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To cite this article: Markus Steen & Rune Njøs (2018): Green restructuring, innovation, and transitions in Norwegian industry: The role of economic geography, Norsk Geografisk Tidsskrift - Norwegian Journal of Geography, DOI: [10.1080/00291951.2018.1558281](https://doi.org/10.1080/00291951.2018.1558281)

To link to this article: <https://doi.org/10.1080/00291951.2018.1558281>



Published online: 24 Dec 2018.



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## Green restructuring, innovation, and transitions in Norwegian industry: The role of economic geography

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This special issue of *Norsk Geografisk Tidsskrift–Norwegian Journal of Geography* ties in with one of the currently most prominent and challenging issues globally, namely how to address environmental concerns and what the implications are for economic activities. A prominent idea in economic geography since the late 2000s has been that economic restructuring and future industrial opportunities are contingent upon historically developed capabilities and resource bases (e.g. Boschma & Martin 2010). The Norwegian economy is characterized by its stronghold – and dependence – on natural resources such as petroleum (Fagerberg et al. 2009; OECD 2017). What, then, does green restructuring imply in the Norwegian context? What are key drivers and barriers for environmental innovation and industrial transformation in different sectors of the economy? Although there has largely been consensus on the *need* to restructure Norwegian industry, key questions remain on *how* this could or should be achieved. Only time will tell which discourses triumph in the debate, which green-ing initiatives gain traction (and where), and at what pace they progress. This special issue of *Norsk Geografisk Tidsskrift–Norwegian Journal of Geography* is devoted to discussing some initiatives and processes relating to this highly relevant topic.

Recent discussions on, for example, ‘the normative turn’ in innovation studies and economic geography (Schlaile et al. 2017; Tödting & Trippel 2018) coupled with debates on the ‘grand challenge’ of climate change and/or environmental degradation (Coenen et al. 2015) constitute the background to this special issue. More specifically, the special issue addresses one of the most pertinent topics both within and outside academia, namely how to restructure the Norwegian economy in a ‘green’ direction (e.g. OECD 2017). This task requires focusing on past, present, and future economic activity (Steen 2016) and is a challenging, multifaceted, and

complex endeavour of high importance in academia and far beyond. However, it is also a task that requires broad and deep insights, and we believe economic geographers can provide important insight in this regard.

The special issue builds on a plural economic geography approach characterised by a conversational attitude (Barnes & Sheppard 2010), rather than a set of fragmented subdisciplines’ approaches (e.g. ‘relational’, ‘evolutionary’, or ‘institutional’) to economic restructuring and/or innovation. Furthermore, our view is that economic geography benefits greatly from interactions with other fields and literature (Turok et al. 2017). For instance, current discussions on the geography of innovation, innovation systems, and industrial restructuring would benefit from interactions with transitions literature (Tödting & Trippel 2018), while the broader literature on innovation and the narrower (yet highly multidisciplinary) field of sustainability transitions would benefit from insights from economic geography on the spatiality of socio-economic shifts (Simmie 2012; Truffer & Coenen 2012). This is one of several examples of how economic geography can contribute towards better understandings of green restructuring, innovation, and transitions in Norwegian industry. Further examples are provided in the individual articles in this special issue.

*Afewerki, Karlsen, and MacKinnon* (Afewerki et al. 2019) study the development of the first-of-its-kind floating offshore wind project ‘Hywind’ in Norway and Scotland. They investigate how material resources, states (Norway and Scotland), and other actors have influenced development of the project. Contributing to theory on Global Production Networks (GPNs), the authors emphasise the key role of materiality in shaping the strategies of involved actors. They further illustrate how Hywind was initiated in Norway (by Statoil) before being piloted and installed in Scotland. The authors

argue that this was due to state-level strategies and initiatives in Scotland attracting such technology solutions. However, in practice, and due to material circumstances (i.e. physical requirements for technology development and deployment of the technology), the project was largely embedded in Norwegian and international supplier industry. Scottish suppliers were not deeply involved because they lacked industrial capabilities and, according to the authors, this was largely due to the distinct materiality of the technology, in turn 'demonstrating that materiality can have a counterbalancing effect on the state's exercise of power in extractive GPNs' (Afewerki et al. 2019, p. 0). Hence, the article offers insights into power relations, strategies (on different levels and within different geographies), networks, and materiality in the development of green technology.

Similarly, *Sjøtun (2019)* argues for the important role of materiality in green economic restructuring. In his study of the maritime industry in south-western Norway, he investigates the development of the world's first electric car ferry, the Ampere project. Sjøtun anchors his work in transition studies and literature on institutional work, and more specifically the role of demonstration projects in sociotechnical transitions. He argues that the Ampere project has had a distinct and far-reaching impact on Norwegian maritime industry, in that through its role as a highly successful demonstration project it has changed public procurement practices in this market. Sjøtun argues further that this has happened because the Ampere ferry has been "doing" institutional work'. The materiality, organisational practices, and discourses linked to the new ferry solution, as well as the agency of involved actors, has led to real changes among maritime companies, but also to institutional change more broadly (e.g. changes in public procurement policies on regional and national levels).

*Kyllingstad and Rypestøl (2019)* are similarly concerned with the green restructuring of an established industry, namely the process industry in Agder. They link their research to theory on evolutionary economic geography and smart specialisation (in particular, 'entrepreneurial discovery processes'), discussing the role of 'firm-level' and 'system-level' entrepreneurs in industrial restructuring. They analyse the role of the two archetypes in new path development, arguing for the reciprocity between these entrepreneurial types in restructuring processes. In their study of the NCE Eyde industry cluster they find that the ongoing restructuring process towards environmental sustainability was initiated by the cluster facilitator and multinational firms that acted as system-level entrepreneurs in guiding the direction of the restructuring process (i.e. towards more sustainable activities).

*Steen, Faller and Ullern (Steen et al. 2019)* bring further insight into theory on smart specialisation and its policy implications. They explore how the recently introduced regional research and innovation strategy RIS3 has been linked to achieving reductions in greenhouse gas (GHG) emissions in Europe. Contrary to previous regional research and innovation strategy, RIS3 emphasises a place-based approach, with regional development strategies ideally emanating from bottom-up entrepreneurial discovery processes. They employ a mixed-methods research approach with two main components. Based on data from an online database and document studies, they first analyse the nature and content of energy-related priorities in RIS3 across Europe, and then probe the question of regions' abilities to foster renewable energy through three in-depth studies of RIS3 strategies, respectively in Galicia (Spain), Schleswig-Holstein (Germany), and Nordland (Norway). Their findings suggest that a large share of regions across Europe have ambitions to concentrate research and innovation efforts on renewable energy and related technologies. However, the prospects for realising those regional-level ambitions may be hampered by uncondusive policies at the national level.

*Tvedt (2019)* analyses the development of clean technology (cleantech) clusters in San Diego (USA), Dublin (Ireland), and Graz (Austria), by employing a multicase research design. He suggests that cleantech clusters have recently emerged in many industrialised regions and that they are 'heralded as a key solution in the transformation toward a greener economy, with the potential to foster regional economic growth while simultaneously mitigating environmental challenges' (Tvedt 2019, 0). However, he argues that there is a dearth of research into what cleantech clusters are and how they emerge. Tvedt's article suggests that cleantech clusters are the outcome of strategic leadership and place-specific conditions and local capabilities. He employs cluster theory and more recent perspectives on various types of path development to scrutinise the formation and structure of these clusters, and finds that in different ways they represent novelty and/or continuation in regional economies.

The article by *Calignano, Fitjar and Hjertvikrem (Calignano et al. 2019)* ties in with the debate on regional industrial path development. Employing quantitative methods, they analyse the impact of EU's environmental R&D programmes on green restructuring in three Norwegian regions (Rogaland, Hordaland, and the former county of Sør-Trøndelag, now Trøndelag) by exploring which regions participate, the international networks that are developed as part of this, and which actors participate from the three regions. Overall, they find limited involvement of Norwegian firms in EU environmental

programmes, whereas participation is dominated by research establishments. However, there are regional differences in this regard, and an interesting finding is that whereas the participation of research establishments suggests potential for path creation, regions that are dependent on the oil and gas industry have a higher share of firm participation and an enhanced potential for path renewal.

Finally, it should be noted that this truly is a *special* issue. Both the editors and lead authors are early career researchers within the field of economic geography. Thus, we believe that the special issue reflects (though not exhaustively) the research interests and contributions from a new generation of economic geographers in Norway towards the field of green restructuring, innovation, and transitions in Norwegian industry. We hope this special issue can initiate future collaborations and cooperation between economic geography researchers in Norway (and beyond) and their respective research institutions, in order for the field of economic geography to take a more prominent role towards developing knowledge on how to deal with pressing environmental concerns, both locally and globally.

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