries. Second, we recommend considering platform companies as part of an integrated platform ecosystem, acknowledging its interrelational, dynamic structure. And third, we shift attention from markets as level playing fields towards societal platform infrastructures where hierarchies and dependencies are built into their architecture. Reframing platform power may be a necessary condition for updating and integrating current regulatory regimes and policy proposals.

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[Overview of Free Innovation](#)

Type: Book Chapter **Chapter Author:** von Hippel, Eric **Book Title:** Free Innovation **ISBN:** 0262035219 **OCLC Number:** 1169183512 **Publisher:** MIT Press **Place of Publication:** United States **Publication Date:** 2016 **DOI:** 10.7551/mitpress/9780262035217.003.0001 **Notes:** In this book I integrate new theory and new research findings into the framework of a 'free innovation paradigm'; Free innovation involves innovations developed and given away by consumers as a 'free good'; with resulting improvements in social welfare. It is an inherently simple, transaction-free, grassroots innovation process engaged in by tens of millions of people.

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[The platform economy: restructuring the space of capitalist accumulation](#)

[Cambridge journal of regions, economy and society](#)

Author: Kenney, Martin ; Zysman, John **Type:** Article **ISSN:** 17521378 **Publisher:** Oxford University Press **Place of Publication:** UK **Publication Date:** 2020-05-15 **Total Pages:** 55-76 **Pages:** 55-76 **Volume:** 13 **Issue:** 1 **DOI:** 10.1093/cjres/rsaa001 **Notes:** Abstract The platform economy and its leading firms, such as Amazon, Facebook and Google, are reorganising the geography of value creation and capture on both a local and global scale. This article argues that economic geographers have underappreciated the implications of the platform on space. First, we demonstrate the concentration of platform giants in terms of location on the US West Coast and in terms of their market share in various services, such as search, maps and online sales. Platforms are simultaneously intermediaries, two-sided markets, data aggregators and leading users of artificial intelligence (AI). Second, we use a labour taxonomy to demonstrate the extensive reach of these platforms in terms of the labour markets that they serve and shape. To illustrate these changes in the geography of value creation, we present case studies of Amazon and Google Maps to show their effects on the location of economic activity. Third, we elaborate on our contention that platforms are at once intermediaries and data hubs. AI is likely to reinforce the power of these platform leaders because they have the largest data sets, the most computational power, enormous teams of the best AI researchers and vast reservoirs of capital that they can use to make acquisitions. We conclude by identifying areas for future research and calling upon economic geographers to consider the implications of the platform economy in reshaping the space of economic activity.

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[The big stories](#)

Author: Brynjolfsson, Erik **Additional Person Name:** McAfee, Andrew **Type:** Book Chapter **Chapter Author:** Brynjolfsson, E. & McAfee, A. **Book Title:** The second machine age : work, progress, and prosperity in a time of brilliant technologies **Book Author:** Brynjolfsson, Erik **ISBN:** 9780393350647; 9780393239355 **OCLC Number:** 133529622-47bibsys_network; (NO-TrBIB)133529622 **Publisher:** Norton **Place of Publication:** New York **Publication Date:** cop. 2014 **Total Pages:** 306 s. **Pages:** 1-13 **Available At:** UiO HumSam-biblioteket Pensum 303.483 Bry; UiO HumSam-biblioteket Pensum (Ikke til utlån) 303.483 Bry; UiO Informatikkbiblioteket UREAL/INF Boksamling K.4.0 Bry

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[The simple macroeconomics of AI](#)

[Economic policy](#)

Author: Acemoglu, Daron **Type:** Article **ISSN:** 02664658 **Publication Date:** 2024-09-11 **DOI:** 10.1093/epolic/eiae042 **Notes:** SUMMARY This paper evaluates claims about the large macroeconomic implications of new advances in Artificial intelligence (AI). It starts from a task-based model of AI's effects, working through automation and task complementarities. So long as AI's microeconomic effects are driven by cost savings/productivity improvements at the task level, its macroeconomic consequences will be given by a version of Hulten's theorem: Gross Domestic Product (GDP) and aggregate productivity gains can be estimated by what fraction of tasks are impacted and average task-level cost savings. Using existing estimates on exposure to AI and productivity improvements at the task level, these macroeconomic effects appear non-trivial but modest – no more than a 0.66% increase in total factor productivity (TFP) over 10 years. The paper then argues that even these estimates could be exaggerated, because early evidence is from easy-to-learn tasks, whereas some of the future effects will come from hard-to-learn tasks, where there are many context-dependent factors affecting decision-making and no objective outcome measures from which to learn successful performance. Consequently, predicted TFP gains over the next 10 years are even more modest and are predicted to be less than 0.53%. I also explore AI's wage and inequality effects. I show theoretically that even when AI improves the productivity of low-skill workers in certain tasks (without creating new tasks for them), this may increase rather than reduce inequality. Empirically, I find that AI advances are unlikely to increase inequality as much as previous automation technologies because their impact is

more equally distributed across demographic groups, but there is also no evidence that AI will reduce labour income inequality. Instead, AI is predicted to widen the gap between capital and labour income. Finally, some of the new tasks created by AI may have negative social value (such as the design of algorithms for online manipulation), and I discuss how to incorporate the macroeconomic effects of new tasks that may have negative social value.

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[A portrait of AI adopters across countries: Firm characteristics, assets' complementarities and productivity](#)

[OECD Science, Technology and Industry Working Papers](#)

Author: Calvino, Flavio ; Fontanelli, Luca **Type:** Article **Publisher:** OECD Publishing **Publication Date:** 2023-04-11 **Volume:** 2023 **Issue:** 2 **DOI:** 10.1787/0fb79bb9-en **Notes:** This report analyses the use of artificial intelligence (AI) in firms across 11 countries. Based on harmonised statistical code (AI diffuse) applied to official firm-level surveys, it finds that the use of AI is prevalent in ICT and Professional Services and more widespread across large – and to some extent across young – firms. AI users tend to be more productive, especially the largest ones. Complementary assets, including ICT skills, high-speed digital infrastructure, and the use of other digital technologies, which are significantly related to the use of AI, appear to play a critical role in the productivity advantages of AI users.

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[Marketing analytics capability, artificial intelligence adoption, and firms' competitive advantage: Evidence from the manufacturing industry](#)

[Industrial marketing management](#)

Author: Hossain, Md Afnan ; Agnihotri, Raj ; Rushan, Md Rifayat Islam ; Rahman, Muhammad Sabbir ; Sumi, Sumaiya Farhana **Type:** Article **ISSN:** 00198501 **Publisher:** Elsevier **Place of Publication:** NEW YORK **Publication Date:** 2022-10-01 **Total Pages:** 240-255 **Pages:** 240-255 **Volume:** 106 **DOI:** 10.1016/j.indmarman.2022.08.017 **Notes:** Data-driven analytics and artificial intelligence (AI) have become the most crucial aspects of today's industrial marketing management. Although many firms

have embraced analytics and AI strategies, corresponding academic advances have been slow. This research investigates how industrial goods manufacturers sustain their competitive advantage in export markets, convincing buyers in a competitive data-rich business environment. The evidence has been taken from the RMG (readymade garment) industry, one of the largest manufacturing industries significantly attached to the export markets. Utilizing multi-phase research design, the study reveals that firms marketing analytics capability play a vital role in sensing, seizing, and reconfiguring the market, consequently leading to a sustained competitive advantage. The performance of sensing, seizing, and reconfiguring becomes higher for a firm when they adopt AI on the strength of the marketing analytics platform. These findings exhibit the latest avenue of exploration within marketing analytics and AI's academic research paradigm. Further, in practice, managers will be aware of the facts that create resilience in this specific industry context.

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Artificial intelligence and scientific discovery: a model of prioritized search

Research policy

Author: Agrawal, Ajay ; McHale, John ; Oettl, Alexander **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2024-06 **Total Pages:** 104989- **Pages:** 104989- **Volume:** 53 **Issue:** 5 **DOI:** 10.1016/j.respol.2024.104989 **Notes:** We model a key step in the innovation process, hypothesis generation, as the making of predictions over a vast combinatorial space. Traditionally, scientists and innovators use theory or intuition to guide their search. Increasingly, however, they use artificial intelligence (AI) instead. We model innovation as resulting from sequential search over a combinatorial design space, where the prioritization of costly tests is achieved using a predictive model. The predictive model's ranked output is represented as a hazard function. Discrete survival analysis is used to obtain the main innovation outcomes of interest – the probability of innovation, expected search duration, and expected profit. We describe conditions under which shifting from the traditional method of hypothesis generation, using theory or intuition, to instead using AI that generates higher fidelity predictions, results in a higher likelihood of successful innovation, shorter search durations, and higher expected profits. We then explore the complementarity between hypothesis generation and hypothesis testing; potential gains from AI may not be realized without significant investment in testing capacity. We discuss the policy implications.

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Automation and New Tasks: How Technology Displaces and Reinstates Labor

The Journal of economic perspectives

Author: Acemoglu, Daron ; Restrepo, Pascual **Type:** Article **ISSN:** 08953309 **Publisher:** American Economic Association **Place of Publication:** NASHVILLE **Publication Date:** 2019-04-01 **Total Pages:** 3-30 **Pages:** 3-30 **Volume:** 33 **Issue:** 2 **DOI:** 10.1257/jep.33.2.3 **Notes:** We present a framework for understanding the effects of automation and other types of technological changes on labor demand, and use it to interpret changes in US employment over the recent past. At the center of our framework is the allocation of tasks to capital and labor—the task content of production. Automation, which enables capital to replace labor in tasks it was previously engaged in, shifts the task content of production against labor because of a displacement effect. As a result, automation always reduces the labor share in value added and may reduce labor demand even as it raises productivity. The effects of automation are counterbalanced by the creation of new tasks in which labor has a comparative advantage. The introduction of new tasks changes the task content of production in favor of labor because of a reinstatement effect, and always raises the labor share and labor demand. We show how the role of changes in the task content of production—due to automation and new tasks—can be inferred from industry-level data. Our empirical decomposition suggests that the slower growth of employment over the last three decades is accounted for by an acceleration in the displacement effect, especially in manufacturing, a weaker reinstatement effect, and slower growth of productivity than in previous decades.

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Generative AI at Work

The Quarterly journal of economics

Author: Brynjolfsson, Erik ; Li, Danielle ; Raymond, Lindsey **Type:** Article **ISSN:** 00335533 **Publisher:** Oxford Univ Press **Place of Publication:** CARY **Publication Date:** 2025-05-01 **Total Pages:** 889-942 **Pages:** 889-942 **Volume:** 140 **Issue:** 2 **DOI:** 10.1093/qje/qjae044 **Notes:** We study the staggered introduction of a generative AI-based conversational assistant using data from 5,172 customer-support agents. Access to AI assistance increases worker productivity, as measured by issues resolved per hour, by 15% on average, with substantial heterogeneity across workers. The effects vary significantly across different

agents. Less experienced and lower-skilled workers improve both the speed and quality of their output, while the most experienced and highest-skilled workers see small gains in speed and small declines in quality. We also find evidence that AI assistance facilitates worker learning and improves English fluency, particularly among international agents. While AI systems improve with more training data, we find that the gains from AI adoption are largest for moderately rare problems, where human agents have less baseline experience but the system still has adequate training data. Finally, we provide evidence that AI assistance improves the experience of work along several dimensions: customers are more polite and less likely to ask to speak to a manager.

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[Are they coming for us? Industrial robots and the mental health of workers](#)

[Research policy](#)

Author: Abeliatsky, Ana Lucia ; Beulmann, Matthias ; Prettnner, Klaus **Type:** Article **ISSN:** 00487333

Publisher: Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2024-04 **Total Pages:** 104956-

Pages: 104956- **Volume:** 53 **Issue:** 3 **DOI:** 10.1016/j.respol.2024.104956 **Notes:** How does the increasing

use of robots affect the mental health of workers? To investigate this question, we combine individual

mental health data from the German Socioeconomic Panel with data on the stock of robots in 14

manufacturing sectors provided by the International Federation of Robotics for the period 2002–2018.

Using mediation analysis and an instrumental variable approach, we find that higher robot intensity is

associated with deteriorating mental health, an effect that is mainly driven by worries about job security

and a lower sense of achievement on the job. A heterogeneity analysis reveals that higher robot

intensity has particularly severe negative effects on the mental health of workers close to retirement, in

low-skilled occupations and performing routine jobs. Women and men are affected similarly, as are

workers of all educational levels. Our results indicate the presence of hidden (health) costs of

automation that policymakers need to address. •We investigate the effect of automation on the mental

health of workers in Germany. •To do so, we apply a mediation analysis and an instrumental variable

approach. •Higher robot intensity is associated with deteriorating mental health. •Worries about job

security and feelings of achievement are mediators of the effect. •A heterogeneity analysis reveals

crucial differences across groups. •Workers who are older, low skilled or in routine intensive jobs are

affected most.

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The digital transformation of innovation and entrepreneurship: Progress,
challenges and key themes

Research policy

Author: Nambisan, Satish ; Wright, Mike ; Feldman, Maryann **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier BV **Publication Date:** 2019-10 **Total Pages:** 103773- **Pages:** 103773- **Volume:** 48 **Issue:** 8 **DOI:** 10.1016/j.respol.2019.03.018 **Notes:** 0048-7333

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Policy mixes for sustainability transitions: New approaches and insights through
bridging innovation and policy studies

Research policy

Author: Kern, Florian ; Rogge, Karoline S. ; Howlett, Michael **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2019-12-01 **Total Pages:** 103832- **Pages:** 103832- **Volume:** 48 **Issue:** 10 **DOI:** 10.1016/j.respol.2019.103832 **Notes:** There has been an increasing interest in science, technology and innovation policy studies in the topic of policy mixes. While earlier studies conceptualised policy mixes mainly in terms of combinations of instruments to support innovation, more recent literature extends the focus to how policy mixes can foster sustainability transitions. For this, broader policy mix conceptualisations have emerged which also include considerations of policy goals and policy strategies; policy mix characteristics such as consistency, coherence, credibility and comprehensiveness; as well as policy making and implementation processes. It is these broader conceptualisations of policy mixes which are the subject of the special issue introduced in this article. We aim at supporting the emergence of a new strand of interdisciplinary social science research on policy mixes which combines approaches, methods and insights from innovation and policy studies to further such broader policy mix research with a specific focus on fostering sustainability transitions. In this article we introduce this topic and present a bibliometric analysis of the literature on policy mixes in both fields as well as their emerging connections. We also introduce five major themes in the policy mix literature and summarise the contributions made by the articles in the special issue to these: methodological advances; policy making and implementation; actors and agency; evaluating policy mixes; and the co-evolution of policy mixes and socio-technical systems. We conclude by summarising key insights for policy making.

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Challenge-Driven Innovation Policy: Towards a New Policy Toolkit

Journal of industry, competition and trade

Author: Mazzucato, Mariana ; Kattel, Rainer ; Ryan-Collins, Josh **Type:** Article **ISSN:** 15661679 **Publisher:** Springer US **Place of Publication:** New York **Publication Date:** 2020-06-01 **Total Pages:** 421-437 **Pages:** 421-437 **Volume:** 20 **Issue:** 2 **DOI:** 10.1007/s10842-019-00329-w **Notes:** Policy makers are increasingly embracing the idea of using industrial and innovation policy to tackle the 'grand challenges' facing modern societies. This article argues that through well-defined goals, or more specifically 'missions', that are focused on solving important societal challenges, policymakers have the opportunity to determine the direction of growth by making strategic investments across many different sectors and nurturing new industrial landscapes, which the private sector can develop further, and as a result induce cross-sectoral learning and increase macroeconomic stability. This 'mission-oriented' approach to industrial policy is not about 'top down' planning by an overbearing state; it is about providing a direction for growth and increasing business expectations about future growth areas and catalysing activity that otherwise would not happen. It is not about de-risking and levelling the playing field, nor about supporting more competitive sectors over less since the market does not always 'know best' but tilting the playing field in the direction of the desired societal goals, such as the sustainable development goals. To achieve this requires a different policy framework, what we call the 'ROAR' framework, which involves strategic thinking about the desired direction of travel (Routes), the structure and capacity of public sector Organisations , the way in which policy is Assessed and the incentive structure for both private and public sectors (Risks and Rewards). The article argues that if we want to take grand challenges such as the SDGs seriously as policy goals, market shaping should become the over-arching approach followed in various policy fields.

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Perspectives on innovation processes

The Academy of Management annals

Author: Garud, Raghu ; Tuertscher, Philipp ; Van De Ven, Andrew H. **Type:** Article **ISSN:** 19416520 **Publisher:** Acad Management **Place of Publication:** BRIARCLIFF MANOR **Publication Date:** 2013-06-01 **Total Pages:** 775-819 **Pages:** 775-819 **Volume:** 7 **Issue:** 1 **DOI:** 10.1080/19416520.2013.791066 **Notes:**

Innovation is often thought of as an outcome. In this chapter, we review the literatures on innovation processes pertaining to the invention, development, and implementation of ideas. In particular, we explore how these processes unfold within firms, across multi-party networks, and within communities. Moreover, we identify four different kinds of complexities associated with innovation processes that we label as evolutionary, relational, temporal, and cultural complexities. While one approach is to manage or control such complexities, we draw attention to literatures that suggest that it is far more productive to harness these complexities for sustaining ongoing innovation. We conclude the chapter by highlighting some areas for future research.

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The transformative capacity of public sector organisations in sustainability transitions

Environmental innovation and societal transitions

Author: Borrás, Susana ; Haakonsson, Stine ; Hendriksen, Christian ; Gerli, Francesco ; Poulsen, René Taudal ; Pallesen, Trine ; Somavilla Croxatto, Lucas ; Kugelberg, Susanna ; Larsen, Henrik **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2024-12 **Total Pages:** 100904- **Pages:** 100904- **Volume:** 53 **DOI:** 10.1016/j.eist.2024.100904 **Notes:** •Green sustainability transitions require path-break transformations. •We review the literature for clues about the concept transformative capacity of public sector organisations (PSOs). •We identify strengths and weaknesses in the literature, extracting key insights. •We develop a higher-order conceptual framework about the transformative capacity of PSOs. •Our framework highlights the interaction between PSOs' roles, resources, and abilities when enacting path-breaking change agency. •We argue that understanding those interactions is crucial for building capacity in PSOs and accelerating transformative change. Public sector organisations (PSOs) such as municipalities, regulatory bodies, and public utilities are key actors in sustainability transitions. However, the conceptualisation of their transformative capacity is underdeveloped, as several strands of literature pay attention to the topic but remain disjointed. The article takes stock of the literature, reviewing the strengths and weaknesses of the main approaches. Building from there, the article proposes a higher-order holistic conceptual framework based on three constitutive elements: roles, resources, and abilities. We conceptualise the

transformative capacity of a public sector organisation as the interaction between its roles, resources, and abilities in the enactment of its transformative agency. This framework offers a granular analytical approach for future empirical studies, acknowledging the diversity of PSOs and sustainability transitions pathways. It also offers practical clues for more targeted efforts to build transformative capacity in PSOs, which is crucial for accelerating transitions.

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Economic Policy for Artificial Intelligence

Innovation policy and the economy

Author: Agrawal, Ajay ; Gans, Joshua ; Goldfarb, Avi **Type:** Article **ISSN:** 15313468 **Publisher:** University of Chicago Press **Place of Publication:** Chicago **Publication Date:** 2019-01-01 **Total Pages:** 139-159 **Pages:** 139-159 **Volume:** 19 **Issue:** 1 **DOI:** 10.1086/699935 **Notes:** Recent progress in artificial intelligence (AI)—a general purpose technology affecting many industries—has been focused on advances in machine learning, which we recast as a quality-adjusted drop in the price of prediction. How will this sharp drop in price impact society? Policy will influence the impact on two key dimensions: diffusion and consequences. First, in addition to subsidies and intellectual property (IP) policy that will influence the diffusion of AI in ways similar to their effect on other technologies, three policy categories—privacy, trade, and liability—may be uniquely salient in their influence on the diffusion patterns of AI. Second, labor and antitrust policies will influence the consequences of AI in terms of employment, inequality, and competition.

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Politics and policy of Artificial Intelligence

The Review of policy research

Author: Ulnicane, Inga ; Erkkilä, Tero **Type:** Article **ISSN:** 1541132X **Publisher:** Wiley **Place of Publication:** HOBOKEN **Publication Date:** 2023-09 **Total Pages:** 612-625 **Pages:** 612-625 **Volume:** 40 **Issue:** 5 **DOI:** 10.1111/ropr.12574 **Notes:** While recent discussions about Artificial Intelligence (AI) as one of the most powerful technologies of our times tend to portray it as a predominantly technical issue, it also has

major social, political and cultural implications. So far these have been mostly studied from ethical, legal and economic perspectives, while politics and policy have received less attention. To address this gap, this special issue brings together nine research articles to advance the studies of politics and policy of AI by identifying emerging themes and setting out future research agenda. Diverse but complementary contributions in this special issue speak to five overarching themes: understanding the AI as co-shaped by technology and politics; highlighting the role of ideas in AI politics and policy; examining the distribution of power; interrogating the relationship between novel technology and continuity in politics and policy; and exploring interactions among developments at local, national, regional and global levels. This special issue demonstrates that AI policy is not an apolitical field that can be dealt with just by relying on knowledge and expertise but requires an open debate among alternative views, ideas, values and interests. 摘要

尽管近期关于人工智能(AI)作为当今时代最强大的技术之一的讨论往往将AI描述为技术问题，但其也具有重大的社会启

Resumen Si bien los debates recientes sobre la inteligencia artificial (IA) como una de las tecnologías más poderosas de nuestro tiempo tienden a presentarla como un problema predominantemente técnico, también tiene importantes implicaciones sociales, políticas y culturales. Hasta ahora, estos han sido estudiados principalmente desde perspectivas éticas, legales y económicas, mientras que la política y las políticas han recibido menos atención. Para abordar esta brecha, este número especial reúne nueve artículos de investigación para avanzar en los estudios de política y políticas de IA mediante la identificación de temas emergentes y el establecimiento de una agenda de investigación futura. Las contribuciones diversas pero complementarias en este número especial hablan de cinco temas generales: entender la IA como coformada por la tecnología y la política; destacando el papel de las ideas en la política y la política de IA; examinar la distribución del poder; interrogar la relación entre la tecnología novedosa y la continuidad en la política y las políticas; y explorar las interacciones entre los desarrollos a nivel local, nacional, regional y mundial. Este número especial demuestra que la política de IA no es un campo apolítico que pueda abordarse simplemente confiando en el conocimiento y la experiencia, sino que requiere un debate abierto entre puntos de vista, ideas, valores e intereses alternativos.

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A framework for mission-oriented innovation policy: Alternative pathways through
the problem–solution space
Science & public policy

Author: Wanzenböck, Iris ; Wesseling, Joeri H ; Frenken, Koen ; Hekkert, Marko P ; Weber, K Matthias

Type: Article **ISSN:** 03023427 **Publisher:** Oxford University Press **Place of Publication:** OXFORD **Publication**

Date: 2020-08-01 **Total Pages:** 474-489 **Pages:** 474-489 **Volume:** 47 **Issue:** 4 **DOI:** 10.1093/scipol/scaa027

Notes: Abstract We aim for a better conceptualization of mission-oriented innovation policy (MIP). Our starting point is an analytical decomposition of societal problems and innovative solutions based on three dimensions of wickedness: (1) contestation; (2) complexity; and (3) uncertainty. We argue that both problems and solutions can be divergent (contested, complex, and uncertain) or convergent (uncontested, well-defined, and informed). Based on the resulting problem–solution typology, we suggest a process-oriented view on MIP and discuss three alternative pathways along which convergence between problems and solutions can be achieved to come from wicked problems to legitimate solutions. We illustrate these pathways using examples for different societal problems related to health (smoking bans), security (CCTV), and energy (wind turbines). For policy makers, locating a societal challenge in this problem–solution space, and implementing policy strategies to achieve problem and solution convergence, is expected to accelerate both the legitimacy of a mission and the resulting solutions.

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EU AI sovereignty: for whom, to what end, and to whose benefit?

Journal of European public policy

Author: Mugge, Daniel **Type:** Article **ISSN:** 13501763 **Publisher:** Routledge **Place of Publication:**

ABINGDON **Publication Date:** 2024-08-02 **Total Pages:** 2200-2225 **Pages:** 2200-2225 **Volume:** 31 **Issue:** 8

DOI: 10.1080/13501763.2024.2318475 **Notes:** EU policy emphasises the need for digital sovereignty, also in artificial intelligence (AI). But because such 'AI sovereignty' could be used for diverse and even conflicting goals, it obscures the tensions that actual EU AI strategy entails. Conceptually, this article proposes three central trade-offs: first, does AI sovereignty pit the EU against other major AI powers, or rather citizens against large tech companies? Second, is AI sovereignty meant to boost the EU's

position in a putative AI race, or is it a means to defy this competitiveness-logic, instead? And third, is EU AI sovereignty primarily meant to benefit European citizens, or does it embrace a global responsibility? The empirical analysis then maps the EU Commission's AI strategy since 2018 and the EU AI Act negotiations onto these three dimensions. It reveals that EU AI policy prioritises jurisdictional independence over citizens sovereignty, that it embraces a global AI race logic, and that it largely neglects its impact on people beyond the EU. This orientation of EU AI sovereignty resonates with and feeds into rising geo-economic tensions. But it would underestimate the importance of public policy to assume that it flowed naturally from technological transformations, rather than from political choices.

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[Are AI existential risks real—and what should we do about them?](#)

Author: Mark MacCarthy **Type:** Website **Publisher:** Brookings **Publication Date:** 2025

[Link \(brookings.edu\)](https://brookings.edu)

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[Anatomy of an AI System](#)

Author: Crawford, Kate and Vladan Joler **Type:** Website **Publication Date:** 2018

[Link \(anatomyof.ai\)](https://anatomyof.ai)

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Additional reading (module 2)

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[China's catching-up in artificial intelligence seen as a co-evolution of corporate and national innovation systems](#)

[Research policy](#)

Author: Lundvall, Bengt-Åke ; Rikap, Cecilia **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2022-01 **Total Pages:** 104395- **Pages:** 104395- **Volume:** 51 **Issue:** 1 **DOI:** 10.1016/j.respol.2021.104395 **Notes:** •Presents Freeman's ideas on technological

revolutions changing the world order. •Explores China's National Innovation System AI catching-up. •Introduces Corporate innovation system (CIS) concept. •Compares Alibaba and Tencent CIS with those of Google, Amazon and Microsoft. •Discusses co-evolution of China's NIS and tech giants' CIS. Inspired by Christopher Freeman's work on how radical technical change opens up for shifts in world leadership and on the role of innovation systems in this process, this paper explores China's emergence as a lead country in artificial intelligence as reflecting a co-evolution of Corporate and National Innovation Systems. Taking Freeman's (1987) work on Japan as our lead, we focus on the domestic interaction within and on the openness of China's national innovation system. To follow up on his prediction of the increasing importance of big companies as network leaders, we introduce the concept "corporate innovation system" with special attention to two Chinese tech giants: Alibaba and Tencent.

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Artificial intelligence adoption in a professional service industry: A multiple case study

Technological forecasting & social change

Author: Yang, Jiaqi ; Blount, Yvette ; Amrollahi, Alireza **Type:** Article **ISSN:** 00401625 **Publisher:** Elsevier Inc **Place of Publication:** NEW YORK **Publication Date:** 2024-04 **Total Pages:** 123251- **Pages:** 123251- **Volume:** 201 **DOI:** 10.1016/j.techfore.2024.123251 **Notes:** This study explores the factors influencing AI adoption in professional service firms. Grounded in the Technological-Organizational-Environmental (TOE) framework, we employed a qualitative, multiple case study approach, investigating three auditing firms of varying sizes through interviews and secondary document reviews. Our findings reveal six factors influencing AI adoption, including technology affordances and constraints, the firm's innovation management approaches and AI readiness, the competition environment, and the regulatory environment. Noteworthy, these factors vary significantly among the three firms. Larger firms, often operating in an environment with high AI penetration, primarily perceive the operating affordance of AI rather than marketing affordance. This means their AI adoption encompasses greater scale and depth than smaller firms. However, this expansive adoption exposes them to a widening gap in regulatory frameworks, hindering AI adoption. Moreover, smaller firms are characterized by weaker AI readiness,

positioning them disadvantageously to mitigate the constraints imposed by AI. This study contributes to existing literature by offering a more holistic perspective on AI adoption in professional services. •The motivation to adopt AI is influenced by different factors depending on firm size. •AI affordances are superficial to small firms, causing low adoption and usage. •Large firms are resourceful to remove AI constraints, facilitating adoption. •Large firms have established and structural organization context to adopt AI. •Small firms are driven by competition but large firms are constrained by regulation.

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Critical Success Factors in a multi-stage adoption of Artificial Intelligence: A

Necessary Condition Analysis

[Journal of engineering and technology management](#)

Author: Solaimani, Sam ; Swaak, Lucas **Type:** Article **ISSN:** 09234748 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2023-07 **Total Pages:** 101760- **Pages:** 101760- **Volume:** 69 **DOI:** 10.1016/j.jengtecman.2023.101760 **Notes:** Notwithstanding the widespread publicity, Artificial Intelligence (AI) adoption has remained relatively limited. One important reason is a lack of insight into critical factors in the adoption process. This study reviews the literature on AI and several similar technologies to identify success factors and employs Necessary Condition Analysis (NCA) to empirically assess the criticality of the identified factors across various stages of adoption. The findings evidence the necessity of performance expectancy, top management support, technical competencies and resources, perceived ease of use, organizational compatibility, and trading partner leverage with varying levels of criticality across various stages of AI adoption. •Adoption of Artificial Intelligence (AI) is dependent on the firms' focus on the 'right' factors. •A list of success factors relevant to the adoption of different technologies in general and AI in specific are collected. •The criticality of the success factors is empirically measured applying the Critical Condition Analysis (NCA). •The Critical Success Factors are ranked based on their relative criticality across various stages of AI adoption. •The relative differences in the criticality of factors in various adoption stages are explained.

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Exploring artificial intelligence adoption in public organizations: a comparative case study

Public management review

Author: Neumann, Oliver ; Guirguis, Katharina ; Steiner, Reto **Type:** Article **ISSN:** 14719037 **Publisher:**

Routledge **Place of Publication:** ABINGDON **Publication Date:** 2024-01-02 **Total Pages:** 114-141 **Pages:**

114-141 **Volume:** 26 **Issue:** 1 **DOI:** 10.1080/14719037.2022.2048685 **Notes:** Despite the enormous

potential of artificial intelligence (AI), many public organizations struggle to adopt this technology.

Simultaneously, empirical research on what determines successful AI adoption in public settings

remains scarce. Using the technology organization environment (TOE) framework, we address this gap

with a comparative case study of eight Swiss public organizations. Our findings suggest that the

importance of technological and organizational factors varies depending on the organization's stage in

the adoption process, whereas environmental factors are generally less critical. Accordingly, this study

advances our theoretical understanding of the specificities of AI adoption in public organizations

throughout the different adoption stages.

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Organizational Implementation of AI: Craft and Mechanical Work

California management review

Author: Hopf, Konstantin ; Müller, Oliver ; Shollo, Arisa ; Thiess, Tiemo **Type:** Article **ISSN:** 00081256

Publisher: SAGE Publications **Place of Publication:** Los Angeles, CA **Publication Date:** 2023-11-01 **Total**

Pages: 23-47 **Pages:** 23-47 **Volume:** 66 **Issue:** 1 **DOI:** 10.1177/00081256231197445 **Notes:** Recent years

have brought major technological breakthroughs in artificial intelligence (AI), and firms are expected to

invest nearly \$98 B in 2023. However, many AI projects never leave the pilot phase, and many

companies have difficulties extracting value from their AI initiatives. To explain this contradiction, this

article reports on a study of 55 projects implementing AI in organizations. It shows that organizational

challenges in implementing AI projects are a result of a paradoxical tension created by two different

perspectives on data science work: craft and mechanical work. Executives, managers, and data

scientists should actively manage this tension to enable and sustain value creation through AI.

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The Productivity J-Curve: How Intangibles Complement General Purpose

Technologies

American economic journal. Macroeconomics

Author: Brynjolfsson, Erik ; Rock, Daniel ; Syverson, Chad **Type:** Article **ISSN:** 19457707 **Publisher:** American Economic Association **Place of Publication:** NASHVILLE **Publication Date:** 2021-01-01 **Total Pages:** 333-372 **Pages:** 333-372 **Volume:** 13 **Issue:** 1 **DOI:** 10.1257/mac.20180386 **Notes:** General purpose technologies (GPTs) like AI enable and require significant complementary investments. These investments are often intangible and poorly measured in national accounts. We develop a model that shows how this can lead to underestimation of productivity growth in a new GPTs early years and, later, when the benefits of intangible investments are harvested, productivity growth overestimation. We call this phenomenon the Productivity J-curve. We apply our method to US data and find that adjusting for intangibles related to computer hardware and software yields a TFP level that is 15.9 percent higher than official measures by the end of 2017.

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Artificial intelligence, firm growth, and product innovation

Journal of financial economics

Author: Babina, Tania ; Fedyk, Anastassia ; He, Alex ; Hodson, James **Type:** Article **ISSN:** 0304405X **Publisher:** Elsevier B.V **Place of Publication:** LAUSANNE **Publication Date:** 2024-01 **Total Pages:** 103745- **Pages:** 103745- **Volume:** 151 **DOI:** 10.1016/j.jfineco.2023.103745 **Notes:** We study the use and economic impact of AI technologies. We propose a new measure of firm-level AI investments using employee resumes. Our measure reveals a stark increase in AI investments across sectors. AI-investing firms experience higher growth in sales, employment, and market valuations. This growth comes primarily through increased product innovation. Our results are robust to instrumenting AI investments using firms' exposure to universities' supply of AI graduates. AI-powered growth concentrates among larger firms and is associated with higher industry concentration. Our results highlight that new technologies like AI can contribute to growth and superstar firms through product innovation.

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The determinants of AI innovation across European firms

Research policy

Author: Igna, Ioana ; Venturini, Francesco **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2023-03-01 **Total Pages:** 104661- **Pages:** 104661- **Volume:** 52 **Issue:** 2 **DOI:** 10.1016/j.respol.2022.104661 **Notes:** Using patent data for a panel sample of European companies between 1995 and 2016 we explore whether the inventive success in Artificial Intelligence (AI) is related to earlier firms' innovation in the area of Information and Communication Technology (ICT), and identify which company characteristics and external factors shape this performance. We show that AI innovation presents strong dynamic returns (learning effects) and benefits from complementarities with knowledge earlier developed in the area of network and communication technologies, high-speed computing and data analysis, and more recently cognition and imaging. AI patent productivity increases with the scale of firm innovation, and is lower for companies with narrow technological competences. There is evidence of knowledge spillovers from ICT innovators to AI innovators, but this effect is confined to the frontier firms of the new technological field. Our findings suggest that, with the take-off of the new technology, the technological lead of top AI innovators has increased due to the accumulation of internal competences and the expanding knowledge base. These trends help explain the concentration process of the world's data market. •AI innovation is developed by the most productive ICT firms. •Network, high-speed computing & cognition technologies are antecedents of AI. •AI patent productivity depends on internal competencies and dynamic returns.

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Automation, workers' skills and job satisfaction

PloS one

Author: Schwabe, Henrik ; Castellacci, Fulvio **Type:** Article **ISSN:** 19326203 **Publisher:** Public Library Science **Place of Publication:** SAN FRANCISCO **Publication Date:** 2020-11-30 **Total Pages:** e0242929- **Pages:** e0242929- **Volume:** 15 **Issue:** 11 **DOI:** 10.1371/journal.pone.0242929 **Notes:** When industrial robots are adopted by firms in a local labor market, some workers are displaced and become unemployed. Other workers that are not directly affected by automation may however fear that these new technologies might replace their working tasks in the future. This fear of a possible future

replacement is important because it negatively affects workers' job satisfaction at present. This paper studies the extent to which automation affects workers' job satisfaction, and whether this effect differs for high- versus low-skilled workers. The empirical analysis uses microdata for several thousand workers in Norway from the Working Life Barometer survey for the period 2016–2019, combined with information on the introduction of industrial robots in Norway from the International Federation of Robotics. Our identification strategy exploits variation in the pace of introduction of industrial robots in Norwegian regions and industries since 2007 to instrument workers' fear of replacement. The results indicate that automation in industrial firms in recent years have induced 40% of the workers that are currently in employment to fear that their work might be replaced by a smart machine in the future. Such fear of future replacement does negatively affect workers' job satisfaction at present. This negative effect is driven by low-skilled workers, which are those carrying out routine-based tasks, and who are therefore more exposed to the risks of automation.

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[The smart enough city : putting technology in its place to reclaim our urban future](#)

Author: Green, Ben, **Type:** Book **ISBN:** 9780262352253; 0262352257; 9780262352246; 0262352249
OCLC Number: (CKB)4100000007812393; (MiAaPQ)EBC5734424; (OCoLC)1082522248;
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(IEEE)8671659; (oapen)https://directory.doabooks.org/handle/20.500.12854/78560; (PPN)236075233;
(FR-PaCSA)888666986; (FRCYB888666986)888666986; (oapen)doab78560 **Publisher:** The MIT Press;
MIT Press **Place of Publication:** Cambridge; Cambridge : **Publication Date:** 2019; 2019. **Pages:** 1 online
resource (226 pages) **Edition:** 1 **DOI:** 10.7551/mitpress/11555.001.0001 **Notes:** Why technology is not an
end in itself, and how cities can be “smart enough,” using technology to promote democracy and equity.
The open access edition of this book was made possible by generous funding from the MIT Libraries.
Smart cities, where technology is used to solve every problem, are hailed as futuristic urban utopias.
We are promised that apps, algorithms, and artificial intelligence will relieve congestion, restore
democracy, prevent crime, and improve public services. In The Smart Enough City, Ben Green warns
against seeing the city only through the lens of technology; taking an exclusively technical view of
urban life will lead to cities that appear smart but under the surface are rife with injustice and inequality.

He proposes instead that cities strive to be “smart enough”: to embrace technology as a powerful tool when used in conjunction with other forms of social change—but not to value technology as an end in itself. In a technology-centric smart city, self-driving cars have the run of downtown and force out pedestrians, civic engagement is limited to requesting services through an app, police use algorithms to justify and perpetuate racist practices, and governments and private companies surveil public space to control behavior. Green describes smart city efforts gone wrong but also smart enough alternatives, attainable with the help of technology but not reducible to technology: a livable city, a democratic city, a just city, a responsible city, and an innovative city. By recognizing the complexity of urban life rather than merely seeing the city as something to optimize, these Smart Enough Cities successfully incorporate technology into a holistic vision of justice and equity.

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Harms of AI

NBER Working Paper Series

Author: Acemoglu, Daron **Type:** Article **ISSN:** 08982937 **Publisher:** National Bureau of Economic Research **Place of Publication:** Cambridge **Publication Date:** 2021-09-01 **DOI:** 10.3386/w29247 **Notes:** This essay discusses several potential economic, political and social costs of the current path of AI technologies. I argue that if AI continues to be deployed along its current trajectory and remains unregulated, it may produce various social, economic and political harms. These include: damaging competition, consumer privacy and consumer choice; excessively automating work, fueling inequality, inefficiently pushing down wages, and failing to improve worker productivity; and damaging political discourse, democracy's most fundamental lifeblood. Although there is no conclusive evidence suggesting that these costs are imminent or substantial, it may be useful to understand them before they are fully realized and become harder or even impossible to reverse, precisely because of AI's promising and wide-reaching potential. I also suggest that these costs are not inherent to the nature of AI technologies, but are related to how they are being used and developed at the moment - to empower corporations and governments against workers and citizens. As a result, efforts to limit and reverse these costs may need to rely on regulation and policies to redirect AI research. Attempts to contain them just by promoting competition may be insufficient.

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The roles of the state in the governance of socio-technical systems' transformation

Research policy

Author: Borrás, Susana ; Edler, Jakob **Type:** Article **ISSN:** 00487333 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2020-06-01 **Total Pages:** 103971- **Pages:** 103971- **Volume:** 49 **Issue:** 5 **DOI:** 10.1016/j.respol.2020.103971 **Notes:** The transformative turn of innovation policy has resulted in calls for a more entrepreneurial and directional role of the state. However, the multiple roles that the state might play remains underexplored. This paper studies the embedded role of the state in four distinct modes of governance of socio-technical systems. Using a three-pillar analytical model, the paper examines four illustrative cases: cryptocurrencies, smart cities, automated vehicles, and nuclear power. The paper identifies 13 different roles of the state: observer, warner, mitigator, opportunist, facilitator, lead-user, enabler of societal engagement, gatekeeper, promoter, moderator, initiator, guarantor and watchdog. The conceptualization of these roles serves to understand that the transformative agency of the state is leveraged/constrained by the modes of governance, and that it is also ultimately exercised through specific mixes of roles. •The role of the state in the transformation of socio-technical systems remains underexplored. •We examine 4 illustrative cases: cryptocurrencies, smart cities, automated vehicles, nuclear power. •We identify 13 different roles of the state: observer, warner, mitigator, opportunist, facilitator, lead-user, enabler of societal engagement, gatekeeper, promoter, moderator, initiator, guarantor and watchdog. •The transformative agency of the state is exercised through mixes of roles. •These are leveraged/constrained by the modes of governance where state action is embedded.

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Mission-oriented innovation systems

Environmental innovation and societal transitions

Author: Hekkert, Marko P. ; Janssen, Matthijs J. ; Wesseling, Joeri H. ; Negro, Simona O. **Type:** Article **ISSN:** 22104224 **Publisher:** Elsevier B.V **Place of Publication:** AMSTERDAM **Publication Date:** 2020-03 **Total Pages:** 76-79 **Pages:** 76-79 **Volume:** 34 **DOI:** 10.1016/j.eist.2019.11.011 **Notes:** •The framework Mission-oriented Innovation system is proposed to contribute to the literature on Mission-oriented Innovation Policy. •The relevance of Mission-oriented Innovation system to the transition community is

explained. • Interesting research avenues on Mission-oriented Innovation Systems are outlined. Rather than merely supporting R&D and strengthening innovation systems, the focus of innovation policy is currently shifting towards addressing societal challenges by transforming socio-economic systems. A particular trend within the emerging era of transformative innovation policy is the pursuit of challenge-based innovation missions, such as achieving a 50 % circular economy by 2030. By formulating clear and ambitious societal goals, policy makers are aiming to steer the directionality and adoption of innovation. In the absence of suitable frameworks to understand and enhance the impact of missions, we introduce the notion of Mission-oriented Innovation Systems (MIS). MIS consists of networks of agents and sets of institutions that contribute to the development and diffusion of innovative solutions with the aim to define, pursue and complete a societal mission. We provide several promising research avenues, including how MIS come into existence, how they are governed and how the interactions taking place in a MIS may influence directionality and technological variety.

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