

Society & Natural Resources

An International Journal

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/usnr20>

Breaking the Treadmill? Climate Change Policy Networks and the Prospects for Low Carbon Futures in Australia and Finland

Tuomas Ylä-Anttila , Antti Gronow , Aasa Karimo , James Goodman & Francesca da Rimini

To cite this article: Tuomas Ylä-Anttila , Antti Gronow , Aasa Karimo , James Goodman & Francesca da Rimini (2020) Breaking the Treadmill? Climate Change Policy Networks and the Prospects for Low Carbon Futures in Australia and Finland, *Society & Natural Resources*, 33:11, 1380-1398, DOI: [10.1080/08941920.2020.1802540](https://doi.org/10.1080/08941920.2020.1802540)

To link to this article: <https://doi.org/10.1080/08941920.2020.1802540>



© 2020 The Author(s). Published with license by Taylor & Francis Group, LLC



[View supplementary material](#)



Published online: 13 Aug 2020.



[Submit your article to this journal](#)



Article views: 604





[View related articles](#)



[View Crossmark data](#)

Breaking the Treadmill? Climate Change Policy Networks and the Prospects for Low Carbon Futures in Australia and Finland

Tuomas Ylä-Anttila^a , Antti Gronow^a , Aasa Karimo^a, James Goodman^b, and Francesca da Rimini^b

^aFaculty of Social Sciences, University of Helsinki, Helsinki, Finland; ^bFaculty of Arts and Social Sciences, University of Technology Sydney, Sydney, Australia

ABSTRACT

The Treadmill of Production Theory (TPT) argues that in advanced capitalist societies, business organizations, trade unions, and state actors form a constellation that prioritizes economic growth over environmental concerns. We combine this perspective with the Advocacy Coalition Framework (ACF) and use methods of social network analysis, survey data on key organizations in Finland and Australia, and in-depth interviews to map the policy network structures that resist low carbon transitions, and identify potential for change in these structures. We find that a coalition of economic, labor, and governmental organizations resists a low carbon transition in both countries. However, we also find several possible avenues of incremental change through changes in the network structures and the beliefs held by actors in the networks. Theoretically, this suggests that the TPT is correct in its diagnosis of the current situation, but the ACF may be a more fruitful perspective for identifying potential for change.

ARTICLE HISTORY

Received 15 May 2019
Accepted 7 July 2020


KEYWORDS

Advocacy Coalition Framework; climate change; policy change; policy networks; treadmill of production

Introduction

It is now common knowledge that climate change, mainly caused by humans burning fossil fuels for energy, is a serious threat to the well-being of ecosystems and livelihoods of people around the world. Yet commitments for emission reductions by the countries of the world fall drastically short of what climate science deems necessary. Thus, there is a need for more knowledge on the structures of current societies that have led to the persistence of carbon-intensive ways of production and consumption, and better understanding of how these structures could be changed so that low carbon futures become possible. Scholars working with concepts such as the “Techno-Institutional Complex” (Unruh 2000) and “socio-technical regimes” (Rip and Kemp 1998; Geels 2002; Markard, Suter, and Ingold 2016; Köhler et al. 2019) have made significant advances in

CONTACT Tuomas Ylä-Anttila  tuomas.yla-anttila@helsinki.fi  Faculty of Social Sciences, University of Helsinki, P.O. Box 54, 00014 Helsinki, Finland.

 Supplemental data for this article can be accessed on the publisher's website at <https://doi.org/10.1080/08941920.2020.1802540>

© 2020 The Author(s). Published with license by Taylor & Francis Group, LLC

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

highlighting the factors sustaining carbon intensity. However, comparative political science has, as Keohane (2015) argues, done very little to investigate the reasons for similarities and differences between countries in the persistence of carbon-intensive societies and in the potential for transformation (for exceptions, see Harrison and Sundstrom 2010; Lachapelle and Paterson 2013). In this paper, we focus on one piece of the puzzle concerning the political factors that influence climate change mitigation, namely, the networks of actors involved in climate change policy making. In doing so, we draw on two complementary theories: The Treadmill of Production Theory (TPT) from the field of environmental sociology and the Advocacy Coalition Framework (ACF) from the field of political science.

More specifically, we address two research questions:

- RQ1: What kind of advocacy coalitions can we find in climate policy networks that may contribute to the persistence of carbon intensity?
- RQ2: What evidence of potential for change do we find in the policy network structures or in the beliefs held by the actors in the networks?

Climate change policy networks consist of the organizations involved in climate policy making. To date, these networks have mostly been investigated by a handful of national case studies (Ingold 2011; Yun, Ku, and Han 2014; Gronow and Ylä-Anttila 2019). We add a comparative dimension to this literature. Comparative work on policy networks is rare not only in the study of climate change policymaking but also overall (exceptions include Kriesi, Adam, and Jochum 2006; Moschitz and Stolze 2009; Brockhaus and Di Gregorio 2014; Ingold, Fischer, and Cairney 2017; Ylä-Anttila et al. 2018). Scholars often reiterate the need for more comparative work but very few take up this task, one reason being that obtaining comparative network data from more than one country is laborious. Furthermore, we make a unique theoretical contribution by combining TPT and ACF. The ACF, with its focus on collaboration between organizations offers a way of operationalizing the often too abstract macro-level TPT. Moreover, while the TPT directs our attention to structures that uphold the status quo, approaching these structures as coalitions of organizations, as suggested by the ACF, opens the possibility of analyzing those features of coalition structures that exhibit potential for change.

Our research material consists of surveys ($N=122$) and in-depth interviews ($N=31$) of representatives of the most important organizations involved in climate change policy in Finland and Australia. Methodologically, we use techniques of quantitative social network analysis, supported by qualitative analysis of the interviews.

We find that the policy networks in both countries exhibit the kind of structures that TPT would predict: coalitions consisting of governmental, business, and labor organizations that prioritize economic growth over climate change mitigation. We also find pro-climate coalitions, but they are not strong enough to push for the comprehensive systemic transformation that TPT scholars call for. However, we do find several possible avenues of incremental change through changes in network structures and the beliefs held by actors in the network, as the ACF suggests.

Theoretical Framework and Earlier Research

The Treadmill of Production Theory (TPT) argues that in advanced capitalist societies, businesses, trade unions and governmental organizations form a constellation which privileges economic growth over environmental protection (Schnaiberg 1980; Schnaiberg and Gould 1994). Businesses can raise their shareholder value in the long term only by growing. Because workers are dependent on businesses for their jobs and livelihoods, trade unions too are concerned about growth. Politicians and governmental organizations think that without growth both businesses and workers suffer, so they must pursue growth to keep their supporters happy.

One of the enduring questions in the literature on TPT concerns empirical measurability. How is it to be shown whether the constellation of actors prioritizing growth over the environment exists? And if it exists, what organizations exactly does this constellation consist of and how does it operate in practice? (Gould, Pellow, and Schnaiberg 2004; Wright 2004). This problem is related to the fact that the TPT is a macro-level theory, concerned with the overall economic and political features of capitalist societies, and lacks in meso-level operationalization. The TPT sees environmental degradation as a macro phenomenon, caused by another macro phenomenon, the functioning of the capitalist production system. This focus on macro-macro causation (Jepperson and Meyer 2011) also dictates how TPT sees the possibilities for change: overcoming environmental problems requires widespread social mobilization and a complete revolutionary transformation of the capitalist system of production (Wright 2004).

Our contribution is to analyze the macro-level structures posited by the TPT at the meso level: guided by the Advocacy Coalition Framework (ACF, Sabatier 1998; Jenkins-Smith et al. 2014), we examine whether these macro structures are reflected in the structure of inter-organizational policy networks. Combining the two theoretical perspectives and analyzing coalition structures at the meso level has the advantage of seeing possibilities for incremental change that the TPT tends to overlook. Finding out how economic power positions in capitalist societies are manifested in concrete coalition relationships between organizations in policy networks makes it possible to identify where changes in these relationships might take place.

Policy networks consist of governmental, nongovernmental and business organizations that are involved in policy making in a certain policy domain, such as climate change. The ACF argues that organizations form collaborating coalitions based on belief similarity. In other words, organizations that see a policy problem in a similar way will collaborate to achieve their common policy objectives (Jenkins-Smith et al. 2014). Combining the coalition approach with TPT leads us to expect that in environmental policy issues like climate change, businesses and trade unions, supported by governmental organizations, hold similar policy beliefs and collaborate with each other to push for policies that are in accordance with these beliefs. If the TPT is correct, the beliefs that unite these actors are oriented toward prioritizing economic growth over environmental protection.

Previous research on climate change politics in Australia and Finland suggests that this may indeed be the case in both countries. In Australia, previous research has pointed to the industry driven character of climate change policy processes from the

mid-1990s onwards, typified by the strong role of the Australian Industry Greenhouse Network (Crowley 2013), and highlighted the “disproportionate corporate influence over the state” due to the long-established “coal industry-state nexus” (Baer 2016, 194–195). Research has also pointed to the abiding relationship between “discursive and policy hostility” enacted by policymakers that characterizes the interconnected climate and energy debate (Hudson 2017). Moreover, the absence of a unified climate policy seems to ripple out to other sectors affected by climate change. For example, a study of networked governance of disaster risk management and climate change adaptation in Australia described a siloed “culture of fiefdoms” rather than a whole of government approach with embedded climate change researchers and inter-agency communication (Howes et al. 2015). Regarding the role of coalitions in Australian climate policy, Bulkeley (2000), who studied discourse coalitions, found a “resource-based coalition” and a “greenhouse coalition.”

In Finland, earlier research has found that climate change policy has been influenced to a great extent by the heavy export industry, whose lobby has been able to hinder effective climate policymaking by framing climate change in an unfavorable way, arguing that climate change mitigation will hurt economic growth and national competitiveness (Hildén 2011). As a small, export-oriented economy, Finland is reliant on the success of its forest, machinery, and other export-oriented industries, which explains the influence of these industries on policy processes (Kerkkänen 2010). Thus, Teräsväinen (2010) has argued that Finnish climate policy has been first and foremost conceptualized as an energy issue and industry interests have been considered the most important stakeholders. According to Ruostetsaari (2010), environmental NGOs have been marginalized in energy and climate policy making. On the role of coalitions in Finnish climate policy, Gronow and Ylä-Anttila (2019) found a strong pro-economy coalition consisting of industry interests, unions, governmental organizations and key political parties that has dominated decision making. They did not, however, examine Finland using a comparative perspective or analyze the potential for change in the coalition structures.

In sum, we have reasons to expect that industry interests play an important role in climate change policy making in both of our case countries, as TPT would predict. Our aim, however, is not to merely replicate the results of the existing studies but to go beyond them in several ways.

First, the theoretical lens of the TPT directs us toward investigating not only the role of industry lobbies in climate policy processes but also the connections of industry-led organizations to trade unions, governmental organizations and political parties. Climate politics is not likely to be a classic left-right issue, but one where the traditional right and the traditional left may find themselves on the same side. Second, combining TPT with ACF is a contribution to the TPT literature as looking at the concrete collaboration relationships between organizations and their coalitions is a novel way of operationalizing TPT. Third, while studies on climate policy coalitions often find opposing economy and ecology camps (Ingold 2011; Yun, Ku, and Han 2014), such a coalition structure is by no means self-evident or the only possible one. For example, in the US, Kukkonen, Ylä-Anttila, and Broadbent (2017) found three competing coalitions, one defending climate science, another one defending ambitious policy, and a third one opposing both.

This is in line with studies on the influence of the denialist countermovement, which shows that in the US case industry-funded think tanks and conservative political organizations play an important role but trade unions do not (Dunlap and McCright 2015). Gronow et al. (2019), on the other hand, found that in Sweden no clear coalition structure exists in the climate change policy domain, and organizations tend to collaborate widely across organization types and to some extent also across political ideologies. In the light of these findings from other countries, the coalition structures in Australia and Finland are not self-evident but something that ought to be investigated.

Finally, and most importantly, our network perspective and focus on coalitions goes beyond existing research in that it opens up a new perspective on the possibilities of change. We are not only interested in uncovering the policy network structures that may stand in the way of low carbon transitions. We are also interested in analyzing the networks in a way that also shows where changes in the networks, and consequently, in the policy output that they contribute to, might begin. This, we will argue, may occur through changes either in coalition structures or in the beliefs held by the organizations in the policy network.

The coalition structure of the policy network may change through changes in coalition membership. Organizations may defect from one coalition to the other, and if the defecting organizations are influential enough, the coalition dominating the policy subsystem may change, leading, in turn, to policy change (Jenkins-Smith et al. 2014, 197). In our case, an ecologically minded coalition could become more influential due to changes in memberships and/or the coalition privileging economic growth over the environment becoming weaker.

Policy change can also result from changes in the beliefs of actors across the network. ACF scholars see belief change as a result of policy learning, whereby the actors learn from either each other or from external sources and change their beliefs as a result (Jenkins-Smith et al. 2014, 198). Broker organizations, which mediate connections between competing coalitions, can play an important role in belief change. Learning induced by brokers often results in reaching an agreement based on compromises and brokers need to have connections to both competing coalitions to be able to mediate between them. It also helps if the brokers' policy beliefs are moderate compared to the beliefs held by members of competing coalitions (Ingold and Varone 2012). Policy actors that are held to be advocates thus cannot convincingly fulfill the functional requirements of the role of a policy broker. Previous research has pointed out that there is a need for cross-national studies of policy brokering (Ingold and Varone 2012, 340). Our study answers this call by comparing the functional roles of brokers in two countries.

Case Selection, Material and Methods

We analyze two country cases, Finland and Australia. Both are carbon intensive economies and not particularly ambitious in their climate change policies, Australia even less so than Finland. As such, they are good cases for investigating the reasons for the persistence of carbon intensity and the possible avenues for change. But the two countries are also very different, both in terms of their economic structures and political

institutions. The Australian economy is heavily dependent on the production of coal, whereas the carbon intensity of the Finnish economy is mainly due to the high consumption of energy by the forestry, steel, and machinery industries. In general, transformations of energy production are probably more difficult than changes in energy consumption. Thus, replacing the Australian coal industry, especially its coal exports, with renewable energy is more difficult than sourcing the energy of the Finnish energy-intensive export industry from renewable or nuclear sources. Therefore, we expect the coalitions that resist low carbon transitions to be stronger in Australia than in Finland. The political institutions of these countries are also different. Australia is a pluralist and majoritarian country, while Finland is corporatist and more consensual (Lijphart 2012).

If we find the kind of policy network structures predicted by the TPT and ACF in these two countries that differ economically and politically, it is plausible to expect them to exist in other countries as well. The case selection, thus, is not comparative in a classic way of selecting most similar or most different cases (Przeworski and Teune 1970). Rather, we have picked two countries where the phenomenon that we are interested in is likely to manifest itself irrespective of institutional differences.

Finland's emissions, at 11.1 tons CO₂ equivalent per capita per year, are the highest of all Nordic countries and well above the EU average of 7.8 tons (EEA 2018). The Germanwatch climate change performance index, which takes into account not only emissions but also trends in emissions and mitigation policies, has long placed Finland lower than most other EU countries, in the 28th place of the 60 ranked countries on a 10-year average (Germanwatch 2019). In terms of political institutions, Finland is a Nordic consensual corporatist polity, where broad coalition governments are the norm, and tripartite negotiations between business, labor and the state influence policymaking in many sectors, including climate change policy (Lijphart 2012; Gronow et al. 2019).

Australia must be unique in losing at least two prime ministers to its failing climate agenda. Since 1990 a range of policies have been introduced and then withdrawn, reflecting the degree of political rivalry over climate and energy policy, and the background of a booming fossil fuel export sector. The result is a substantial increase in Greenhouse Gas emissions, from 420 mt in 1990, to 543 mt in 2012, and 556 mt in 2018, a rise of 34% since 1990 (UNFCCC 2019; DEE 2018). Australia's per capita emissions are among the highest the world, at 21.5 tons of CO₂ equivalent in 2018 (DEE 2018), and the country stands as a pariah among high-income countries, rated 55 on the Germanwatch climate change performance index (again on a 10 year average, Germanwatch 2019). In terms of political institutions, Australia is a pluralist, majoritarian polity with a lack of cross-party deliberative bargaining. This institutional background has played a role in creating the back and forth in climate policy described above.

Research Material

Our research material is a combination of network surveys and qualitative in-depth interviews. The online surveys were conducted in 2014 (April–May) in Finland and June 2015 to May 2016 in Australia. The surveys were collected as a part of the Comparing Climate Change Policy Networks research project (see compon.org).

The respondents were representatives of the most important organizations involved in climate change policy making in the two countries. To determine which organizations were the important players in the field of climate policy that should be included in each country's sample, we compiled a preliminary list based on previous research, media coverage of climate politics and our knowledge of the climate change policy domain. We then consulted experts representing different types of organizations, who reviewed our list and suggested additions and some omissions. In the final sample, organizations from different sectors of society (e.g., business, government, and NGOs) were represented. The responding person in each organization was in a leadership position in matters related to environmental issues. The response rate was 85.4% for Finland and 45.3% for Australia, with 122 total responses. The survey material was used in the first step of analysis to identify the coalition structures of the climate change policy networks in the two countries.

In addition, we conducted 18 in-depth interviews in Finland (October–November 2015) and 13 in Australia (late May–mid June 2016) with representatives of a subsample of the surveyed organizations, aiming to cover the plurality of different types of organizations and diversity in opinion within the survey population. Guided by the ACF and the knowledge we already had based on our survey responses, the interview questions focused on the role of different groups of actors in the climate policy process. In particular, we asked whether the respondents saw signs of old alliances breaking up and new ones being formed, or new policy positions and beliefs being adopted.

It should be noted that we are interested in not only analyzing the present network structures and policy beliefs but also conducting this analysis in a way that focusses on features of these structures where potential for change can be identified, such as the role of brokers that could initiate change. Our material, nevertheless, is cross-sectional, in the sense that we only have surveys from one point of time and interviews from one, soon after the survey time. Thus, we constrain ourselves to analyzing the potential for change and the change that the informants say they are observing, rather than measuring change that has already occurred in networks or beliefs, which would require longitudinal data.

Methods

The mapping of the coalition structures of the policy networks is based on a survey question on collaboration. The respondents were presented with a list of all other organizations in the target population and asked to check those with whom they collaborate regularly on climate change policy. The resulting network matrix was symmetrized using the maximum criterion, meaning that a collaboration tie between two organizations was coded if either one of them had indicated the existence of collaboration. This method has the advantage of enabling the inclusion of non-respondents in the network analysis, if they were indicated as collaboration partners by respondents.

We measured the perceived influence of each organization by asking all survey participants to indicate which organizations in the roster they think are influential in climate change policy making. This measure, also known as reputational power, assumes that

actors participating in the policy process have the best view of their peers' power (Fischer and Sciarini 2015).

To find the collaborating coalitions, we used the Factions algorithm in the UCInet software package. This algorithm fits the nodes of the network into subgroups that have the highest possible number of ties among each other and a low number of ties to other subgroups. In other words, it makes it possible to find organizations that collaborate with each other but little with other organizations. There are several alternative algorithms for analyzing the subgroup structure of a network. Blockmodelling is a commonly used technique, but we see it as less suitable for identification of advocacy coalitions since it is based on structural equivalence rather than direct links between network nodes. We also experimented with the Louvain algorithm (Blondel et al. 2008) and obtained similar results. We chose the factions algorithm over Louvain because the statistical fit and the interpretability of the results were slightly better.

With the factions algorithm one needs to decide the number of factions the algorithm tries to fit the nodes into. In practice, several solutions (typically with 2, 3, 4, and 5, sometimes with more) are tested, and the best one is chosen based on statistical fit and theoretical interpretability. How good a fit might be is assessed by a measure called proportion of correctness. It is a measure of the total number of "errors," which refers to absent within-faction and present between-faction ties. The factions routine needs to be run several times to see whether the factions are stable or whether there are nodes that could plausibly be placed in two or more factions. We ran the algorithm 25 times for each country and calculated the final proportion of correctness as the mean of the numbers produced by these 25 runs.

In identifying policy brokers previous research has often relied on counting betweenness centrality scores for individual actors (cf. Ingold and Varone 2012). This is a measure of the times that an actor is located between other actors. While betweenness centrality is a useful measure for identifying central nodes in information flows in networks, from the perspective of the Advocacy Coalition Framework it misses an important point: actors should be located between coalitions, not just between any two actors. Therefore, we operationalize brokers as organizations located between coalitions. We do so by identifying organizations that have an equal number of collaboration ties to two or more subgroups. The factions algorithm in UCInet places each actor to a subgroup based on the number of their ties to other actors in that subgroup. If an actor has an equal number of ties to two or more subgroups, the algorithm places it in a different subgroup when it is run several times. We identified these actors as brokers by running the factions algorithm 25 times, and then removed them from the subgroups and analyzed them separately.

The ACF argues that groups of organizations are advocacy coalitions if they fulfill two criteria: engaging on coordination and holding similar beliefs (Weible et al. 2019). In practice, due to limitations of data and methods most ACF scholarship tends to focus on beliefs only and assume that coordination automatically follows. In this study we take both criteria specified by ACF theorists into account, considering groups of organizations to be coalitions only if they both collaborate and exhibit belief similarity (see also Ansell, Reckhow, and Kelly 2009; Gronow and Ylä-Anttila 2019). We do so by complementing the subgroup analysis described above with an analysis of how much beliefs vary within and differ between the subgroups.

To measure the policy beliefs, we began with a set of 21 survey questions. Based on exploratory factor analyses we identified six strongly correlated variables and constructed a summary variable which measures pro-climate beliefs. These six items ranged from the validity of climate science to the desirability of governmental mitigation efforts and the prioritization of mitigation over economic growth. The questions represent what the ACF calls “policy core beliefs,” which tend to bring policy actors together into coalitions. Policy core beliefs include the “basic orientation and value priorities for the policy system” as well as “assessments of the seriousness of the problem, its basic causes and the preferred solutions for addressing it” (Jenkins-Smith et al. 2014, 191).

We calculated the simple sum of all items (as opposed to summing by factor scores) to maximize transparency of interpretation and scaled the final composite variable so that values ranged from 0 to 1 to maximize readability. Cronbach’s alpha for the composite variable is 0.875 for Finland and 0.816 for Australia (for details, see [Supplement Table 1](#)). The main advantage of this approach to measuring beliefs is that it is relatively simple and transparent to the reader, and suitable for identifying similarity within coalitions and belief differences between coalitions. Other approaches exist, such as using a Manhattan distance matrix (Cranmer et al. 2017; Wagner and Ylä-Anttila 2018, 2020), but they are only necessary in situations where the interest lies in belief differences between individual organizations rather than coalitions. We used the means and standard deviations of the composite variable to assess how much beliefs vary within and differ between the coalitions identified through the subgroup analysis based on collaboration ties. Coalitions identified this way may include individual actors that differ from other coalition members in their beliefs to some degree, but the overall variation within coalitions is smaller than in solutions with a different number of factions. The coalitions thus display within-coalition belief homophily.

The qualitative interviews were recorded, transcribed and read through to identify the sections that were the most relevant in light of our research questions, namely, those where the respondents described their understanding about the possibilities of change. These were then coded in more detail using a semi-open coding scheme guided but not completely dictated by the theoretical framework presented above. This means we were particularly looking for and classifying instances where the respondents referred to possibilities of change brought about by changes in the coalition structure or in policy beliefs, but we were also open to including codes for any additional drivers of change that the respondents mentioned.

Results on Policy Network Structures

As predicted by TPT, coalitions that consist of business, labor and government organizations and that privilege economic growth over climate change mitigation are strong in both countries. We do, however, also find evidence that incremental change in coalition structures and beliefs, as pointed to by the ACF, is possible in both countries, but more likely in Finland than in Australia.

To find coalitions, we began by testing subgroup solutions with 2, 3, 4 and 5 factions for each country. We compared different solutions using the final proportion of

Table 1. Densities between coalitions.

Finland	Treadmill	Climate	Government	Australia	Treadmill	Climate	Government
Treadmill	0.66	0.10	0.24	Treadmill	0.19	0.03	0.03
Climate	0.10	0.65	0.12	Climate	0.03	0.49	0.05
Government	0.24	0.12	0.68	Government	0.03	0.05	0.33

correctness, interpretability of the solutions, and the mean the standard deviation of climate policy beliefs within a coalition as criteria. Our goal was to identify subgroups that can be identified as coalitions based on both their collaboration ties and belief similarity, measured by the mean and the standard deviation of beliefs within the subgroups first identified using the factions algorithm. As a result, we divided the network in both countries into three subgroups. The final proportion of correctness for the factions solution in Finland is 0.74 and in Australia 0.73. Adding subgroups beyond this number produced only marginally better proportions of correctness and the subgroups were less dense internally (which indicates less collaboration within the subgroups).

The coalition structures in the two countries look remarkably similar: a Treadmill of Production Coalition (or Treadmill coalition for short), a Pro-Climate Coalition (or Climate Coalition for short) and a Government and Research Coalition. Figures 1 and 2 in the Supplement show the network structure in Finland and Australia, respectively, with the three coalitions distinguished by the different shapes and colors of the nodes. The differences in node sizes indicate the perceived influence of the actors. The density of the whole collaboration network is 0.26 in Finland and 0.11 in Australia. This means that 26% of potential ties in the network are actualized in Finland and 11% in Australia. The internal densities of the subgroups range from 0.65 to 0.68, and the between-group densities from 0.10 to 0.24 in Finland. In Australia in within-group densities range from 0.19 to 0.49 and the between-group densities from 0.03 to 0.05 (see Table 1). These figures indicate a high degree of collaboration within the subgroups and low collaboration between them, which indicates that they are actual coalitions.

Further support to this interpretation comes from an analysis of belief congruence within the coalitions. The differences in the means of pro-climate beliefs between the three coalitions are statistically significant in both countries (Finland: ANOVA $F = 14.26$, $p = 0.000$; Australia ANOVA $F = 25.16$, $p = 0.000$). On a scale from 0 to 1 where 1 is the most pro-climate, in Finland the Treadmill Coalition scores 0.55, the Government and Research coalition 0.76 and the Climate Coalition 0.97. In Australia, the corresponding figures are 0.34, 0.30 and 0.63. Table 2 presents the ANOVA results.

We find a strong Treadmill of Production coalition in both countries (see supplement Table 2 for more detailed information on the coalitions). In Finland business organizations collaborate with the main labor peak organization SAK, the agricultural labor peak organization MTK and two of the three biggest political parties, right wing Kokoomus and the Center Party that represents the interests of the agricultural producers. The opposing Climate Coalition consists exclusively of environmental and other nongovernmental organizations. The third coalition consists of governmental organizations and it includes the Ministry of Environment, governmental research organizations, and government-controlled energy corporations.

Table 2. ANOVA of pro-mitigation beliefs by coalition in Finland and Australia.

	Finland		Australia	
	Mean	sd	Mean	sd
Treadmill	0.554	0.252	0.335	0.033
Climate	0.966	0.042	0.632	0.060
Government	0.723	0.158	0.295	0.209
Brokers between Treadmill and Climate	0.815	0.108	0.551	0.124
Brokers between Treadmill and Government	0.685	0.156	0.266	0.100
Total	0.736	0.201	0.504	0.190
ANOVA	F	sig	F	sig
	6.877	0.000	17.302	0.000

In Australia, the Treadmill Coalition is, similarly, a combination of business, labor and governmental organizations. The business actors include energy producers and associations of energy intensive industries like the coal industry association Minerals Council of Australia and the Australian Aluminum Council. The coalition also includes the labor organizations Australian Workers Union and the Construction, Forestry, Mining, Maritime and Energy Union, as well as governmental organizations like the Council of Australian Governments and the Liberal Party, the most influential organization in the entire network.

Like Finland, The Climate Coalition consists mostly of nongovernmental organizations, for example, the Australian Conservation Foundation and the Australian branches of WWF and Greenpeace, The Green Party, and also some research organizations. The third coalition consists mostly of research organizations. Federal and State government organizations in general, including State Environment Protection Authorities, as well as a few business organizations like the Investor Group on Climate Change, also belong to this coalition.

Overall, the coalition structure of the policy network in both countries clearly reflects the scenario described by the Treadmill of Production Theory. Industry organizations, trade union organizations, key governmental organizations and political parties form a coalition that holds beliefs prioritizing economic growth over ambitious climate change policy. In both countries there is an opposing climate coalition, which consists mostly of Environmental NGOs. In addition to these similarities in advocacy coalitions, there are also differences between the countries in the beliefs that the coalitions hold, Australian organizations being much less favorable to ambitious climate change policies than their Finnish counterparts. In Finland, the Treadmill Coalition is close to the mid-point of the pro-mitigation scale (0.55), whereas the Climate Coalition is almost as pro-mitigation as can be (0.97) and the Government Coalition is in between these two. In Australia, the beliefs held by all of the coalitions are markedly less in favor of pro-mitigation than in Finland: the Climate Coalition is most in favor of climate change mitigation but still scores just slightly above midscale of the variable (0.63) and the Government Coalition is even less in favor of mitigation than the Treadmill Coalition.

Results on Brokers and Potential for Change

In both countries, we found a significant number of organizations are not members of any of the coalitions (33 in Finland and 30 in Australia). These organizations have the same number of links to two or more coalitions, and thus occupy a broker position between these coalitions and hold potential to mediate between them. The other criteria for brokerage that

Table 3. ANOVA of beliefs on green growth by coalition in Finland and Australia.

	Finland		Australia	
	Mean	sd	Mean	sd
Treadmill	3.920	0.900	3.000	1.414
Climate	4.560	0.527	4.830	0.383
Government	3.960	0.841	3.570	0.976
Brokers between Treadmill and Climate	4.430	0.535	3.710	1.254
Brokers between Treadmill and Government	4.250	0.886	2.750	0.957
Total	4.130	0.806	4.080	1.100
ANOVA	<i>F</i>	<i>Sig</i>	<i>F</i>	<i>Sig</i>
	1.442	0.232	8.242	0.000

we focus on is holding moderate beliefs compared to the coalitions whose connections the brokers mediate (cf. Ingold and Varone 2012). Table 2 lists the mean pro-mitigation beliefs of the three coalitions in both countries and the beliefs of the organizations that occupy broker positions between these organizations. In Australia, there are only two organizations located between the Climate and the Government Coalitions. This is an interesting result because it shows that there is a lack of organizations that could act as brokers between these two coalitions. This is not promising in terms of low carbon policy and belief changes—especially when one considers that the Government Coalition does not hold beliefs in favor of mitigation. In Finland, the pro-mitigation beliefs of the brokers between the Climate and Government Coalitions fall between the beliefs of these two but are closer to the beliefs of the latter. Furthermore, Table 2 shows that in Finland all organizations that occupy brokerage positions are also brokers in the sense that their beliefs fall between the coalitions that they mediate. In Australia, the beliefs of brokers that mediate the connections between the Treadmill and the Climate Coalitions fall in the middle but this is not true in the case of the organizations that broker between the Treadmill and the Government Coalitions; the latter group of organizations is even less in favor of mitigation than the Government Coalition. These results indicate that there are more organizations in Finland than in Australia that are both in a broker position in the collaboration network and also mediate in terms of their beliefs. This makes it more likely for the organizations in Finland to engage in brokerage behavior, which is an enabling factor for policy learning between coalitions.

Besides enabling policy learning, another way for organizations currently occupying broker positions in the collaboration networks to initiate change would be to sever their ties with one of the two coalitions they currently collaborate with, becoming members of the other coalition. In Finland there are several organizations that, based on their network position and beliefs, might be inclined to leave the Treadmill Coalition and become members of the Government and Research Coalition which would then become the dominant coalition, shifting the balance of power toward those who believe more strongly in ambitious climate change measures. This group of broker organizations is quite supportive of the idea that instead of being expensive, climate change mitigation might actually generate growth—the idea known as “green growth,” as shown in Table 3. As green technology advances further, the organizations in this current broker group will reap further benefits from it, giving them more reasons to shift their alliances. This is particularly true for the three largest forestry corporations that are part of this group. They are major energy and wood users but also intensively developing technologies of green growth. This differs from the situation in Australia, where the

Treadmill coalition, and especially the broker organizations between the Treadmill and Government coalitions, are less supportive of green growth than other coalitions. This suggests that there is a distinct possibility that the Finnish Treadmill Coalition could be marginalized and replaced by a new dominant coalition consisting of business organizations that are oriented toward green growth and well connected with governmental and research organizations. In Australia, the current coalition structure of the policy networks does not seem susceptible to such changes.

Results on Potential for Change in the Interviews

Our interviews also provide evidence that there is potential for change in the network structure and beliefs. In particular, the emerging alliances between Labor Unions, currently belonging to the Treadmill Coalition and NGOs, currently belonging to the Climate Coalition, are recognized. The formation of these alliances seem to be, at least in part, driven by what is going on in the international climate change negotiations, which shows how developments outside the national policy networks can have an influence on how organizations within the network collaborate. Commenting on a declaration of climate policy objectives issued jointly by a group of environmental organizations and trade unions in Finland before the Paris COP 2015, a labor union peak organization representative said:

This begins with the fact that we collaborate internationally with NGOs and human rights organizations through the International Trade Union Confederation who represents us in the international climate change negotiations. It's the logic of the negotiations and how we are grouped there, as a part of the civil society group of organizations.

In Australia, too, a union organization had participated in organizing the People's Climate March alongside ENGOs. But organizations representing miners and farmers were far from engaging in this kind of collaboration, showing that a rift between different types of unions may also be developing between those more and those less in favor of climate change action.

Regarding belief change, we find little evidence of a potential overall shift from prioritizing economic growth to prioritizing climate change mitigation, insofar as the two are mutually exclusive. Instead, we do find many interviewees describing an ongoing change toward thinking that it is possible to combine climate change mitigation policies with continuing economic growth. As our survey results show, this type of thinking is more prevalent in Finland than in Australia (see [Table 3](#) and the section above), which our interviews also reflected.

In Finland, ten out of eighteen interviewees mentioned the idea that emission reductions could produce economic benefits lead to economic benefits rather than costs. A political party representative argued:

We think that sustainability and jobs can be combined ... Climate friendly solutions are an enormous boom over the world and Finnish export industries can successfully be a part of it right now.

In Australia, six out of thirteen interviewees mentioned the idea that emission reductions could produce economic benefits, but with widely varying degree of enthusiasm. Mostly the idea was expressed in the language of "co-benefits." In large part the co-

benefit became the main tangible benefit of decarbonization, with climate concerns defined as ancillary. An industry association representative remarked:

Those technologies... will just be about practice change that's adopted by the industry for its productivity benefits and it will have an, you know, an incidental mitigation benefit as a result of that as well.

Likewise, with low-cost renewable energy, business could “maintain its ‘energy advantage’ over competitors” (Industry association representative, Australia) and with reduced particulate pollution from the burning of fossil fuels there would be reduced health costs, incidental to emissions reduction (NGO representative, Australia). For others there was an attempt to conceptually bridge climate and the everyday. For a party political agency the challenge was to “create internal institutionally embedded ways to resolve the jobs versus environment debate.” For a union representative, the issue was to look beyond the immediate workplace and recognize that “workers have an interest not only in what happens at work but what happens in their communities, and they have a responsibility for much broader social issues,” including, and especially, climate change.

Discussion and Conclusions

This study set out to investigate the structures of the policy networks that contribute to the persistence of high carbon ways of production and consumption in Finland and Australia, and to identify where potential for change in these networks might lie. Using techniques of social network analysis, we found that in both countries there is a coalition of business organizations, trade unions and governmental organizations that privileges economic growth over ambitious climate change policy. These findings are in line with what the Treadmill of Production Theory (TPT) would predict. The findings make an original contribution to the literature, as they show how TPT, a macro-level theory, can be operationalized drawing from a meso-level theory, the Advocacy Coalition Framework, by using methods of social network analysis. In addition, we have shown that the structures predicted by TPT exist in countries with different economic structures (Australia being a producer and Finland a heavy consumer of fossil fuel energy) and different political institutions (pluralist and majoritarian Australia, corporatist and consensual Finland) (Lijphart 2012).

Even though our findings suggest that the TPT is at least partly correct in its diagnosis of the current situation, they do not show that the TPT would necessarily be correct in its assessment of the possibilities for change toward low carbon futures. TPT theorists argue that green capitalism is not possible, and the only way toward a cleaner future is a comprehensive transformation of the entire economic system (Wright 2004). Our findings suggest that there are several factors, pointed out by the Advocacy Coalition Framework, that may contribute to an incremental change toward more climate-friendly societies, including policy learning induced by broker organizations, changes in coalition structures (organizations currently in broker positions migrating to a “greener” coalition) and belief change toward valuing green growth.

A further source of policy change identified by ACF scholars that we have not investigated because our data do not provide much information on it is external shocks to

the policy subsystem. Developments outside the networks we have investigated could contribute to change toward low carbon societies, either through the effects that they have on the networks or by influencing decisions by politicians, businesses and consumers directly. Perhaps the most important external factor is technological change. Markard, Suter, and Ingold (2016) have shown that policy change can occur through technological change even without much change in coalitions or in their beliefs. This is because new technologies can become an attractive option also to those coalitions who prioritize economic competitiveness over environmental protection when their price drops (see also Schmidt and Sewerin 2017; Meckling, Sterner, and Wagner 2017). Indeed, wind power has recently become cheap enough to build without government subsidies. Because it is also relatively quick to build, many existing coal plants could soon be replaced by windmills (Kankare 2019). These developments may drive policy change in and of themselves but also through the effects they have on coalition structures. As the economic weight of cleantech firms and the number of jobs they create increases, this may create a rift within the Treadmill coalition between old energy intensive industries, and the associated unions on the one side, and new cleantech industries and their workers on the other.

A limitation of our analysis is the survey response rate in Australia. It is likely that our data slightly underestimates the overall density of the Australian network, the internal density of the Treadmill Coalition, and perceived influence scores of the entire network and in particular, of the Treadmill coalition. This is because the response rate for the Australian survey (45.3%) is lower than for Finland (85.4%), with business organizations responding less often than others (39.4%). The less survey participants, the less collaboration links they will report, resulting in a less dense network overall. The less the participants come from a particular type of organization, the less it looks like that organization type—in this case, business organizations—collaborate. These observations also hold for the influence scores. Organizations tend to collaborate with similar organizations (e.g., businesses with businesses, Leifeld and Schneider 2012; Wagner and Ylä-Anttila 2020) and survey participants have a tendency to overemphasize the influence of their collaboration partners (Fischer and Sciarini 2015). If a particular type of organization is underrepresented in the survey, their influence is likely to be underestimated. For this reason, we have avoided comparing the influence scores between the countries and making strong statements about the relative influence scores of the Treadmill and Climate coalitions in Australia. Due to the response rate and the underrepresentation of business actors in the sample, it is likely that the Treadmill Coalition in Australia is actually more dense internally and also more influential than our data shows. Future research could try to corroborate our results based on other data sources besides surveys and interviews, such as media data and Discourse Network Analysis (Leifeld, 2013).

Another obvious limitation is that we do not have longitudinal network data. Our analysis of the potential for change relies on identifying potential sources of change in the coalition structures and mapping ongoing changes in network collaboration and beliefs through interviews. How the networks, beliefs and policies will actually change over time remains a question for future research.

Finally, it is worth reflecting on whether the indications of incremental change we identified are sufficient to produce a fundamental transformation of energy systems that is

necessary to curb climate change. A key question here concerns time; changes are taking place, but in the light of our results it is not necessarily the case that they would occur quickly enough to achieve the drastic reductions in emissions that are necessary to keep global warming below 1.5 degrees. One thing our results clearly show is that change is likely to be significantly slower and more difficult in Australia than in Finland. At the level of policy networks, this is visible in the role of broker organizations, and the fact that beliefs across the network are more favorable to climate change mitigation and green growth. These factors make the building of a “winning coalition” for the decarbonization of the economy (cf. Meckling et al. 2015) more likely in Finland.

These country differences at the meso level of networks also reflect macro-level economic and political differences between the two countries. The pulp factories and steel mills that are important for Finland’s economy could, in principle, run on renewable power in the future, while Australia’s coal industry would have to be entirely replaced with something else. Politically, Australia’s adversarial institution structures discourage political parties from supporting low-carbon transition. Australia is a pluralist, competitive polity with a lack of cross-parliamentary deliberative bargaining. This means that there are few veto points for the opposition of climate policies which incentivizes “an anti-climate opposition party and its allied interest groups to oppose, delay, and block climate policy investment until their side comes to power, at which point they can reverse course” (Finnegan 2019, 33). Finland, in contrast, is a corporatist polity where multi-party cabinets are the norm and policymaking processes are often characterized by continuous negotiations between a broad array of stakeholder groups such as unions and businesses. Even though this system may give rise to Treadmill Coalitions, it may also do a better job in compensating those who stand to lose when ambitious climate policies are put in place, ensuring cross-parliamentary support (Finnegan 2019, 34). This means that potential policy brokers between coalitions are likely to have a higher chance of success in mediating between conflicting coalitions in Finland because the political institutions of the country exhibit a tendency toward negotiated solutions to political conflicts.

ORCID

Tuomas Ylä-Anttila  <http://orcid.org/0000-0002-6908-3495>

Antti Gronow  <http://orcid.org/0000-0002-7639-6422>

References

- Ansell, C., S. Reckhow, and A. Kelly. 2009. How to reform a reform coalition: Outreach, agenda expansion, and brokerage in urban school reform. *Policy Studies Journal* 37 (4):717–43. doi:10.1111/j.1541-0072.2009.00332.x.
- Baer, H. A. 2016. The nexus of the coal industry and the state in Australia: Historical dimensions and contemporary challenges. *Energy Policy* 99:194–202. doi:10.1016/j.enpol.2016.05.033.
- Blondel, V. D., J. L. Guillaume, R. Lambiotte, and E. Lefebvre. 2008. Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment* 2008 (10): P10008. doi:10.1088/1742-5468/2008/10/P10008.
- Brockhaus, M., and M. Di Gregorio. 2014. National REDD + policy networks: From cooperation to conflict. *Ecology and Society* 19 (4):14. doi:10.5751/ES-06643-190414.

- Bulkeley, H. 2000. Discourse coalitions and the Australian climate change policy network. *Environment and Planning C: Government and Policy* 18 (6):727–48. doi:10.1068/c9905j.
- Cranmer, S. J., P. Leifeld, S. D. McClurg, and M. Rolfe. 2017. Navigating the range of statistical tools for inferential network analysis. *American Journal of Political Science* 61 (1):237–51. doi:10.1111/ajps.12263.
- Crowley, K. 2013. Pricing carbon: The politics of climate policy in Australia. *Wiley Interdisciplinary Reviews: Climate Change* 4 (6):603–13. doi:10.1002/wcc.239.
- DEE. 2018. *Quarterly Update of Australia's National Greenhouse Gas Inventory*. Canberra: Department of Environment and Energy.
- Dunlap, R. E., and A. M. McCright. 2015. Challenging climate change: The denial countermovement. In *Climate change and society: Sociological perspectives*, eds. R. E. Dunlap and R. J. Brulle, 300–32. Oxford: Oxford University Press.
- EEA (European Environmental Agency). 2018. *Greenhouse gas emissions per capita*. København: EEA.
- Geels, F. W. 2002. Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy* 31 (8-9):1257–74. doi:10.1016/S0048-7333(02)00062-8.
- Germanwatch. 2019. Climate Change Performance Index 2019. https://germanwatch.org/sites/germanwatch.org/files/CCPI2019_Results_WEB.pdf.
- Gould, K. A., N. D. Pellow, and A. Schnaiberg. 2004. Interrogating the treadmill of production. *Organization & Environment* 17 (3):296–316. doi:10.1177/1086026604268747.
- Gronow, A., and T. Ylä-Anttila. 2019. Cooptation of ENGOs or treadmill of production? Advocacy coalitions and climate change policy in Finland. *Policy Studies Journal* 47 (4):860–81. doi:10.1111/psj.12185.
- Gronow, A., T. Ylä-Anttila, M. Carson, and C. Edling. 2019. Divergent neighbors: corporatism and climate policy networks in Finland and Sweden. *Environmental Politics* 28 (6):1061–83. doi:10.1080/09644016.2019.1625149.
- Fischer, M., and P. Sciarini. 2015. Unpacking reputational power: Intended and unintended determinants of the assessment of actors' power. *Social Networks* 42:60–71. doi:10.1016/j.socnet.2015.02.008.
- Finnegan, J. 2019. Institutions, climate change, and the foundations of long-term policymaking. Centre for Climate Change Economics and Policy Working Paper No. 353.
- Harrison, K., and L. M. Sundstrom. 2010. *Global commons, domestic decisions: The comparative politics of climate change*. Cambridge, MA: MIT Press.
- Hildén, M. 2011. The evolution of climate policies: The role of learning and evaluations. *Journal of Cleaner Production* 19 (16):1798–811. doi:10.1016/j.jclepro.2011.05.004.
- Howes, M., Tangney, P., Reis, K. Grant-Smith D. Heazle, M. Bosomworth, K., and Burton, P.. 2015. Towards networked governance: Improving interagency communication and collaboration for disaster risk management and climate change adaptation in Australia. *Journal of Environmental Planning and Management* 58 (5):757–76. doi:10.1080/09640568.2014.891974.
- Hudson, M. 2017. Wind beneath their contempt: Why Australian policymakers oppose solar and wind energy. *Energy Research & Social Science* 28:11–6. doi:10.1016/j.erss.2017.03.014.
- Ingold, K. 2011. Network structures within policy processes: Coalitions, power, and brokerage in Swiss climate policy. *Policy Studies Journal* 39 (3):435–59. doi:10.1111/j.1541-0072.2011.00416.x.
- Ingold, K., and F. Varone. 2012. Treating policy brokers seriously: Evidence from the climate policy. *Journal of Public Administration Research and Theory* 22 (2):319–46. doi:10.1093/jopart/mur035.
- Ingold, K., M. Fischer, and P. Cairney. 2017. Drivers for policy agreement in nascent subsystems: an application of the advocacy coalition framework to fracking policy in Switzerland and the UK. *Policy Studies Journal* 45 (3):442–63. doi:10.1111/psj.12173.
- Jepperson, R., and J. W. Meyer. 2011. Multiple levels of analysis and the limitations of methodological individualisms. *Sociological Theory* 29 (1):54–73. doi:10.1111/j.1467-9558.2010.01387.x.

- Jenkins-Smith, H. C., D. Nohrstedt, C. Weible, and P. Sabatier. 2014. The Advocacy Coalition Framework: Foundations, Evolution, and Ongoing Research. In *Theories of the policy process*, eds. P. A. Sabatier and C. M. Weible, 183–223. Boulder, CO: Westview Press.
- Kankare, M. 2019. Etelä-Pohjanmaalla alkaa valtava tuulivoimabuumi. Kauppalehti, 3 May, 2019. <https://www.kauppalehti.fi/uutiset/etela-pohjanmaalla-alkaa-valtava-tuulivoimabuumi-kokonai-sinvestointi-nousee-yli-500-miljoonaan-euroon/a2d9e8e9-bc44-4281-a244-ad0f19198417>.
- Keohane, R. O. 2015. The global politics of climate change: Challenge for political science. *PS: Political Science & Politics* 48 (1):19–26. doi:10.1017/S1049096514001541.
- Kerkkänen, A. 2010. *Ilmastomuutoksen hallinnan politiikka. Kansainvälisen ilmastokysymyksen haltuunotto Suomessa*. [The politics of climate change governance. The handling of the international climate question in Finland]. PhD diss., University of Tampere.
- Köhler, J., F. W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wiczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, et al. 2019. An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions* 31:1–32. doi:10.1016/j.eist.2019.01.004.
- Kriesi, H., S. Adam, and M. Jochum. 2006. Comparative analysis of policy networks in Western Europe. *Journal of European Public Policy* 13 (3):341–61. doi:10.1080/13501760500528803.
- Kukkonen, A., T. Ylä-Anttila, and J. Broadbent. 2017. Advocacy coalitions, beliefs and climate change policy in the United States. *Public Administration* 95 (3):713–29. doi:10.1111/padm.12321.
- Lachapelle, E., and M. Paterson. 2013. Drivers of national climate policy. *Climate Policy* 13 (5): 547–71. doi:10.1080/14693062.2013.811333.
- Leifeld, P. 2013. Reconceptualizing Major Policy Change in the Advocacy Coalition Framework: A Discourse Network Analysis of German Pension Politics. *Policy Studies Journal* 41 (1): 169–98. doi:10.1111/psj.12007.
- Leifeld, P., and V. Schneider. 2012. Information exchange in policy networks. *American Journal of Political Science* 56 (3):731–44. doi:10.1111/j.1540-5907.2011.00580.x.
- Lijphart, A. 2012. *Patterns of democracy. Government forms and performance in thirty-six countries*. 2nd ed. New Haven & London: Yale University Press.
- Markard, J., M. Suter, and K. Ingold. 2016. Socio-technical transitions and policy change – Advocacy coalitions in Swiss energy policy. *Environmental Innovation and Societal Transitions* 18:215–37. doi:10.1016/j.eist.2015.05.003.
- Meckling, J., N. Kelsey, E. Biber, and J. Zysman. 2015. Climate change. Winning coalitions for climate policy. *Science (New York, N.Y.)* 349 (6253):1170–1. doi:10.1126/science.aab1336.
- Meckling, J., T. Sterner, and G. Wagner. 2017. Policy sequencing toward decarbonization. *Nature Energy* 2 (12):918–22. doi:10.1038/s41560-017-0025-8.
- Moschitz, H., and M. Stolze. 2009. Organic farming policy networks in Europe: Context, actors and variation. *Food Policy*. 34 (3):258–64. doi:10.1016/j.foodpol.2009.03.007.
- Przeworski, A., and H. Teune. 1970. *The logic of comparative social inquiry*. New York: Wiley-Interscience.
- Rip, A., and R. Kemp. 1998. Technological Change. In *Human choice and climate change – Resources and technology* (Vol. 2), eds. S. Rayner and E. L. Malone, 327–99. Columbus: Battelle Press.
- Ruostetsaari, I. 2010. Changing regulation and governance of Finnish energy policy making: New rules but old elites?. *Review of Policy Research* 27 (3):273–97. doi:10.1111/j.1541-1338.2010.00442.x.
- Sabatier, P. A. 1998. The advocacy coalition framework: Revisions and relevance for Europe. *Journal of European Public Policy* 5 (1):98–130. doi:10.1080/13501768880000051.
- Schmidt, T. S., Sewerin S. 2017. Technology as a driver of climate and energy politics. *Nature Energy* 2 (6):17084. doi:10.1038/nenergy.2017.84.
- Schnaiberg, A. 1980. *Environment: from surplus to scarcity*. New York: Oxford University Press.
- Schnaiberg, A., and K. A. Gould. 1994. *Environment and society: The enduring conflict*. New York: St. Martin's Press.

- Teräväinen, T. 2010. Political opportunities and storylines in Finnish climate policy negotiations. *Environmental Politics* 19 (2):196–216. doi:10.1080/09644010903574475.
- UNFCCC. 2019. Detailed GHG data from UNFCCC. Online Dataset. https://di.unfccc.int/detailed_data_by_party.
- Unruh, G. C. 2000. Understanding carbon lock-in. *Energy Policy* 28 (12):817–30. doi:10.1016/S0301-4215(00)00070-7.
- Wagner, P., and T. Ylä-Anttila. 2018. Who got their way? Advocacy coalitions and the Irish climate change law. *Environmental Politics* 27 (5):872–91. doi:10.1080/09644016.2018.1458406.
- Wagner, P., and T. Ylä-Anttila. 2020. Can policy forums overcome echo chamber effects by enabling policy learning? Evidence from the Irish climate change policy network. *Journal of Public Policy* 40 (2):194–211. doi:10.1017/S0143814X18000314.
- Weible, C. M., K. Ingold, D. Nohrstedt, A. D. Henry, and H. C. Jenkins-Smith. 2019. Sharpening advocacy coalitions. *Policy Studies Journal*. doi:10.1111/psj.12360.
- Wright, E. O. 2004. Interrogating the treadmill of production: Some questions I still want to know about and am not afraid to ask. *Organization & Environment* 17 (3):317–22. doi:10.1177/1086026604267937.
- Ylä-Anttila, T., A. Gronow, M. C. Stoddart, J. Broadbent, V. Schneider, and D. B. Tindall. 2018. Climate change policy networks: Why and how to compare them across countries. *Energy Research & Social Science* 45:258–65. doi:10.1016/j.erss.2018.06.020.
- Yun, S.-J., D. Ku, and J.-Y. Han. 2014. Climate policy networks in South Korea: Alliances and conflicts. *Climate Policy* 14 (2):283–301. doi:10.1080/14693062.2013.831240.