From Integration to Fragmentation? Output and Process Dimensions of Climate Policies

Inauguraldissertation
zur Erlangung des akademischen Grades Dr. rer. pol.
im Fach Politikwissenschaft

vorgelegt von

Nicole Schmidt

eingereicht an der
Fakultät für Wirtschafts- und Sozialwissenschaften
der Ruprecht-Karls-Universität Heideberg

Erstgutachterin: Prof. Dr. Jale Tosun
Zweitgutachter: Prof. Dr. Aurel Croissant

Heidelberg
Juli 2019

Meinen Eltern
Anneliese und Siegfried Schmidt
in Dankbarkeit gewidmet

Summary

This dissertation seeks to advance the academic debate on policy integration and coordination. Using the example of climate policy, I aim to provide a robust understanding of this nascent policy field, investigating both output and process dimensions. The main argument put forward is that increasingly comprehensive climate policy portfolios require greater examination of the opposite direction traditionally examined as climate policy integration: that is to say, while the integration of climate concerns into other policy domains is important, so is the integration of concerns such as agriculture into climate policies. The climate domain's multidimensional character is often assumed, though it has not yet been systematically traced. The greater display of concerns also requires increased coordination of relevant stakeholders' involvement to ensure achieving cross-cutting objectives. However, the growing number of calls for greater policy integration and coordination do little to capture its concomitant dilemmas and trade-offs, especially those which appear at the local level.

This thesis explores the composition and development of more than 1,000 national climate policies between 1990 and 2017. It also examines determinants and drivers of climate policies in more than 170 countries, thereby providing a truly global perspective. The cross-country quantitative analyses are further substantiated using qualitative evidence from 59 semi-structured interviews with various experts, including scientists, ministerial bureaucrats and politicians to gain a more nuanced understanding of climate policy-making processes. By means of two case studies, which are situated in Israel and Germany, meaning that both non-Annex I (developing) and Annex I/II (developed) countries under the United Nations Framework Convention on Climate Change are represented, this paper highlights the various challenges that bureaucrats in administrations and politicians face when developing climate policies and dealing with the paramount issue of integrating climate concerns.

The findings show that the density of policy outcomes increases over time and that energy-related aspects dominate national climate policies. Nevertheless, the portfolio of climate policies is becoming more inclusive as concerns related to adaptation, transportation and agriculture are addressed. The more comprehensive coverage in climate policies is most pronounced for European Union membership, economies with a high Gross Domestic Product per capita, and to a lesser extent for countries that are environmentally vulnerable. Looking at the national adaptation plan in Israel and the integration of climate concerns at the local level in the Rhein-Neckar region in Germany, the challenges during the policy-making processes are manifold.

They range from insufficient knowledge to the preference of decision-makers to deal with competing issues instead, such as security or economic concerns. For adaptation policy-making, the perception that Israel has already adapted, or will easily adapt, has negatively affected the policy-making process. Moreover, the incorporation of climate objectives is particularly challenging in the metropolitan region of Rhein-Neckar, since its growing population and economy have reduced the amount of available space.

Coordination is fragmented horizontally and vertically in both cases, showing the difficulty of integrative approaches for cross-cutting problems. This is an insightful finding, since it suggests that having more integrated policies might be symbolic, or that the policies themselves merely indicate political intentions, rather than being substantive policies anchored across relevant institutions. Ministerial bureaucrats as well as politicians are aware of the urgency, importance and difficulty of dealing with the long-term policy problem that climate change represents. However, their motivation is often geared more towards short-term approaches, complying with certain policy requirements or mollifying the impacts of climate change, which are already being felt, rather than making the integration of climate aims a priority.

Taken together, these findings advance the current state of research in three ways. First, the global perspective and identification of broad empirical patterns highlight the multidimensional character of climate policies. The display of agriculture, for instance, shows that existing databases fail to capture adequately all the concerns that national climate policies address. Crucially, it also highlights the importance of networked and multi-sector approaches. Second, the examination of two previously uninvestigated case studies improves our understanding of the challenges in climate policy-making processes. In particular, the case studies also provide qualitative insights into decision makers' preferences. Lastly, these findings demonstrate the importance of studying policy integration from a multidisciplinary perspective, for doing so broadens our understanding of the challenges inherent in integrative governance approaches.

Acknowledgements

Over the past years, I have received support and encouragement from a great number of people. First and foremost, I would like to thank my supervisor Jale Tosun. Early on, you involved me in your stimulating research projects and let me travel to international conferences, allowing me to engage with different scholarly communities. These countless opportunities, as well as your trust and guidance throughout the years, have been invaluable. I am also thankful for discussions and insightful comments from Aurel Croissant, who co-supervised this dissertation.

I have come to think of writing research articles as working on a jigsaw puzzle. It begins with contemplating suitable research questions, theoretical frameworks, data and methodological approaches, before moving on to debating the implications of the findings. Then comes the search for journal outlets, followed by repeated editing of the running text – until every piece fits seamlessly and reviewers and editors are happy to accept it.

For that magic to happen, even with my single-authored pieces, I was fortunate to be advised by esteemed scholars and experts. To all the interviewees: thank you for sharing your knowledge and views on climate change with me. I am particularly grateful to the COST Action 'Innovations in Climate Governance' (INOGOV). Thank you to Andrew Jordan and David Huitema for providing such a rich and interdisciplinary study field. I benefited immensely from an INOGOV short-term research grant at Wageningen University and would especially like to thank Robbert Biesbroek – not just for hosting me, but also for sparking my interest in adaptation and for guiding and supporting me both during and after my time in Wageningen.

This dissertation has also greatly benefited from a research stay in Israel, funded by the MINERVA foundation. I am grateful to Eran Feitelson, my host supervisor at the Hebrew University of Jerusalem, whose time and advice were extremely valuable. Thanks also to Itay Fischhendler and Amit Tubi for making the Geography Department such a welcoming place.

I would also like to extend thanks to the Heidelberg Center for the Environment (HCE) for their sustained support over the years, both financially and intellectually. I am especially indebted to Nicole Aeaschbach for allowing me to do 'my thing' by attending the UNFCCC Conferences of the Parties. To Sanam Vardag and Sabrina Ebenhoch: it was a true pleasure to manage projects with you. I am incredibly thankful for your support.

The HCE was also crucial in facilitating a project funded by the HEiKA-Heidelberg Karlsruhe Research Partnership. I would like to thank Anna Growe for involving me in this project, and Madeleine Wagner, who has taught me so much about urban planning. Thanks also to the Field of Focus

4 for funding a travel grant and a workshop, and to Sabine Falke especially for your words of encouragement.

My dissertation profited from further discussions with scholars on many occasions. I owe special thanks to Paul Tobin – it is always such a pleasure to work with you – and to Pawel Pustelnik for his excellent advice. Thanks also go to Stephanie Austin, my 'adaptation buddy', for brilliant discussions. I would also like to express my sincerest gratitude to Sybille Große, Paolo Graziano and Fabrizio De Francesco.

To my colleagues at the Institute of Political Science: you have made this journey much more pleasant. Heartfelt thanks go to Andreas Fleig for teaching me patiently about quantitative research, being my office mate, providing advice and being a trusted co-author. To Simon Weiß, I think back so fondly on those early days at the institute – thank you for all the lunch breaks filled with laughter. To Bettina Schuck, Julia Weiß, Jennifer Shore and Felix Hörisch – 'the CUPESSE crew' – thank you for your support, for breakfast, lunch, cake and coffee breaks; and to Julia in particular: I could have not asked for someone better, with whom to teach those EU introductory seminars. To Markus Baumann for his reassurance ('It's practically accepted!'), even when the end was nowhere to be seen. Thanks also to Uli Hartung: we have spent a large portion of this dissertation journey together, navigating and supporting each other along the way. To Uschi Eger, for there is no other like you; thank you for your collegial nature. Andrea Ficht, I have known you since the second semester – thank you for being a trusted companion.

I also want to thank my friends – you provided invaluable support, especially Sophia Bellosevich, Franziska Diesing and Andrea Kuhlmann. Thank you to Max Thielmann, Tobias Bock, Leonie Fleck and Katja Potche, for celebrating every 'submit', 'R&R', and 'accept' with me. I also extend a sincere thank-you to Moritz Eypasch, who convinced me to embark on this journey in the first place.

Finally, to my family. To my parents Anneliese and Siegfried Schmidt, I am so deeply appreciative of your unconditional love and never-ending support. I dedicate this dissertation to you. To my brother Michel Schmidt, thank you – I know I can always count on you. I cannot wait to tell both my grandfathers that this thesis is finally written.

The most heartfelt thanks, however, go to Nissan Oz. We have shared the adventures of love and life – but also those of 'the PhD'. Out of all of the people that marked this journey, you are the most meaningful. Writing a dissertation takes up a lot of space and you responded with such generosity and pride. For that, I will always be grateful.

Table of Contents

List of Figures

List of Tables

List of Acronyms

API	Agricultural Policy Integration
CDU	Christlich Demokratische Union Deutschlands (Christian Democratic Union of Germany)
CO2	Cabon Dioxide
COP	Conference of the Parties
COST	European Cooperation in Science and Technology
CPI	Climate Policy Integration
CS	Chief Scientist
DV	Dependent Variable
EPI	Environmental Policy Integration
ETS	Emissions Trading System
EU	European Union
EVI	Environmental Vulnerability Indedx
FAO	Food and Agricultural Organisation
FDP	Freie Demokratische Partei (Free Democratic Party)
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
ICCIC	Israeli Climate Change Information Center
(I)NDC	(Intended) Nationally Determinded Contribution
INOGOV	Innovations in Climate Governance
INT	Interview

KIT	Karlsruhe Institute of Technology
LULUCF	Land Use, Land-Use Change And Forestry
MoEP	Ministry of Environmental Protection
NCRD	National Council for Research and Development
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
REDD +	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
SD	Standard Deviation
SDG	Sustainable Development Goals
SPD	Sozialdemokratische Partei Deutschlands (Social Democratic Party of Germany)
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WDI	World Development Indicators of the World Bank

Part I

Introduction

Climate change is a problem of global significance. Its public-goods nature provokes free-riding incentives (Nordhaus, 1991) and the magnitude and unequal distribution of its impacts (Stern and Stern, 2007) have prompted scholars to characterize climate change as 'wicked' (Head, 2008; Head and Alford, 2015) or even 'super wicked' (Levin et al., 2012). Scientist Anothony Leiserowitz even went so far as to say that it is 'a policy problem from hell', challenging the very way our institutions work (Climate Lab, 2017). From a policy perspective, climate change does not affect a single domain but many (Tosun and Lang, 2017). It involves many actors at different levels, who have diverging interests, and requires a long-term policy approach that reduces the present consumption of greenhouse gases (GHG) – otherwise future damage will be inevitable (Levin et al., 2012). In light of this, it is unsurprising that climate change is repeatedly cited as one of the biggest challenges of the 21st century (IPCC, 2014, 2018; Swinburn et al., 2019).

The Intergovernmental Panel on Climate Change (IPCC) has declared with 'high confidence' that climate change is a phenomenon caused by human activities, which has already led to approximately 1 degree Celsius of global warming (IPCC, 2018: 4). Primarily, the burning of fossil fuels produces staggering amounts of atmospheric greenhouse gases (GHGs), such as carbon dioxide (CO_2). Other GHGs, some of which are much more potent and whose concentrations are rising more rapidly than CO_2's, are also on the rise (UNFCCC, 2019). These include, for example, sulfur hexafluoride, which is used in the electrical industry, as well as methane and nitrous oxide, which mostly both stem from increased agricultural production (Bennetzen et al., 2016). New scientific evidence regularly identifies the emergence of new sources of GHGs (IPCC, 2019).

Climate change emerged as a topic during the broader sustainability debate of the 1970s. The United Nations (UN) Conference on the Human Environment in Stockholm in 1972 put deterioration processes of the environment and natural resources on the international agenda and established the World Commission on Environment and Development (later known as

the 'Brundtland Commission'). In their final report, climate change – alongside ozone depletion and species loss – is mentioned as one of the greatest threats to the future of the world (Brundtland et al., 1987). Indeed, despite some efforts to counteract climate change, global average temperatures are rising rather than falling (IPCC, 2018), increasing the number of extreme weather events, such as heat waves, floods, hurricanes, and raising sea-levels (IPCC, 2013; Stern and Stern, 2007).

The two most prominent strategies in responding to anthropogenic climate change have been mitigation, the action of reducing carbon emissions, and adaptation, which involves managing and limiting the degree of actual or expected climate impacts. For instance, countries in the European Union (EU) have adopted framework legislations that address both aspects (Fleig et al., 2017). In addition to the burgeoning number of case studies addressing this topic (see, for example, Hulme and Dessai, 2008; Ingold, 2011; Rahman and Tosun, 2018), studies have also analysed the variation in policy ambition among developed states (Tobin, 2017), or tracked adaptation policies in a large number of countries over time (Bauer et al., 2012; Berrang-Ford et al., 2014). Hence, despite the issue's complexity, climate change has become a key area of public policy.

Missing from this perspective thus far is a global and encompassing view of the patterns within this nascent policy field. Scholars have started collecting data on policy outputs at the national (Bernauer and Böhmelt, 2013; Lesnikowski et al., 2016; Townshend et al., 2011, 2013) and local levels (Heidrich et al., 2013; Reckien et al., 2018; Wood et al., 2014). These studies show the impressive number of climate policies that have been developed over recent decades and have also started to reveal the extent to which climate concerns have been integrated into adjacent domains, such as energy (Adelle and Russel, 2013; Hogl et al., 2016; Mickwitz et al., 2009; Van Asselt et al., 2015). However, studies have not yet systematically assessed these policy outputs; in particular, the often implicitly assumed, multidimensional nature of climate policies is still to be examined. The variation in climate policy output, i.e. the number and scope of addressed aspects in climate policies, as well as the underlying processes determining how these policies come about in national and local contexts, are the primary puzzles driving this dissertation. The following two overarching research questions guide this thesis:

What concerns do national climate policies address globally? What are the underlying processes determining how these policies come about?

The papers of this dissertation are arranged into two parts. Each of the four papers addresses different aspects of these overarching research questions. The first part (papers 1 and 2) investigates the output dimension, examining the formation and development of national climate policies in a large sample of countries. The first paper investigates their comprehensiveness and aims to explain patterns over time. The second paper investigates the role of agriculture and agricultural ministries in climate policies especially. These are, at heart, empirical questions. Even so, they may help to develop a better understanding of the integrative patterns of climate policies globally.

The second part (papers 3 and 4) engages in the analysis of crucial institutions, such as ministries, and in the engagement of bureaucrats and politicians in the policy-making process. While the third paper investigates the development of the national adaptation plan in Israel, the fourth paper examines the ways in which local decision-makers, especially politicians, have responded to integrating climate concerns into policy-making. In the remainder of the introduction, I give an overview of key concepts. Afterwards, I briefly outline the main arguments as well as the theoretical and methodological foundations of this thesis. Next, I summarize the findings of each of the four papers, then in the conclusion I discuss their implications.

Overview of central concepts

In essence, I seek to understand the concerns displayed by climate policies, to examine the processes which produce climate policies, and to identify crucial actors in these policy-making processes. Before I define central concepts, I briefly introduce the international climate architecture and explain how it has guided climate policy-making processes.

The UN Conference on Environment and Development (known also as the 'Earth Summit') held in Rio de Janeiro in 1992 has come to be of crucial importance to climate policy-making. Although the conference had various other items on the agenda, such as biodiversity loss or water scarcity, it later became renowned for adopting the United Nations Framework Convention on Climate Change (UNFCCC), which institutionalized engagement on climate change. For many scholars, these international commitments mark 1990 or the early 1990s as the beginning of the climate policy domain (Adelle and Russel, 2013; Fankhauser et al., 2015; Tobin, 2017; Townshend et al., 2013). The Convention also created the 'common but differentiated responsibilities' (CBDR) principle. This important distinction between 'parties' was designed to acknowledge the different states' responsibilities:

Developed states carry a greater 'burden' and are obliged to reduce GHG emissions, since both their historic and current emissions are larger, whereas developing states are allowed to increase their emissions in order to develop economically (Hurrell and Sengupta, 2012). As a result, three categories were created: 'Annex I' for industrialized countries and 'economies in transition' from Communism; 'Annex II', which comprises solely of developed states; and the 'non-Annex I' developing countries (UN, 1992). Ever since the Convention came into force in 1994, parties have met regularly at the so-called 'Conferences of the Parties' (COPs). There, heads of states and ministry officials have negotiated a number of important agreements, such as the Kyoto Protocol in 1997, which set reduction targets on binding emissions for developed states.

In part, these international events have driven policy-making at the supranational (see, for example, the climate and energy package of the EU) and national levels (Bernstein and Cashore, 2012; Boasson, 2014; Fankhauser et al., 2016; Never and Betz, 2014; Wüstenhagen and Bilharz, 2006). However, national states have also always responded to climate change individually. In the context of adaptation, for example, the process is known as autonomous adaptation (IPCC, 2001). Moreover, Sæverud and Wettestad (2006) argue that the convergence of the Norwegian GHG emissions trading system was determined by domestic industry rather than international factors. Scholars have also stressed that international efforts usually fail to coordinate national contributions and to distribute costs equitably (Tavoni et al., 2011).

Such viewpoints were refuted by the adoption of the Paris Agreement on 12 December 2015. After years of gridlock, all 197 parties to the UNFCCC agreed to keep global mean temperature to well below 2 degrees Celsius above pre-industrial levels (UN, 2015). This also represented a significant departure from the CBDR principle, for the Paris Agreement's core instrument of Nationally Determined Contributions (NDCs) targets *national* action from *every* country. Behind the cumbersome term 'NDCs' lies the recognition that, after nearly three decades of international negotiations, varying levels of success and rising GHG emissions, the best way forward would be to redirect responsibility to national governments.

The process of developing NDCs has emphasized the role of national governments (Fleig et al., 2017; Tobin et al., 2018). It also concurs with scholarly research, which has noted an increasingly polycentric climate governance landscape (Ostrom, 2010) that shifts the focus away from the international level and onto developments at the national, transnational, and local levels especially (Jordan et al., 2015). While the papers in this dissertation do not fully adopt a polycentric approach, they nonetheless shed light on national and subnational developments. Now that every country sets and reports on

their own mitigation and adaptation goals, policies addressing climate change occupy the center of attention. This is exactly why climate policy-making, especially at the national level, has received renewed academic interest; it is also the point of departure for this dissertation.

Previous studies have often investigated the impact of policies rather than the policy output itself, the latter representing 'the content of the decision' (Schmitt, 2012: 31). This thesis conceives of the term 'policy output' as any sort of legally binding or executive policy which was enacted by elected policymakers and addresses climate change. Hence, rather than looking at the outcome of policies (Bättig and Bernauer, 2009; Burck et al., 2014; Niedertscheider et al., 2018), I am interested in the composition of national climate change policies.

Furthermore, the understanding of which and how institutions and crucial actors interact in the policy-making process, especially in non-Annex I countries, remains limited. I define the term 'process' as the way in which actor constellations, for instance, civil servants in national ministries, as well as politicians such as mayors, engage with one another in developing, deciding and implementing climate policies and climate concerns across domains. In particular, this thesis investigates such processes in Israel and Germany.

Central to both output and process dimensions in this dissertation is the concept of policy integration, whose conceptual underpinnings will be scrutinized further in the theoretical section. I define policy integration in broad terms. Scholars have investigated policy integration in terms of whether, how and to what extent certain concerns have been integrated into other domains (Adelle and Russel, 2013; Alons, 2017; Di Gregorio et al., 2017; Geerlings and Stead, 2003; Hogl et al., 2016; Persson et al., 2018). While the last paper examines political commitment towards the integration of climate concerns at the local level, the other papers mostly focus on the presence of specific concerns rather than on their extent. This has the advantage of facilitating the assessment of a large set of policies, rather than looking, for instance, at specific policy instruments. Strictly speaking, the presence, for example, of a keyword does not (yet) represent policy integration. However, in the context of aligning climate governance with urban water management, Tosun and Leopold have argued that the mentioning of certain keywords is a 'necessary condition' for integration processes (2019: 702).

Most studies to have investigated policy integration in policy outputs, regard it as a 'static outcome or desired governance principle' (Candel, 2019: 3). In line with arguments made by Candel and Biesbroek (2016), I conceive of policy integration as a concept which ought to be explored in terms of process as well. The advantage is that processes can be investigated over time and highlight 'the many shades of grey between sectoral policymaking and full

policy integration' (Candel and Biesbroek, 2016: 23, see also Geerlings and Stead, 2003). Furthermore, the aligning of concerns within policy integration usually takes place within two dimensions, i.e. vertically across levels of government and horizontally across different sectors or associations (Giessen, 2011a, 2011b). Both perspectives are presented in this study.

Main arguments

This volume of papers aims to advance our understanding of the nascent academic field of climate policy, and of policy integration in particular, in three ways. First, the main argument put forward is that increasingly comprehensive climate policy portfolios require greater examination of the opposite direction, which was traditionally examined as climate policy integration (CPI). That is to say: While the integration of climate concerns into other policy domains is important, so is the integration of concerns such as agriculture into climate policies. The climate domain's multidimensional character is often assumed, though it has not yet been systematically traced. Most of the literature is concerned with looking at the integration of climate objectives in non-climate domains. Hence, existing approaches can hardly be used to reveal the comprehensiveness of climate policies and to claim that concerns are coherent across domains.

Second, I argue that the greater display of concerns also requires a more coordinated form of involvement regarding relevant stakeholders. The attainment of coherent cross-cutting concerns should not only be displayed in terms of 'well' integrated policy output but also reflected by the increased desire for coordination in the underlying processes of climate policy-making. At the same time, I show that the growing number of calls for greater policy integration and coordination do little to capture its concomitant dilemmas and trade-offs, especially those which appear at the local level.

Finally, this dissertation combines different methodological approaches. On the one hand, I demonstrate the advantages of analyzing policy output quantitatively, highlighting the possibility of identifying general patterns of climate policy portfolios and their development over time. On the other, I seek to show that cross-country comparisons of policy processes offer a suitable theoretical approach for explaining challenges in climate policy-making in both Annex I/II and non-Annex I countries. I reflect on these objectives in the theoretical framework, methodological approach, main empirical findings, and conclusion.

Theoretical approach

At the theoretical level, this study is located within the academic debate on policy integration and coordination. Policy integration is a term in good currency, as exemplified by the burgeoning literature on environmental policy integration (EPI) and more recently on CPI (Adelle and Russel, 2013; Biermann et al., 2009; Candel and Pereira, 2017; Dupont, 2016; Geerlings and Stead, 2003; Hogl et al., 2016; Hull, 2008; Jacob et al., 2008; Jordan and Lenschow, 2010; Lafferty and Hovden, 2003; Persson et al., 2018). The idea of integration is also central to the Sustainable Development Goals (Tosun and Leininger, 2017) and the New Urban Agenda (UN, 2016), which stresses the importance of integrated approaches in urban planning.

Studies within the realm of policy integration tend to stress the avoidance of parallel policies, misfits, or differing goals (Briassoulis, 2004). Thus far, only a handful of studies have analyzed policy integration in broader theory-building. These have stressed the importance of coherence (May et al., 2005, 2006; Nilsson et al., 2012). They argue that coherence is important, because it 'implies that various policies go together because they share a set of ideas and objectives' (May et al., 2006: 382). Policy domains, such as climate policy, which share diverse and cross-cutting issues, are not automatically incoherent, yet they ought to have 'consistent issue framing' so that ideas, objectives and interests can be commonly developed and signaled to relevant policy actors (May et al., 2006: 383). However, if objectives pull in different directions, then coherence is undermined (May et al., 2005). A few studies have explicitly remarked on the importance of exploring the opposite directions and developments of an emerging policy field in other domains. Massey (2016) has done this for the case of adaptation. In this regard, this thesis argues that coherence can be appropriately advanced by looking at the opposite direction of integration.

In general, studies on EPI and CPI comprise a diverse set of perspectives and produce mixed assessments of the degree of policy integration. One of the reasons for this is the lack of suitable, especially large-n, data (Schaffrin et al., 2014). Furthermore, many of the theoretical shortcomings might stem from the fact that the literature is scrutinized through a range of different disciplinary glasses. Tosun and Lang (2017) have discussed the variety of terms used for policy integration in different disciplines, such as comprehensive or holistic planning, boundary-spanning policy regimes, or joined-up government, while urban studies often approach integration from a 'nexus' viewpoint (Moss, and Hüesker, 2017). In addition, adaptation scholars frequently use the term 'mainstreaming' (Brouwer et al., 2013; Runhaar et al., 2017).

Just as policy output can be expected to become more comprehensive over time, the development of more integrated, coherent policy portfolios also entails important challenges, such as avoiding the production of counterproductive effects during the policy process (Briassoulis, 2004; Candel and Biesbroek, 2016). Theoretical approaches in public policy analysis, such as the theoretical framework of comparative policy analysis (Wenzelburger and Zohlnhöfer, 2015; Knill and Tosun, 2015), seek to explain why and under which conditions policy-makers decide on policies by offering a range of explanatory variables, such as party difference theory. Levi-Faur notes 'that political processes are shaped by a country's unique national and historically determined characteristics embedded in specific state traditions and national institutions' (2004: 180). In this sense, it is likely that policy-making processes in relation to climate change differ amongst the cases in point. In order to analyze the behavior and activities of important actors in the area of climate policy-making, namely bureaucrats and politicians, the individual studies also combine and borrow from public administration, as well as from literature in the field of urban studies.

Coordination has been shown to be of crucial importance in policy-making processes, especially for achieving cross-cutting concerns (May et al., 2006; Peters, 2015; Tosun and Lang, 2017). Otherwise, we may have better and more integrated policies, but those may only have symbolic meaning or point to political intentions rather than being substantive policies anchored across relevant institutions. The question of coordination's desirability has been answered differently by scholars, depending on the focus of the policy field (Candel, 2019). Public administration scholars have highlighted that different administrative traditions affect policy integration efforts (Capano, 2003; Peters, 2015, 2018), while for urban studies, the spatial implications are crucial and competition amongst actors is highlighted (Benz, 2007). I argue for a balanced view on this matter as I stress the importance of increased coordination yet also show the limits of integration. Furthermore, since the literature on policy integration and coordination highlights the importance of different levels, the analyses of the case studies focus on the national and subnational levels as well as on different types of actors: bureaucrats versus politicians.

Scholars have convincingly argued that it is difficult to compare the 'policy-making behavior of governments in its entirety' (Schmitt, 2012: 33). Therefore, I focus on different stages of the policy process, namely policy formulation and decision-making. The former refers to the development of specific policy options within government, whereas the later looks at the courses of action that governments adopt (Howlett et al., 2009). The third paper particularly focuses on the incorporation of scientific advice during

the policy formulation stage at the national level, investigating ministerial bureaucrats, since studies have shown that bureaucracies often play a crucial role in policy-making, especially with regards to policy formulation (Carpenter, 2001; Meckling and Nahm, 2018).

Moreover, scholars have highlighted the importance of the local level in climate governance (Betsill and Bulkeley, 2007; Bulkeley, 2010). In particular, studies have been conducted on the processes underlying local coordination in the context of climate change (Bendlin, 2019). Therefore, the forth paper specifically investigates the local level, analyzing decision-making processes in the metropolitan region of Rhein-Neckar, with a particular focus on politicians and the incorporation of climate concerns in urban contexts.

Methodological approach and research design

This section introduces the data and methods used in the empirical analyses. Scholars have emphasized the benefits of linking both quantitative and qualitative approaches (Creswell, 2003; Liebermann, 2005). For the study of comparative public policy, Biesenbender and Héritier highlight that 'quantitative analyses are apt to ensure the generalizability of the results, [and] qualitative case studies of the processes might help to identify the causal mechanism at work' (2014: 238). Therefore, this dissertation employed a mixed-methods approach (Creswell, 2003). Combining cross-country quantitative analyses with two additional qualitative case studies enabled me to gain an overarching view of, and in-depth insights into, the nascent field of climate policy. Importantly, the focus here does not lie exclusively on the validation of findings but also on the integration of qualitative work, which warrants complementary perspectives (Kelle and Erzberger, 2004).

The core dependent variable to be explained in the first two papers is the variation in more inclusive climate policy output. Wälti (2004: 609) has argued that the advantage of output data is 'its direct link with institutional factors', a factor that paper 2 addresses. Indeed, data availability is often a problem, especially when the number of cases is high. In recent years, organizations or researchers have overcome this problem by collecting and analyzing various data on climate policy outputs. Examples include the International Energy Agency, which compiles data on renewable energy policies, or various communication documents sent to the UNFCCC (Lesnikowski et al., 2011; Tobin et al., 2018). The downside of these materials is that they are not comprehensive, focusing on certain aspects such as energy; sometimes, they also do not represent adopted policies but mere strategy papers. To measure the comprehensiveness of climate policy outputs in a cross-country quantita-

tive analysis, I draw on the most comprehensive data set so far, namely the Climate Change Laws of the World database, which was established by the Grantham Institute at the London School of Economics. It is continuously updated and contains information on national climate policies (Averchenkova et al., 2017). The data I investigated cover the time period from 1990 to 2016 (2017, respectively), include a total of 171 (174, respectively) countries and follow the density approach, i.e. they do not simply count the number of policy outputs but assess their density (Knill et al., 2012). The independent variables comprise of EU membership, income-level and environmental vulnerability.

While the second paper also looks at the comprehensive character of climate policy output, technically speaking, the dependent variable is the role of agriculture as it constitutes a more inclusive presence of concerns in climate policies. I begin by sourcing legislation on climate change from the Climate Change of the Laws of the World database. Then I build a separate database based on the information I have coded, which concerns the presence of agricultural and food-related mentions over time. This allows me to employ a descriptive, quantitative large-n analysis on the role of agriculture in climate policies. The operationalization of the dependent variable also considers institutional factors and codes the coordination between ministries.

The last two papers offer insights into the processes underlying policy-making. The core dependent variable that the last two papers seek to explain is the policy-making process. In particular, they explore institutions and crucial actors, as well as how these bring about the previously investigated policy outputs, thus following a deductive research logic. By means of two case studies – which are situated in Israel and Germany, meaning that countries classed by the UNFCCC as non-Annex I (developing: Israel) and as Annex I/II (developed: Germany) are represented – these papers highlight the various challenges that politicians and administrative bureaucrats face when developing climate policies and dealing with the paramount issue of integrating climate concerns.

The selection of the two case studies was motivated by several factors. Most significantly, both Israel and Germany are high-income countries, though their vulnerability to climate change differs; also, Israel is not a member of the EU. This means that Israel and Germany can be characterized as a most-different case study design. Strictly speaking, however, both case studies are designed to fill important gaps in the literature by generating original data and exploring different aspects of the policy-making process. Consequently, it might be more meaningful to characterize these cases according to the typology developed by Gerring (2008), namely as 'deviant' (Israel) and 'typical' (Germany).

Arguing from the perspective of the UNFCCC architecture, Israel represents a non-Annex I (developing) country, whereas Germany falls under Annex I/II. Germany is thus the more typical case, having had to share more responsibility in the reduction of GHG emissions, and can be expected to be more experienced in climate policy-making, since it had already adopted legally binding targets under the Kyoto Protocol. Before the Paris Agreement became obligatory, Israel, conversely, simply provided communications to the UNFCCC of its own accord. Nonetheless, Israel displays legislative output over time – a demonstration of a 'surprising value', one of the criteria that make it a 'deviant' case (Gerring, 2008: 655).

Moreover, the selection of Israel represents an under-researched case in the context of climate policy, meaning it is certain to lead to novel insights. While a number of studies exist, for instance, on water and security implications (Feitelson and Fischhendler, 2009; Feitelson et al., 2012), or which deal with climate impact assessments (Haim et al., 2008), the literature on climate policy is sparse. In fact, the study conducted by Michaels and Tal (2015), which investigates Israel's mitigation framework, represents the only significant research in the realm of climate policy. In part, the selection of Israel was also motivated by the fact that the country often falls 'in-between' categories: The UNFCCC class it as 'developing', yet Israel has been a member of the OECD since 2010 and is characterized as a high income-country. In terms of administrative traditions, Israel embodies contrasting characteristics as they stem from both the British Colonial Office and the Jewish Zionist agency, which is characterized by improvisation (Menahem and Zehavi, 2016). Finally, the comparative approach often requires a certain degree of pragmatism, such as the availability of research funding and of data (Gerring, 2008).

The data used in this dissertation are original and were constructed through the collection of primary and secondary data. The main sources of data were legislative and executive policy documents (for the investigation of policy output) as well as semi-structured elite interviews (for the investigation of policy process), in addition to existing secondary literature. The advantage of interviewing elites, such as 'political appointees and career civil servants' (Aberbach and Rockmann, 2002: 673), is that they provide profound insights, which could have not been drawn from the analysis of written documents only. The transcriptions of the interview material were compared and interpreted qualitatively using MAXQDA software, which facilitates the structuring and organizing of large quantities of data as well as the construction of coding schemes.

Empirical findings

In this section, I briefly summarize, one after the other, the key findings of the individual papers in relation to the two research questions posed above. In addition, I highlight potential avenues for future research. I debate the implications of the findings in the conclusion.

Paper 1

The first paper addresses the policy output dimension and provides a large-n overview of enacted national climate policies. It investigates eight individual categories over 27 years in 171 countries. Each category can be characterized as a different type of concern, such as energy or R&D, thereby showing which concerns are addressed in national climate policies globally. Looking at the coverage of these eight categories individually over time reveals that they grew considerably across all categories. While energy-related concerns dominated, so-called administrative arrangements were also frequently addressed. These include, for example, policies which establish inter-ministerial committees for the development of climate policies. Less frequently addressed concerns included carbon pricing and transportation. Examining their development over time reveals that the different categories were addressed at different points in time, though they exhibited accelerated growth in the late 1990s and early 2000s especially. However, the number of addressed categories, i.e. the comprehensiveness of climate policies, varies across countries. EU membership, a high income level and the country's environmental vulnerability are all associated with the more comprehensive coverage of national climate policies, though they are most pronounced for EU membership and for economies with a high GDP per capita. These findings are in line with previous research, which showed the growth of climate legislation over time (Fankhauser et al., 2015). Yet they also highlight the importance of the EU (Damro et al., 2008; Jordan et al., 2010) and show that having the financial means for addressing climate policy is essential (Tobin, 2017). One direction to examine further these findings would be to focus on outcomes, rather than outputs. Some scholars have attempted to do this by developing an index (Burck et al., 2014; Schaffrin et al., 2015).

Due to the large number of countries, finding and compiling information on other factors is challenging. However, the investigation of other explanatory variables would be a fruitful endeavor for future research. In particular, the level of democracy would be an interesting measure to explore further. A number of studies analyze democracies and their engagement with environmental commitment (Neumeyer, 2002) or mitigating climate change (Clulow,

2019). The 23 developed states currently bearing the greatest responsibility to reduce emissions are all democracies (Tobin, 2017). However, the role of political regimes and the possible superiority of autocracies in combating ecological challenges have been discussed in studies, too (Croissant and Wurster, 2013; Tosun and Croissant, 2016). Therefore, it would be interesting to investigate explicitly the comprehensiveness of policy outputs developed by autocracies.

Paper 2

Like paper 1, paper 2 addresses the policy output dimension and provides a large-n overview of enacted national climate policies. However, the approach here diverts in the sense that paper 2 examines agriculture and the way it is addressed in national climate policies globally. Agriculture is an interesting case in point because emissions from the agricultural sector are significant and rising (Bennetzen et al., 2016). Nonetheless, climate databases fail to categorize agriculture as a separate concern, giving the impression that it falls between the cracks of climate policy-making. Overall, the paper provides a number of descriptive findings and analytical insights. It investigates agricultural concerns in over 1,000 policies in 174 countries between 1990 to 2017, demonstrating that agriculture is indeed represented in around half the sample. Remarkably, however, out of more than 1,000 policies worldwide, environmental and agricultural ministries did not even issue a dozen climate policies together – an observation which exposes the fragmented cooperation patterns between both ministries. Indeed, it appears as if ministries of environment and agriculture largely decide on issues regarding climate change separately, meaning that both domains continue to co-exist rather than cooperate and merge.

This study offers numerous suggestions and methodological approaches for how the broad patterns of agricultural presence could be investigated further. It would, for instance, be worth exploring the agricultural content qualitatively in order to gain insights into the levels of integration; this may also shed light on whether agriculture focuses on adaptation or mitigation. As the documents are very long, machine-learning approaches would be ideally suited for such a task (Ford et al., 2016). In addition, studies could investigate a few of the eleven case studies which also represent ministries of agriculture more closely, as well as explore the development of national climate strategies. Lastly, donor agencies appeared on a number of climate policies. Studies have shown the influence of foreign consultants on climate-policy making (Tobin et al., 2018), hence future research could analyze the influence of donor agencies on the development of these policies.

Paper 3

The third paper addresses the underlying processes which determine how these policies come about. It complements the previous papers by looking in-depth at the formation of the Israeli national adaptation plan. As this policy has not yet been adopted, the focus lies on uncovering the formulation stages of the plan, which is developed by an inter-ministerial committee and headed by the Israeli Ministry of Environment. The extent to which civil servants are influenced by prevailing administrative traditions, while they gather knowledge and provide advice to other actors, is relevant in the context of adaptation (Biesbroek et al., 2018). Moreover, studies have shown that support for climate policy-making and societal action on climate change are linked to perceptions of scientific agreement (Ding et al., 2011). The role of the so-called chief scientist, a key administrative position in various Israeli ministries, is therefore investigated in an attempt to analyze efforts towards evidence-based decision-making. The findings show two distinct patterns of challenges. On the one hand, these are related to the position of the chief scientist itself: Although they are able to initiate and prioritize the issue of adaptation independently, chief scientists have little actual decision-making power. They face several challenges, ranging, for example, from the need to fill important knowledge gaps to financial constraints, such as small budgets. These factors all hamper evidence-based decision-making processes.

On the other hand, many Israeli decision-makers involved in this process share the perception that Israel is already adapted or will easily adapt. This finding seems fitting for a country which has had to deal with a range of climatic challenges for the past decades, relying on innovation and technological advancements. The findings, however, are particularly interesting with regards to the dynamics of the inter-ministerial committee. Coordination was fragmented horizontally and vertically, revealing the difficulty of integrated approaches for cross-cutting problems, which are likely to be found in other countries as well. Studies could also investigate from a policy-learning perspective the challenges of meaningful coordination across sectors (Benson and Lorenzoni, 2014; Hildén, 2011) as crucial actors came to understand the importance of adaptation over time.

Paper 4

The fourth paper also addresses the process dimension. It diverts from the previous papers as it does not focus on a particular climate policy per se but elucidates processes in the context of climate change within the metropolitan region of Rhein-Neckar in Germany. While the first three papers deal with

the national level, this paper complements previous work by shedding light on subnational processes. In particular, the focus lies primarily on politicians and their commitments towards the integration of climate concerns in urban contexts. This paper takes a more multidisciplinary approach by combining research from the disciplines of political science and urban studies.

The analysis of semi-structured interviews shows that other competing (economic) interests hamper the prioritization of climate concerns. This aligns with research showing that, although politicians believe climate change is important, they do not automatically make it a priority (Willis, 2018). In addition, the integration of climate objectives is particularly challenging for growing metropolitan regions due to limited available space. Other issues that affect policy-making include varying levels of knowledge, insufficient funding and guidance from the national level, and the tendency of municipalities in the same metropolitan region to compete with one another. This last factor also reveals that coordination is fragmented horizontally and vertically between local and regional levels.

Future studies could investigate policy-making processes in other cities or regions of Germany, for instance, in those that are not growing as fast, for this would allow us to see whether the availability of space changes the fragmented picture that is climate policy-making. Furthermore, this study shows that mayors show commitment to long-term engagement on climate change, even if they risk not being re-elected. This finding could be investigated explicitly. Keeping the global mean temperature no more than two degrees Celsius above pre-industrial temperatures is one of the goals of the Paris Agreement. However, as of now, it seems as if there is a looming gap between what is being proclaimed in increasingly comprehensive policy outputs and the realities of the climate policy-making processes, which exhibit a range of challenges and patterns of fragmentation.

Conclusion

What concerns do national climate policies address globally? What are the underlying processes in how these policies come about? These were the two overarching research questions guiding this dissertation.

The papers in this volume provided various perspectives on climate policy output and policy-making processes. Taken together, these findings advance the current state of research in three ways. First, the papers' global perspective and the identification of empirical patterns and diverse concerns, such as agriculture, highlight the multidimensional character of climate policies and the importance of investigating the opposite direction of integration.

The comprehensiveness of climate policies is most pronounced for EU membership, economies with a high GDP per capita, and to a lesser extent for countries that are environmentally vulnerable. The findings also reveal that energy-related aspects and administrative arrangements are dominant concerns in climate policies. Although a number of other concerns related to transport or carbon pricing are less pronounced, it is likely that these will continue to rise as the general trend of policy output accumulates over time. Crucially, this also underlines the importance of networked and multi-sector approaches.

Second, the examination of two previously uninvestigated case studies improves our understanding of the challenges underlying climate policy-making processes in non-Annex I countries and at the subnational level. In particular, the case studies provide qualitative insights into decision makers' preferences. Ministerial bureaucrats and politicians (alike) are aware of the urgency, importance and difficulty of dealing with the long-term policy problem that climate change represents. However, their motivation is often geared more towards short-term approaches, complying with certain policy requirements or mollifying the impacts of climate change, which are already being felt, rather than making the integration of climate aims a priority. While investigating the national adaptation plan in Israel and the integration of climate concerns at the local level in the Rhein-Neckar region in Germany, I found that both cases displayed similar coordination challenges – which is remarkable, considering how different their contexts are. Fragmented horizontal and vertical coordination highlight the difficulty that crucial actors face both in formulation and in the decision-making stages of the policy process. More studies are needed to determine whether these findings correspond to processes in other countries, and how they impact effective policy design (Meckling and Nahm, 2018).

Third, these findings demonstrate the importance of studying policy integration from a multidisciplinary perspective, for doing so broadens our understanding of the challenges inherent in integrative governance approaches. By taking into account the administrative, temporal, political, and spatial implications of climate policy integration and coordination, I link climate policy integration to theories of public administration and urban planning. By making informed assessments of the goals that political actors wish to achieve, I provide a more nuanced understanding of the challenges (see also, Candel, 2019) and possible spatial limits of integration.

Looking ahead, three developments have the potential to elevate climate policy development in the future. First, it is plausible that the adoption of the Paris Rulebook in December 2018 will not only structure NDCs but might also produce more coherent ones. These will subsequently inform and

likely increase the development of national climate policies on a range of issues. Second, the European election results of May 2019 may be crucial for re-directing enthusiasm and resources towards the high-reaching implementation of climate policy commitments (European Parliament, 2019). Third, perspectives on vulnerability are likely to change. With 2019 looking as though it will be the hottest year on record (just as the previous four years were before it), heat waves and other extreme weather events may increase the pressure on policy makers to take action that combats climate change.

However, after nearly 30 years of climate policy-making, gaps remain apparent – even within the increasingly 'better integrated', comprehensive national climate policies – for climate policy-making is still riven by fragmented coordination. This not only shows a disconnect between what is being written and agreed upon; it also reveals how far countries must come if they are to combat the colossal challenges presented by climate change – let alone achieve the goal of the Paris Agreement.

In light of this, Geden goes on to argue that 'setting ambitious long-term global climate targets has not been a prerequisite but a substitute for appropriate action' (2016: 793). Other scholars are milder in their assessments, noting that the accumulation of rules and regulations is apparent across nearly all policy sectors and developed democracies, meaning that societal demands are being addressed (Adam et al., 2019). At the same time, they note that 'the continuous expansion and differentiation of policy portfolios is a highly ambivalent process' (Adam et al., 2019: 4). For the climate policy domain, this means that the comprehensive patterns of national climate portfolios and the integration of concerns such as agriculture represent significant progress. It also, however, creates demands. These range from the increased administrative capacity to foster the desirability of coordination in the processes underlying climate policy-making, to the provision of financial resources, knowledge, and guidance in the prioritization of specific concerns, since this is required for preventing the accumulation of implementation burdens (Mazmanian and Sabatier, 1983).

Bibliography

Aberbach, J. D. and Rockman, B. A. (2002). Conducting and coding elite interviews. *Political Science and Politics*, 35(04):673–676.

Adam, C., Hurka, S., Knill, C., and Steinebach, Y. (2019). *Policy Accumulation and the Democratic Responsiveness Trap*. Cambridge University Press, Cambridge, UK.

Adelle, C. and Russel, D. (2013). Climate policy integration: a case of déjà vu? *Environmental Policy and Governance*, 23(1):1–12.

Alons, G. (2017). Environmental policy integration in the eu's common agricultural policy: greening or greenwashing? *Journal of European Public Policy*, 24(11):1604–1622.

Averchenkova, A., Fankhauser, S., and Nachmany, M. (2017). *Trends in Climate Change Legislation*. Edward Elgar Publishing, Cheltenham, UK.

Baettig, M. B. and Bernauer, T. (2009). National institutions and global public goods: Are democracies more cooperative in climate change policy? *International Organization*, 63(2):281–308.

Bauer, A., Feichtinger, J., and Steurer, R. (2012). The governance of climate change adaptation in 10 oecd countries: Challenges and approaches. *Journal of Environmental Policy and Planning*, 14(3):279–304.

Bendlin, L. (2019). *Orchestrating Local Climate Policy in the European Union: Inter-Municipal Coordination and the Covenant of Mayors in Germany and France*. Springer, Wiesbaden.

Bennetzen, E. H., Smith, P., and Porter, J. R. (2016). Agricultural production and greenhouse gas emissions from world regions—the major trends over 40 years. *Global Environmental Change*, 37:43–55.

Benson, D. and Lorenzoni, I. (2014). Examining the scope for national lesson-drawing on climate governance. *The Political Quarterly*, 85(2):202–211.

Benz, A. (2007). Inter-regional competition in co-operative federalism: New modes of multi-level governance in germany. *Regional Federal Studies*, 17(4):421–436.

Bernauer, T. and Böhmelt, T. (2013). National climate policies in international comparison: The climate change cooperation index. *Environmental Science and Policy*, 25:196–206.

Bernstein, S. and Cashore, B. (2012). Complex global governance and domestic policies: four pathways of influence. *International Affairs*, 88(3):585–604.

Berrang-Ford, L., Ford, J. D., Lesnikowski, A., Poutiainen, C., Barrera, M., and Heymann, S. J. (2014). What drives national adaptation? a global assessment. *Climatic Change*, 124(1):441–450.

Betsill, M. and Bulkeley, H. (2007). Looking back and thinking ahead: A decade of cities and climate change research. *Local Environment*, 12(5):447–456.

Biermann, F., Davies, O., and van der Grijp, N. (2009). Environmental policy integration and the architecture of global environmental governance. *International Environmental Agreements: Politics, Law and Economics*, 9(4):351.

Biesbroek, G. R., Peters, B. G., and Tosun, J. (2018). Public bureaucracy and climate change adaptation. *Review of Policy Research*, 35(6):776–791.

Biesenbender, S. and Héritier, A. (2014). *Mixed-methods designs in comparative public policy research: The dismantling of pension policies*, pages 237–264. Springer.

Boasson, E. L. (2014). *National Climate Policy: A Multi-field Approach*. Taylor and Francis.

Briassoulis, H. (2004). The institutional complexity of environmental policy and planning problems: the example of mediterranean desertification. *Journal of environmental planning management*, 47(1):115–135.

Brouwer, S., Rayner, T., and Huitema, D. (2013). Mainstreaming climate policy: The case of climate adaptation and the implementation of eu water policy. *Environment and Planning C: Government and Policy*, 31(1):134–153.

Brundtland, G. H., Khalid, M., Agnelli, S., Al-Athel, S., and Chidzero, B. (1987). *Our common future*. New York.

Bulkeley, H. (2010). Cities and the governing of climate change. *Annual Review of Environment and Resources*, 35:229–253.

Burck, J., Marten, F., and Bals, C. (2014). *The climate change performance index: Results 2014*. Germanwatch Berlin.

Candel, J. J. L. (2019). The expediency of policy integration. *Policy Studies*, pages 1–16.

Candel, J. J. L. and Biesbroek, R. (2016). Toward a processual understanding of policy integration. *Policy Sciences*, 49(3):211–231.

Candel, J. J. L. and Pereira, L. (2017). Towards integrated food policy: Main challenges and steps ahead. *Environmental Science and Policy*, 73:89–92.

Capano, G. (2003). Administrative traditions and policy change: When policy paradigms matter. the case of italian administrative reform during the 1990s. *Public Administration*, 81(4):781–801.

Carpenter, D. P. (2001). *The forging of bureaucratic autonomy: Reputations, networks, and policy innovation in executive agencies, 1862-1928*, volume 78. Princeton University Press.

Climate Lab (2017). Why humans are so bad at thinking about climate change. https://www.youtube.com/watch?v=dkz7bjqupva&t=44s.

Clulow, Z. (2019). Democracy, electoral systems and emissions: explaining when and why democratization promotes mitigation. *Climate policy*, 19(2):244–257.

Creswell, J. W. (2003). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage, 2. edition.

Croissant, A. and Wurster, S. (2013). Performance and persistence of autocracies in comparison: introducing issues and perspectives. *Contemporary Politics*, 19(1):1–18.

Damro, C. D., Hardie, I., and MacKenzie, D. (2008). The eu and climate change policy: law, politics and prominence at different levels. *Journal of Contemporary European Research*, 4(3):179–192.

Di Gregorio, M., Nurrochmat, D. R., Paavola, J., Sari, I. M., Fatorelli, L., Pramova, E., Locatelli, B., Brockhaus, M., and Kusumadewi, S. D. (2017). Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages. *Environmental Science and Policy*, 67:35–43.

Ding, D., Maibach, E. W., Zhao, X., Roser-Renouf, C., and Leiserowitz, A. (2011). Support for climate policy and societal action are linked to perceptions about scientific agreement. *Nature Climate Change*, 1:462.

Dupont, C. (2016). *Climate Policy Integration Into EU Energy Policy: Progress and Prospects*. Taylor and Francis.

European Parliament (2019). 2019 european election results. https://www.election-results.eu/european-results/2019-2024.

Fankhauser, S., G. C. and Collins, M. (2015). The political economy of passing climate change legislation: Evidence from a survey. *Global Environmental Change*, 35:52–61.

Fankhauser, S., Gennaioli, C., and Collins, M. (2016). Do international factors influence the passage of climate change legislation? *Climate Policy*, 16(3):318–331.

Feitelson, E. and Fischhendler, I. (2009). Spaces of water governance: The case of israel and its neighbors. *Annals of the Association of American Geographers*, 99(4):728–745.

Feitelson, E., Tamimi, A., and Rosenthal, G. (2012). Climate change and security in the israeli–palestinian context. *Journal of peace research*, 49(1):241–257.

Fleig, A., Schmidt, N. M., and Tosun, J. (2017). Legislative dynamics of mitigation and adaptation framework policies in the eu. *European Policy Analysis*, 3(1):101–124.

Ford, J. D., Tilleard, S. E., Berrang-Ford, L., Araos, M., Biesbroek, R., Lesnikowski, A. C., MacDonald, G. K., Hsu, A., Chen, C., and Bizikova, L. (2016). Opinion: Big data has big potential for applications to climate change adaptation. *Proceedings of the National Academy of Sciences*, 113(39):10729–10732.

Geden, O. (2016). The paris agreement and the inherent inconsistency of climate policymaking. *Wiley Interdisciplinary Reviews: Climate Change*, 7(6):790–797.

Geerlings, H. and Stead, D. (2003). The integration of land use planning, transport and environment in european policy and research. *Transport Policy*, 10(3):187–196.

Gerring, J. (2008). *Case selection for case-study analysis: qualitative and quantitative techniques*. Oxford University Press, Oxford.

Giessen, L. (2011a). *Horizontal policy integration*, pages 293–296. Sage.

Giessen, L. (2011b). *Vertical policy integration*, pages 486–489. Sage.

Haim, D., Shechter, M., and Berliner, P. (2008). Assessing the impact of climate change on representative field crops in israeli agriculture: a case study of wheat and cotton. *Climatic Change*, 86(3-4):425–440.

Head, B. W. (2008). Wicked problems in public policy. *Public policy*, 3(2):101.

Head, B. W. and Alford, J. (2015). Wicked problems: Implications for public policy and management. *Administration and society*, 47(6):711–739.

Heidrich, O., Dawson, R., Reckien, D., and Walsh, C. (2013). Assessment of the climate preparedness of 30 urban areas in the uk. *Climatic Change*, 120(4):771–784.

Hildén, M. (2011). The evolution of climate policies – the role of learning and evaluations. *Journal of Cleaner Production*, 19(16):1798–1811.

Hogl, K., Kleinschmit, D., and Rayner, J. (2016). Achieving policy integration across fragmented policy domains: Forests, agriculture, climate and energy. *Environment Planning C: Government and Policy*, 34(3):399–414.

Howlett, M., Ramesh, M., and Perl, A. (2009). *Studying public policy: Policy cycles and policy subsystems*, volume 3. Oxford University Press, Oxford, UK.

Hull, A. (2008). Policy integration: What will it take to achieve more sustainable transport solutions in cities? *Transport Policy*, 15(2):94–103.

Hulme, M. and Dessai, S. (2008). Negotiating future climates for public policy: a critical assessment of the development of climate scenarios for the uk. *Environmental science and policy*, 11(1):54–70.

Hurrell, A. and Sengupta, S. (2012). Emerging powers, north–south relations and global climate politics. *International Affairs*, 88(3):463–484.

Ingold, K. (2011). Network structures within policy processes: Coalitions, power, and brokerage in swiss climate policy. *Policy studies journal*, 39(3):435–459.

IPCC (2001). *Climate change 2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change*, volume 2. Cambridge University Press.

IPCC (2013). *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

IPCC (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC, Geneva, Switzerland.

IPCC (2018). *Summary for Policymakers. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. In Press.

IPCC (2019). Refinement to the 2006 ipcc guidelines for national greenhouse gas inventories. https://www.ipcc.ch/site/assets/uploads/2019/06/19r_v0_01_overview_advance.pdf. Report.

Jacob, K., Volkery, A., and Lenschow, A. (2008). *Instruments for environmental policy integration in 30 OECD countries*, pages 24–47. Edward Elgar Publishing, Cheltenham.

Jordan, A., Huitema, D., Hildén, M., Van Asselt, H., Rayner, T., Schoenefeld, J., Tosun, J., Forster, J., and Boasson, E. (2015). Emergence of polycentric climate governance and its future prospects. *Nature Climate Change*, 5(11):977–982.

Jordan, A., Huitema, D., van Asselt, H., Rayner, T., and Berkhout, F. (2010). *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge University Press.

Jordan, A. and Lenschow, A. (2010). Environmental policy integration: a state of the art review. *Environmental Policy and Governance*, 20(3):147–158.

Kelle, U. and Erzberger, C. (2004). *Qualitative and Quantitative Methods. A companion to qualitative research.* Sage, London.

Knill, C., Schulze, K., and Tosun, J. (2012). Regulatory policy outputs and impacts: Exploring a complex relationship. *Regulation and Governance*, 6(4):427–444.

Knill, C. and Tosun, J. (2015). *Einführung in die Policy-Analyse*. UTB.

Lafferty, W. and Hovden, E. (2003). Environmental policy integration: towards an analytical framework. *Environmental Politics*, 12(3):1–22.

Lesnikowski, A., Ford, J., Berrang-Ford, L., Paterson, J., Barrera, M., and Heymann, S. (2011). Adapting to health impacts of climate change: a study of unfccc annex i parties. *Environmental Research Letters*, 6(4):044009.

Lesnikowski, A., Ford, J., Biesbroek, R., Berrang-Ford, L., and Heymann, S. J. (2016). National-level progress on adaptation. *Nature Climate Change*, 6(3):261–264.

Levi-Faur, D. (2004). Comparative research designs in the study of regulation: How to increase the number of cases without compromising the strengths of case-oriented analysis. In *The politics of regulation: Institutions regulatory reforms for the age of governance*, pages 177–199. Edward Elgar Publishing.

Levin, K., Cashore, B., Bernstein, S., and Auld, G. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy sciences*, 45(2):123–152.

Lieberman, E. (2005). Nested analysis as a mixed-method strategy for comparative research. *American political science review*, 99(3):435–452.

Massey, E. E. (2016). *Innovation in policy: The emergence of climate adaptation as a new policy field*. Thesis.

May, P. J., Jones, B. D., Beem, B. E., Neff-Sharum, E. A., and Poague, M. (2005). Policy coherence and component-driven policymaking: Arctic policy in canada and the united states. *Policy studies journal*, 33(1):37–63.

May, P. J., Sapotichne, J., and Workman, S. (2006). Policy coherence and policy domains. *Policy studies journal*, 34(3):381–403.

Mazmanian, D. A. and Sabatier, P. A. (1983). *Implementation and public policy*. Scott Foresman.

Meckling, J. and Nahm, J. (2018). The power of process: State capacity and climate policy. *Governance*, 31(4):741–757.

Menahem, G. and Zehavi, A. (2016). *Policy Analysis in Israel*. Policy Press at the University, Bristol.

Michaels, L. and Tal, A. (2015). Convergence and conflict with the 'national interest': Why israel abandoned its climate policy. *Energy Policy*, 87:480–485.

Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., Jensen, A., Kivimaa, P., Kuhlicke, C., and Kuindersma, W. (2009). *Climate policy integration, coherence and governance*. Peer.

Moss, T. and Hüesker, F. (2017). Politicised nexus thinking in practice: Integrating urban wastewater utilities into regional energy markets. *Urban Studies*, page 0042098017735229.

Neumayer, E. (2002). Do democracies exhibit stronger international environmental commitment? a cross-country analysis. *Journal of peace research*, 39(2):139–164.

Never, B. and Betz, J. (2014). Comparing the climate policy performance of emerging economies. *World Development*, 59:1–15.

Niedertscheider, M., Haas, W., and Görg, C. (2018). Austrian climate policies and ghg-emissions since 1990: What is the role of climate policy integration? *Environmental Science and Policy*, 81:10–17.

Nilsson, M., Zamparutti, T., Petersen, J. E., Nykvist, B., Rudberg, P., and McGuinn, J. (2012). Understanding policy coherence: analytical framework and examples of sector–environment policy interactions in the eu. *Environmental Policy Governance*, 22(6):395–423.

Nordhaus, W. (1991). To slow or not to slow: the economics of the greenhouse effect. *The economic journal*, 101(407):920–937.

Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*, 20(4):550–557.

Persson, A.; Runhaar, H. K.-V. S. I. M. G. R. D. and Widmer, A. (2018). Environmental policy integration: Taking stock of policy practice in different contexts. *Environmental Science and Policy*, 85:113–115.

Peters, B. G. (2015). *Pursuing horizontal management: The politics of public sector coordination*. Lawrence: University Press of Kansas.

Peters, G. (2018). *Administrative traditions and administrative reform*. Oxford University Press, Oxford.

Rahman, M. and Tosun, J. (2018). State bureaucracy and the management of climate change adaptation in bangladesh. *Review of Policy Research*, 35(6):835–858.

Reckien, D., Salvia, M., Heidrich, O., Church, J. M., Pietrapertosa, F., De Gregorio-Hurtado, S., D'alonzo, V., Foley, A., Simoes, S. G., and Lorencová, E. K. (2018). How are cities planning to respond to climate change? assessment of local climate plans from 885 cities in the eu-28. *Journal of clearner production*, 191:207–219.

Runhaar, H., Wilk, B., Persson, s., Uittenbroek, C., and Wamsler, C. (2017). Mainstreaming climate adaptation: taking stock about "what works" from empirical research worldwide. *Regional Environmental Change*, pages 1–10.

Schaffrin, A., Sewerin, S., and Seubert, S. (2014). The innovativeness of national policy portfolios–climate policy change in austria, germany, and the uk. *Environmental Politics*, 23(5):860–883.

Schaffrin, A., Sewerin, S., and Seubert, S. (2015). Toward a comparative measure of climate policy output. *Policy studies journal*, 43(2):257–282.

Schmitt, S. (2012). *Comparative approaches to the study of public policy-making*, pages 47–61. Routledge.

Stern, N. and Stern, N. H. (2007). *The economics of climate change: the Stern review*. Cambridge University Press.

Sæverud, I. A. and Wettestad, J. (2006). Norway and emissions trading: From global front-runner to eu follower. *International Environmental Agreements: Politics, Law Economics*, 6(1):91–108.

Swinburn, B. A., Kraak, V. I., Allender, S., Atkins, V. J., Baker, P. I., Bogard, J. R., Brinsden, H., Calvillo, A., De Schutter, O., and Devarajan, R. (2019). The global syndemic of obesity, undernutrition, and climate change: The lancet commission report. *The Lancet*, 393(10173):791–846.

Tavoni, A., Dannenberg, A., Kallis, G., and Löschel, A. (2011). Inequality, communication, and the avoidance of disastrous climate change in a public goods game. *Proceedings of the National Academy of Sciences*, 108(29):11825–11829.

Tobin, P. (2017). Leaders and laggards: Climate policy ambition in developed states. *Global Environmental Politics*, 17(4):28–47.

Tobin, P., Schmidt, N. M., Tosun, J., and Burns, C. (2018). Mapping states' paris climate pledges: Analysing targets and groups at cop 21. *Global Environmental Change*, 48:11–21.

Tosun, J. and Croissant, A. (2016). Policy diffusion: A regime-sensitive conceptual framework. *Global Policy*, 7(4):534–540.

Tosun, J. and Lang, A. (2017). Policy integration: mapping the different concepts. *Policy Studies*, 38(6):553–570.

Tosun, J. and Leininger, J. (2017). Governing the interlinkages between the sustainable development goals: Approaches to attain policy integration. *Global Challenges*, 1(9):1700036.

Tosun, J. and Leopold, L. (2019). Aligning climate governance with urban water management: Insights from transnational city networks. *Water*, 11(4):701.

Townshend, T., Fankhauser, S., Aybar, R., Collins, M., Landesman, T., Nachmany, M., and Pavese, C. (2013). How national legislation can help to solve climate change. *Nature Climate Change*, 3(5):430–432.

Townshend, T., Fankhauser, S., Matthews, A., Feger, C., Liu, J., and Narciso, T. (2011). Legislating climate change on a national level. *Environment: Science and Policy for Sustainable Development*, 53(5):5–17.

UN (1992). United nations framework convention on climate change. https://unfccc.int/resource/docs/convkp/conveng.pdf.

UN (2015). Paris agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

UN (2016). *Habitat III: The New Urban Agenda*. Quito.

UNFCCC (2019). Kyoto protocol - targets for the first commitment period. https://unfccc.int/process-and-meetings/the-kyoto-protocol/what-is-the-kyoto-protocol/kyoto-protocol-targets-for-the-first-commitment-period.

Van Asselt, H., Rayner, T., and Persson, s. (2015). *Climate policy integration*, book section 34, pages 388–399. Edward Elgar Publishing.

Wenzelburger, G. and Zohlnhöfer, R. (2015). *Handbuch Policy-Forschung*. Springer-Verlag.

Willis, R. (2018). Constructing a 'representative claim'for action on climate change: Evidence from interviews with politicians. *Political Studies*, 66(4):940–958.

Wälti, S. (2004). How multilevel structures affect environmental policy in industrialized countries. *European journal of political research*, 43(4):599–634.

Wood, R. S., Hultquist, A., and Romsdahl, R. J. (2014). An examination of local climate change policies in the great plains. *Review of Policy Research*, 31(6):529–554.

Wüstenhagen, R. and Bilharz, M. (2006). Green energy market development in germany: effective public policy and emerging customer demand. *Energy policy*, 34(13):1681–1696.

Part II

Paper 1

Global Patterns of National Climate Policies: Analyzing 171 Country Portfolios on Climate Policy Integration*

with Andreas Fleig

Abstract

Over the last decades, a growing number of countries around the world adopted policies towards climate change. However, apart from the remarkable increase in legislative activity, we know little about the composition of country portfolios on climate policy and whether those rely mainly on specific climate policies or the integration of climate objectives across domains. Research on policy integration is often bound by a dearth of suitable data and has to rely on small-n comparative case study designs or a certain type of policy when investigating these phenomena. Our paper addresses this gap by drawing on the Climate Change Laws of the World database for national climate legislation across eight policy categories. Hereby, we systematically assess how climate-related policies have developed over the last 27 years and across 171 countries. The analysis shows that since 1990, the scope of country portfolios has risen considerably. This increase started somewhat slowly in the 1990s but accelerated afterwards across all categories, albeit at different times and to varying degrees of coverage. In particular, climate policies

*This journal article was co-authored with Andreas Fleig. Nicole Schmidt developed the idea for the paper and the conceptual framework, while Andreas Fleig conducted the empirical analyses and results. Both authors contributed equally to the respective other parts.

on energy demand and supply as well as administrative arrangements are widespread. Our findings suggest that efforts at CPI were more common in the energy than the transportation domain. The focus of climate specific categories, i.e. no efforts at CPI, were 'administrative arrangements', and, albeit to a much lesser extent, policies addressing carbon pricing. With respect to future climate action, the results of our cross-country analysis are two-fold. On the one hand, it is reasonable to assume that countries not having enacted policies in the most commonly addressed categories will soon follow suit. On the other hand, transportation and carbon pricing, specifically, are policy areas that are least addressed in our sample and represent an area where much is yet to be uncovered.

Introduction

Governing the challenges of climate change has been addressed by a multitude of perspectives and approaches. International negotiations have been a focal point of social science research since the early 1990s with a renewed debate due to the successful adoption of the Paris Agreement in 2015 (Rajamani, 2016; Rogelj et al., 2016). In recent years, however, policies addressing climate change at the national level are moving to the center of political attention worldwide (Bernauer & Böhmelt, 2013; Jordan et al., 2015; Lachapelle & Paterson, 2013). Hence, a literature has begun emerging, drawing particular attention to these new patterns of national policy activity and focusing on comparative policy and politics globally (Cao, Milner, Prakash, & Ward, 2014; Fankhauser, Gennaioli, & Collins, 2015; Lesnikowski, Ford, Biesbroek, Berrang-Ford, & Heymann, 2016; Nachmany et al., 2015; Never & Betz, 2014; Tobin, 2017; Townshend et al., 2013)

The cross-cutting nature of climate change affects many different domains. Therefore, it is vital to coordinate the various efforts (Adelle & Russel, 2013). Scholars of climate policy integration (CPI) investigate whether, how and to what extent climate concerns are integrated into other domains (Adelle, Pallemaerts, & Chiavari, 2009; De Roeck, Orbie, & Delputte, 2018; Dupont, 2013). Yet, most studies are restricted to single or small-n case studies (see Jacob, Volkery, & Lenschow, 2008 for an exception) leaving little to no possibility to derive generalizable results (Tosun & Lang, 2013). This is, among other reasons, due to the fact that large-n empirical assessments of CPI are often bound by the lack of suitable data (Dubash, Hagemann, Höhne, & Upadhyaya, 2013 for an overview of databases that track national climate policies). To address this research gap, we investigate portfolios of national climate policy on a global scale. Specifically, we complement ex-

isting literature and add to emerging topics and pressing questions in CPI research by assessing different climate policy categories in 171 countries over the last 27 years.

The following research questions guide this study: how has climate related policy developed over time and across countries? Specifically, do we observe patterns where countries show efforts at CPI? With our analysis, we are not only able to display national climate policy portfolios but also investigate whether countries rely on either specific climate policies or CPI when addressing the challenges of climate change.

The remainder of this study is structured as follows. The next segment presents an overview of previous literature on CPI. By discussing key phenomena, we derive the respective hypotheses for answering our research questions. Subsequently, data sources, operationalisation and methods of our empirical analysis are explained. After discussing the results, we conclude by summarising the main findings and indicate avenues for further research.

CPI in the context of climate policy

Climate change is a complex, boundary-spanning problem (Jochim & May, 2010), and policies cut through a myriad of domains because they concern adjacent sectors (van Asselt, Rayner, & Persson, 2015). Coordination efforts are highly contested when policies originate in various sectors (at times with competing priorities) because it can lead to disputes over accountability among policy actors (Peters, 2015; Tosun & Lang, 2017) whose responsibilities are often distributed over various ministries (Schmidt, Teschner, & Negev, 2018). This predicament also applies to the environmental policy integration (EPI) literature that proceeded CPI (Jordan & Lenschow, 2010; Mickwitz et al., 2009; Runhaar, Driessen, & Uittenbroek, 2014). Broadly speaking, both strings of literature call for coordinated policy approaches, but the debate around climate targets has, so far, received less attention 'despite its increased prominence in policy circles' (Adelle & Russel, 2013, p. 2).[1]

Indeed, not only the sheer increase in policy activity over the last decades but also the respective scope and diversity of climate policies are remarkable (Keohane & Victor, 2011). Studies investigate, for example, the adoption patterns of specific climate policies with regards to both mitigation and adaptation (Fleig, Schmidt, & Tosun, 2017) or analyze the socalled (Intended)

[1] The existing literature in both fields can be useful for identifying potential variables. However, there is also a debate between the specific differences of CPI and EPI (Adelle and Russel, 2013).

Nationally Determined Contributions [(I)NDCs] formulated by each individual state following negotiations at COP 21 (Tobin, Schmidt, Tosun, & Burns, 2018).

However, we need to take a more reflective stance beyond a mere confirmation that countries act upon a CPI strategy as envisaged in the literature. For instance, Höhne et al. (2017) find that globally, though especially in developing countries, the process of formulating (I)NDCs has produced an increasing number of climate plans and strategies. Studies find that acting upon broader guiding principles or strategies is indeed more common (Brouwer, Rayner, & Huitema, 2013; Nunan, Campbell, & Foster, 2012) than having legally binding targets because these softer measures of governance can, in turn, also be adopted more frequently; they do not interfere with sector-related policy-making and/or the existing institutional structure.

Assessing the degree to which climate objectives have been integrated into established policy domains is not an easy task. This is primarily because the literature is not consistent, using CPI synonymously with other, related concepts (Di Gregorio et al., 2017) such as 'mainstreaming' (Kok & de Coninck, 2007; Swart & Raes, 2007), which investigates mainstreaming climate objectives in relation to adaptation (Brouwer et al., 2013; Runhaar, Wilk, Persson, Uittenbroek, & Wamsler, 2017). Clearly differentiating CPI from EPI and energy policy integration (EnPI) is challenging (Tosun & Peters, 2018). Yet, it is even more difficult to distinguish CPI from climate policy 'per se' (Adelle & Russel, 2013, p. 2) when operationalizing it. This is why most CPI scholars focus on one specific policy area such as forests, agriculture, energy or transport (Adelle et al., 2009; Hogl, Kleinschmit, & Rayner, 2016; Stead, 2003), using document analysis and semi-structured interviews (Ahmad, 2012), or case-study design (Kivimaa & Mickwitz, 2009; Mickwitz et al., 2009) to assess CPI. However, looking at one particular aspect reveals only a piece of the (entire) puzzle and makes it difficult to provide 'historical perspectives' (Persson, Eckerberg, & Nilsson, 2016, p. 478) in order to better understand how practices evolve over much longer periods of time and across the world.

While in general, little is known about successful implementation of CPI (Persson et al., 2018), disagreement exists with regard to the integration efforts' assessment of output success. Some scholars draw distinct lines between sufficient and insufficient integration (Dupont, 2013; Nilsson & Nilsson, 2005), but others acknowledge that processes move at different paces (Jordan & Halpin, 2006), calling for an output (Abramczyk, 2013) or 'processual' understanding of the matter (Candel & Biesbroek, 2016).

In both cases, CPI as policy output or as policy process, integration of policy goals across scales usually takes place within two dimensions, i.e.

vertically across levels of government and horizontally across different sectors (Giessen, 2011a, 2011b). Both are important aspects of the equation, but as we are primarily interested in looking at whether or not categories have been addressed by national climate policies, we focus on horizontal integration efforts and conceptualize these 'policy categories' in our subsequent empirical analysis. In analysing the spread of climate policies, we focus on the policy output dimension manifested as national level policy. In 'an attempt to bring environmental [or in our case: climate] objectives on equal terms with sectoral objectives' (Persson et al., 2016), we take on the harmonisation perspective on integration. This means that instead of looking at one particular domain or at a specific policy instrument, we assess climate policy on mitigation and adaptation and focus on assessing a large sample set of countries over nearly three decades. In doing so, we follow Di Gregorio et al.'s definition of CPI 'as the integration of multiple policy objectives, governance arrangements and policy processes related to climate change mitigation, adaptation and other policy domains' (2017, p. 36).

Hypotheses

Apart from the remarkable increase in legislative activity over the last decade, we know little about the composition of country portfolios on climate policies. As climate change requires a policy mix 'in a multidimensional and cross-sector manner' (Christopoulos, Horvath, & Kull, 2012, p. 308), we argue that the number of categories addressed by national climate policy will increase. Looking at how many categories are addressed, we are able to assess whether countries show a more comprehensive coverage approach. We argue that such a comprehensive approach can serve as a proxy for CPI, in particular when the respective policies address established policy sectors. Importantly, we do not expect such a development to be uniformly distributed across countries. As multiple factors influence individual state responses towards climate change (Christoff & Eckersley, 2011; Tobin, 2017), our analysis further investigates potential determinants such as political conditions, institutional capacity and problem characteristics. By factoring in such variables, we are able to investigate what countries do and assess how much more (or less) they are doing than others.

I) Looking at political conditions, we first turn to the member states of the European Union (EU). Early on, the EU installed EPI as a key and extended principle, for example citing it in the Third Environmental Action Programme adopted in 1982 (Geerlings & Stead, 2003). In 1998, the 'Cardiff Process' initiated integration strategies for sectors such as transport, energy and agriculture. Similarly, the EU prominently and repeatedly has claimed a

global leadership role in combatting climate change (Gupta & Ringius, 2001; Oberthür & Roche Kelly, 2008), establishing the European Trading Systems (ETS) and the EU's Climate and Energy Package with ambitious targets (European Commission, 2016). As individual member states have been criticized for the gulf between ambition and reality considering the actual implementation of climate policy goals (Fleig et al., 2017; Parker & Karlsson, 2010), we are interested in examining whether EU countries actually do lead the way in terms of passing national climate policies. Here, we expect that the EU's climate change leadership aspiration manifests itself, c. p., in a temporal aspect of enacting climate policy at an earlier point in time (Hypothesis 1a). In addition, we expect EU countries to display climate policies across more policy categories (Hypotheses 1b).

H1a. EU member states act earlier on climate policy.

H1b. EU member states show more CPI.

II) Assessing institutional capacities, previous studies highlight the need of financial support from the central government (Measham et al., 2011; Nalau, Preston, & Maloney, 2015) for acting on climate change as 'larger and wealthier states appear to innovate first' (Volden, 2006, p. 312). Accordingly, we raise the questions as to when (Hypothesis 2a) and to what extent (Hypothesis 2b) are governments able to pursue policy integration (Persson et al., 2016) by taking into account a country's income level.

H2a. High-income countries act earlier on climate policy.

H2b. High-income countries show more CPI.

III) Examining problem characteristics, Tosun and Lang (2013) argue that accountability as well as affectedness matter for policy integration. In this regard, it makes sense that the degree of vulnerability (Adger, 2006; Baettig, Wild, & Imboden, 2007) is prominently mentioned as a condition driving climate policies (Barnett, Lambert, & Fry, 2008; Christoff & Eckersley, 2011). We, therefore, investigate whether a country's environmental vulnerability is linked to earlier climate policies (Hypothesis 3a) and is more pronounced across categories (Hypothesis 3b).

H3a. Environmentally vulnerable countries act earlier on climate policy.

H3b. Environmentally vulnerable countries show more CPI.

Operationalisation, methods and data

For answering our research questions, we rely on the Climate Change Laws of the World database.[2] It is the most reliable and comprehensive dataset on national legislative activities for climate change mitigation, adaptation and litigation (Averchenkova, Fankhauser, & Nachmany, 2017), covering 171 countries since 1963 and comprising of information on 1359 pieces of climate legislation (version November 2017). This remarkable amount of data is collected, on the one hand, by using a rather broad definition of the term 'legislation' because the database also includes 'regulations, policies and decrees with a comparable status [...] to ensure the best reflection of the overall legislative and regulatory response to climate change' (Averchenkova et al., 2017, p. 21 f.). On the other hand, general environmental laws and policies are only included when comprising of an explicit climate change focus. Even more important for our research interest, the data contains for each entry its specific allocation towards the following eight categories: adaptation, carbon pricing, energy demand, energy supply, institutions/administrative arrangements,[3] REDD+and LULUCF, research and development (R&D), and transportation. This classification only partly corresponds with established policy sectors: both 'energy' categories relate to climate policy for the energy sector, 'REDD + and LULUCF' to the forestry and land-use sector, 'R&D' to the 'R&D' sector, and 'transportation' to the 'transport' sector. 'Adaptation' likely addresses multiple sectors, leaving 'carbon pricing' and 'administrative arrangements' as two specific climate categories which do not mirror efforts at CPI. Despite this, we stick with the original categorization for reasons of transparency.

While we use this content-related information on targeted categories, please note that our approach is purely enumerative as any qualitative measures are not considered. However, simply counting the amount of national policies is likely to produce measurement errors (Grant & Kelly, 2008). Others have addressed this issue by looking at the content of laws and policies (Adam, Knill, & Fernandez-i-Marín, 2017) or by constructing an index (Schaffrin, Sewerin, & Seubert, 2014). In contrast, we follow Christoff and

[2]The Climate Change Laws of the World database (formerly known as GLOBE) is compiled by the Grantham Research Institute on Climate Change and the Environment together with the Sabin Center for Climate Change Law and can be accessed at www.lse.ac.uk/GranthamInstitute/climate-change-laws-of-the-world.

[3]The 'administrative arrangements' category contains policies which 'manage and support domestic responses to climate change and/or mainstreaming climate change management and financing; a good example is Bangladesh's 2009 Climate Change Trust Fund Act, which establishes a new institutional framework to fund adaptation activity' (Averchenkova et al., 2017, p. 3).

Eckersley (2011) by focusing on potential emerging patterns in policy activity per category and capture a country's climate policy density (see Knill, Schulze, & Tosun, 2012 for a corresponding discussion on regulatory policy outputs and impacts). In other words, we measure the existence of a policy within a category (density referring to its presence or absence), but we are unable to account for a policy's quality.

Primarily, we use the available data on climate policies in three ways when describing the legislative information in more detail and addressing our hypotheses in the next section. Firstly, we look at the coverage of any of the eight individual categories, i.e. whether a country enacted a policy in the respective category. Secondly, on an aggregated level, we consider the amount of categories addressed by national climate policies, i.e. in how many of the overall eight categories a country enacted policies. Thirdly, we examine the date of the first enacted policy within a category, i.e. how many years have passed since the first piece of national climate policy addressed a respective category.

During the course of the empirical analysis in the subsequent section, we investigate differences within the coverage across different groups of countries by considering EU membership, a country's income level as well as its environmental vulnerability as potential determinants of climate policies. Please note that this approach is not intended to provide a fully-specified model for a country's degree of CPI. The subdivision allows rather for indicating patterns of policy activity, and the number and type of categories may serve as an approximation for CPI. Summary statistics of the country characteristics, together with their definition and the source from which the data were extracted, are presented in alphabetical order in Table 1.1. Our focus on national climate policies from 1990 until 2016 results in the observation of 171 countries over 27 years, amounting to 4617 country-years.

Variable	Obs	Mean	SD	Min	Max	Short description	Source
EU	4617	0.15	0.36	0	1	Indication of a country's membership in the European Union. As the Climate Change Laws of the World database covers all EU countries except for Malta and Luxembourg, our sample consists of 26 EU member states.	EU
EVI category	4617	3.18	1.09	1	5	A country's vulnerability group (ordinal classification) based on its EVI score: extremely vulnerable, highly vulnerable, vulnerable, at risk, resilient.	Kaly et al. (2004)
EVI score	4617	300.19	52.27	181	428	Aggregated measure across 50 sub-indices on the vulnerability of a country's environment to future shocks.	Kaly et al. (2004)
GDP per capita	4419	10488.44	15835.02	115.8	141165.1	GDP per capita in constant 2010 US$. It comprises the sum of gross value added by all resident producers in the economy divided by mid-year population.	WDI
Income level	4617	2.64	1.04	1	4	Ordinal classification of income group level by the world bank: high income, upper-middle income, lower-middle income, low income.	WDI

Abbreviations: EVI - Environmental Vulnerability Index (http://www.vulnerabilityindex.net); WDI - World Development Indicators of the World Bank (databank.worldbank.org/data/download/site-content/CLASS.xls).

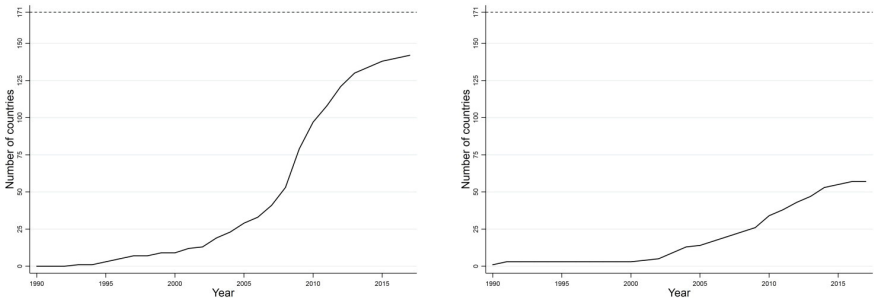
Table 1.1: Summary statistics of explanatory variables.

Results

We begin our empirical analysis by looking at the coverage of the eight individual categories over the last 27 years. Figure 1.1 shows for each category, separately, how many of the 171 countries enacted respective policies. Altogether, the eight graphs illustrate that the coverage grew (considerably) across all categories.

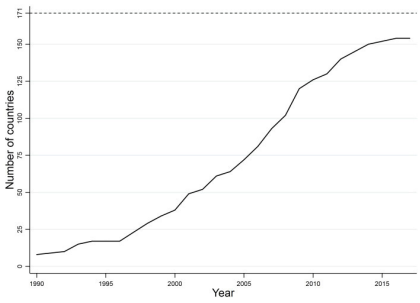
Besides this common trend, differences across categories are most noteworthy. First, the strongest growth since 1990 and highest coverage in 2016 can be observed for both energy categories as well as administrative arrangements. In contrast, we obtained the lowest values for carbon pricing and transportation. Secondly, the development occurred across categories at different points in time. After a slow start in the 1990s, regulations on administrative arrangements and energy moved forward to lead the steady increase in coverage, while policies on adaptation and R&D only became more prominent after 2005. This corresponds to previous contributions (Jordan & Halpin, 2006), which argue that policy integration processes move at different paces.

In addition, while growth patterns vary across categories, most curve progressions closely resemble the prominent S-shape of policy adoption in

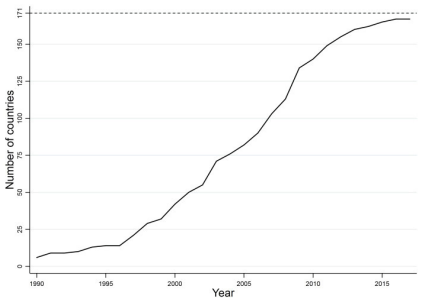


(a) Adaptation

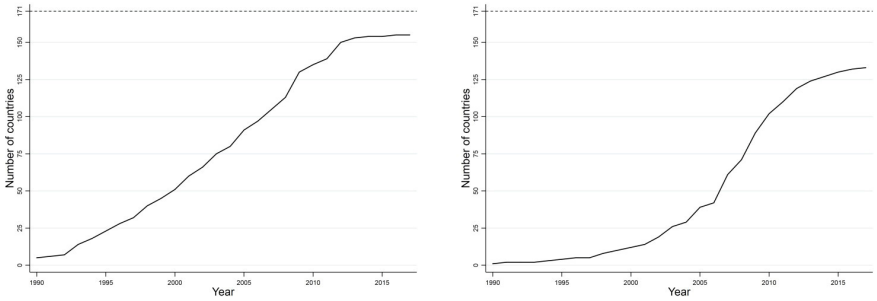
(b) Carbon pricing



(c) Energy demand

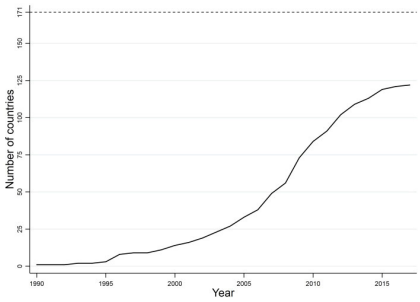


(d) Energy supply

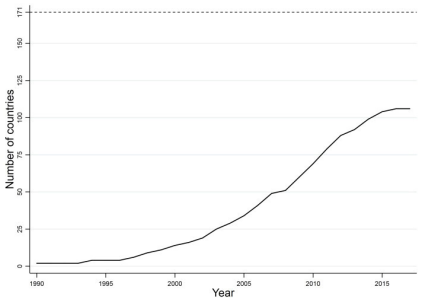


(e) Administrative arrangements

(f) R & D



(g) REDD+ and LULUCF



(h) Transportation

Figure 1.1: The coverage of climate change categories over time.

diffusion studies (Jordan & Huitema, 2014; Massey, Biesbroek, Huitema, & Jordan, 2014).

In particular, the late 1990s and early 2000s stand out as the first period of accelerating growth. This corresponds to previous findings on climate change legislation at large (Fankhauser et al., 2015), but, importantly, it is also observable at the individual category level.

Next, we turn towards the aggregated level. Table 1.2 shows the overall coverage by listing the average number of addressed categories across all 171 countries. In accordance with the individual category developments, we observe that since 1990 this rate has risen from 0.14 to 5.95. This significant expansion emphasizes the increasing importance of climate policies over the last decades from the perspective of individual category coverage.

Table 1.2 emphasizes yet another aspect. While the increase in category coverage over time is obvious, it becomes clear that the number of addressed categories varies considerably across countries (SD, range). In our next step, therefore, we address our hypotheses and look for potential drivers of the variance in coverage. This is accomplished with respect to two measures, namely the date when countries first regulated a category and the amount

of regulated categories throughout the observation period. We examine both aspects with respect to the previously discussed country characteristics (see Table 1.1). More specifically, we investigate whether countries that are members of the EU, possess a higher income level, or are more environmentally vulnerable enact climate policy earlier and/or in a more comprehensive way.

Year	Mean	SD	Min	Max
1990	0.14	0.63	0	5
1995	0.42	1.02	0	5
2000	1.07	1.54	0	7
2005	2.30	2.19	0	8
2010	4.60	2.21	0	8
2015	5.95	1.74	1	8

Explanatory note: The table lists the average number out of max. 8 categories addressed by national climate policies across all 171 countries for the years 1990, 1995, 2000, 2005, 2010 and 2015.

Table 1.2: The overall coverage of climate change categories over time.

We first look at the date when countries first regulated a category and whether this is related to country characteristics. The respective measures are shown in Table 1.3. We observe that EU members took early action with respect to adaptation, carbon pricing, energy demand, REDD+and LULUCF and transportation. Thus, Hypothesis 1a is partly confirmed. Interestingly, we observe similar results for the measures of GDP per capita and environmental vulnerability. Countries averaging a higher income level or being more at risk started early with policies on carbon pricing, energy demand / supply and transportation (in the case of GDP also with administrative arrangements). Therefore, Hypotheses 2a and 3a are also partly confirmed.

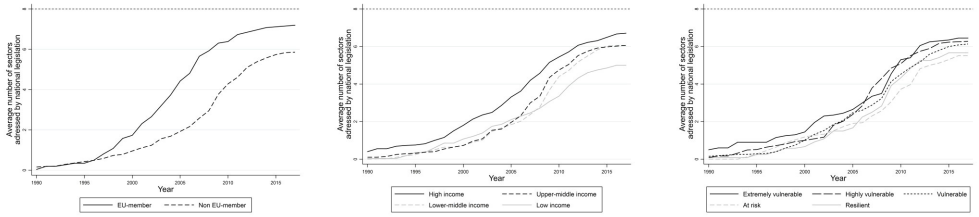
Next, we look at the aggregated amount of regulated categories over the observation period and relate them to the discussed country characteristics. Corresponding overview graphs are shown in Figure 1.2. In order to keep the graphs legible, we use ordinal categories for depicting the development with respect to income level, and environmental vulnerability (see Table 1.1).

DV: date of first policy within a category	EU member	GDP per capita	EVI score
N	171	168	171
Adaptation	0.449 **	0.029	0.049
Carbon pricing	0.656 ***	0.292 ***	0.0141 **
Energy demand	0.522 **	0.268 ***	0.169 ***
Energy supply	0.351	0.146 ***	0.090 *
Administrative Arrangements	0.385	0.138 ***	0.080
R & D	0.386	0.078	0.081
REDD + and LULUCF	0.548 ***	0.067	0.014
Transportation	0.617 ***	0.263 ***	0.218 ***

Explanatory note: The tables list measures of association and corresponding significance levels for the date of first regulation of a category within a country and the explanatory variables. We use two different measures of association: For the nominal variable EU membership, we rely on Cramer's V. For metric levels of measurement as EVI score and GDP per capita, we use the Kendall rank correlation (Tau B), a non-parametric hypothesis test for statistical dependence (Agresti, 2010). Please note that correlations between explanatory variables themselves do not exceed a moderate relationship. The Bonferroni and continuity corrected significance levels are indicated as *=0.1; **=0.05 and ***=0.01.

Table 1.3: Effects of explanatory variables on the first policy within a category.

In the left graph, we observe, as expected, that EU member states exhibit a higher rate of coverage. This becomes particularly pronounced at the end of the 1990s, while the gap visibly shrinks from the late- 2000s onward as non-EU members 'catch-up'. The middle graph clarifies that the group of high-income countries stands out the most against low-income countries with the least comprehensive coverage. Upper and lower-middle-income countries behave rather similarly. With respect to a country's environmental vulnerability, the right graph shows no strictly separate development across the groups over the entire observation period. Until the early 2000s, extremely vulnerable countries are most active. From 2005 onward, highly vulnerable countries show a steep increase while 'at risk' instead of 'resilient' countries exhibit the lowest number of addressed categories.



(a) EU membership (b) Income level (c) Environmental vulnerability

Figure 1.2: The amount of climate change categories by country groups.

Explanatory note: The threes graphs show the average number of addressed climate change categories across all 171 countries separated by respective country characteristics. Source: own calculations based on Climate Change Laws of the World database.

In addition to the visual inspection, Table 1.4 lists the corresponding test statistics with the developments just discussed. In order to use all available information, the measures are calculated based on metric values for income level, and environmental vulnerability instead of the ordinal categories used in Figure 1.2.

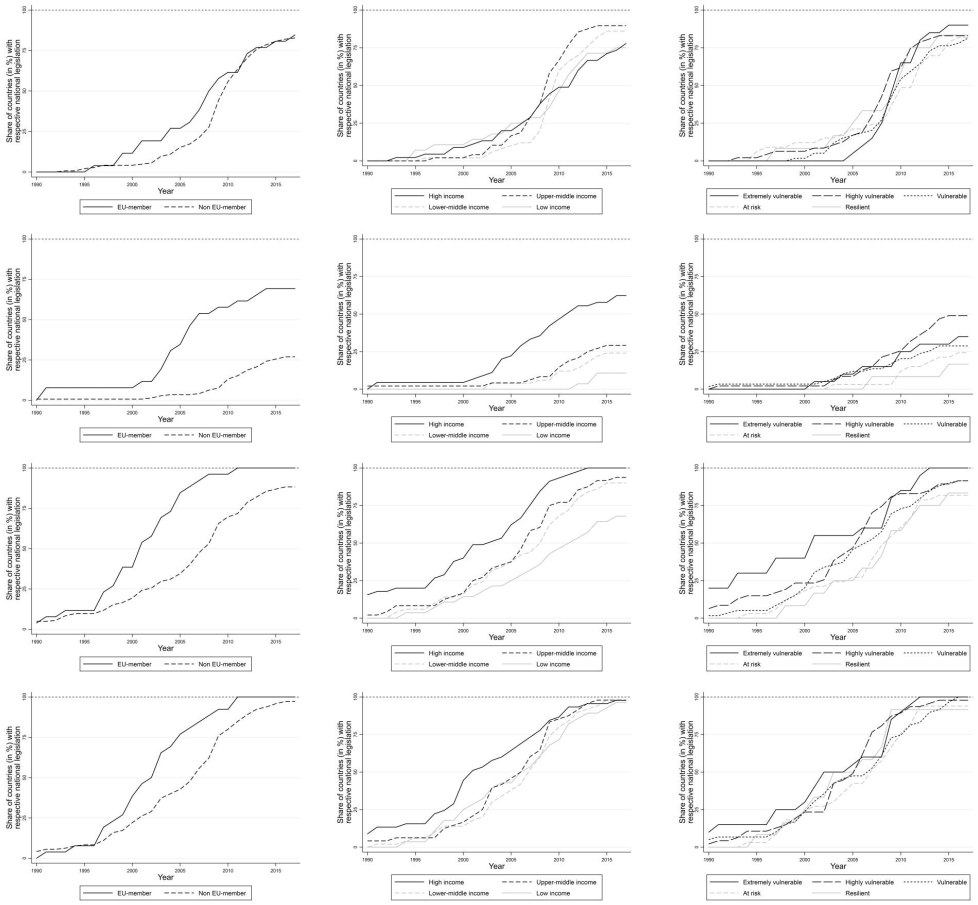
With respect to EU membership, the results confirm the visual impression as test statistics are statistically significant from 2000 onward. This supports Hypothesis 1b for the last 17 years where EU member states show a higher number of addressed categories. Next, a larger GDP per capita is significantly associated with a higher number of addressed categories and corroborates Hypothesis 2b. As Figure 1.2 shows, the group of high-income countries predominantly drives this development. For environmental vulnerability, we only observe until 1995 and from 2010 onwards an association to more climate policies. Thus, Hypothesis 3b is partly confirmed.

DV: date of first policy within a category	EU member	GDP per capita	EVI score
N	171	168	171
1990	0.083	0.214 ***	0.137 **
1995	0.187	0.168 ***	0.154 **
2000	0.307 **	0.174 ***	0.008
2005	0.467 ***	0.164 ***	0.057
2010	0.433 ***	0.209 ***	0.175 ***
2015	0.333 ***	0.249 ***	0.159 ***

Explanatory note: The tables list measures of association and corresponding significance levels for the amount of categories addressed by national climate policy and explanatory variables. We use two different measures of association: For the nominal variable EU membership, we rely on Cramer's V. For metric levels of measurement as EVI score and GDP per capita we use the Kendall rank correlation (Tau B), a non-parametric hypothesis test for statistical dependence (Agresti, 2010). As most policies are passed after 2000, empirical findings for 1990 and 1995 are based on rather few laws and should, therefore, be treated with caution. Bonferroni and continuity corrected significance levels are indicated as *=0.1; **=0.05 and ***=0.01.

Table 1.4: Effects of explanatory variables on the amount of categories addressed by national climate policy.

Finally, we can also have a look into which categories drive these differences. Figure 1.3 shows for every category the share of countries within a specific group that enacted respective climate policies. While EU membership is associated with a higher share of countries passing respective policies throughout all categories, adaptation is least pronounced, while carbon pricing as well as transportation are most dominant. Looking at income levels, the domination of high-income countries is not manifested within adaptation measures. Also noteworthy is the high share of lower-middle-income countries with regulation concerning administrative arrangements, R&D and REDD+ and LULUCF. For environmental vulnerability, we observe similar values over time for all risk categories in case of adaptation, energy supply and REDD+ and LULUCF. Carbon pricing and energy demand show a clear pattern of more activity in relation to vulnerability, while also the high share of resilient countries with R&D policies is quite noticeable.



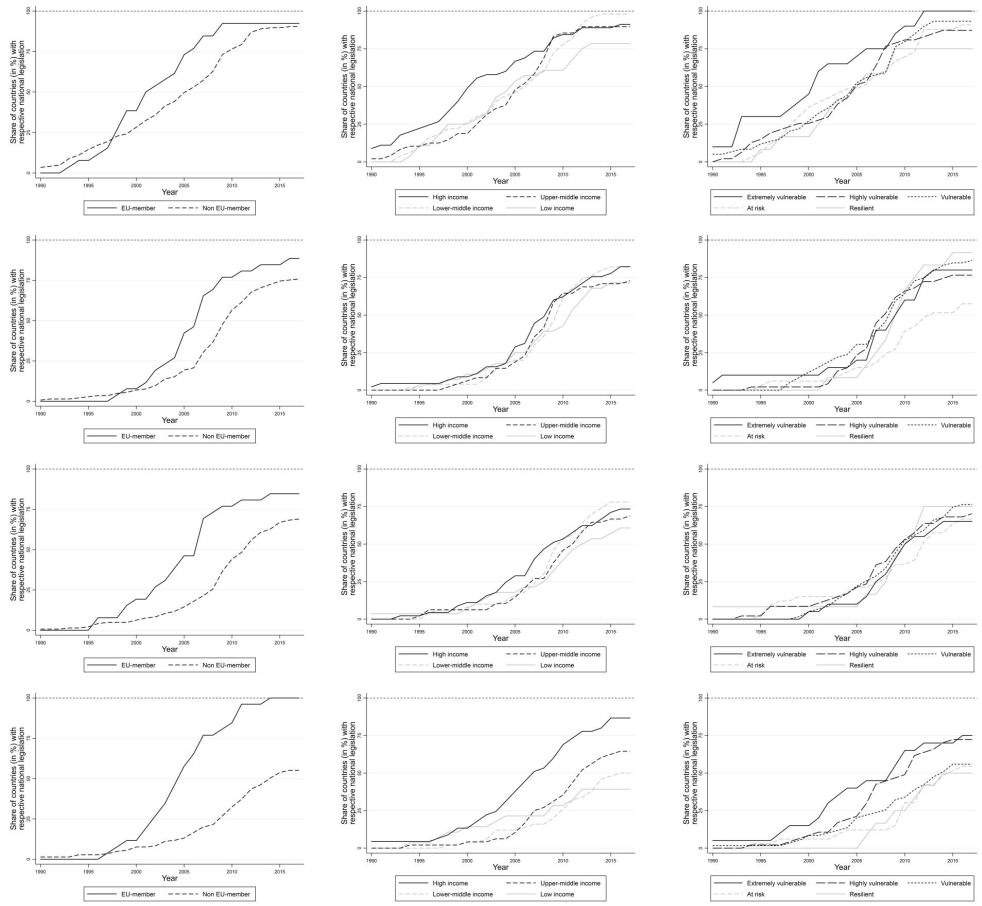


Figure 1.3: The coverage of climate change categories by country groups.

Explanatory note: The graphs depict the share of countries within a specific group that enacted a policy in a respective category. Source: own calculations based on Climate Change Laws of the World database.

Discussion and concluding remarks

Climate policies and politics have evolved significantly since the early 1990s, yet our understanding of this evolution has been rather meager. In this paper, we provide a comprehensive assessment of global patterns of national climate policies over the last 27 years and across 171 countries. Overall, our results clearly substantiate a considerable increase in numbers of categories addressing climate policies.

Taking a closer look at our findings, we contribute to the state of research in three ways. First, we find that EU membership, a countries' income level as well as its environmental vulnerability are each associated with a more

comprehensive coverage, i.e. more addressed categories. The results are most pronounced for EU membership, which also relates to earlier action on climate policy, and economies with a high GDP per capita. Second, within our sample we observe that the following categories of 'energy supply' and 'energy demand' as well as 'administrative arrangements' are addressed most frequently throughout our observation period. In contrast, less commonly addressed categories are carbon pricing and transportation. Thus, the results of our cross-country analysis over time highlight the importance of multi-sector policy approaches towards the challenges of climate change (Christopoulos et al., 2012) but may also serve as indication for future climate action. On the one hand, it is reasonable to assume that countries not having enacted regulations in the most commonly addressed categories will soon follow suit. On the other hand, transportation and carbon pricing, specifically, are policy areas that are least addressed and represent an area where much is yet to be uncovered.

Third, the varying degrees of category coverage offer further insights. The time-series cross-country character of our analysis complements existing literature resting prominently on small-n case-study designs focusing on the EU (Fleig et al., 2017), Annex II (Tobin, 2017) or OECD countries (Jacob et al., 2008). While we lack qualitative information and the circumstances under which policies were enacted, we can assess that within our sample, policies in both 'energy' categories are most pronounced. Hence, our findings suggest that efforts at CPI were more common with respect to the energy domain than towards transportation. With respect to climate specific categories, i.e. no efforts at CPI, 'administrative arrangements' were in the focus of these efforts in comparison to the low numbers of policies addressing carbon pricing.

While we believe that these are important insights, we acknowledge that our findings only constitute a first step towards further assessments. In addition, we address several shortcoming of this study. Empirically, the first and most evident drawback is that our dataset is restricted by the coding format of the Climate Change Laws of the World database. For example, rather than treating adaptation as a single unit, we believe that policies included in this category certainly extend across multiple domains. This provides an opportunity for future studies to uncover whether this umbrella term conceals important sectors such as agriculture. At the same time, further distinctive classifications might ultimately allow for comparative assessment of regulatory policy outputs with their respective impacts (for example setting the amount of emitted greenhouse gases against the overtime enacted number of climate policies; see for the case of Austria, Niedertscheider, Haas, & Görg, 2018).

Second, while our investigation of external factors serves well as onset, future studies should definitely extend the set of explanatory variables towards political conditions, such as level of democracy; institutional capacity, such as economic importance of the agricultural sector; or problem characteristics, such as population density (Christoff & Eckersley, 2011). However, it is important to note that every comparably large sample will face difficulties in compiling the respective amount of information. Therefore, we also encourage the exploration of such factors in selected groups of countries.

Third, obtaining qualitative information on country cases would allow us to infer whether and, if so, which mechanisms enable integration of climate policies across countries and particular categories. Future studies, for example, by means of process tracing, would be well suited for determining whether and, if so, which diffusion mechanisms (i.e. learning, emulation and competition) drive the spread of policies across countries and categories (Croissant & Tosun, 2016; Jordan & Huitema, 2014; Maggetti & Gilardi, 2016). Future research should also look at actor constellations, or might assess the potential influence of external events (i.e. timing aspects) on progressing integration, such as the Kyoto Protocol adopted in 1997, or the Conferences of the Parties (COPs) as they are usually accompanied by public attention. Lastly, the analysis would benefit from including policies enacted at the subnational level.

Acknowledgements

This work was supported by the INOGOV network (EU COST Action: IS1309). We are grateful for comments by Tanya Heikkila and Nicole Herweg on earlier versions of the manuscript and thank the two anonymous reviewers for their helpful feedback. Zachary Herriges deserves credit for language editing.

Bibliography

Abramczyk, O. (2013). *Framework for Analysing Climate Policy Integration in the EU's Policies. A Case Study of the EU's Energy Efficiency Policy*. Thesis.

Adam, C., Knill, C., and Fernandez-i Marín, X. (2017). Rule growth and government effectiveness: why it takes the capacity to learn and coordinate to constrain rule growth. *Policy Sciences*, 50(2):241–268.

Adelle, C., Pallemaerts, M., and Chiavari, J. (2009). Climate change and energy security in europe. *Stockholm: Swedish Institute for European Policy Studies*.

Adelle, C. and Russel, D. (2013). Climate policy integration: a case of déjà vu? *Environmental Policy and Governance*, 23(1):1–12.

Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, 16(3):268–281.

Ahmad, I. H. (2012). *Climate Policy Integration at National Scale*. Thesis.

Averchenkova, A., Fankhauser, S., and Nachmany, M. (2017). *Trends in Climate Change Legislation*. Edward Elgar Publishing.

Baettig, M. B., Wild, M., and Imboden, D. M. (2007). A climate change index: Where climate change may be most prominent in the 21st century. *Geophysical Research Letters*, 34(1).

Barnett, J., Lambert, S., and Fry, I. (2008). The hazards of indicators: Insights from the environmental vulnerability index. *Annaös of the Association of American Geographers*, 98(1):102–119.

Bernauer, T. and Böhmelt, T. (2013). National climate policies in international comparison: The climate change cooperation index. *Environmental Science and Policy*, 25:196–206.

Brouwer, S., Rayner, T., and Huitema, D. (2013). Mainstreaming climate policy: The case of climate adaptation and the implementation of eu water policy. *Environment and Planning C: Government and Policy*, 31(1):134–153.

Candel, J. J. L. and Biesbroek, R. (2016). Toward a processual understanding of policy integration. *Policy Sciences*, 49(3):211–231.

Cao, X., Milner, H. V., Prakash, A., and Ward, H. (2014). Research frontiers in comparative and international environmental politics: An introduction. *Comparative Political Studies*, 47(3):291–308.

Christoff, P. and Eckersley, R. (2011). *Comparing State Responses*. The Oxford Handbook of Climate Change and Society. Oxford University Press, Oxford.

Christopoulos, S., Horvath, B., and Kull, M. (2012). Advancing the governance of cross-sectoral policies for sustainable development: A metagovernance perspective. *Public Administration and Development*, 32(3):305–323.

Commission, E. 2020 climate & energy package. http://ec.europa.eu/clima/policies/ strategies/2020/index_en.htm.

Croissant, A. and Tosun, J. (2016). Introduction: Bringing regime types into diffusion studies. *Global Policy*, 7(4):531–533.

De Roeck, F., Orbie, J., and Delputte, S. (2018). Mainstreaming climate change adaptation into the european union's development assistance. *Environmental Science & Policy*, 81:36–45.

Di Gregorio, M., Nurrochmat, D. R., Paavola, J., Sari, I. M., Fatorelli, L., Pramova, E., Locatelli, B., Brockhaus, M., and Kusumadewi, S. D. (2017). Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages. *Environmental Science & Policy*, 67:35–43.

Dubash, N. K., Hagemann, M., Höhne, N., and Upadhyaya, P. (2013). Developments in national climate change mitigation legislation and strategy. *Climate Policy*, 13(6):649–664.

Dupont, C. (2013). *Climate policy integration into EU energy policy*. Routledge.

Fankhauser, S., Gennaioli, C., and Collins, M. (2015). The political economy of passing climate change legislation: Evidence from a survey. *Global Environmental Change*, 35:52–61.

Fleig, A., Schmidt, N. M., and Tosun, J. (2017). Legislative dynamics of mitigation and adaptation framework policies in the eu. *European Policy Analysis*, 3(1):101–124.

Geerlings, H. and Stead, D. (2003). The integration of land use planning, transport and environment in european policy and research. *Transport Policy*, 10(3):187–196.

Giessen, L. (2011a). *Vertical Policy Integration. Schiffman, H. and Robbins, P. (eds.). Green Issues and Debates.*, pages 293–296. SAGE, New York.

Giessen, L. (2011b). *Horizontal Policy Integration. Schiffman, H. and Robbins, P. (eds.). Green Issues and Debates.*, pages 293–296. SAGE, New York.

Grant, J. T. and Kelly, N. J. (2008). Legislative productivity of the u.s. congress, 1789-2004. *Political Analysis*, 16(3):303–323.

Gupta, J. and Ringius, L. (2001). The eu's climate leadership: Reconciling ambition and reality. *International Environmental Agreements*, 1(2):281–299.

Höhne, N., Kuramochi, T., Warnecke, C., Röser, F., Fekete, H., Hagemann, M., Day, T., Tewari, R., Kurdziel, M., Sterl, S., and Gonzales, S. (2017). The paris agreement: resolving the inconsistency between global goals and national contributions. *Climate Policy*, 17(1):16–32.

Hogl, K., Kleinschmit, D., and Rayner, J. (2016). Achieving policy integration across fragmented policy domains: Forests, agriculture, climate and energy. *Environment and Planning C: Government and Policy*, 34(3):399–414.

Jacob, K., Volkery, A., and Lenschow, A. (2008). *Instruments for environmental policy integration in 30 OECD countries*, pages 24–47. Edward Elgar Publishing, Cheltenham.

Jochim, A. E. and May, P. J. (2010). Beyond subsystems: Policy regimes and governance. *Policy Studies Journal*, 38(2):303–327.

Jordan, A. and Huitema, D. (2014). Innovations in climate policy: the politics of invention, diffusion, and evaluation. *Environmental Politics*, 23(5):715–734.

Jordan, A., Huitema, D., Hildén, M., Van Asselt, H., Rayner, T., Schoenefeld, J., Tosun, J., Forster, J., and Boasson, E. (2015). Emergence of polycentric climate governance and its future prospects. *Nature Climate Change*, 5(11):977–982.

Jordan, A. and Lenschow, A. (2010). Environmental policy integration: a state of the art review. *Environmental Policy and Governance*, 20(3):147–158.

Jordan, G. and Halpin, D. (2006). The political costs of policy coherence: Constructing a rural policy for scotland. *Journal of Public Policy*, 26(1):21–41.

Keohane, R. O. and Victor, D. G. (2011). The regime complex for climate change. *Perspectives on Politics*, 9(1):7–23.

Kivimaa, P. and Mickwitz, P. (2009). Making the climate count: Climate policy integration and coherence in finland. *The Finnish Environment*, 3.

Knill, C., Schulze, K., and Tosun, J. (2012). Regulatory policy outputs and impacts: Exploring a complex relationship. *Regulation and Governance*, 6(4):427–444.

Kok, M. T. J. and de Coninck, H. C. (2007). Widening the scope of policies to address climate change: directions for mainstreaming. *Environmental Science & Policy*, 10(7):587–599.

Lachapelle, E. and Paterson, M. (2013). Drivers of national climate policy. *Climate Policy*, 13(5):547–571.

Lesnikowski, A., Ford, J., Biesbroek, R., Berrang-Ford, L., and Heymann, S. J. (2016). National-level progress on adaptation. *Nature Climate Change*, 6(3):261–264.

Maggetti, M. and Gilardi, F. (2016). Problems (and solutions) in the measurement of policy diffusion mechanisms. *Journal of Public Policy*, 36(1):87–107.

Massey, E., Biesbroek, R., Huitema, D., and Jordan, A. (2014). Climate policy innovation: The adoption and diffusion of adaptation policies across europe. *Global Environmental Change*, 29:434–443.

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., and Morrison, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, 16(8):889–909.

Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., Jensen, A., Kivimaa, P., Kuhlicke, C., Kuindersma, W., Máñez, M., Melanen, M., Monni, S., Pedersen, A. B., Reinert, H., and van Bommel, S. (2009). Climate policy integration, coherence and governance. Report 9789521133794, PEER.

Nachmany, M., Fankhauser, S., Setzer, J., and Averchenkova, A. (2017). Global trends in climate change legislation and litigation: 2017 update. Journal article, Grantham Research Institute on Climate Change and the Environment.

Nalau, J., Preston, B. L., and Maloney, M. C. (2015). Is adaptation a local responsibility? *Environmental Science and Policy*, 48:89–98.

Never, B. and Betz, J. (2014). Comparing the climate pplicy performance of emerging economies. *World Development*, 59:1–15.

Niedertscheider, M., Haas, W., and Görg, C. (2018). Austrian climate policies and ghg-emissions since 1990: What is the role of climate policy integration? *Environmental Science & Policy*, 81:10–17.

Nilsson, M. and Nilsson, L. J. (2005). Towards climate policy integration in the eu: evolving dilemmas and opportunities. *Climate Policy*, 5(3):363–376.

Nunan, F., Campbell, A., and Foster, E. (2012). Environmental mainstreaming: The organisational challenges of policy integration. *Public Administration and Development*, 32(3):262–277.

Oberthür, S. and Roche Kelly, C. (2008). Eu leadership in international climate policy: Achievements and challenges. *The International Spectator*, 43(3):35–50.

Parker, C. F. and Karlsson, C. (2010). Climate change and the european union's leadership moment: An inconvenient truth? *JCMS: Journal of Common Market Studies*, 48(4):923–943.

Persson, s., Eckerberg, K., and Nilsson, M. (2016). Institutionalization or wither away? twenty-five years of environmental policy integration under shifting governance models in sweden. *Environment and Planning C: Government and Policy*, 34(3):478–495.

Peters, B. G. (2015). *Pursuing horizontal management: The politics of public sector coordination*. University Press of Kansas, Lawrence.

Rajamani, L. (2016). Ambition and differentiation in the 2015 paris agreement: Interpretative possibilities and underlying politics. *International and Comparative Law Quarterly*, 65(02):493–514.

Rogelj, J., den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., Schaeffer, R., Sha, F., Riahi, K., and Meinshausen, M. (2016). Paris agreement climate proposals need a boost to keep warming well below 2c. *Nature*, 534:631–639.

Runhaar, H., Wilk, B., Persson, s., Uittenbroek, C., and Wamsler, C. (2017). Mainstreaming climate adaptation: taking stock about "what works" from empirical research worldwide. *Regional Environmental Change*, pages 1–10.

Schaffrin, A., Sewerin, S., and Seubert, S. (2014). The innovativeness of national policy portfolios – climate policy change in austria, germany, and the uk. *Environmental Politics*, 23(5):860–883.

Schmidt, N. M., Teschner, N., and Negev, M. (2018). Scientific advice and administrative traditions: The role of chief scientists in climate change adaptation. *Review of Policy Research*, 35(6):859–880.

Stead, D. (2003). Transport and land-use planning policy: really joined up? *International Social Science Journal*, 55(176):333–347.

Swart, R. and Raes, F. (2007). Making integration of adaptation and mitigation work: mainstreaming into sustainable development policies? *Climate Policy*, 7(4):288–303.

Tobin, P. (2017). Leaders and laggards: Climate policy ambition in developed states. *Global Environmental Politics*, 17(4):28–47.

Tobin, P., Schmidt, N. M., Tosun, J., and Burns, C. (2018). Mapping states' paris climate pledges: Analysing targets and groups at cop 21. *Global Environmental Change*, 48:11–21.

Tosun, J. and Lang, A. (2013). Coordinating and integrating cross-sectoral policies: A theoretical approach. In *7th ECPR General Conference*.

Tosun, J. and Lang, A. (2017). Policy integration: mapping the different concepts. *Policy Studies*, 38(6):553–570.

Tosun, J. and Peters, B. G. (2018). Intergovernmental organizations' normative commitments to policy integration: The dominance of environmental goals. *Environmental Science & Policy*, 82:90–99.

Townshend, T., Fankhauser, S., Aybar, R., Collins, M., Landesman, T., Nachmany, M., and Pavese, C. (2013). How national legislation can help to solve climate change. *Nature Climate Change*, 3(5):430–432.

Van Asselt, H., Rayner, T., and Perrson, . (2015). *Climate Policy Integration*, pages 388–399. Edward Elgar Publishing, UK.

Volden, C. (2006). States as policy laboratories: Emulating success in the children's health insurance program. *American Journal of Political Science*, 50(2):294–312.

Paper 2

Late Bloomer? Agricultural Policy Integration and Coordination Patterns in Climate Policies

Abstract

The ambitious goal of the Paris Agreement demands action across all policy domains and even scrutinizes traditionally privileged ones, including agriculture. Is agriculture playing an increasingly important role in climate policies? Existing research argues that the insulated agricultural domain is opening up and becoming more multidimensional. Whether such developments are visible in the comparatively new climate domain, however, has not been systematically assessed yet. This article seeks to advance the academic debate on policy integration by examining the opposite direction of integration, i.e. the integration of agricultural components into climate policies. To assess coordination efforts, I investigate which ministries are represented in climate policies. I provide a global perspective by analyzing over 1000 climate policies from 1990 to 2017 and find that climate policies with mentions of agriculture are increasing. This is particularly true of EU and African countries, and since 2005. However, half of the data made no reference to agriculture and hardly ever mentioned agricultural ministries. I argue that agricultural ministries' involvement in climate policymaking is crucial to the meaningful achievement of agri-climate objectives. The fragmented picture suggests that, while climate policies are becoming more multidimensional, both domains continue to co-exist rather than to merge into an entity.

Introduction

The ambitious goal of the Paris Agreement to limit global average temperature increase to well below 2 °C necessitates action across all domains, even traditionally privileged ones such as agriculture. Climate portfolios often comprise (renewable) energy or policy frameworks for administrative arrangements, such as the establishing of inter-ministerial committees or funds. To a lesser extent, they tackle transportation or carbon-pricing (Schmidt and Fleig 2018). Agriculture often seems to be overlooked or summed up under land-use, and one cannot help but wonder whether agriculture somehow falls between the cracks in climate policymaking.

Two recent developments, however, are noteworthy. First, some policy makers and scholars attribute tremendous potential to the agricultural domain (Gerber et al. 2013) due to its 'unique [...] ability to both reduce its own emission, but also increase carbon removals from the atmosphere, and contribute to emission reductions in other sectors' (Lóránt and Allen 2019: 6). Second, scholars found that even the established agricultural sector has shown an increasing multidimensionality by integrating environmental objectives and issues related to sustainable development more broadly (Alons 2017; Daugbjerg and Feindt 2017). The question, then, is to what extent this can be translated to the comparatively 'new' climate policy field. Policy integration studies have extensively assessed whether and to what extent environmental or climate objectives are integrated in other domains (Jordan and Lenschow 2010; Persson et al. 2018). However, existing research often neglects to analyze the integration of other objectives, i.e. agriculture, into climate policy. Scholars have long argued that both directions of policy integration are important to attaining fully integrated domains without opposing goals (Tosun and Lang 2017). This is not only relevant in the context of policy integration research per se but also, as Massey (2016) argues for the case of adaptation, important for establishing a new policy field.

The successful integration of agricultural objectives into climate policies greatly depends on the institutions involved. Not only must they reduce contradictions but work together to achieve meaningful policy integration (Briassoulis 2005; Peters 2018). Usually, governmental policymaking bodies are organized into specialized ministries, but with cross-cutting issues, public administration and public policy scholars have shown, that it is national environmental ministries alone which act as 'central agencies' undertaking policymaking (Jordan and Lenschow 2010; Peters 2018; Peterson and Skovgaard 2019).

Looking at agriculture and how it is represented in climate policies matters because agriculture's status as a principal contributor to climate change

makes it a major and rising concern for many countries (Smith et al. 2007; Lipper et al. 2014; Bennetzen et al. 2016). However, mitigation within agriculture is a highly contested issue (Golcher et al. 2018), for the sector is also extremely vulnerable to the impacts of climate change. Its inability to adapt effectively to the various impacts of climate change affects biodiversity, crops, livestock and food security (Berry et al. 2006; Fouilleux et al. 2017). These unique features as contributor to and victim of climate change make for an interesting case in point for thorough examination. Two fundamental questions arise: Is agriculture playing an increasingly influential role in climate policies? What can be said about the coordination efforts of agricultural ministries on attaining the integration of agriculture in climate policy?

The aim of this study is to uncover how agriculture is represented in climate policies and to apply the claim of multidimensionality to the 'new' public policy field of climate change. Given the cross-cutting nature of climate change, one could argue that the climate policy domain is multidimensional by nature, which is to say that it 'automatically' displays an array of concerns, including agriculture. However, no study thus far has systematically assessed this claim. Moreover, I am interested in the relationship between ministries of environment and ministries of agriculture and contribute to the theoretical debate on policy integration and coordination research by showing that cross-cutting policy objectives cannot be delivered by cross-cutting ministries of environment alone. I argue that agricultural ministries' involvement in climate policymaking is crucial to the meaningful achievement of agri-climate objectives as it better 'anchors' such goals in both institutions.

Empirically, I generate a new dataset regarding the role of agriculture and agricultural ministries in climate policies. This dataset extends beyond research investigating only democratic welfare states and thereby shifts the empirical focus to a truly global one. Moreover, it provides a longitudinal and quantitative application of the concept of agricultural policy integration (API). By examining climate policies between 1990 and 2017, the analysis explores the formation and development of agricultural components in climate policies in 176 countries. It furthermore investigates which ministries are represented in climate policies addressing agriculture.

The remainder of this study unfolds as follows. The subsequent section reviews the conceptual underpinnings of policy integration and coordination in relation to agriculture in climate policy. Methodology and data generation come next. Then the results of the analyses are presented and hypotheses formed. The discussion debates the implications of the findings before the paper concludes with a summary.

Achieving policy integration across domains

Cross-policy linkages and the question of how best to align policy objectives across domains have long been tackled by the literature on policy integration (Tosun and Lang 2017). It is an approach that has often been criticized for being undertheorized, though it draws increasingly on policy coherence research (May et al. 2006; Peters 2018). This reiterates the importance of preventing inconsistencies, in addition to avoiding the development of parallel policies and misfits (Briassoulis 2005).

The academic debate surrounding environmental policy integration (EPI) started in the late 1970s and is well developed (Persson et al. 2018). Lafferty and Hovden perhaps best summarize the core idea behind EPI as 'a fundamental recognition that the environmental sector alone will not be able to secure environmental objectives, and that each sector must therefore take on board environmental policy objectives if these are to be achieved' (2003: 1). The integration of environmental objectives into other domains also extends to climate objectives – 'Climate Policy Integration' (CPI), which some scholars consider a subset of EPI and others a research topic in its own right (Schmidt and Fleig 2018).

Policy integration has been labelled a European concept because research has especially been conducted in Europe (Tosun and Lang 2017). Weale (1992) noted that this is largely due to the fifth Environmental Action Program, which made the incorporation of environmental objectives into other sectoral policies a principled priority. The Cardiff Process, launched in 1998 under the United Kingdom's European Union (EU) Presidency, initiated integration strategies for sectors, such as transport, energy, and also agriculture (Jordan and Lenschow 2010).

Alons (2017) found notable integration of environmental goals within agricultural policy but no fundamental policy changes, which limits these policies' effectiveness. Previous research has, at length, described why agriculture has been somewhat reluctant to 'open up' to other policy issues. Its essential function of generating and securing food has made agriculture a rather insulated and privileged policy domain (Skogstad 1998). However, recent research has shown that the paradigm shift towards multifunctionality and sustainability has affected the sector's 'exceptionalist' nature, making linkages with other policy sectors more visible (Daugbjerg and Feindt 2017).

The climate domain represents an ideal case for assessing whether it has likewise 'opened up' to agricultural concerns. Despite the cross-cutting nature of climate change, the integration of agricultural components is arguably not straightforward due to its double-edged role with both agricultural adaptation and emissions a concern. Examining agricultural components in cli-

mate policies across the globe is then relevant not only from a policymaking perspective but also for advancing policy integration research. Assessing the opposite direction of policy integration ensures that domains can achieve full integration, without opposing goals.

The role of ministries in coordination efforts

Attaining the policy integration of cross-cutting, boundary-spanning issues is driven by many factors. First and foremost, coordination between and amongst levels of government has been shown to successfully affect the extent and degree of policy integration (May et al. 2006; Peters 2015; Tosun and Lang 2017). Studies have often focused on countries' administrative and organizational structures: how they coordinate, integrate, and ultimately implement public policies, emphasizing that 'public policies are embedded in institutions and organizational structures that adapt slowly and gradually to policy demands' (Trein et al. 2019: 2).

Studies within the realm of public administration and bureaucratic politics (Egeberg 1999; Peters 2015) have long argued that policy output is shaped by different bureaucratic organizations and reflects their respective policy objectives. A recent study has shown how individual ministries can influence the allocation of climate finance (Peterson and Skovgaard 2019). Ministries generally have an important role as they support national governments in the development stages of policymaking. Moreover, articles have also contributed to an increased understanding of the importance of ministries' names. Their names, and whether they include 'climate change' in their designation, are important in the development of corresponding policies (Tosun 2018).

Through the process of developing Nationally Determined Contributions (NDCs), the Paris Agreement has emphasized the role of the national level (Tobin et al. 2018). By extension, it is usually national ministries of environment (or sometimes departments or agencies subordinate to the ministry) which are assigned to coordinate climate-related policies (Peterson and Skovgaard 2019). Interestingly, studies have found that agriculture is a primary component in most NDCs (Food and Agriculture Organization of the United Nations 2017). However, what remains unclear is the extent to which ministries of agriculture are involved in formulating and adopting climate policies.

Typically, extensive coordination processes characterize policies developed by two or more ministries. The difficulty of attaining policy integration stems from the fact that two different organizations need to pursue the very

same goal. While ministries of agriculture arguably can play an important role, they usually have their own political interests. For instance, Alons (2017) has found very limited levels of coordination between agricultural and non-agricultural departments – a trend she relates to exceptionalism tendencies and low levels of policy integration.

Page (2003) has argued that achieving coherence of policy goals depends on entrepreneurial actors who take on special roles during coordination processes. They need to frame an issue in a way that makes it possible – and desirable – for ministries to cooperate with one another (Jordan and Lenschow 2010). Finding strategic solutions to a complex problem that advances both ministries' agendas facilitates meaningful coordination. Many countries have therefore created measures to enhance coordination and prevent fragmentation. Finland, for example, has implemented special policy programs which are managed and coordinated by a number of ministries to ensure coherence (Peters 2015).

Fundamentally divergent interests, limited budgets or power structures between national ministries, however, often hamper governmental interagency collaborations. Few organizations pursue a single goal, which leads to trade-offs. Difficulties between different ministries or governmental departments are therefore common (Peters 2015), especially when they have their own rules, networks, and needs, or when administrative traditions do not promote cross-sector coordination (Schmidt et al. 2018). Lipper et al. – in explaining climate smart agriculture – have therefore suggested that one of the main action areas ought to be 'fostering coherence between climate and agricultural policies [...] through increased coordination [...] across relevant ministries.' (2014: 1068)

Methodology and data collection

This section presents the data sources and data generation methods used by this study to investigate the notion of increased multidimensionality of climate policies, as well as the role of agricultural ministries.

Alons (2017) developed a way of measuring EPI in terms of output, process and outcome in the context of the Common Agricultural Policy. Scholars usually also differentiate between horizontal and vertical dimensions of policy integration (Peters 2015). However, I diverted from Alons's (2017) conceptualizations in an attempt to provide a global perspective. While the vertical dimension of policy integration is also an important aspect, it goes beyond the scope of this study.

Adopting a more quantitative approach will enable the investigation of

the emergence (longitudinal) and presence of agricultural components (cross-cutting) in climate policies. However, comparing a large policy sample in countries worldwide requires pragmatic approaches. First, I focused exclusively on the horizontal output dimension of policy integration, manifested as national level climate policy. This will facilitate the assessment of a large set of policies adopted over nearly three decades, rather than looking at one particular policy or domain in a small set of countries or a specific policy instrument.

Second, I conceptualized the role of ministries pragmatically. Usually, scholars assess the role of coordination in light of its process dimension, paying attention to the actors involved (Page 2003; Sabatier and Weible 2014). However, such an approach would have called for more qualitative work. By capturing the presence of ministries in the issuing of a policy, I can explore comparatively their roles as the relevant institutions in a high number of observations. Examining the issuing ministries arguably assesses the output more than the process dimension. However, their presence means they likely held some capacity during the decision-making process and allows conclusions about their joint coordination efforts to be drawn. This descriptive large-n analysis is further complemented by qualitative data from five semi-standardized expert interviews with ministerial officials, representatives from environmental associations, and international policy makers[1].

Data sources

To examine agricultural components within climate policies worldwide, the paper builds on the *Climate Change Laws of the World* database. This is the most comprehensive database for national climate policies globally (Nachmany et al. 2017), for it facilities the extraction of information regarding policy name and year of enactment.[2] Unlike other climate policy data sources, compiled for instance by the International Energy Agency, it does not merely focus on energy-related policies. Rather, climate policies are defined broader – divided into eight different categories, such as energy, transportation or adaptation. However, they do not capture the presence of agriculture in a separate category. Therefore, I built a database that assesses agriculture-related mentions.

[1] The Appendix gives an overview of all conducted interviews.

[2] The Climate Change Laws of the World database is continuously updated. The data used here was retrieved in November 2017.

Data generation

In retrieving information from the *Climate Change Laws of the World* database for individual countries, each listed law or policy (n=1469) was downloaded from the website. In instances where the website did not provide the text or link to the original document, these policies were manually searched for online. If the relevant text could not be found, it was excluded from the sample (n=212). The analytical scope was widened using languages other than English, so that a more global overview could be offered. The keywords were therefore translated into the respective languages[3]. Supranational legislative documents (n=30), as well as policies in certain languages, including Romanian, Cyrillic or Japanese, were excluded from the database (n=178). This resulted in coverage of more than a thousand climate policies (n=1049) in both developed and developing countries.

The contents were coded manually with any reference considered eligible for inclusion as an observation in the database. By using the keywords 'agri*' and 'food', regularly employed in agri-food research (Tosun 2017), all texts were searched for variations of these terms, meaning that mentions of 'agriculture' or 'agricultural' were likewise included. Assessing the existence of agricultural search words in legislative texts is a method regularly employed in legislation research, known in the literature as 'density approach' (Knill et al. 2012). The number of 'hits' is a good indication of whether agriculture is present in climate policies, and also suggests the increasingly multidimensionality of climate policies.

By measuring the density of agricultural and food mentions in a large-n comparative data set, this study established a quantitative, arguably narrow measurement of API. One disadvantage of this approach is that it does not allow any qualitative assessments to be made regarding the content of these components; for instance, whether these mentions concern livestock, the use of fertilizer, adaptation in the face of climate variability, and/or the reduction of greenhouse gas emissions. Making any claims about the content and intensity of measures, however, would involve extensive qualitative work, for instance, developing a detailed coding scheme that ranks the degree of API in climate policies.

To enable analyses regarding regional spread, I coded the EU membership of countries, as well as the respective regions, according to the United Nations Country Grouping classification (UN 2018). Lastly, whenever pos-

[3]This study conducted keyword searches for 'agri*' and 'food' in Danish, Dutch, English, French, German, Italian, Norwegian, Portuguese, Spanish and Swedish. Employing the use of online translation services may result in inaccuracies. Their accuracy was checked by Native speakers.

sible, the issuing organization, i.e. government and/or ministry/ministries, was likewise included. I looked especially for joint efforts between ministries of agriculture and ministries of environment. Having these (or more) ministries present means it is more likely that they not only agree on the same agri-climate goals, but that their aims are also anchored in both institutions. To strengthen the empirical findings, I complemented them with the qualitative interview material of experts who are either working for agricultural ministries or who have long-term experience in the field.

Results

Of 1049 climate policies, 47 per cent (47,47 %; n=498) had both 'agri' and 'food' mentions, which establishes that agriculture and food are a component in around half of the sample. Mentions were generally higher for 'agri' (n=704) than for 'food' (n=525). Policies and laws differed greatly in length, and keyword 'hits' ranged from the low tens to the hundreds.

However, in 53 per cent of cases (n=551), 'agriculture' and 'food' were not mentioned. This is a sizeable portion of countries' climate policies given the broad keywords searches. Examples include the United Kingdom's 'Climate Change and Sustainable Energy Act' from 2006 and the 2016 Kenyan 'National Climate Change Act'. Israel, a country with 15 different climate laws and policies, only once mentioned agriculture.

Of the 176 countries present in the database, 159 featured agricultural or food-related mentions. Examining how many policies contained either of the analyzed keywords in a given year, Spain scores the highest (n=20), followed by Italy (n=18), and Vietnam (n=13). Geographically, Europe (n=183) is the region with the highest number of agriculture-related climate policies, followed closely by Africa (n=180), the Americas (n=151), Asia (n=133), Oceania (n=51) and Australia (n=6).

Figure 2.1 depicts the average number of enacted climate policies that mention agriculture and/or food for the groups of EU and non-EU countries over the last 27 years. The two ascending curves vividly illustrate how the stocks of the respective policies have risen in both groups since the mid-1990s. After a modest rise spanning roughly one decade, followed a phase of accelerated growth that began in 2005. While this pattern applies to both groups, a clear difference exists in level as, right from the beginning, EU countries were the more active group in terms of mentioning agriculture and/or food in their climate policies. Please note that the peculiar grouping represents the stepwise enlargement of the EU throughout the observation period. This is particularly visible in the increase from 15 to 25 EU member

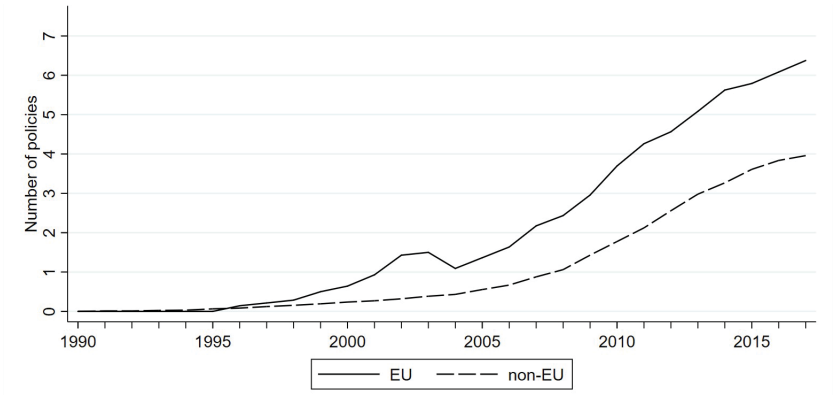


Figure 2.1: Average number of climate policies with agriculture and/or food mentions per country over time.

Source: Own illustration based on agri climate database.

states in 2004, which is responsible for the corresponding drop of the EU curve that year. Nonetheless, the subsequent steep increase again underlines the EU's beneficial influence on mentioning agriculture and/or food within climate policies.

Table 2.1 lists the ministries of agriculture that have issued their respective executive policy documents in conjunction with other ministries. Coordination of agricultural ministries with other ministries has only taken place in eleven cases – a very low number. The names of the policies indicate that they primarily concern encompassing national climate policies. In two instances, ministries of agriculture were involved in energy- and biofuel-related policies. In the remainder of cases, usually environmental or energy ministries were responsible for issuing the policies. In a small amount of cases, ministries of agriculture issued executive climate policies on their own (n=29).

Country	Year	Issuing Ministries	Name of Policy
(1) Austria	2010	**Ministry for Agriculture and Forestry**, Environment and Water Management; Ministry of Economy, Family and Youth	Energy Strategy
(2) Brazil	2008	President's Office; **Ministry of Agriculture, Livestock and Food**; Ministry of Science and Technology; Ministry of Finance; and other ministries	National Plan on Climate Change
(3) Chile	2014	Ministry of Environment; Ministry of Housing and Urbanism; Ministry of Economy, Development and Tourism; **Department of Agriculture**; Ministry of Education; and other ministries	National Climate Change Adaptation Plan
(4) Colombia	2011	National Planning Department; Ministry of Environment and Sustainable Development; Ministry of Housing; Ministry of Foreign Affairs; **Ministry of Agriculture and Rural Development**; Ministry of Mines and Energy; Ministry of Social Protection; and other ministries	Institutional Strategy for the Articulation of Policies and Actions in Climate Change
(5) Costa Rica	2009	President; **Ministry of Agriculture and Livestock**; Ministry of Environment, Energy and Telecommunications	Biofuel Regulation (Executive Decree 35091)
(6) Estonia	2007	Ministry of the Environment; **Ministry of Agriculture**; Ministry of Social Affairs & Ministry of Internal Affairs; Ministry of Research and Education; Ministry of Economic Affairs and Communications; and other ministries	National Environmental Strategy until 2030

(7) Gambia	2016	President; Department of Water Resources; UNFCCC Focal Point; Ministry of Planning; Ministry of Finance; **Ministry of Agriculture**; Department of Fisheries; Ministry of Energy; Ministry of Environment; and other ministries and organizations	Climate Change National Policy
(8) Grenada	2011	Ministry of Finance, Planning, Economy, Energy and Cooperatives; Ministry of Environment, Foreign Trade and Export Development; Ministry of Health; **Ministry of Agriculture, Forestry and Fisheries**; and other ministries	Grenada Strategic Program for Climate Resilience
(9) Madagascar	2013	**Ministry of Agriculture and Rural Development** & Ministry of Fisheries & Ministry of Environment, Ecology and Forestry & Ministry of Infrastructure and Territorial Planning & other ministries	National Strategy to Face Climate Change in Agriculture-Livestock-Fishery
(10) Netherlands	2007	Ministry of Housing, Spatial Planning and the Environment, Ministry of Transport, Public Works and Water Management, **Ministry of Agriculture, Nature and Food Quality**, Ministry of Economic Affairs	National Programme for Spatial Adaptation to Climate Change
(11) Peru	2016	Ministry of Environment; **Ministry of Agriculture and Irrigation**; Ministry of Economy and Finance; and other ministries	National Forestry and Climate Change Strategy

Table 2.1: Overview of agricultural ministries' coordination efforts in executive climate policies.

The agricultural dimension in climate policies

Regarding the sizeable number of policies which did not contain agri-food mentions, a representative of the Dominican Republic noted: 'For the majority of developing countries, especially smaller ones, emissions do not come from agriculture' (INT 4, 2018). She likewise remarked that it is almost always a crucial topic – especially in countries like Uruguay, Brazil or Argentina, where emissions from agriculture are rising (Bennetzen et al. 2016). However, policy engagement has focused almost exclusively on adaptation.

A representative for the UNFCCC explained, that 'until very recently, mitigation in agriculture was an absolutely provocative talking subject for developing countries or, I should say, medium income countries which are big meat exporters' (INT 3, 2018). In 2017, after many years of gridlock, policy makers at the international climate reached the so-called Koroniva Decision, initiating a neutral platform for parties to discuss openly the impacts of the agricultural sector on climate change (UNFCCC 2018). Not only did earlier activities in the agricultural sector result in the Koroniva Decision taking place, but the event itself, deemed focal by several experts, 'mobilized the agricultural sector' (INT 2, 2018).

The interviewees further attributed the initial 'absence' on agriculture, evidenced by the relatively low number of climate policies with agricultural mentions during the 1990s, to the way in which climate change was primarily tackled. One interviewee working for a leading environmental NGO revealed that agricultural production is less directly linked with GHG emissions:

> 'I think that agriculture is a little bit more indirectly linked to emissions because [...] we mostly look at it from a fossil fuel reserves and energy consumption perspective, so it is a much more direct link for policy makers to see energy consumption in individual vehicles, transportation and in the power generation sector.' (INT 5, 2018).

Emissions from energy consumption were addressed by renewable energy developments early on, and research has shown the dominance of energy in climate policies (Schmidt and Fleig 2018). Moreover, various emissions trading schemes created a demand structure and made it possible for countries to trade emissions globally: 'There was support for energy, to have windmills and everything. And you could also sell the credits' (INT 4, 2018). The Clean Development Mechanisms established under the Kyoto Protocol are a prime example of this.

'It's hard work'[4]: the difficulty of addressing agriculture in climate change

In addition to agriculture's importance for a country, and its more indirect link to climate change, all interviewees stressed the immense difficulty of addressing agricultural concerns in climate policies, especially with regards to mitigation (INT 1-5, 2018). It is a complex endeavor which requires long-term planning, the incorporation of land-use and land-use change, the development of territorial and agricultural zoning plans, the monitoring of deforestation, and so forth. This led one interviewee to conclude: '[Agriculture] is not not important; it's just much much much more difficult' (INT 4, 2018).

Moreover, initiating these national and subnational processes involves coordinating with many different stakeholders – primarily farmers with strong connections to farmers' unions, but also political parties. An executive director from an environmental NGO noted that there is 'almost a disconnect and opposition between environmental and ecological preoccupations, and the ties between parties and farmers are very very strong' (INT 5, 2018). The strength of the relationship between farmers, farmers' unions and political parties have long been attributed to an 'exceptionalist' feature of the agricultural policy domain (Tosun 2017).

A related topic that emerged during the interviews was the relationship between different ministries. While personal relationships have been shown to impact inter-ministerial cooperation (Schmidt et al. 2018), an aspect acknowledged by interviewees (INT 2, 2018), they also noted rivalry between ministries of environment and ministries of agriculture. For the case of Germany, one IO representative said: 'In the cabinet hierarchy, the Minister of Agriculture is ranging much higher in the food chain than the Ministry of Environment' (INT 3 & 5, 2018). This suggests that the limited role of agricultural ministries is an institutionally embedded problem which hinders inter-ministerial coordination.

In France, the Ministry of Agriculture, which 'is very powerful in terms of political weight in the government', has also always been a stable entity and has never needed to adjust and incorporate adjacent issues such as health, environment, or social concerns – something other ministries have had to do, occasionally by changing their title (INT 5, 2018). An NGO representative summarized this circumstance for the case of France as follows:

> 'Well, in France the Ministry of Agriculture has never been directly linked institutionally to the Ministry of Environment. En-

[4] Quote from an interviewee (INT 4, 2018).

> ergy has, transportation has. It's never even been the Ministry of Agriculture and Food' (INT 5, 2018).

Research has argued for the increased importance of ministries' names (Tosun 2018), and this quote is reflective of an understanding of how the French Ministry of Agriculture has been a stable, preserved entity. Although, in practice, there is not always a lot of thought put into ministries' names, interviewees noted that some ministries have adjusted their names to reflect additional priorities. I found examples of agricultural ministries in the database which reflect this. In Denmark, the ministry is called the Ministry of Agriculture and Food. For Peru, it is the Ministry of Agriculture and Irrigation. What is more striking, however, is that, despite the evident 'stableness' of agricultural ministries and their lack of involvement, agriculture is the primary component in most country's NDCs (FAO 2017), documents often used for subsequent climate policy development. One interviewee, explaining which actors were involved in drafting them, noted:

> 'In many cases, the Ministers of Agriculture were not even consulted. And this is precisely because the NDCs are better than national policies. Now you are committed on the highest political level to do something on agriculture. Now, Minister of Environment, Minister of Agriculture, sit together and find out how the hell you are going to do that' (INT 3, 2018).

This quote reveals that ministries of agriculture were not necessarily consulted in the formulation of NDCs. It likewise evinces the importance that ministries of environment attribute to agriculture in the context of climate change. This may also be why national climate policies with integrated agricultural elements, as analyzed in the context of this study, were found in only around half of the sample, while agricultural components in NDCs exhibit up to 80 per cent (FAO 2017). It further shows that the political reasoning behind the decision not to include agricultural ministries is for fear of them refusing to undertake more action than is currently present in the NDCs.

In sum, the interviews highlighted several factors which explain the limited presence of agriculture in climate policies. These include country-specific, technical reasons and the fact that agriculture, in comparison with other policy domains, is more indirectly linked to emissions. Political considerations and different power structures within governmental administrations also play a vital role. To generate hypotheses, I related these accounts to the results from the descriptive large-n analysis, which revealed the increasing presence

of climate policies with agricultural mentions, the extremely limited presence of agricultural ministries, and the limited joint coordination efforts, mainly visible in encompassing national climate policies:

First, the nature of the agricultural sector likely determines if agricultural components are present in climate policies. Here, interviewees emphasized that the country context is key and could take on two different roles: countries with a small agricultural sector are less likely to include agricultural components in climate policies (hypothesis 1a). Or, countries with a small agricultural sector are more likely to include agricultural components (hypothesis 1b). Either the limited relevancy of the agricultural sector is simply not reflected, or attainment of policy integration is actually easier because the agricultural sector is small and there is less conflict surrounding the incorporation of agri-climate objectives.

Second, Table 1 shows that coordination efforts between ministries of environment and agriculture mostly took place in the context of national climate strategies. This means that the broader and more encompassing a climate policy is, the higher its likelihood to include a Ministry of Agriculture (hypothesis 2). Since, in other cases, these broad national climate policies did not always include agricultural ministries, future research could investigate the circumstances under which agricultural ministries were involved.

Third, research has shown that the way in which policy objectives are framed determines policy integration (Jordan and Lenschow 2010). Coherence in policy output is especially difficult to attain in the context of complex goals, such as integrating agriculture into climate policy (Briassoulis 2005; May et al. 2006). Therefore, the greater the overlap between ministries of agriculture and environment in their views on agri-climate objectives, the greater their likelihood to coordinate climate policies jointly (hypothesis 3).

Lastly, studies have stressed the importance of administrative structures or governmental programs which make cooperation desirable (Peters 2015). Scholars have also shown how administrative traditions can play a role in adaptation policy-making (Biesbroek et al. 2018). Hence, the higher the political incentives to cooperate, e.g. through establishing inter-ministerial committees or programs, the more likely it is for climate policies to be jointly issued by the ministries of agriculture and environment (hypothesis 4).

Discussion

Agriculture is widely seen as a relatively insulated policy sector (Skogstad 1998), but looking at how agriculture has been integrated in national climate policies, I found that climate policies with agricultural mentions are

undeniably – and increasingly – represented in the sample. Interviewees acknowledged that the linkages between agriculture were part of the debate early on but while some states have a dominant agricultural sector (especially meat exporting countries, such as Brazil), small island or developing countries have minor agricultural emissions. In addition, interviewees explained that agriculture is more indirectly link to climate change. Emissions are almost intuitively associated with fossil fuel use and energy consumption, and a demand structure for renewable energy and trading schemes existed, which is not (yet) the case for agriculture.

The Koroniva decision on joint work on agriculture (UNFCCC 2018) was reached after more than ten years of negotiations at the international level, and exposed political and technical difficulties around agriculture. For example, agriculture is impacted by climate change, posing a threat to food security (Fouilleux et al. 2017); or the fact that agriculture has many links to land use, water and energy sectors and involves a high number of stakeholders, such as (smallholder) farmers. This may also explain the characterization of agriculture within the context of climate change as 'hard work' (INT 4, 2018).

As for coordination efforts, it is striking that this study found only eleven cases – out of more than one thousand – in which agricultural ministries issued climate policies jointly with another ministry. Interviewees illustrated agricultural ministries as politically powerful, which were (intentionally) not consulted during the process of developing NDCs. This suggests that environmental ministries have been unable to cooperate with ministries of agriculture, and vice versa. I interpret this finding as an indication that climate and agricultural policy domains continue to co-exist rather than to merge into an entity.

In the few instances where agricultural and environmental ministries worked together, the policies encompassed national climate strategies, which also included a number of other ministries. Interestingly, the majority of those agricultural ministries had additional descriptions beyond 'agriculture', such as 'Ministry of Agriculture and Forestry and Environment and Water Management' (Austria), 'Ministry of Agriculture, Livestock and Food' (Brazil), or 'Ministry of Agriculture and Rural Development' (Madagascar). This seems to align with research attributing importance to ministries' names (Tosun 2018) and their ability to adapt to 'new' policy demands by changing them.

The often independent and privileged status of agricultural ministries makes policy integration and cross-sector coordination challenging. Agriculture is certainly increasingly on the policy agenda; but since ministries of agriculture are not involved in coordination, policies may have symbolic

meaning or point to political intentions rather than being substantive policies anchored across relevant institutions (Egeberg 1999; Peters 2018). Increasing the desirability of coordination across ministries is crucial (Peters 2015), which is why I argue that agricultural ministries' involvement in climate policymaking is crucial to the meaningful achievement of agri-climate objectives.

One issue that arises from the variation in the regional distribution is related to how EU countries, on average, have the most climate policies with agricultural and/or food mentions. Given that the aligning of environmental concerns is a key and extended principle in the EU (Jordan and Lenschow 2010), this finding is not too surprising. When examining the overall data, however, African countries scored an impressively high number of agriculture-related climate policies as well. Surely, climate impacts are most severe in many African countries, where agriculture also remains a crucial economic sector (Fouilleux et al. 2017). It may also be fair to reason that policy integration efforts have extended beyond EU countries. However, another likely scenario is what Vink and Schouten (2018) have shown for African adaptation policies: ministries anticipate including certain concepts, such as policy integration, to ensure foreign assistance.

The large-n descriptive quantitative approach proved useful as it helped to develop a better understanding of how climate policies with agricultural content have developed over time. By coding a large number of policies and looking for patterns, I generated hypotheses for future testing. It is important to stress that the data employed here is the most comprehensive source of adopted climate policies at the national level thus far, and the same results are likely to be found in other national climate databases. Nevertheless, since only the density of measures was assessed, no qualitative assessments regarding their intensity can be made. Future analyses could investigate additional keywords, such as 'livestock', 'manure', or 'fertilizer', and whether agricultural components include adaptation or mitigation efforts. They could then state whether climate policies present agriculture as a 'problem' or a 'solution'.

Conclusion

The aim of this study was to uncover how agriculture is represented in climate policies and to apply the claim of multidimensionality to the 'new' public policy field of climate change. Two research questions guided the paper: Is agriculture playing an increasingly important role in climate policies? What can be said about the coordination efforts of agricultural ministries on attaining the integration of agriculture into climate policy?

By generating a novel dataset, I showed that agriculture is represented in nearly half of climate policies. Legislative activity especially bloomed since 2005 for both EU and non-EU countries. However, on average, EU countries are the more active group underlining the EU's beneficial influence on mentioning agriculture in climate policies. Agriculture constitutes an increasing concern and it follows that climate policies show an increasing multidimensionality, mirroring the same multidimensional characteristics postulated for the agricultural policy domain (Daugbjerg and Feindt 2017). We may see a general trend towards more multidimensionality, observable not only in 'old' policy domains but in 'new' ones, too.

Nevertheless, half of the data made no reference to agriculture and hardly ever mentioned agricultural ministries. The fragmentation of agricultural components and the absence of agricultural ministries in the coordination process highlight the challenges of integrating agriculture in climate policies and suggest that both domains continue to co-exist rather than to merge into an entity. In this regard, exploring how policies are made and whether certain administrative traditions foster or hinder horizontal coordination efforts between ministries would be worthwhile (Biesbroek et al. 2018).

Lastly, this study has revealed that the presence of agriculture and/or food references in climate policies means that existing databases – which do not adequately categorize agriculture systematically – fail to acknowledge their presence in climate policies. Generating a unique, large-n database, which allowed for systematic and comparative assessments of the agricultural content of national-level climate policies, closed this empirical gap.

Acknowledgements

I am grateful for valuable comments by Jale Tosun, Robbert Biesbroek, Paolo Graziano, Fabrizio De Francesco, and Andreas Fleig, as well as research assistance by Friederike Bickmann, Christine Reiner and Lucas Leopold. Laurence Crumbie deserves credit for language editing.

Bibliography

Alons, G. (2017). Environmental policy integration in the eu's common agricultural policy: greening or greenwashing? *Journal of European Public Policy*, 24(11):1604–1622.

Bennetzen, E. H., Smith, P., and Porter, J. R. (2016). Agricultural production and greenhouse gas emissions from world regions -the major trends over 40 years. *Global Environmental Change-Human and Policy Dimensions*, 37:43–55.

Berry, P. M., Rounsevell, M. D. A., Harrison, P. A., and Audsley, E. (2006). Assessing the vulnerability of agricultural land use and species to climate change and the role of policy in facilitating adaptation. *Environmental Science & Policy*, 9(2):189–204.

Biesbroek, R., Peters, B. G., and Tosun, J. (2018). Public bureaucracy and climate change adaptation. *Review of Policy Research*, 35(6):776–791.

Briassoulis, H. (2005). *Policy Integration and Compley Environmental Problems: The Example of Mediterranean Desertification*. Ashgate, Aldershot.

Daugbjerg, C. and Feindt, P. H. (2017). Post-exceptionalism in public policy: transforming food and agricultural policy. *Journal of European Public Policy*, 24(11):1565–1584.

Egeberg, M. (1999). The impact of bureaucratic structure on policy making. *Public Administration*, 77(1):155–170.

Food and Agriculture Organization of the United Nations (2017). Addressing agriculture, forestry and fisheries in national adaptation plans. Rome.

Fouilleux, E., Bricas, N., and Alpha, A. (2017). 'feeding 9 billion people': global food security debates and the productionist trap. *Journal of European Public Policy*, 24(11):1658–1677.

Gerber, P., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., and Tempio, G. (2013). Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities. Rome.

Golcher, C. S., Arts, B., and Visseren-Hamakers, I. (2018). Seeing the forest, missing the field: Forests and agriculture in global climate change policy. *Land Use Policy*, 77:627–640.

Jordan, A. and Lenschow, A. (2010). Environmental policy integration: a state of the art review. *Environmental Policy and Governance*, 20(3):147–158.

Knill, C., Schulze, K., and Tosun, J. (2012). Regulatory policy outputs and impacts: exploring a complex relationship. *Regulation & Governance*, 6(4):427–444.

Lafferty, W. M. and Hovden, E. (2003). Environmental policy integration: Towards an analytical framework. *Environmental Politics*, 12(3):1–22.

Lipper, L., Thornton, P., Campbell, B. M., Baedeker, T., Braimoh, A., Bwalya, M., Caron, P., Cattaneo, A., Garrity, D., Henry, K., Hottle, R., Jackson, L., Jarvis, A., Kossam, F., Mann, W., McCarthy, N., Maybeck, A., Neufeldt, H., Remington, T., Sen, P. T., Sessa, R., Shula, R., Tibu, A., and Torquebiau, E. F. (2014). Climate-smart agriculture for food security. *Nature Climate Change*, 4(12):1068–1072.

Lóránt, A. and Allen, B. (2019). Net-zero agriculture in 2050: how to get there? Report, Institute for European Environmental Policy.

Massey, E. (2016). *Innovation in policy: The emergence of climate adaptation as a new policy field*. Dissertation.

May, J., Sapotichne, J., and Workman, S. (2006). Policy coherence and policy domains. *Policy Studies Journal*, 34(3):381–403.

Nachmany, M., Fankhauser, S., Setzer, J., and Averchenkova, A. (2017). Global trends in climate change legislation and litigation: 2017 update. London.

Page, S. (2003). Entrepreneurial strategies for managing interageny collaboration. *Journal of Public Administration Research and Theory*, 13(3):311–339.

Persson, Å.; Runhaar, H. K.-V. S. M. G. R. D. W. A. (2018). Editorial: environmental policy integration: taking stock of policy practice in different contexts. *Environmental Science & Policy*, 85:113–115.

Peters, G. (2015). *Pursuing Horizontal Management: The Politics of Public Sector Coordination*. University Press of Kansas, Kansas.

Peters, G. (2018). *Policy Problems and Policy Design*. Edward Elgar Publishing, Cheltenham.

Peterson, L. and Skovgaard, J. (2019). Bureaucratic politics and the allocation of climate finance. *World Development*, 117:72–97.

Sabatier, P. and Weible, C. (2014). *Theories of the Policy Process*. Westview Press, Boulder.

Schmidt, N. M. and Fleig, A. (2018). Global patterns of national climate policies: analyzing 171 country portfolios on climate policy integration. *Environmental Science and Policy*, 84:117–185.

Schmidt, N. M., Teschner, N., and Negev, M. (2018). Scientific advice and administrative traditions: the role of chief scientists in climate change adaptation. *Review of Policy Research*, 35(6):859–880.

Skogstad, G. (1998). Ideas, paradigms and institutions: agricultural exceptionalism in the european union and the united states. *Governance*, 11:463–490.

Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., O'Mara, F., Rice, C., Scholes, B., and Sirotenko, O. (2007). *Agriculture*, pages 497–540. Cambrige University Press, Cambridge and New York.

Tobin, P., Schmidt, N. M., Tosun, J., and Burns, C. (2018). Mapping states' paris climate pledges: Analysing targets and groups at cop21. *Global Environmental Change*, 48:11–21.

Tosun, J. (2017). Party support for post-exceptionalism in agri-food politics and policy: Germany and the united kingdom compared. *Journal of European Public Policy*, 24(11):1623–1640.

Tosun, J. (2018). Investigating ministry names for comparative policy analysis: Lessons from energy governance. *Journal of Comparative Policy Analysis: Research and Practice*, 20(3):324–335.

Tosun, J. and Lang, A. (2017). Policy integration: Mapping the different concepts. *Policy Studies Journal*, 38(6):553–570.

Trein, P., Meyer, I., and Maggetti, M. (2019). The integration and coordination of public policies: a systematic comparative review. *Journal of Comparative Policy Analysis: Research and Practice*, pages 1–18.

UNFCCC (2018). Decision -/ cp.23: Koronivia joint work on agriculture.

United Nations Statistics Division (2018). Methodology - geographic regions. https://unstats.un.org/unsd/methodology/m49.

Vink, M. and Schouten, G. (2018). Foreign-funded adaptation to climate change in africa. *Review of Policy Research*, 35:792–834.

Weale, A. (1992). *The New Politics of Pollution*. Manchester University Press, Manchester.

Appendix

Number	Date	Position/Institution
INT 1	10.05.2018	Agriculture and Climate Change Expert, Ministry of Agriculture of Kenya
INT 2	01.06.2018	Senior Natural Resources Officer, Climate and Environment Division, Food and Agriculture Organization of the United Nations
INT 3	14.06.2018	Senior Policy Director and Programme Coordination, UNFCCC
INT 4	30.10.2018	Country Representative, Dominican Republic; Senior Research Associate, Department of Forest Resources and Environmental Conversation
INT 5	02.11.2018	Executive Director, Foundation GoodPlanet

Table 2.2: Overview of interviews.

Paper 3

Scientific Advice and Administrative Traditions: The Role of Chief Scientists in Climate Change Adaptation*

with Na'ama Teschner and Maya Negev

Abstract

The role of the chief scientist (CS), a key administrative position in various Israeli ministries, is to fund policy-oriented research and support evidence-based decision-making. Has the CS's role promoted or constrained incorporation of scientific advice regarding climate change adaptation into governmental policy? Have administrative traditions affected the adaptation planning process in Israel? Analysis of documents and 26 in-depth interviews with key stakeholders sheds light on the ongoing climate change adaptation policy formulation process. Our study reveals that the CS of the Ministry of Environmental Protection functions as a bridge at different interfaces and can be characterized as a boundary worker between institutions. The inherent independence of this position facilitates the CS's ability to initiate, foster, and prioritize complex issues such as adaptation. Our findings further suggest that the perception that Israel has already adapted, or will easily adapt, has negatively affected the adaptation process.

*This journal article was co-authored with Na'ama Teschner and Maya Negev. Nicole Schmidt developed the idea for the paper, and was responsible for the conceptualization, carrying out of 26 interviews and writing of the article. The thematic analysis was undertaken jointly.

Introduction

Public administrators face many challenges when dealing with the complex issue of climate change adaptation (Termeer, Dewulf, & Breeman, 2013). Scholars have long documented how national political cultures, regulatory styles, or administrative traditions, broadly defined as sets of institutionalized norms and procedures, have influenced policy responses to complex global problems (Halffman, 2005; Howlett, 2014; Peters, 2018; Wellstead, Howlett, & Rayner, 2016). Administrative traditions vary among countries and over time. They partly explain political decisions and policy choices and, therefore, are also expected to influence climate change adaptation strategies (Biesbroek, Peters, & Tosun, 2018).

Scientific advice is an important element within the context of administrative traditions. Debates over how scientific advice enters the government or how science-policy boundaries are organized have received increased scholarly attention (Brugger, Meadow, & Horangic, 2016; Craft & Wilder, 2017). Advisory processes within the government often rely on scientists to provide guidance to decision-makers (Jasanoff, 1990). Administrative traditions affect the way public bureaucrats use their sources of advice and how policy makers assess knowledge that is often very unfamiliar to them. Since information is transferred to politicians by bureaucrats, the latter's processing of the information for use by others is important. Furthermore, in certain administrative traditions, scientists themselves hold a position in the administration and may also advocate for preferred outcomes (Craft & Howlett, 2013; Pielke Jr, 2007)

In this article, we focus on the role of chief scientists (CSs) in the Israeli government and, in particular, in the Ministry of Environmental Protection (MoEP). In recent years, the CS of the MoEP has been leading an interministerial committee to draft a national climate change adaptation plan. We investigated if and how administrative traditions affect the adaptation planning process, focusing on the ability of the CS—as a boundary worker—to incorporate scientific advice about climate change adaptation into governmental policy. Previous studies assessing administrative traditions usually focused on established Western democracies in Europe and North America or post-Soviet or post-colonial states (Painter & Peters, 2010; Verheijen, 2007). Israel, other small or young countries, as well as African states (Vink & Schouten, 2018) are often overlooked. Research characterizing current adaptation strategies 'remains in its infancy' (Ford et al., 2015, p. 801). Israel's experience in developing a national adaptation policy may contribute to a better understanding of other countries, especially non-Annex I states, that were not required to meet international commitments under the United

Nations Framework Convention on Climate Change (UNFCCC).

In Israel, the ideal policy maker is characterized by a capacity to improvise and an ability to make the most of limited and available means, rather than being guided by rationality and planned action (Sharkansky & Zalmanovitch, 2000). Interestingly, this distinctive administrative tradition also permeates the organizational bureaucracy in general. According to Menahem and Zehavi (2016, p. 175), Israel has inherited two opposing administrative traditions: on the one hand is the 'civil servants' tradition of political neutrality and professional norms, which was developed over the years by the British Colonial Office'; while on the other hand is the Jewish Zionist agency tradition which is characterized by improvisation and undisguised political activism (Menahem & Zehavi, 2016).

While administrations around the world have begun adopting policies regarding climate change, particularly in efforts to mitigate its effects (Nachmany et al., 2015; Tobin, Schmidt, Tosun, & Burns, 2018), and, increasingly also, have combined approaches of mitigation and adaptation (Fleig, Schmidt, & Tosun, 2017), most countries still have not yet comprehensively implemented these policies (Lesnikowski, Ford, Biesbroek, Berrang-Ford, & Heymann, 2016; Wellstead et al., 2016). The Paris Agreement, which Israel ratified in 2016, directs countries to respond to climate change nationally by taking both mitigation and adaptation measures. Thus far, Israeli policy makers have struggled to translate implications arising from climate change into domestic policies, let alone legislation (Michaels & Tal, 2015).

Israel's relatively slow progress regarding mitigation and adaptation is puzzling, especially considering the many local technological innovations that support adaptation and that have been transferred worldwide. Due to the country's lack of economic and natural resources, arid climate, and long-lasting water crisis, Israel has developed technological solutions for drylands adaptation, including seawater desalination, drip irrigation, and solar-thermal technologies (Erdan, 2009; Ministry of Economy, 2015; Teschner, Garb, & Paavola, 2013). Yet a comprehensive adaptation policy, which takes into account future impacts and cross-sector synergies, has not yet been adopted.

Our study attempts to shed light on the role of the CS in the ongoing climate change adaptation policy formulation process based on analysis of government documents and in-depth interviews we conducted with key stakeholders. In the first section, we examine how scientific knowledge enters bureaucracy and discuss key concepts pertinent to the science–policy interface and administrative traditions. We then describe the origins and tasks of Israeli CSs and present an overview of climate change adaptation measures in Israel. The subsequent section outlines our data sources and methodol-

ogy. Finally, we present the results of the thematic analysis of 26 interviews, followed by a discussion of our main findings and conclusions.

How knowledge enters bureaucracy

In this section, we investigate the interplay of national administrative traditions with climate change adaptation policy, paying particular attention to the significant body of literature on the role of advisory systems and boundary workers in policymaking processes.

Use of scientific expertise in climate change adaptation policy making

The practice of using scientific expertise in public administration is by no means a new one. Bureaucrats regularly rely on scientific knowledge to shape policy (Jasanoff et al., 1998; Page, 2012). Much of the literature on scientific knowledge and government has, therefore, primarily involved debates on how to best integrate expertise into decision-making processes (Brugger et al., 2016; Himsworth, 1980; Sarewitz, 2004).

Due to their complexity, environmental issues are perhaps the most challenging science-informed decisions to tackle, often considered 'wicked problems' and characterized by uncertainty, irreversibility, controversies, interdependency, and conflicting interests (Dryzek, 1987; Sandler, 1997; Termeer et al., 2013). Climate change adaptation is further confined by social perceptions of risks, values, ethics, and culture, as well as different levels of vulnerability (Adger, Lorenzoni, & O'Brien, 2009; Jordan, Huitema, van Asselt, Rayner, & Berkhout, 2010; Pelling, 2010), which, again, scientific postulates alone cannot solve.

As a result, policy makers' heavy reliance on scientific models to identify, understand, or communicate potential solutions to climate change adaptation is sometimes viewed as an impediment to policy formulation and decision-making (Biesbroek, Klostermann, Termeer, & Kabat, 2013). Such challenges contribute to the fact that policies, especially in the field of adaptation, remain poorly developed in many countries (Araos, Ford, Berrang-Ford, Biesbroek, & Moser, 2016; Wellstead et al., 2016).

Bureaucrats and administrative traditions

The question of who brings scientific expertise into the government and under which constraints they operate is also important. Biesbroek et al. (2018)

discuss the link between knowledge gathering of civil servants and administrative traditions in the context of adaptation in great detail. Rahman and Tosun (2018) further show, for example, how national project directors play an important role in implementing and managing adaptation projects in the administration of Bangladesh.

Bureaucrats are very often faced with numerous constraints; exercising their mandate to advise politicians means navigating between what should be done and what can be done (Page, 2012). Scholarly evidence, however, indicates that the scientific expertise of bureaucrats does not automatically translate into the ability to influence policy processes. On the contrary, public administrators with policy experience are much more active in recommending and actually developing legislation (Page, 2010).

Translating is the key function of bureaucrats working in the science–policy interface (Hoppe, 2010). The challenge facing bureaucrats dealing with climate change is often how to translate their efforts into action (Hoppe, 2010). This is why scholars have raised a need for 'climate science integrators' (Jacobs, Garfin, & Lenart, 2005) or 'boundary workers' (Brugger et al., 2016). The idea is that boundary workers not only participate in the process of developing applicable science, but also have developed a favorable set of skills for putting policy into practice (Brugger et al., 2016).

For example, boundary workers need to communicate and sustain relationships with scientists from different fields, various decision-makers in government and industry, and also stay in touch with practitioners and the public (Jacobs et al., 2005; Lemos & Morehouse, 2005). In addition, civil servants rely on their traditional disciplinary training (Brugger et al., 2016) and previous professional experiences (Christensen & Lægreid, 2008).

However, difficulties can arise when different departments within government play by their own rules or have specific needs (Geerlings & Stead, 2003). Negev (2016) illustrates how personas and individual efforts of bureaucrats are crucial in enabling governmental interagency collaborations, especially in countries with relatively low policy integration, such as Israel. An administrative tradition that fosters cross-sector coordination is therefore all the more important (Persson et al., 2018).

Science and policy in Israeli administration: chief scientists

Special institutions for integrating science and political decision-making exist across various policy contexts and levels (Arimoto & Sato, 2012; Gallopín, Funtowicz, O'Connor, & Ravetz, 2001; Guston, 1999; Jasanoff, 1990; Rei-

necke, 2015). In the United Kingdom, for example, advisory systems are embedded inside the government (Holmes & Clark, 2008) and the government chief scientific advisor directly advises the prime minister regarding risk and resilience, energy, and climate change (Government Office for Science, 2015). In the federal structure of Germany as well, every provincial state has its own governmental division and bureaucrats who deal with environmental and special technical aspects of climate change. In contrast, advisors for climate change issues in Finland are part of the Finnish Environment Institute which is an independent agency outside of the government. The following section situates the role of scientific advisors in the Israeli administration based on our analysis of relevant government documents and protocols.

In Israel, in 1966 the Kachalsky Committee for the Organization and Administration of Government Research recommended creating CS positions in relevant ministries to coordinate research and technology activities and to stimulate applied research. In its early years of existence, Israel relied heavily on foreign expertise (Leck, & Tash, 2016), and the committee's main conclusions were that there is a solid foundation for research at local universities, but no satisfactory mechanism to apply this academic-based knowledge in the industry or government (Keynan, 1988). The first scientific advisor in governmental ministries was in the Ministry of Defense (Keynan, 1998), but the first official CS was positioned in the Ministry of Economy in order to prioritize and fund civil research and development (R&D), mainly through research grants (Teubal, 1983).[1]

Discussions over the extent and nature of the CS's independence took place during the successive years. A Governmental Decision from 2001 (no. 2895/MT/16) stated that 'a CS must be a senior scientist recognized and accepted by the scientific community, who is active as a researcher in the field relevant to the activities of his office, and has authority and jurisdiction in his area of expertise. The CS will be able to bridge between academia and other factors involved in R&D' (Knesset Research and Information Center, 2016).

A report from a public investigation committee a decade later found, however, that 'in contrast to the original intention, in some of the ministries, several appointees for the CS positions were not academics or researchers' (Knesset Research and Information Center, 2016). The committees also

[1]Its primary goal, which was defined by law in 1984, is to foster innovation in industry and to advance the long-term economic future of Israel (Knesset Research and Information Center, 2016). Funding innovative, state-of-the-art technologies and products at various stages in development has contributed to Israel's reputation as a 'start-up nation' (Trajtenberg, 2000). In January 2016, the Office of the CS at the Ministry of Economy was replaced by a National Authority for Technological Innovation (Leck et al., 2016).

found that there was a lack of uniformity and clarity regarding the qualifications required for the CS position in the various ministries (Knesset Research and Information Center, 2016). CSs are usually external to the bureaucracy and are recruited from universities or the industry sector (e.g., the current CS at the Ministries of Environmental Protection and Transport), appointed to directly advise cabinet members of the respective ministries (Keynan, 1988), but it also happens that she or he are appointed from within the administrative structure of the ministry (e.g., a former CS at the MoEP).

CS positions have developed over the years in almost all executive ministries, such as the Ministries of Economy, Science and Technology, Agriculture, and Environmental Protection. In 2011, twelve CSs were employed by government ministries (15 ministries did not have one), but the number declined in 2016 to only nine (Knesset Research and Information Center, 2016). Depending on their responsibilities, CSs have varying sizes of staff and budgets in the office they head. For instance, the Office of the CS in the MoEP has five permanent and three temporary staff positions and a budget of nearly 1.7 million euros. In contrast, the CSs in the Ministry of Agriculture and the Ministry of Energy oversee a much higher budget, approximately 23 million and 11 million euros, and have eight and twelve staff positions, respectively (Knesset Research and Information Center, 2016).

The length of employment of a CS can vary as well, and sometimes ministries opt not to employ a CS for a certain period as was the case, for example, in the Ministry of Transportation from 1979 to 1994. Following a governmental decision on this topic, however, most CSs today are appointed for 4 years with the option of extending their contract for another 4 years.[2]

CSs play a critical role in the interface of science, policy, and politics in Israel. First, they are responsible for setting research priorities, publishing calls for proposals, evaluating them, and administering research funds. Second, they provide in-house scientific advice to the minister, the director general, and departments within the ministry, thereby supporting decision-making (NCRD, 2014). CSs also foster international scientific collaborations and each office may decide upon additional priorities.

The CS's activities at the MoEP regarding climate change adaptation include preparing for and participating in the Conferences of the Parties under the UNFCCC, supporting the Israeli Climate Change Information Center (ICCIC) established in 2011, and raising awareness regarding environmental issues (Chief Scientist Office, 2015). Furthermore, the CS leads an interminis-

[2]The CS in the Ministry of Health can be appointed for up to 6 years, with the possible extension of another 4 years. Also excluded from this rule is the CS at the Ministry of Economy, who is appointed for 6 years according to Government Decision 4470 (Government of Israel, 2009a).

terial Director Generals Committee created to prepare a national adaptation plan. This task was officially assigned to the CS of the MoEP by Government Decision 474 in 2009. It details which entities should take part in the process, including twelve ministries, among them the Ministry of Agriculture, Ministry of Health, and Ministry of Energy, in addition to representatives of local authorities and NGOs. Other relevant organizations may also be invited to participate (Government of Israel, 2009b).

In summary, the R&D governance in Israel is decentralized and each ministry is responsible for R&D in its own sector. Working in a bureaucratic–political environment, rather than an academic one, poses numerous challenges for CSs who are mandated to translate scientific knowledge, advise, and support regulation in multiple fields (Knesset Research and Information Center, 2016). We further discuss these complexities below following a brief review of the effects of climate change on Israel.

Climate change and adaptation in Israel

Israel faces numerous ecological challenges. Most likely, Israel will become hotter and drier through increasing frequency and severity of extreme weather events resulting from climate change, specifically heat waves as well as continued decline in rainfall leading to droughts (Drobinski et al., 2016; Michaels & Alpert, 2013). Generally, the entire region (Israel, Palestinian Authority, and Jordan) is extremely vulnerable and predicted to experience an increase in the average temperature of 1°C, which lies above the global warming rate (Givati, 2016).

Water is an extremely scarce resource in the country, with 75% of the available freshwater reserved for domestic, agricultural, and industrial use. Israel has addressed water shortages through the development of desalinated water (80% of drinking and industrial demand in 2017) and agriculture-related technologies (Israeli Water Authority, 2017; Ministry of Economy, 2015). Yet some argue that any change in Israel's rainfall pattern will have major implications for the country that might also be trans-boundary in nature in a geopolitically volatile region (Feitelson, Tamimi, & Rosenthal, 2012; Teschner et al., 2013).

Climate change will also impact Israel through a second channel: Israel will likely be affected by floods and a rise in the sea level, albeit to a lesser extent (Israeli Climate Change Information Center, 2011). A study, for example, found that Tel-Aviv is one of the top 15 coastal cities most likely to be affected by climate change worldwide (Hallegatte, Green, Nicholls, & Corfee-Morlot, 2013). This is particularly worrisome as the country has a population density of 387.2 persons per km^2, with the majority of residents

living in cities along the coast. The population growth rate was 2% in 2016 (World Bank, 2017), a very high rate compared with the EU's annual average of 0.13% (OECD, 2017).

As part of the long process of drafting recommendations for the official adaptation plan, the ICCIC was established in 2011 and mandated to produce research and policy recommendations in seven main fields: climatic changes, public health, water, biodiversity, urban planning and building, economy, and geostrategic implications (Israeli Climate Change Information Center, 2014). The center consisted of scientists from Israeli universities and was budgeted for the years 2011–13. Since then it did not receive additional funding.

During this period, three reports were produced. The first report gathers existing knowledge regarding the implications of climate change on the State of Israel (Israeli Climate Change Information Center, 2011). The second report focuses on the proposed national adaptation policy in relevant areas and details possibilities of international marketing for the ICCIC (Ofira Ayalon et al., 2012). The third and final report specifically addresses the local level of government and adaptation to climate change in the local authorities (Ofira Ayalon, Grinberg, & Liebes, 2013).

These reports identified research and knowledge gaps in the abovementioned sectors so they could lay the foundations for the national adaptation plan. Thus far, the Israeli government has not enacted an official adaptation policy; currently, a full draft of recommendations for the national plan, as well as a resolution to adapt, has been written and is circulating among ministries. The resolution acknowledges that Israel needs to adapt, and the national adaptation plan envisions that each ministry will submit an annual progress report on its preparation for climate change (INT 6, 2017).

Methodology

To investigate the role of CSs and examine their influence on climate change adaptation policy in the Israeli administrative system, in addition to a document analysis of government protocols and policy papers, we conducted elite interviews (Aberbach & Rockman, 2002) with relevant stakeholders. Scholars agree that gathering data from those directly involved in the daily process (Gläser & Laudel, 2010) is useful because expert judgments can identify key actors. Hence, in seeking to understand the inner workings of Israeli CSs with regards to the national climate change adaptation plan, semistructured interviews helped to reconstruct the process (Anfara Jr., Brown, & Mangione, 2002).

In total, we conducted 26 interviews, the majority of them face-to-face,

between 2016 and 2017 (for a detailed list of the interviewees' affiliations see the Appendix). The sample consists of current and past CSs, senior staff members of CS offices, as well as Israeli academics and NGO representatives—all of whom have had longterm experience with aspects of climate change and many of whom participated in the national drafting process. They were able to offer insights regarding the role of a CS and the use of scientific advice in policy making in general, and in adaptation policy in particular. The diversity of the interviewees helped to control for subjective influences of individuals, adding validity to our primary data set (Flick, von Kardoff, Steinke, & Jenner, 2004). With the consent of all interviewees, notes were taken during the interviews and the recorded audio files were transcribed subsequently with the transcription software f5.

The transcriptions were compared and interpreted qualitatively using MAXQDA software, which enables structuring and organization of large quantities of data as well as the construction of coding schemes. We employed the qualitative thematic analysis approach to identify and analyze emerging themes from detailed and complex data (Braun & Clarke, 2006). In seeking to identify these themes, we coded the interviews in an inductive manner using the grounded theory approach (Glaser & Strauss, 1967). In the first reading of the interview material, codes were created and then redefined at subsequent stages of the coding development.

In determining patterns, thematic analysis enables identification of commonalities and determination of repetitive themes across interviews. The fact that codes change throughout the process is common (MacQueen, McLellan, Kay, & Milstein, 1998). At later stages, the analysis consisted of fine-tuning our coding until novel aspects no longer surfaced (Guest, Bunce, & Johnson, 2006). Coding of the data ended when we reached saturation—that is, once further analysis did not result in new codes or in the additional fine-tuning of existing codes. At this stage, codes were clustered into themes.

Results

In this section, we present a detailed overview of the four prominent themes that emerged from the interviews. To better understand the contribution and constraints of boundary workers, such as CSs, we will concentrate on the role of the CS in the MoEP and its relationship with other actors involved in the national adaptation plan in Israel. The results also help address our question as to how administrative traditions have affected the adaptation process in the country.

In Israel, CSs are characterized by their interactions inside and outside of

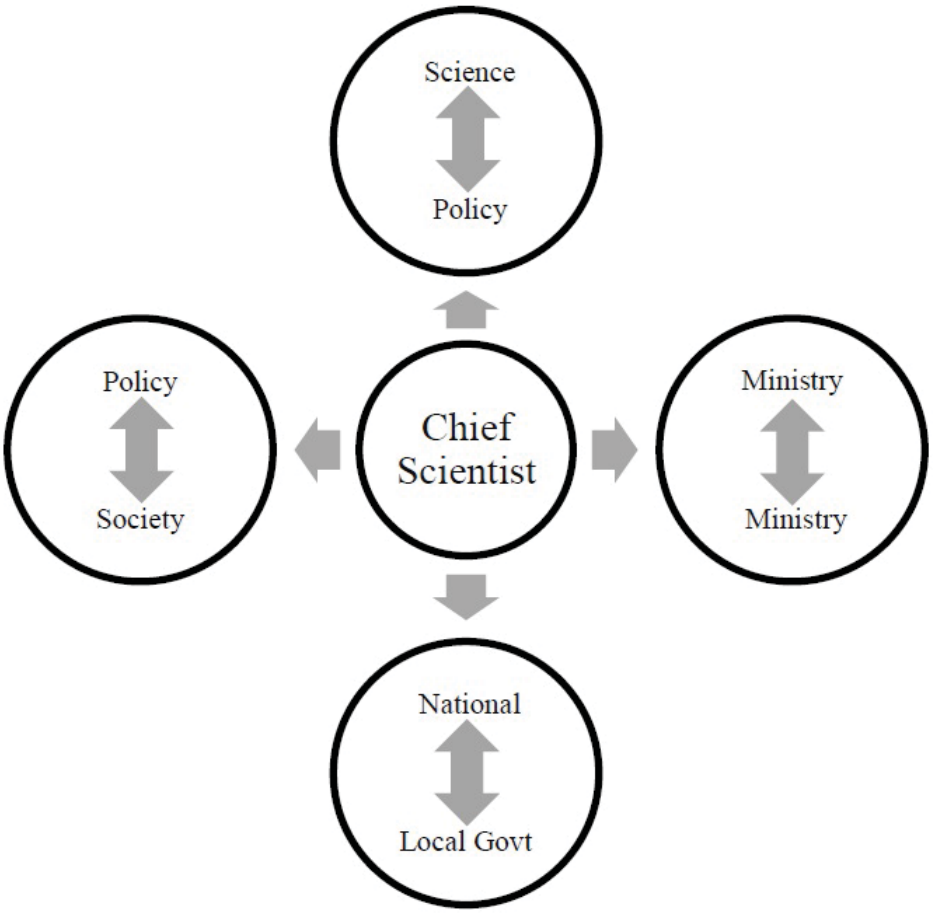


Figure 3.1: The CS of the MoEP as a bridge between institutions.

their ministry. The constant interaction between various interfaces makes the role of the CS at the MoEP collaborative and participatory in nature. The CS bridges between (1) science and policy through support of and collaboration with academic research conducted at universities; (2) government and the public sphere, for example, engagement with NGOs; (3) governmental sectors (various ministries); and (4) governmental levels (local–national). In the following, we detail the four abovementioned interfaces and the boundary-spanning activities undertaken by the CS at the MoEP (see also Figure 3.1).

Science–policy interface

A recurring theme was the science–policy interface and the CS's function as a bridge between the science and policy arenas. Several interviewees, includ-

ing current and former CSs, perceived that the CS's role mediated scientific advice about current issues to other policy actors. Interviewees noted in particular that collaborations between the CS and scientists from higher education institutions in Israel take place frequently and through several different projects and channels.

The majority of CSs are scientists themselves, which means that they not only have scientific credibility to handle complex issues, but also value the fair and objective advice given to them by active academics (INT 22, 2016; INT 23, 2016). Other scientists shared a more critical view, arguing that even though CSs usually hold PhDs, their administrative position imposes various limitations since it is part of a larger administrative system (INT 20, 2016). As one university professor noted: 'As an academic, I perceive them as being part of the bureaucracy.' Another university professor said that overall, the science–policy interface is not managed well in Israel and that the interconnectedness between the two systems is fragile:

> My feeling is that compared to other countries, the position of experts within the government is rather weak and the connection between academia and the ministries is weak. Academia is very independent, very research-oriented—not policy oriented. (INT 25, 2016)

Furthermore, comments regarding the occupancy of the position repeatedly surfaced throughout the interview sessions. For instance, in the Ministry of Science CSs usually come and go from/to academia, thereby staying connected to both worlds. Coming from academia prepares them to identify important questions in their respective fields. It also presents a unique opportunity for scientists to showcase their accumulated knowledge, 'test' it in the policy sphere, and influence decision- making. The following quote by a CS in the current administration captures these aspects:

> And this is why I believe that this job should be done in rotation and that people who come will serve a few years in this position and go back to academia [...]. Because, otherwise we lose contacts in the community, we lose contact to what's going on; what's on the agenda. So it's very important in my view that it is a position which is fulfilled by a high-rank academic, recognised by his colleagues. (INT 23, 2016)

Moreover, relationships with other scientists that were formed during CSs' scientific careers form a large network of experts that can be contacted and

consulted later. This especially helped with regards to setting the agenda on adaptation, as the CS of the MoEP tried to bring together relevant stakeholders. Furthermore, the CS of the MoEP and scientists who were part of the ICCIC argued about the need for evidence-based decision-making in relation to adaptation.

Despite the scientific credibility of a CS and the close working relationships with other scientists, one university professor claimed that when it comes to policy formulation, the one great limitation of a CS is the lack of decision-making authority. In the case of adaptation, one NGO worker mentioned that the CS of the MoEP can draft a resolution but does not have the opportunity to enact it into policy (INT 8, 2016). This exemplifies the clear boundaries between collecting expertise for politicians and actual decision-making authority. The CS certainly has independence in prioritizing research on adaptation and advancing adaptation policy, but as a bureaucrat, the CS does not have the power to design and implement governmental policy.

The situation in Israel is particularly aggravating because the policy-making style is 'reactive' and the application of scientific evidence is less prevalent in policy formation (INT 15, 2016). Another deputy CS confirmed that once the government has identified a problem, it usually wants an immediate solution (INT 17, 2016). Such an attitude makes it difficult to garner support among politicians for issues such as adaptation. To make matters worse, frequent rotation of politicians conflicts with the long-term scientific perspective of the issue. As one university professor noted:

> [Bureaucrats/politicians say to themselves] climate change will not happen. If it happens it will not be during my term of office. We have other issues to be troubled with or to be concerned about. They know that the likelihood that things will happen is unknown. (INT 12, 2016)

In relation to the frequent turnover of political appointments, another factor mentioned by several interviewees was the perception that politicians seem to believe that Israel will be able to meet the challenge of adaptation by improvisation. A CS attributed inconsistent work on policies in several fields to this attitude and also stressed the nonexistent long-term planning approach of policy actors:

> Maybe, at the political level there is such an understanding that we will be able to improvise. But we are not rehabilitating at a rate that is appropriate. There is a gap between what the

> professionals know and what the political level is dealing with. [...] There is no systematic planning mentality. You see a lot of ad-hoc decisions. (INT 6, 2017)

That CS attributed the lack of long-term planning to the frequent changes of ministers and director generals in Israel, each politician and bureaucrat promoting their own agenda and shifting policy processes. This poses a challenge to CSs in their efforts to bridge science and policy, and supporting long-term, scientifically sound policy making.

Policy-society interface

The CS's position as a bridge and potential mediator between the policy and the public spheres, and in particular NGOs, was another important aspect of the adaptation policy-making process. A civil servant in an office of a CS viewed the access of NGOs to government positively. Likewise, NGOs feel that channels of communication with key bureaucrats and politicians are generally open (INT 9, 2016). In contrast to the position of minister or director general of a ministry, the position of the CS has more leeway and a CS is able to participate and engage with civil society in various contexts.

If a CS has a good working relationship with an NGO member, collaboration can be effective (INT 9, 2016). Under such circumstances, the CS functions as a trigger to raise awareness of a certain issue on a higher level, which, as a former advisor to a CS described, indeed happened with the topic of climate change adaptation where both the CS and an NGO worked well together and promoted adaptation (INT 2, 2016).

Yet, while many viewed the CS's position positively and stressed his or her efforts to 'build a bridge,' there were some critical views pointing toward a lack of cooperation, particularly in contrast to the aforementioned science–policy interface. For example, there were more mixed opinions and assessments of the CS's cooperation with NGOs. One CS pointed out the active science–policy engagement but discredited the public-policy sphere, contending that they do not collaborate at all:

> We [the CSs] work with all the academia in Israel. That's our main field of operation. We work a lot also with other governmental offices. You don't work a lot with NGOs. (INT 22, 2016)

It seems that the successful functioning of a CS in the policy-public sphere depends on the individual in the position, the ministry, the relevant NGO, and the issue at stake.

Horizontal policy interface between ministries

Interviewees noted that CSs serve as a bridge between their ministry and other relevant ministries during the adaptation formulation process. For instance, all CSs meet regularly in the so-called Chief Scientists Forum headed by the Ministry of Science. In specific cases, they also have long-term collaborations with other relevant ministries to coordinate horizontal issues. These frameworks are important and respected venues for exchange and make collaboration across different sectors possible.

In the case of climate change adaptation, the main venue for exchange between entities was the interministerial committee on adaptation established by the Government Decision 474 in 2009. CSs had an active role and the CS of the MoEP assigned each ministry the task of writing a chapter in the adaptation plan detailing their specific needs in order to close existing knowledge gaps in each sector. The CS at the MoEP led the process, and had the power to bring on board the relevant ministries, and the capacity to provide scientific advice and coordinate a comprehensive adaptation plan, which is in the final stages of preparation. However, this boundary work proved to be challenging. In fact, providing scientific advice horizontally and convincing other ministries that there is a need for adaptation in Israel was not an easy task, as a CS noted:

> There was a huge gap in understanding [of climate-related science]. When I approached people [in ministries] five years ago they looked at me like: What the hell are you talking about? Now they come to me and ask: Can you help us convince our director general? Can I share this document with another department? But it took time to convince people that there is an issue. (INT 6, 2017)

The former and current CSs in the MoEP deliberately reached out to other ministries to approach climate change adaptation from a horizontal perspective. Here, a former CS reasoned that climate change adaptation is not relevant exclusively to the MoEP but to a whole range of other sectors as well (INT 10, 2016). Coordination efforts of the CS proved challenging because some ministries were reluctant to cooperate. Some interviewees revealed that the CS of the MoEP had to manage the unwillingness of certain ministries since some sectors were not even aware that they should concern themselves with climate change (INT 14, 2016). For example, the Ministry of Interior did not contribute to the national adaptation plan because according to them, adaptation does not concern them. Surprisingly, questions related

to migration in the context of climate change were raised by the Ministry of Public Security (INT 6, 2017).

NGO employees and university professors further attested to these difficulties and even spoke of 'rivalries,' 'fights,' and 'clashes' between ministries (INT 13, 2016; INT 14, 2016; INT 15, 2016; INT 20, 2016). As the CS depends on other ministries' input and consent, one university professor described the process as follows:

> We had to confine ourselves to those areas or sectors in the system where the other ministries felt that it would be ok. (INT 13, 2016)

Lastly, and with regards to the ministerial landscape in Israel, many participants from different sectors mentioned that in order for a policy to succeed, the involvement of the Ministry of Treasury is essential (INT 8, 2016; INT 15, 2016; INT 25, 2016). In Israel, this ministry is responsible for all fiscal planning of the government, which is why it is considered one of the most powerful ministries. As one university professor noted:

> The bottleneck is always the Ministry of Treasury. And if it leads the process, [there is] a greater likelihood that the rest will join along. (INT 20, 2016)

The MoEP is a relatively small ministry with a modest staff and budget. Therefore, it depends on the other ministries' willingness to engage in its agenda, especially in the case of horizontal issues such as adaptation. One NGO representative referred to this problem by emphasizing 'the marginality of this office' and pointed out the need for stronger cooperation between ministries in order to advance national adaptation policy (INT 7, 2016).

Vertical policy interface

In Israel the CS has also assumed a connecting role between the national and the local levels of government. Some interviewees mentioned the efforts undertaken by the CS, predominantly in relation to the MoEP, to actively involve representatives from the local level. NGO representatives stressed the efforts undertaken by the CS to actively involve municipalities; representatives from city councils; and the Forum 15, which is comprised of Israel's largest and most financially independent cities (INT 7, 2016; INT 8, 2016). This is important since concrete adaptation measures and implementation responsibilities often lie at the local level (INT 13, 2017). Others claimed that the local level is not as involved as it could be in knowledge gathering

for the adaptation plan. Mayors attended meetings for informative reasons but did not participate beyond that.

Engagement at the municipal level is vitally important in the context of adaptation. Barber (2013) argues that cities and the mayors that govern them exhibit a leadership quality to deal with global problems such as climate change. Certainly, local administrative bodies are equipped with the specific knowledge about its residents, including vulnerable populations, and critical infrastructure—in essence, the community's needs—and they are also responsible for supplying local climate resilient measures such as flood and cyclone shelters (Araos et al., 2016). Studies have examined the state of preparedness at the local level (Heidrich, Dawson, Reckien, & Walsh, 2013), but often fail to also highlight how important coordination between different levels is (Henstra, 2017; Nalau, Preston, & Maloney, 2015). Often, the local level lacks the necessary financial resources or capacity to adequately deal with the impacts of climate change (Measham et al., 2011) and is reliant on the leadership and financial support of the central government.

The significance of the local level was also highlighted in the third and final report of the ICCIC, entitled 'Adaptation to Climate Change in the Local Authorities' (Ofira Ayalon et al., 2013). The realization was that different accountabilities and obligations reside at various levels, but that the local level is essential when it comes to implementing adaptation policies. Rather than preparing simple guidelines, the CS emphasized the importance of developing several models for big and mediumsized towns in Israel as well as rural areas on how to prepare for climate change (INT 6, 2017).

Discussion

In this section, we discuss the role of CSs in Israel and focus specifically on the advantages and constraints affecting the provision of scientific advice for the adaptation strategy. We discuss our findings in the context of the literature on scientific knowledge and how it enters bureaucracy, the role of boundary workers, and the framework of administrative traditions.

The role of the chief scientist and its ability to bring scientific advice related to climate change adaptation into governmental policy

The CS is a unique position inside the bureaucratic system of Israel and an integral part of most Israeli ministries. Its purpose is twofold: to advise ministers in order to ensure evidence-based decision-making and to advance

applied research relevant to specific ministries' needs. However, responsibilities differ among ministries and some CSs are more active in advising their minister and director general than others.

Often considered 'short-term bureaucrats' who come from and go back to academia (or the private sector), a CS may lack the political know-how to advance their innovative scientific agendas (Peled, 2000, p. 222). However, CSs can hold this position for 4 years and longer, thereby ensuring consistency and continuity which, in the case of the MoEP, helped in keeping the topic of adaptation on the ministry's agenda. In addition, the former CS at the MoEP was a civil servant of the ministry prior to the appointment. This meant familiarity with the bureaucracy of ministerial and governmental procedures.

Evidently, recruiting and duration of Israeli CSs is more heterogeneous in practice than envisioned in the governmental decision. For example, some CSs do not necessarily come from academia (Knesset Research and Information Center, 2016) or hold the position for less than 4 years (INT, 12; INT, 18). Sometimes, ministries do not employ a CS at all; among other reasons for lack of suitable candidates. Future research could investigate this matter in-depth across a larger number of Israeli CSs over time. However, with regard to our interview sample and the CS at the MoEP in particular, one distinct feature is prominent regardless the origins of the CS: it equips its holder with considerable leeway to prioritize long-term progressive tasks such as adaptation. An example for this would be engaging in international research collaborations, but also issuing calls for proposals on adaptation and organizing events to engage the public or leading the inter-ministerial committee on climate change adaptation.

(Craft & Wilder, 2017) argue that those 'inside' a government advisory system enjoy a limited level of autonomy. Yet, many interviewees mentioned that the position of the Israeli CS, despite his or her location within the government, enjoys a great deal of independence. Furthermore, many recounted that the CS is highly respected thanks to his or her scientific credentials and that this status reinforces the position's independence. Having the freedom to initiate, foster, and prioritize issues such as adaptation before they have been prioritized by the government can be considered a clear advantage.

On the downside, interviewees revealed numerous constraints that the CS faces despite his or her independence, for example, low budget, inadequate manpower to shoulder the task, and limited political power, as well as the CS's lack of policymaking authority. These findings are in line with observations by Page (2010, 2012) who noted that experts—whether part of the ministerial landscape or outside of it—are simply consultants to policy makers and are not the ones who enact policy decisions.

Adaptation is an intersector task, and by bridging adaptation across various scientific disciplines and sectors, the CS is certainly a boundary worker (Brugger et al., 2016) who actively integrates climate change adaptation science among relevant actors. The fact that the MoEP is a ministry that deals with other environmental cross-cutting issues may have been beneficial to the work on the adaptation plan as well. At times, however, bureaucrats can feel 'underprepared to deal with boundary work situations, without a compass, or guidelines on how to productively engage in it' (Hoppe, 2010, p. 115). According to our interviewees, recent CSs at the MoEP have faced this challenge with a scientific approach by first focusing their efforts on closing existing knowledge gaps in the context of adaptation.

Being part of the bureaucracy helps to build and sustain relationships with various other departments and other CSs. The interviewees' responses attested that the CS of the MoEP tried to include as many relevant actors as possible in the developing phases of the adaptation strategy. This is exemplified by the circumstance that more ministries than initially required by the government decision, such as the Ministry of Public Security, were part of the process.

The translating function raised by (Hoppe, 2010) and others was critically important in the CS's work. Seeing the interlinkages across ministries and vertical levels of governance; explaining what adaptation means; and most importantly, translating to relevant actors that adaptation is a cross-cutting issue that concerns them, was one of the biggest challenges of this cross-sector collaboration. This is especially significant because horizontal collaborations are generally hard to establish in Israel due to an administrative structure that often hampers interministerial collaborations (Negev, 2016). This became evident when some ministries avoided collaboration during the adaptation formulation process.

Another barrier to successful dissemination of scientific advice is that academia and administration speak different languages and have different goals. For example, one interviewee mentioned the tension between the technical language of the guidelines of the CS at the MoEP and an academic writing style. This illustrates the gap between scientific and bureaucratic work. We can relate this to Sarewitz's (2004) finding that administrators often politicize—or in this case bureaucratize— scientific resources. While this can be characterized as a typical struggle within a bureaucracy, it might also attest to the fact that scientists consider applied work in the governmental arena troublesome.

Administrative traditions and their impact on the adaptation policy-making process in Israel

Preparation of a comprehensive climate change adaptation strategy for the Israeli government officially started in 2009. Taking into account that the former CS at the MoEP began engaging in this subject as early as 2007 (through participation in research supported by a European grant), this process has lasted longer than a decade up to now. While it certainly has been time intensive, the process has focused on providing a knowledge base for future policy actions.

To some extent, international pressures, for example, the process of joining the OECD and the Paris Agreement, have had some effect on raising awareness of politicians and the public in Israel regarding climate change issues. In general, however, this has led to measures being taken in relation to mitigation (Government of Israel, 2016; Michaels & Tal, 2015). In contrast, adaptation is a topic that has received very little public and political attention in Israel thus far, partly because of the country's persistent security concerns (Michaels & Alpert, 2013). The question then arises, to what can we attribute the low awareness and long process regarding the issue at hand?

Adaptation is not only confined by different levels of vulnerability but also by risk perceptions (Adger et al., 2009; Jordan et al., 2010; Pelling, 2010). Interviewees attested that politicians and bureaucrats seem to be guided by a perception that Israel is de facto adapted. As a civil servant working for a CS accounted: 'We don't call it adaptation, but we are adapting' (INT 4, 2016). One the one hand, one could argue that there is a persistent belief that Israel is adapted. The country has developed many innovative technological solutions to deal with the arid climatic conditions, most importantly, advanced seawater desalination but also drip irrigation and solar-thermal technologies (Erdan, 2009; Ministry of Economy, 2015; Teschner et al., 2013).

On the other hand, adaptation efforts do not translate sufficiently to other spheres, especially the political, the municipal level, and the public arena. Here, a big barrier is the quick rotation and frequent changes of the Israeli political cycle, which constrains long-term, strategic policy approaches and is rather characterized by a 'reactive' policy-making style (INT 15, 2016)

Since Israel is an arid country, innovative technologies for the hot and dry climate were developed early to overcome water shortages. Most of these actions regarding water or energy efficiency were not strategically planned as adaptation but were driven by severe climatic conditions which needed 'to be addressed regardless of climate change' (Feitelson et al., 2012, p. 253). Several interviewees hinted at this observation by naming past adaptive technological advancements, such as desalination or other technologies developed

in Israel (e.g., water tanks heated by thermal energy). However, one could argue that these past advancements in technology will not be enough in the face of future challenges and constitute an assumed sense of preparedness.

In sum, the long climate change adaptation policy process can be attributed in part to an Israeli administrative tradition that values short-term planning and improvisation. While not all interviewees shared this view, some noted that improvising has been effective in the past in light of Israel's scarce resources. The assumption is that innovation is embedded in the DNA of the Israeli administrative tradition and thus, ways of coping with other emerging issues such as adaptation will develop. Simultaneously, a tradition valuing short-term solutions over systematic knowledge-based policies has constrained the ability of the CS to push forward the national adaptation plan in particular.

Conclusion

We typified four different interfaces in which the CS of the MoEP actively connected with various entities in the adaptation planning process, that is, between science and policy, between science and the general public, and at the horizontal and vertical government levels. Hence, the role of the CS can be characterized as boundary work. It functions—to varying extents—as a bridge between different institutions resulting in important implications for climate change adaptation policy. The administrative tradition of Israel, and the position of scientific advice in the country, may explain some of the advantages and barriers to efforts of the CS of the MoEP in advancing adaptation policy, and might also explain why Israel, like many other countries (Wellstead et al., 2016), does not have a well-developed adaptation policy in place.

Climate change is a cross-cutting issue and will continue to demand boundary work. Despite our conclusions regarding limitations of the role of Israeli CSs, we recommend that further research be conducted to reveal additional variables which influence the process of integrating scientific advice in the national adaptation policy-making process, such as politicians' attitudes to climate change in general, and adaptation in particular.

Acknowledgements

This study is an outcome of COST Action IS1309 'Innovations in Climate Governance: Sources, Patterns and Effects' (INOGOV). The work by Nicole M. Schmidt was supported by the MINERVA Foundation and she expresses gratitude to Eran Feitelson and Amit Tubi for their guidance and suggestions during the planning and development stage of this research. The authors are grateful to all interviewees for their kind collaboration and generosity with which they shared their views and experiences. An early version of this article was presented at the INOGOV Intensive ResearchWorkshop (Amsterdam, April 19–20, 2016). The authors thank all workshop participants for their helpful comments. In particular, the authors thank Jale Tosun, Robbert Biesbroek, Guy Peters, and three anonymous reviewers for their constructive comments that greatly improved the manuscript. The authors acknowledge Xenia Rak's and Dajana Jost's assistance in the interview transcription process.

Bibliography

Aberbach, J. D. and Rockman, B. A. (2002). Conducting and coding elite interviews. *Political Science and Politics*, 35(04):673–676.

Adger, W. N., Lorenzoni, I., and O'Brien, K. L. (2009). *Adapting to climate change: Thresholds, values, governance*. Cambridge University Press.

Anfara Jr., Vincent A.; Brown, K. M. M. T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researcher*, 31(7):28–38.

Araos, M., Ford, J., Berrang-Ford, L., Biesbroek, R., and Moser, S. (2016). Climate change adaptation planning for global south megacities: the case of dhaka. *Journal of Environmental Policy & Planning*, pages 1–15.

Arimoto, T. and Sato, Y. (2012). Rebuilding public trust in science for policy-making. *Science*, 337(6099):1176–1177.

Ayalon, O.; Kutiel, H. K. N. G. M. S. M. T. T. E. T. L. I. (2013). Adaptation to climate change in the local authorities.

Barber, B. (2013). If mayors ruled the world: Dysfunctional nations, rising cities.

Biesbroek, G. R., Klostermann, J. E. M., Termeer, C. J. A. M., and Kabat, P. (2013). On the nature of barriers to climate change adaptation. *Regional Environmental Change*, 13(5):1119–1129.

Biesbroek, G. R., Peters, B. G., and Tosun, J. (2018). Public bureaucracy and climate change adaptation. *Review of Policy Research*, 6(35):776–791.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101.

Brugger, J., Meadow, A., and Horangic, A. (2016). Lessons from first-generation climate science integrators. *Bulletin of the American Meteorological Society*, 97(3):355–365.

Chief Scientist Office (2015). Summary of activities for 2015: The office of chief scientist.

Christensen, T. and Lægreid, P. (2008). Administrative reforms and competence in central government organizations. *Working Paper 7 Stein Rokkan Centre for Social Studies*.

Craft, J. and Howlett, M. (2013). The dual dynamics of policy advisory systems: The impact of externalization and politicization on policy advice. *Policy and Society*, 32(3):187–197.

Craft, J. and Wilder, M. (2017). Catching a second wave: Context and compatibility in advisory system dynamics. *Policy Studies Journal*, 45(1):215–239.

Drobinski, P., Da Silva, N., Panthou, G., Bastin, S., Muller, S., Ahrens, B., Borga, M., Conte, D., Fosser, G., Giorgi, F., Güttler, I., Kotroni, V., Li, L., Morin, E., Önol, B., Quintana-Segui, P., Romera, R., and Zsolt Torma, C. (2016). Scaling precipitation extremes with temperature in the mediterranean: past climate assessment and projection in anthropogenic scenarios. *Climate Dynamics*.

Dryzek, J. S. (1987). Complexity and rationality in public life. *Political Studies*, 35(3):424–442.

Erden, G. (2009). Statement at the un special summit on climate change. jerusalem: Ministry of environmental protection.

Feitelson, E., Tamimi, A., and Rosenthal, G. (2012). Climate change and security in the israeli–palestinian context. *Journal of Peace Research*, 49(1):241–257.

Fleig, A., Schmidt, N. M., and Tosun, J. (2017). Legislative dynamics of mitigation and adaptation framework policies in the eu. *European Policy Analysis*, 3(1):101–124.

Flick, U., von Kardoff, E., Steinke, I., and Jenner, B. (2004). *A Companion to Qualitative Research*. Sage.

Ford, J. D., Berrang-Ford, L., Bunce, A., McKay, C., Irwin, M., and Pearce, T. (2015). The status of climate change adaptation in africa and asia. *Regional Environmental Change*, 15(5):801–814.

Gallopín, G. C., Funtowicz, S., O'Connor, M., and Ravetz, J. (2001). Science for the twenty first century: From social contract to the scientific core. *International Social Science Journal*, 53(168):219–229.

Geerlings, H. and Stead, D. (2003). The integration of land use planning, transport and environment in european policy and research. *Transport Policy*, 10(3):187–196.

Givati, A. (2016). Observed and predicted climate change in the eastern mediterranean and their impact on the water sector. water and irrigation. http://iwwaportal.co.il/index.php/.

Glaser, B. G. and Strauss, A. L. (1967). *The Discovery of grounded theory : strategies for qualitative research*. de Gruyter, New York.

Gläser, J. and Laudel, G. (2010). *Experteninterviews und Qualitative Inhaltsanalyse*. Springer.

Government of Israel (2009a). *The list of senior positions in the civil service for which there is a determination of the term of office (Government Decision 4470)*. Cabinet of Israel [in Hebrew], Jerusalem.

Government of Israel (2009b). National plan for implementation of the greenhouse gas emissions reduction targets and for energy efficiency(government decision 1403).

Government of Israel (2009c). Preparedness for climate change in israel: Adaptation to climate change in israel and mitigation of ghg emissions(government decision 474).

Government Office for Science (2015). Chief scientific advisers and their officials: An introduction.

Guest, G., Bunce, A., and Johnson, L. (2006). How many interviews are enough? *Field Methods*, 18(1):59–82.

Guston, D. H. (1999). Stabilizing the boundary between us politics and science. *Social Studies of Science*, 29(1):87–111.

Halffman, W. (2005). Science/policy boundaries: National styles? *Science and Public Policy*, 32(6):457–467.

Hallegatte, S., Green, C., Nicholls, R. J., and Corfee-Morlot, J. (2013). Future flood losses in major coastal cities. *Nature Climate Change*, 3(9):802–806.

Heidrich, O., Dawson, R. J., Reckien, D., and Walsh, C. L. (2013). Assessment of the climate preparedness of 30 urban areas in the uk. *Climatic Change*, 120(4):771–784.

Henstra, D. (2017). Climate adaptation in canada: Governing a complex policy regime. *Review of Policy Research*, 34(3):378–399.

Himsworth, H. P. (1980). On the integration of expert knowledge into the machinery of government. *British Medical Journal*, 281(6249):1197–1199.

Holmes, J. and Clark, R. (2008). Enhancing the use of science in environmental policy-making and regulation. *Environmental Science and Policy*, 11(8):702–711.

Hoppe, R. (2010). *Lost in translation? A boundary work perspective on making climate change governable*. From climate change to social change : perspectives on science-policy interactions. International Books, Utrecht.

Howlett, M. (2014). Why are policy innovations rare and so often negative? blame avoidance and problem denial in climate change policy-making. *Global Environmental Change*, 29:395–403.

Israeli Climate Change Information Center (2011). Executive summary — 1st interim report.

Israeli Climate Change Information Center (2014). Adaptation to climate change in israel: Recommendations and knowledge gaps.

Israeli water Authority (2017). Water desalination.

Jacobs, K., Garfin, G., and Lenart, M. (2005). More than just talk: Connecting science and decisionmaking. *Environment: Science and Policy for Sustainable Development*, 47(9):6–21.

Jasanoff, S. (1990). The fifth branch: Scientific advisors as policymakers.

Jasanoff, S., Wynne, B., Buttel, F., Charvolin, F., Edwards, P., Elzinga, A., Haas, P. M., Kwa, C., Lambright, W. H., and Lynch, M. A. (1998). Science and decisionmaking.

Jordan, A., Huitema, D., van Asselt, H., Rayner, T., and Berkhout, F. (2010). *Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?* Cambridge University Press, Cambridge, UK.

Keynan, A. (1988). Science and israel's future: A blueprint for revitalizing basic research and strengthening science-based industry. Jerusalem. Israel Academy of Sciences and Humanities.

Keynan, A. (1998). The original perception of the chief scientists. chief scientists in israeli governmental ministries. Jerusalem. Israel Academy of Sciences and Humanities [in Hebrew].

Knesset Research and Information Center (2016). Chief scientists and r&d institutes in government ministries. In *Jerusalem: Knesset Research and Information Center [in Hebrew]*.

Leck, Iran; Lemarchand, G. and Tash, A. (2016). *Mapping research and innovation in the State of Israel. GO-SPIN country profiles in science, technology and innovation policy*. UNESCO, Paris.

Lemos, M. C. and Morehouse, B. J. (2005). The co-production of science and policy in integrated climate assessments. *Global Environmental Change*, 15(1):57–68.

Lesnikowski, A., Ford, J., Biesbroek, R., Berrang-Ford, L., and Heymann, S. J. (2016). National-level progress on adaptation. *Nature Climate Change*, 6(3):261–264.

MacQueen, K. M., McLellan, E., Kay, K., and Milstein, B. (1998). Codebook development for team-based qualitative analysis. *CAM Journal*, 10(2):31–36.

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., and Morrison, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, 16(8):889–909.

Menahem, G. and Zehavi, A. (2016). *Policy Analysis in Israel*. Policy Press, Bristol, UK.

Michaels, L. and Alpert, P. (2013). *Anthropogenic Climate Change in Israel*, pages 309–333. An Environmental History of Israel. University of Pittsburgh Press, Pittsburgh.

Michaels, L. and Tal, A. (2015). Convergence and conflict with the 'national interest': Why israel abandoned its climate policy. *Energy Policy*, 87:480–485.

Ministry of Economy (2015). Israeli know-how and adaptation technologies for climate change.

Nachmany, M.; Fankhauser, S. D. J. K. N. L. T. R. H. and Townshend, T. (2015). The 2015 global climate legislation study. a review of climate change legislation in 99 countries. summary for policy-makers.

Nalau, J., Preston, B. L., and Maloney, M. C. (2015). Is adaptation a local responsibility? *Environmental Science and Policy*, 48:89–98.

National Council for R&D (2014). *Government R&D activities report 2012-2013*. National Council for R&D [in Hebrew], Jerusalem.

Negev, M. (2016). Interagency aspects of environmental policy: The case of environmental health. *Environmental Policy and Governance*, 26(3):205–219.

OECD (2017). Population growth (indicator).

Page, E. C. (2010). Bureaucrats and expertise: Elucidating a problematic relationship in three tableaux and six jurisdictions. *Sociologie du Travail*, 52(2):255–273.

Page, E. C. (2012). *Policy without politicians: bureaucratic influence in comparative perspective*. Oxford University Press.

Painter, M. and Peters, B. G. (2010). *Tradition and public administration*. Springer.

Peled, A. (2000). The politics of outsourcing: bureaucrats, vendors, and public information technology (it) projects. *Information Infrastructure and Policy*, 6(4):209–225.

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. Routledge, Abingdon, UK.

Persson, s., Runhaar, H., Karlsson-Vinkhuyzen, S. I., Mullally, G., Russel, D., and Widmer, A. (2018). Environmental policy integration: Taking stock of policy practice in different contexts. *Environmental Science and Policy*, 81.

Peters, B. G. (2018). *Administrative Traditions and Administrative Reform*. Oxford University Press, Oxford.

Pielke, J; Roger, A. (2007). *The honest broker: making sense of science in policy and politics*. Cambridge University Press, Cambridge, UK.

Rahman, M. S. and Tosun, J. (2018). State bureaucracy and the management of climate change adaptation in bangladesh. *Review of Policy Research*, 35(6):835–858.

Reinecke, S. (2015). Knowledge brokerage designs and practices in four european climate services: A role model for biodiversity policies? *Environmental Science & Policy*, 54:513–521.

Research, K. and Center, I. (2016). *Chief scientists and R&D insitutes in government ministries*. Knesset Research and Information Center [in Hebrew], Jerusalem.

Sandler, T. (1997). *Global challenges: an approach to environmental, political, and economic problems*. Cambridge University Press, Cambridge, UK.

Sarewitz, D. (2004). How science makes environmental controversies worse. *Environmental Science and Policy*, 7(5):385–403.

Sharkansky, I. and Zalmanovitch, Y. (2000). Improvisation in public administration and policy making in israel. *Public Administration Review*, 60(4):321–329.

Termeer, C., Dewulf, A., and Breeman, G. (2013). *Governance of Wicked Climate Adaptation Problems*, pages 27–39. Springer.

Teschner, N., Garb, Y., and Paavola, J. (2013). The role of technology in policy dynamics: The case of desalination in israel. *Environmental Policy and Governance*, 23(2):91–103.

Teubal, M. (1983). Neutrality in science policy: The promotion of sophisticated industrial technology in israel. *Minerva*, 21(2):172–197.

Tobin, P., Schmidt, N. M., Tosun, J., and Burns, C. (2018). Mapping states' paris climate pledges: Analysing targets and groups at cop 21. *Global Environmental Change*, 48:11–21.

Trajtenberg, M. (2000). R&d policy in israel: an overview and reassessment. Report, National Bureau of Economic Research, Cambridge, MA.

Verheijen, T. (2007). *Public administration in post-communist states*, pages 311–319. Sage.

Wellstead, A., Howlett, M., and Rayner, J. (2016). Structural-functionalism redux: adaptation to climate change and the challenge of a science-driven policy agenda. *Critical Policy Studies*, pages 1–20.

World Bank (2017). Population growth 2016 (annual %).

Appendix

Number	**Date**	**Position/Institution**
		Telephone interviews
INT 1	10.03.2016	Former scientific advisor to the Chief Scientist (Ministry of Environmental Protection)
INT 2	21.03.2016	Former scientific advisor to the Chief Scientist (Ministry of Environmental Protection)
INT 3	22.03.2016	Former scientific advisor to the Chief Scientist (Ministry of Environmental Protection)
INT 4	04.04.2016	Scientific advisor to the Chief Scientist (Ministry of Energy)
INT 5	09.05.2016	Former Chief Scientist (Ministry of Transportation)
INT 6	27.07.2017	Chief Scientist (Ministry of Environmental Protection)
		Face to face interviews
INT 7	21.03.2016	Scientific advisor to the Chief Scientist (Ministry of Economy)

INT 8	28.03.2016	Environmental NGO employee
INT 9	30.03.2016	Executive Director, a leading Environmental NGO
INT 10	10.04.2016	Office of the Chief Scientist (Ministry of Environmental Protection) employee
INT 11	01.05.2016	Former Chief Scientist (Ministry of Environmental Protection)
INT 12	02.05.2016	Former Chief Scientist (Ministry of Science)
INT 13	04.05.2016	Leading scientist in the Israeli Climate Change Information Center
INT 14	04.05.2016	Professor (University of Haifa) ICCIC member
INT 15	04.05.2016	Professor (University of Haifa) ICCIC member
INT 16	08.05.2016	Professor (Hebrew University)
INT 17	10.05.2016	Post-Doc (Hebrew University)
INT 18	11.05.2016	Deputy Chief Scientist (Ministry of Science)
INT 19	11.05.2016	Scientific advisor to the Chief Scientist (Ministry of Economy)
INT 20	13.05.2016	Former Chief Scientist (Ministry of Environmental Protection)
INT 21	15.05.2016	Professor (Hebrew University)
INT 22	15.05.2016	Former scientific advisor to the Chief Scientist (Ministry of Science)
INT 23	16.05.2016	Chief Scientist (Ministry of Transportation)
INT 24	17.05.2016	Chief Scientist (Ministry of Health)
INT 25	18.05.2016	Scientific advisor to the Chief Scientist (Ministry of Energy)
INT 26	23.05.2016	Professor (Hebrew University)

Table 3.1: Overview of interviews

Paper 4

Spatial Implications of Adaptation and Mitigation in a German Metropolitan Region: Local Politicians' and Bureaucrats' Perspectives on Integrating Climate Change

Abstract

The role cities and regions play in combatting climate change has received widespread scholarly attention. However, there are still too few detailed empirical analyses on the practical fulfilment of the integration of climate concerns in urban contexts, especially in small and medium-sized municipalities. This article explores the spatial implications of adaptation and mitigation in the metropolitan region of Rhein-Neckar in Germany, with a view to identify local politicians' and bureaucrats' willingness to integrate climate concerns. How do local decision makers respond to demands of integrating climate objectives? Do they state a preference for climate mitigation over adaptation? I argue that the strive for integration often fails to capture trade-offs that arise when integrating climate objectives. Drawing on insights gained from 28 expert interviews with city councils and mayors, representatives from city administrations and regional agencies, I found that competing issues make aligning climate concerns extremely challenging, even when long-term political commitment exists. This suggests that the integration of climate concerns at the local level is fragmented. Increasing the understanding and prioritizing specific climate aims may improve this.

Introduction

Integrated approaches are a cornerstone of sustainable development and are called for in urban contexts, too. In 2015, the United Nations (UN) Sustainable Development Summit adopted 17 Sustainable Development Goals (SDGs), of which SDG goal 11 emphasizes 'sustainable cities and communities'. The goal further specifies the need of 'adopting and implementing integrated policies and plans towards [...] mitigation and adaptation to climate change' (United Nations, 2015, goal 11.b). However, it remains unclear what that means in practical terms and how cities would respond to the impacts of climate change by means of adaptation and mitigation in the face of critical trade-offs.

The integration of global concerns such as climate change is difficult for most cities, and scholars have lamented the inconsistencies in climate policymaking (Geden, 2016) as well as the lack of empirical studies at the local level in smaller and medium-sized towns (Gerhard and Marquardt, 2015). Lenschow argued that policy integration is 'more persuasive from an aggregate and long-term perspective', i.e. gains acceptance more easily with higher levels of government, but 'often loses power on the ground' (2002: 227). Comparing local governments in the UK and Germany, Bulkeley and Kern (2006) showed the significant role local governments can play in climate protection, while stressing the need for more political support and capacity building.

This study examines these findings nearly 15 years later in the German metropolitan region of Rhein-Neckar and presents findings from 28 qualitative interviews. By reporting the views of mayors, city council politicians, city administration representatives and regional agencies, this paper aims to assess whether local decision makers are actually willing to integrate climate concerns, as well as whether they would use open and green spaces for either adaptation or mitigation. How do local decision makers respond to demands of integrating climate objectives? Do they state a preference for climate mitigation over adaptation? These research questions guide this study.

Cities and municipal actors have played an increasing role in the governance of climate change for some time now (Bulkeley and Betsill, 2005; Bulkeley and Kern, 2006; De Oliveira, 2009; Fuhr et al., 2018; Kern, 2019; Wagner et al., 2019). To meet the target of integrating climate concerns in cities, spatial planning processes must go through several important stages, such as assessing potential urban areas, adjusting to temporal scales, and understanding actors' decision-making patterns (Davoudi et al., 2009). I argue that the strive for integration is often too broad a claim to capture the dilemmas and trade-offs that arise when integrating climate objectives at the

local level. In that sense, the concept of policy integration is limited in its practical application – especially in growing metropolitan regions, where the spatial dimension of climate measures has important implications for how the urban context is shaped.

Scholarly works have looked into whether and to what extent mitigation or adaptation considerations have been integrated in spatial planning contexts (Biesbroek et al., 2009; Endo et al., 2017). However, too few empirical studies exist which analyze such dynamics in metropolitan regions with smaller and medium-sized cities. The examination of a previously uninvestigated case study, namely the Rhein-Neckar metropolitan region in Germany, therefore provides an ideal platform for studying decision makers' responses and gaining qualitative insights into the preferences of local actors, as well as for examining how those decisions are shaping growing urban regions. It also offers a useful analytical touchstone of vertical aspects of policy integration and coordination, investigating challenges and conflicts that arise between levels of government, in particular between local and regional levels, and taking into account the horizontal dimension between municipalities (Kern, 2019; Peters, 2015).

With this article, I seek to advance the debate on policy integration and coordination in urban regions. First, I highlight the process dimension of policy integration, which Lenschow argues is not limited to implementation processes per se but also 'works in the interactions shaping the policy formulation and decision-making stages' (2002: 220). Second, I not only investigate policy-making processes but apply them to an urban context by focusing on the spatial implications of integrating climate measures. I thereby seek to advance a more multidisciplinary perspective. Third, I contribute to research on integrated urban planning, which has become a salient theme in recent years (Rode, 2018; Rydin, 2012) and has been endorsed again by the New Urban Agenda (United Nations, 2016). Scholars have argued that such initiatives offer opportunities for transformative urban climate action, and that research is needed both in the Global North and South if the investigation of different local conditions is to be properly facilitated (Romero-Lankao et al., 2018). For this reason, I relate my findings to the demands of a modern city, for instance, a compact city agenda, focusing on the need to integrate climate change concerns and investigate possible synergetic effects, as well as identify key challenges related to climate change mitigation and adaptation in growing metropolitan regions.

The remainder of this study unfolds as follows. The subsequent section reviews the conceptual underpinning of (climate) policy integration in relation to urban contexts. After this, the methods are described and the empirical interview results are presented. The discussion debates the find-

ings, and the conclusion considers the implications for urban studies and the local governance of cities.

Climate policy integration and cooperation in metropolitan regions

Policy integration is a term in good currency. Integrating climate concerns, a concept referred to as climate policy integration (CPI), is seen as a beneficial way of aligning such objectives across domains and achieving synergetic effects and coherence (May et al., 2006). Yet this strand of research is largely policy-oriented (Monstadt and Coutard, 2010). In urban studies, scholars also use the (policy) integration concept, though they often refer to it in terms of a 'nexus' approach or as 'urban integration' (Macrorie and Marvin, 2018; Monstadt and Coutard, 2010; Moss and Hüesker, 2017). In relation to regional governance in Europe, Albrechts et al. argue that urban planning theory and practice also have incentives, for instance, 'to articulate a more coherent spatial logical for land use regulations' (2003: 113).

Studies frequently assess levels of vertical integration in the context of multi-level systems of the European Union (EU) (Albrechts et al., 2003; De Francesco et al., 2018; Kern, 2019), focusing on directing an issue mainly from the supranational or national level to the local, but also the other way around, i.e. up from the municipal level. Studies of the latter sort, such as research on polycentric or transnational climate governance, reveal the innovativeness at the local level (Jordan et al., 2015; Ostrom, 2010). Scholars observe, however, that 'rescaling' does not automatically ensure successful application of an objective in the long run, because 'what is less clear is the extent to which these exercises are a local response to pressing problems experienced locally and articulated by local political processes' (Albrechts et al., 2003: 115). This is important because it shows that, even with issues such as climate change, which naturally also affect the local level, efforts of integration are usually very broad in their conception and do not take into account the 'realities on the ground' sufficiently.

In defining CPI, scholars stress, that both climate mitigation and adaptation objectives need to be integrated in order to reduce inconsistencies with other policy areas (Mickwitz et al., 2009: 19). However, research has shown that both measures have an important spatial dimension (Biesbroek et al., 2009). At the local level, these take the form of significant trade-offs. In their investigation of the integration of water treatment and energy production, Moss and Hüesker (2017) highlight that integration has four important im-

plications – namely material, spatial, temporal and political – and argue that these are often poorly understood. I will discuss the latter three in greater detail in due course.

Integrating climate objectives in urban regions effectively means re-using or providing more green and open spaces for climate measures. Thus far, knowledge on how such challenges are playing out on a smaller scale, such as on growing metropolitan regions, is limited. Population density and urbanization processes make it difficult to design green and open urban spaces that accommodate climate objectives while providing affordable housing and other services (Frommer, 2009; Rößler, 2015). Even though urbaniation processes are slower than in developing or emerging countries, Growe (2017) has shown that metropolitan regions are increasing in Germany, because there is a continuing trend to live and work in cities (United Nations, 2014).

The metropolitan region of Rhein-Neckar is situated in southwestern Germany, conglomerates three federal states – namely Baden-Wuerttemberg, Rhineland Palatinate and Hesse – and is valued for its excellent infrastructure. It includes several larger towns, among them Heidelberg and Mannheim, as well as smaller but economically strong cities, such as Walldorf and Weinheim. Together, these provide good employment opportunities and a high standard of living for the region's 2.4 million inhabitants (Growe, 2017). In terms of climate impacts, the area will especially be affected by intense rain and urban heat islands following continuous high temperatures. Further consequences of climate change in this region include flooded rivers, decreased ground-water levels after dry spells, and damage to buildings by hail or storms (Frommer, 2009; Stone et al., 2010). These problems can be tackled by adaptation; for instance, building lightweight houses that cool faster, imposing flood management areas, or creating biotope networks to promote plant and animal ecosystems (Umweltbundesamt, 2013). In contrast, climate mitigation in urban regions concentrates on providing renewable energy, such as wind turbines or solar panels. Another possibility is to support compact building developments with good local transport networks, thereby reducing greenhouse gas emissions (Endo et al., 2018; Stone et al., 2010)

For some time now, municipalities and their civil servants have been organizing themselves into various networks, exchanging experiences and preparing for the concomitant challenges of climate change (Bulkeley and Betsill, 2005; Bulkeley and Kern, 2006; Goh, 2019). The Rhein-Neckar metropolitan region, for instance, has an 'upper-tier' Rhein-Neckar association that actively fosters interaction between local and regional levels and even advises local authorities concerning climate change, thereby boosting cooperation (Wagner et al., 2019). Coordination is one of the main drivers for attaining

policy integration (Peters, 2015; Tosun and Lang, 2017; Trein et al., 2019). However, in relation to urban governance, Rode has stated that 'identifying the desired level of coordination while acknowledging critical trade-offs [is] extremely difficult' (2018: 4).

Against this background, two scenarios could unfold. One the one hand, one could expect there to be an incentive for municipalities to coordinate their climate action. Climate impacts will be similar across the metropolitan region, and the Rhein-Neckar association is there to foster cooperation. However, Bulkeley and Kern (2006) have argued that insufficient guidance and resources are given to local authorities and that these have low incentives to work in partnership with others. Studies have also shown that financial support and leadership could be improved at the local level (Austin et al., 2018; Rode, 2018). Moreover, Benz (2007) has shown how cities are in competition with each other. For these reasons, it would seem reasonable to expect a low level of coordination among local decision-makers.

Turning now to the temporal and political implications of integrating climate measures in urban contexts, the standard argument is that there is little incentive for politicians to govern long-term policy problems like climate change because political gains are distant and uncertain (Pahl et al., 2014). The reluctance of politicians mainly stems from the fact that their actions are driven by 'electoral survival' incentives (Victor, 2011: 66), meaning they prefer short-term action over cost-intensive measures that do not benefit the electoral cycle (Jacobs, 2011). This makes political commitment to climate change hard to secure. Yet, with 2018 being the fourth hottest consecutive year on record and multiple European member states calling temperature emergencies in 2019, local actors are realizing that political commitment to climate measures is needed now.

I understand political commitment in a broad way: It does not focus exclusively on elected politicians but also on bureaucrats in local administration departments. It also focuses on mayors – elected politicians, who, as the heads of municipalities, hold administrative roles. Barber (2013) has argued that local politicians (such as mayors) have the necessary expertise and knowledge of local needs and vulnerabilities to make relevant leadership decisions about climate change, but research has only started to answer how members of parliament view their role in combating climate change (Willis, 2017; Rickards et al., 2014). Hence it remains unclear whether politicians are willing to integrate climate concerns.

With the Paris Agreement in place, it can be fairly argued that the 2-degree goal necessitates action across areas and levels of government. However, scholars argue that attempts thus far have only brought about incremental change, which is why they call for transformative urban climate action

(Romero-Lankao et al., 2018). Since mitigation and adaptation have spatial implications (Biesbroek et al., 2009), they can be expected to produce trade-offs with other potential measures at the local level. Therefore, political commitment to stopping climate change and prioritizing climate objectives in urban areas will likely be low. Moreover, it will probably cause conflicts (some of them long-term) during the planning and decision-making process, especially in growing regions such as Rhein-Neckar.

Materials and methods

Gathering data from those directly involved is useful because experts can identify key issues (Gläser and Laudel, 2010). Semi-structured elite interviews (Aberbach and Rockman, 2002) with relevant local and regional stakeholders were deemed the most appropriate method for investigating whether and how climate concerns will be integrated in the Rhein-Neckar region. Politicians are elusive research subjects (Boswell et al., 2019). Indeed, only 14 local politicians out of the 53 contacted agreed to be interviewed for this study.

In total, 28 interviews were conducted,[1] all of them face-to-face, between June 2017 and June 2018 (for a detailed list of the interviewees' affiliations, see Table 4.1). The sample consists of current and former lord and first mayors, political party members of environmental committees and district councils, senior members of local planning and administration offices, and representatives from the regional metropolitan association. They offered insights into their commitment towards integrating climate aims in cities, into issues surrounding coordination and into the conflicts that can arise when addressing long-term issues such as climate change. The diversity of the interviewees helped to control for subjective influences, adding validity to the primary data set (Flick et al., 2004). The interviews lasted between 25 and 90 minutes. All except one of the interviewees gave permission for the recorded audio files to be transcribed (using the transcript's software f5).

The transcriptions were analyzed qualitatively using MAXQDA software, which structures and organizes large quantities of data and constructs coding schemes. The interviews were coded in an inductive manner using the

[1]The interview material was an outcome of the HEiKA Projekt 'Assessment and Perception of Green and Open Spaces in Urban Regions in the Context of Mitigation and Adaptation'. Out of 28 interviews, Nicole Schmidt conducted 12 interviews and 5 in cooperation with Madeleine Wager. Madeleine Wagner carried out the remaining 11 interviews. The analysis concentrates on the interviews which were conducted by Nicole Schmidt with local politicians and mayors (n=17).

Figure 4.1: Overview of interview locations in the Metropolitan region of Rhein-Neckar.

grounded theory approach (Glaser and Strauss, 1967). Two independent researchers analyzed the same interview material separately and compared the coding thereafter to ensure intercoder-reliability.

Results

The interviews provided in-depth information on the difficulties and conflicts that local decision-makers face when incorporating climate objectives in the metropolitan Rhein-Neckar region. In terms of *vertical and horizontal* integration processes, i.e. between municipalities, as well as between local and regional actors, *cooperation* is fragmented, and there is a lack of clear authority and guidance from upper-tier levels. Regarding *political commitment*, I observed three distinct aspects: 1. there is no distinct preference for either mitigation or adaptation measures; 2. the local level deals with competing issues that lie beyond climate concerns; and 3. time is (remarkably) not as important as research has previously posited.

Fragmented cooperation

In Germany, cooperation between regions and municipalities in planning matters is an established principle. The regional level is particularly important for planning in metropolitan regions (Wagner et al., 2019). Continuous cooperation and coordination between local and regional, (as well as national and supranational) decision-makers should therefore be present.

Overall, bureaucrats and local politicians said that cooperation between local and regional entities is relatively good. They attested that regional representatives have run many events about flood protection and other mitigation measures (INT 25; 27). The regional association holds important information about regional issues and is a place for network activities (INT 1–4; 7; 26). Interviewees also noted the importance of personal networks and whether mayors liked one another. They also said that individuals are themselves responsible for getting involved (INT 5–6; 21).

However, some interviewees did not understand the responsibility of the regional association (e.g., INT 7). One interviewee from the civil council in Mannheim said that the main purpose of the regional association was unclear:

> 'Ok, we have the Metropolregion Rhein-Neckar [association] and, there, we have the planning committee. They discuss bigger projects like wind turbines [...] but I have to say [...] if you would ask me, "What is their function?" I couldn't answer. I don't know' (INT 18).

From this, one can infer that regional cooperation exists for bigger projects but that its purpose is not fully understood. Moreover, interviewees stated that regional ideas are not included fairly in the general urban context. This may be because the region consists of three different states, as evidenced in the following quote:

> 'Looking at the metropolitan region, it really is hard, I will say this openly. Because we have such different systems: We have the Rhineland Palatinate, we have Hesse and we have Baden-Wurttemberg' (INT 27; but also INT 19; 25).

Having to cooperate with three different federal states means having to understand different administrative systems as well as different areas of responsibilities and competences. This problem was highlighted when bicycle fast lanes were planned, which many described as a tenacious process (INT 8; 9; 26; 27). These findings suggest that, although climate change goes beyond the municipal boards, there is very little regional involvement (INT 17).

Interviewees also noted that cities within the metropolitan region find cooperation partners in the south of Germany, for example in Konstanz or Munich. Both cities are forward-thinking with regard to climate change; Munich has, for instance, developed an integrated action plan for the city (Stadtverwaltung München, 2019). The climate mitigation manager, an employee of the environmental services directorate and the mayor of Worms explained that the Climate Alliance, a network of local authorities founded in 1990, helped to establish and develop climate mitigation and climate adaptation in the city. Yet he still saw the benefit of having a regional metropolitan association:

> 'We are part of it [the metropolitan region], but the main things are happening in Heidelberg or Mannheim. This is why we need to be permanently present, we need to actively engage, [. . .] and if you are really part of it, you can really benefit from it. [...] But as I said, for us the Climate Alliance was decisive' (INT 25).

This quote illustrates that the regional association benefits all municipalities but centers its main activities on the two biggest cites: Heidelberg and Mannheim. This statement was supported by the first mayor of Weinheim (INT 24). However, bureaucrats and local politicians from Heidelberg and Mannheim claimed there is actually little cooperation between the two cities (INT 1–3; 8–10; 18; 20). A Mannheim city councilor explained that neighboring cities are simply forgotten: 'Heidelberg is directly next to us [Mannheim],

but you don't think of Heidelberg, at least not in terms of exchange and interaction' (INT 18). An employee of the Heidelberg city administration also claimed there are few personal relationships between the municipalities (INT 9). Another Mannheim city councilor said that competition gets in the way of cooperation within the region: 'naturally, individual municipalities are in plain competition with one another' (INT 19).

In sum, these quotes show that the presence of the regional association did not boost cooperation between municipalities. Moreover, even though cities within the region are affected by climate change similarly, their municipalities display very fragmented cooperation patterns. They prefer to cooperate with cities outside the metropolitan region, confirming initial expectations that cooperation is low due to competition between cities.

Lack of clear authority, finances and guidance

Many interviewees deplored the lack of clear authority in the federal system, citing unclear, competing rules and regulations between states, as well as a lack of guidance from upper-tier governments. Interviewees believed that the national level does not provide enough resources (INT 5–6; 25-27). For instance, it was mentioned that the national level is only useful 'if you need financial assistance' and access to subsidies for climate-related programs (INT 1–2; INT 18; 20).

Municipalities already deal with the impacts of climate change. For example, intense rainfall has overwhelmed drainage systems, and homes in Worms have been flooded (INT 25). While cities have specific local knowledge of their residences and are willing to provide public services, many still claimed to feel abandoned by upper-tier governments or marginalized by conflicting guidelines (INT 1–4; 26, 27).

This becomes evident in the case of housing, where regulations impose barrier-free building. However, omitting entrance steps increases water flow into homes, making flood prevention more challenging. Although this is easily remedied, managing the vast array of responsibilities is challenging for many municipalities. A mayor summarized this as follows:

> 'We have too little guidance and a lot of responsibility; this responsibility is given downwards, and we are, as municipalities, at a point where we feel we should do everything: digitalization, climate change, refugees, demographic changes. [...] But there is no strategy. [...] And we are a small municipality relatively well equipped financially. [...] In the long run, it will not work' (INT 26).

No interviewees questioned the principle of local self-government, but they did say that cooperation between levels and between cities was fragmented. While the regional level offered some guidance, financial support is insufficient and the lack of clear guidance from the national level. Having concrete guidelines on how to integrate adaptation and/or mitigation within urban spaces would therefore be useful for cities.

No distinct preference for mitigation or adaptation

Local politicians, administrations and representatives from regional associations reported that climate change is a highly important issue for municipalities and the region: 'It has a high, high priority' one city councilor confirmed (INT 20). Impacts of climate change are already being felt in various ways: heat waves, insufficient cooling at night, intense rain and flooding, and changing tree populations (INT 1–28). Being able to feel the effects of climate change makes inhabitants of the region feel vulnerable. One mayor summarized the situation as follows:

> 'The topic of climate change plays a very, very big role. This may be because we are directly located at the Upper Rhine Valley and [...] have been able to observe for the last 30 years that we have increasingly hot and long summers and longer dry periods' (INT 24).

In terms of how to respond to the increased vulnerability due to climate change, the interviewees' understanding of climate responses proved varied and unclear. They found it difficult to state a clear preference for mitigation or adaptation. While some stated, 'We do both' (e.g., INT 1; 25-26), others differentiated (e.g., INT 18; 22). In addition, some could not differentiate between both strategies (INT 17: 'I can't think of a distinction right now') and one interviewee noted, 'We do this [adaptation] in Africa, but not in Germany. Here we mainly deal with mitigation' (INT 21). This assessment was echoed by a city councilor, who stated that mitigation is 'more common, and something that we use in the environment and building committee. [...] Adaptation is a term which is new to me' (INT 20).

These differences existed between different cities and parties and, at times, within the same departments (e.g., INT 4) and political parties (e.g., INT 18; 19). While some noted that, depending on the suitability of the urban area, renewables (mitigation) were favored, they were also quick to note that renewables are difficult to incorporate in this region. This is the case for solar panels and wind turbines, two topics fiercely debated by city councils (INT 18; 24).

> 'In confined areas like Heidelberg, this [renewables] is really not a topic. We have a solar field at an abandoned land fill, south of Heidelberg. This space cannot be used for agriculture. But this is the only one' (INT 20).

This quote shows that political commitment is limited with regards to using green and open spaces for mitigation, i.e. renewable energy. The preferred strategy is to use the few available areas as they are, without integrating any other purposes.

Competing land-use concerns

The interviews revealed that competing land-use concerns not related to climate change were far more important to municipalities. Decision makers in densely populated areas, such as the metropolitan region of Rhein-Neckar, must deal with a multitude of concerns. Climate change competes with issues such as housing shortages, rent increases, and the scarcity of commercial real estate. Politicians and the planning administration must therefore decide whether to make climate concerns a priority and, if so, where to rank them in their list of priorities. Central lines of conflict do not lie between mitigation and adaptation but rather between population pressure and economic interests.

The provision of housing was one of the core issues that surfaced throughout the interviews. Many portrayed the need for living space as far greater than the incorporation of climate objectives in urban areas. One mayor noted:

> 'The core conflict cannot be solved: They [companies] want to build – that's it. And for them, what is in these [climate] concepts, is often an obstacle. A tremendous obstacle' (INT 25).

Compromises include fitting rooftops with solar panels or other greening measures. Indeed, many passive houses in cities in the metropolitan region have incorporated climate goals by being more energy-friendly. Interviewees also stated that passive houses as the default option had downsides, 'because it usually also means more costs and investments' – money that mayors are not always willing to spend (INT 24, 25). In addition, bureaucrats are cautious of tender offers that specify implementation of climate measures. A city councilor recalls:

> 'For instance, if I write a tender offer and want to say that I only want investors who put a solar panel on rooftops – there is just too

> little cooperation and willingness from the local administration. They always say, "No, we cannot dictate that"' (INT 19).

The clear preference for housing over climate measures is also reflected in the refugee crisis, which increased the need for readily built apartments. Asked whether climate concerns were considered during the planning process, a first mayor answered: 'To be honest, we did not think about climate mitigation' (INT 24).
The issue of mobility is also contested. Many accounted for the significance of mobility, and one even stated, 'it's the mega topic, mobility, really' (INT 20). Good infrastructure is an absolute priority for many cities. Increasing traffic, roadworks or ticket costs are more pressing than climate change: 'Transportation is the main issue; it's the most important issue of municipal politics in Heidelberg' (INT 17).

Another competing topic that surfaced during interviews was agriculture. Because of the region's rich soil (INT 25), available space is primarily used for small-scale farming rather than for renewable energy (INT 26). This led one mayor to conclude:

> 'Supplying the general public with "bio" and regionally cultivated food, which we all want, or renewable power generation – it's impossible to solve. For me, this conflict is impossible to solve' (INT 27).

Local politicians pointed towards other issues that are more important to their voters. For instance, members of the Social Democratic Party (SPD) and the Left highlighted good pensions or minimum wage for citizens. However, interviewees from every political spectrum agreed that co-benefits are important. For example, although building a solar park would reduce CO_2 production, the spatial implications of such measures are too difficult to accommodate in growing urban regions (INT 22; 24-28). Other (easier) ways of achieving synergies would be reducing pesticide usage or making the construction of buildings less CO_2-intensive (INT 21). Another example would be to increase biotopes, which would be good for the climate and could be enjoyed by citizens: 'That is well-being. Whether the toad slows down climate change is impossible to grasp', said one mayor, adding that local recreation has additional health benefits (INT 27).

In summary, climate change is generally 'high' on the agenda, but local decision-makers consider competing issues, such as affordable housing or mobility, higher priorities; many even prefer to do nothing and simply sustain the very few green open spaces that are left (INT 17; 20; 28). Alternatively,

local decision makers favor 'co-benefits' that consider climate concerns, such as greening measures, compact city development, bicycle stands, or boosting local public transport systems in cities.

Long-term problem and election cycles

Research has shown that politicians are primarily concerned with re-election (Victor, 2011), but the interviews in the present study revealed that politicians do not necessarily consider the long-term aspects of climate change. Mayors and local administration were interested in finding ways to integrate climate concerns. They were keen to discuss measures that they have implemented, because 'it is simply necessary to do them [climate measures]. Plain and simple' (INT 25).

In contrast, some interviewees argued that long-term issues hamper the decisions of local actors. For example, politicians do not prioritize climate matters as they should. One CDU party member stated:

> 'Unfortunately, I agree. And we cannot simply destroy the planet without thinking where we will be able to live in 10, 20 years. [...] I really don't understand why we leave this issue on the political sidelines' (INT 22).

City councilors said that municipal politics usually have a five- to eight-year cycle, within which certain short- to mid-term interests and dependencies are prioritized (INT 19). A city councilor from the Left party agreed, stating that the 'decisive arguments [...] are economic and financial ones' (INT 17). Overall, willingness to build long-term policy approaches and seriously prioritize climate concerns is low.

However, some actors did not think that the problem has anything to do with time but wondered whether climate change needs to be more appealing. In line with this, the mayor of Leimen said that 'long-term problems are always more challenging to handle in a democracy; the key issue is persuasion' (INT 27). Another mayor agreed, noting:

> 'I don't think it has anything to do with time. I don't think this is the main issue. I've rather come to think – maybe it just needs to be chic' (INT 24).

Interviewees, politicians and bureaucrats stressed that leadership from mayors is more decisive for climate action. For instance, the lord mayor initiated climate mitigation and adaptation in the city of Worms. The engagement of the lord mayor, as the highest appointee, has strong influence

on the municipality's administration and leads to the approval of climate measures in the city's building and finance committees (INT 25). In a similar vein, the late lord mayor of Speyer stressed that incorporating climate objectives was one of the key issues he wanted to tackle when he took office eight years ago. His predecessor had become involved in environmental and climate causes, which were also very important to him:

> 'The question of political commitment for climate change mitigation, for environmental questions, and in a bigger picture also in terms of city development, I find them very exciting, also because they were key issues during my legislative period. I have developed an integrated approach for the city of Speyer, for the administration [...] Divisions have been restructured in an interdisciplinary manner. [...] Because I did not get re-elected again, I realized that the citizens' expectations were not met. [...] However, if I had known seven and a half years ago that I would not be re-elected, [...] I would have still done it' (INT 28).

This disagrees with the common mantra that politicians only care about re-election and shows that some elected politicians are willing to respond to climate change with an integrated approach. Long-term political commitment exists – against initial expectations – but it is fragmented by other issues that are often prioritized over climate change.

Discussion

The analysis revealed that the regional metropolitan association offers many possibilities for discussing climate issues within the region. However, horizontal and vertical cooperation were fragmented. Cities tend to think for themselves, and cooperation depends on existing relationships between local decision makers. Rather than cooperating with cities in the region, municipalities compete with one another and look for external (municipal) partners and experts. This aligns with research stressing competition amongst cities (Benz, 2007). Since interviewees also highlighted the lack of resources, another likely explanation might be that municipalities are in competition for funding, for instance from the EU, and therefore prefer to work together with other, (foreign) cities outside the metropolitan region.

The fragmented cooperation patterns raise further questions regarding the usefulness of integrating climate objectives in regional contexts. Strengthening cooperation through the association may yield comprehensive climate

improvements in the Rhein-Neckar region, as would clearly prioritizing specific climate aims to ensure coherence (May et al., 2006). Yet it seems that more tailored solutions are required. Hence Portney (2013) has advocated for an integrative 'portfolio' of policies and measures to improve sustainability. Such an approach recognizes the diverse circumstances of cities and urban areas. Municipalities could assume different responsibilities, which are more in line with their spatial, financial and administrative capacities.

The absence of a coherent climate strategy in the region is further explained by the remarkable differences in the politicians' understanding of adaptation and mitigation. Both approaches were not properly understood and were predominately discussed together; except for a few exceptions, this also held true for actors in the political and administrative sphere. These issues of conflation and incomplete comprehension not only make it difficult to assess which strategy has been prioritized; they also do not align with the academic literature, which largely discusses the two approaches separately (but see e.g. Biesbroek et al. (2009) and Moser (2012), who call for a more integrated understanding). Moreover, Biesbroek (2009) has argued that politicians and scholars use this dichotomy between adaptation and mitigation, whereas my results point towards a largely research-driven distinction.

Furthermore, the central land-use conflicts were not between mitigation and adaptation but rather between climate change and other competing interests, such as housing or agriculture. While local politicians and bureaucrats, as well as regional representatives, saw climate change as a high priority, they were less willing to incorporate climate objectives over economic objectives (except in Speyer). Mobility and transportation were other very important municipal topics, but those were not discussed in terms of climate objectives – a finding that concurs with previous research, which showed that integrations efforts are rarely made in the transportation domain (Schmidt and Fleig, 2018). In addition, interviewees repeatedly stressed that the alignment of climate concerns is especially challenging in growing urban regions due to the lack of available space to accommodate climate measures.

Local decision makers often thought of climate change precautions as 'add-ons', i.e. measures resulting, for example, from the designing of new building sites or the incorporation of greening space, but which play a subsidiary role in the actual planning processes. This is problematic in the sense that 'climate objective[s] must be intentional, otherwise it signifies policies with synergies for climate policy aims' (Mickwitz et al., 2009: 22). Indeed, political commitment to minimize such contradictions was low. However, politicians are starting to make long-term investments in climate change prevention measures – action which goes against the mantra of politicians only

caring about re-election (Jacobs, 2011; Victor, 2011) – though the motivation of mayors is geared more towards mollifying the impacts of climate change, which are already being felt, rather than making the integration of climate aims a priority. Hence political commitment could be characterized as fragmented, likely showing more 'political rationalities [...where] the focus is no longer on the environmentally desirable, but on the politically feasible' (Geden, 2016: 792). While these results broadly confirm the potential cities exhibit in relation to climate change (Bulkeley and Kern, 2006), adaptation and mitigation have spatial, temporal and political implications (Biesbroek et al., 2009; Moss and Hüesker, 2017), which clearly challenge their incorporation at the local level.

The results of this study should be interpreted with caution as the interviews only depict the views of those willing to give and share information. It was challenging to secure interviews with members from all political parties. Most interviewees were members of the Green, Social Democratic and Christian Democratic parties, who consider climate and environmental topics important. However, integrating climate concerns is challenging, making it safe to assume that the accounts in these interviews reflect the genuine obstacles decision makers are faced with in the growing metropolitan region of Rhein-Neckar.

Conclusion

The study has set out to uncover how local decision makers, i.e. politicians and bureaucrats of the metropolitan Rhein-Neckar region in Germany, integrate climate concerns. Issues related to sustainability have shaped urban regions in a variety of ways, but the incorporation of climate objectives is particularly challenging for growing metropolitan regions due to limited available space.

A crucial finding was that competing issues actually prevented climate concerns from becoming a top priority, making the development of coherent solutions to climate change more difficult. Rather than favoring the integration of mitigation or adaptation measures in green or open spaces, different levels of understanding and an insufficient differentiation between climate adaptation and mitigation made it difficult for some interviewees to state a preference. This prevents systematic coordination of climate change measures in cities and the region, a notion evidenced by the fragmented cooperation between the local and regional levels and between municipalities. While the habit of leaving green or open spaces untouched could be viewed as a mitigation measure, indicating a preference for mitigation over adaptation,

it is more plausible that municipalities simply want to safeguard those spaces. The integration of climate change measures represents yet another concern that local decision makers must consider, thereby adding to the already growing number of responsibilities in metropolitan regions (León-Moreta, 2018).

For urban studies, this study shed light on how local politicians and bureaucrats understand and deal with the implications of climate change in urban contexts. Interestingly, the electoral cycle did not necessarily influence the long-term investment in climate change, though the opinions of local leaders, i.e. mayors, on the salience of the topic did. Nonetheless, climate change is yet to take a more important stance in urban contexts. Thus far, central lines of conflict do not lie between mitigation and adaptation but are overridden by population pressure and economic interests. The increasing frequency of record-breaking heat waves might compel decision-makers to adjust their priorities, but urban regions still have to find a better approach to governing climate challenges in the medium- to long-run.

Concepts like the New Urban Agenda – or policy integration – provide broad frameworks. However, they also reveal the shortcomings of such holistic approaches, where striving for increased integration neglects the different circumstances and capacities cities naturally display. They also do not provide detailed plans on how to realize such encompassing goals. Cities must themselves rethink how best to accommodate arising needs and deal with resulting trade-offs. Thus far, economic interests have often dominated, protecting the urban economies from harmful impacts of climate change while largely ignoring justice aspects (Long and Rice, 2018). Despite some visible political commitment, the local level lacks clear guidance from upper-tier governments on how to accommodate and achieve the goals of the Paris Agreement (Fuhr et al., 2018; Kern, 2019; Romero-Lankao et al., 2018).

Lastly, this paper also demonstrated the importance of studying policy integration from a multidisciplinary perspective. When dealing with a cross-cutting issue, such as climate change, it is crucial not only to examine integration processes from a policy-driven perspective, but also to consider its political, temporal, and especially spatial implications. Combining political science and urban planning viewpoints broadens our understanding of the challenges associated with integrating climate concerns in urban contexts. Even though circumstances in Germany differ from those in developing countries, this study may still offer insights into how climate approaches are (not) integrated in urban regions, especially in those that have only limited space for accommodating climate measures. It may also deepen our understanding regarding the limits of integration.

Acknowledgements

This study is an outcome of the research project 'Assessment and Perception of Green and Open Spaces in Urban Regions in the Context of Climate Mitigation and Adaptation', a joint project carried out at Heidelberg University and Karlsruhe Institute of Technology (KIT), funded by the HEiKA-Heidelberg Karlsruhe Research Partnership; Germany. I am grateful to all interviewees for their kind collaboration and generosity with which they shared their views and experiences.

Bibliography

Aberbach, J. D. and Rockman, B. A. (2002). Conducting and coding elite interviews. *Ps-Political Science & Politics*, 35(4):673–676.

Albrechts, L., Healey, P., and Kunzmann, K. R. (2003). Strategic spatial planning and regional governance in europe. *Journal of the American Planning Association*, 69(2):113–129.

Austin, S. E., Ford, J. D., Berrang-Ford, L., Biesbroek, R., Tosun, J., and Ross, N. A. (2018). Intergovernmental relations for public health adaptation to climate change in the federalist states of canada and germany. *Global Environmental Change-Human and Policy Dimensions*, 52:226–237.

Barber, B. R. (2013). *If mayors ruled the world: dysfunctional nations, rising cities*. Yale University Press.

Benz, A. (2007). Inter-regional competition in co-operative federalism: New modes of multi-level governance in germany. *Regional & Federal Studies*, 17(4):421–436.

Biesbroek, G. R., Swart, R. J., and van der Knaap, W. G. M. (2009). The mitigation-adaptation dichotomy and the role of spatial planning. *Habitat International*, 33(3):230–237.

Boswell, J., Corbett, J., Dommett, K., Jennings, W., Flinders, M., Rhodes, R. A. W., and Wood, M. (2019). State of the field: What can political ethnography tell us about anti-politics and democratic disaffection? *European Journal of Political Research*, 58(1):56–71.

Bulkeley, H. and Betsill, M. M. (2005). Rethinking sustainable cities: Multilevel governance and the 'urban' politics of climate change. *Environmental Politics*, 14(1):42–63.

Bulkeley, H. and Kern, K. (2006). Local government and the governing of climate change in germany and the uk. *Urban Studies*, 43(12):2237–2259.

Davoudi, S., Crawford, J., and Mehmood, A. (2009). *Planning for Climate Change: Strategies for Mitigation and Adaptation for Spatial Planners*. Earthscan, London.

de Oliveira, J. A. P. (2009). The implementation of climate change related policies at the subnational level: An analysis of three countries. *Habitat International*, 33(3):253–259.

Endo, I., Magcale-Macandog, D. B., Kojima, S., Johnson, B. A., Bragais, M. A., Macandog, P. B. M., and Scheyvens, H. (2017). Participatory land-use approach for integrating climate change adaptation and mitigation into basin-scale local planning. *Sustainable Cities and Society*, 35:47–56.

Flick, U., Kardorff, E., and Steinke, I. (2004). *A Companion to Qualitative Research*. Sage Publications, London.

Frommer, B. (2009). Handlungs- und steuerungsfähigkeit von städten und regionen im klimawandel. *Raumforschung und Raumordnung*, 67(2):128–141.

Fuhr, H., Hickmann, T., and Kern, K. (2018). The role of cities in multi-level climate governance: local climate policies and the 1.5 degrees c target. *Current Opinion in Environmental Sustainability*, 30:1–6.

Geden, O. (2016). The paris agreement and the inherent inconsistency of climate policymaking. *Wiley Interdisciplinary Reviews-Climate Change*, 7(6):790–797.

Gerhard, U. and Marquardt, E. (2015). *The Greener, the Happier? Urban Sustainability in the Knowledge City: Policies, Programs and Practices in the German Context*, pages 65–86. Common Grounds Publishing, Champaign.

Glaser, B. G. and Strauss, A. L. (1967). *Discovery of Grounded Theory: Strategies for Qualitative Research*. de Gruyter, New York.

Gläser, J. and Laudel, G. (2010). *Experteninterviews und Qualitative Inhaltsanalyse*. Springer, Wiesbaden.

Goh, K. (2019). Flows in formation: The global-urban networks of climate change adaptation. *Urban Studies*, 0042098018807306.

Growe, A. (2017). *Metropolregionen.* Akademie für Raumforschung und Landesplanung, Hannover.

Habitat (2016). Habitat iii: New urban agenda.

Jacobs, A. (2011). *Governing for the Long Term: Democracy and the Politics of Investment.* Cambridge University Press, Cambridge.

Jordan, A. J., Huitema, D., Hilden, M., van Asselt, H., Rayner, T. J., Schoenefeld, J. J., Tosun, J., Forster, J., and Boasson, E. L. (2015). Emergence of polycentric climate governance and its future prospects. *Nature Climate Change*, 5(11):977–982.

Kern, K. (2019). Cities as leaders in eu multilevel climate governance: embedded upscaling of local experiments in europe. *Environmental Politics*, 28(1):125–145.

León-Moreta, A. (2018). Functional responsibilities of municipal government: Metropolitan disparities and instruments of intergovernmental management. *Urban Studies.*

Lenschow, A. (2002). *Conclusion: What Are the Bottlenecks and Where Are the Opportunities for Greening theEuropean Union?*, pages 193–215. Earthscan, London.

Long, J. and Rice, J. L. (2019). From sustainable urbanism to climate urbanism. *Urban Studies*, 56(5):992–1008.

Macrorie, R. and Marvin, S. (2019). Bifurcated urban integration: The selective dis-and re-assembly of infrastructures. *Urban Studies.*

May, P. J., Sapotichne, J., and Workman, S. (2006). Policy coherence and policy domains. *Policy Studies Journal*, 34(3):381–403.

Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., Jensen, A., Kivimaa, P., Kuhlicke, C., Kuindersma, W., Máñez, M., Melanen, M., Monni, S., Pedersen, A. B., Reinert, H., and van Bommel, S. (2009). *Climate Policy Integration, Coherence and Governance. PEER Report No 2.* Partnership for European Environmental Research, Helsinki.

München, S. (2019). Das integrierte handlungsprogramm klimaschutz in münchen.

Monstadt, J. and Coutard, O. (2019). Cities in an era of interfacing infrastructures: Politics and spatialities of the urban nexus. *Urban Studies.*

Moser, S. C. (2012). Adaptation, mitigation, and their disharmonious discontents: an essay. *Climatic Change*, 111(2):165–175.

Moss, T. and Hüesker, F. (2017). Politicised nexus thinking in practice: Integrating urban wastewater utilities into regional energy markets. *Urban Studies*.

Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change-Human and Policy Dimensions*, 20(4):550–557.

Pahl, S., Sheppard, S., Boomsma, C., and Groves, C. (2014). Perceptions of time in relation to climate change. *Wiley Interdisciplinary Reviews-Climate Change*, 5(3):375–388.

Peters, G. (2015). *Pursuing Horizontal Management: The Politics of Public Sector Coordination*. University Press of Kansas, Kansas.

Portney, K. (2013). *Taking sustainable cities seriously: Economic development, the environment, and quality of life in American cities*. MIT Press, Cambridge.

Rickards, L., Wiseman, J., and Kashima, Y. (2014). Barriers to effective climate change mitigation: the case of senior government and business decision makers. *Wiley Interdisciplinary Reviews-Climate Change*, 5(6):753–773.

Rößler, S. (2015). Klimawandelgerechte stadtentwicklung durch grüne infrastruktur. *Raumforschung und Raumordnung*, 73(2):123–132.

Rode, P. (2018). *Governing compact cities: how to connect planning, design and transport*. Edward Elgar Publishing, Cheltenham.

Romero-Lankao, P., Bulkeley, H., Pelling, M., Burch, S., Gordon, D. J., Gupta, J., Johnson, C., Kurian, P., Lecavalier, E., Simon, D., Tozer, L., Ziervogel, G., and Munshi, D. (2018). Urban transformative potential in a changing climate. *Nature Climate Change*, 8(9):754–756.

Rydin, Y. (2011). *The purpose of planning: Creating sustainable towns and cities*. Policy Press, Bristol.

Schmidt, N. M. and Fleig, A. (2018). Global patterns of national climate policies: Analyzing 171 country portfolios on climate policy integration. *Environmental Science & Policy*, 84:177–185.

Stone, B., Hess, J., and Frumkin, H. (2010). Urban form and extreme heat events: Are sprawling cities more vulnerable to climate change than compact cities? *Environmental health perspectives*, 118(10):1425–1428.

Tosun, J., De Francesco, F., and Peters, B. G. (2018). From environmental policy concepts to practicable tools: Knowledge creation and delegation in multilevel systems. *Public Administration*, 97(2):399–412.

Tosun, J. and Lang, A. (2017). Policy integration: mapping the different concepts. *Policy Studies*, 38(6):553–570.

Trein, P., Meyer, I., and Maggetti, M. (2019). The integration and coordination of public policies: A systematic comparative review. *Journal of Comparative Policy Analysis: Research and Practice*, 21(4):332–349.

Umweltbundesamt (2013). Handlungsfeld biologische vielfalt. https://www.umweltbundesamt.de/themen/klima-energie/folgen-des-klimawandels/klimafolgen-deutschland/klimafolgen-handlungsfeld-biologische-vielfalt#textpart-1.

United Nations (2014). World urbanization prospects: The 2014 revision, highlights (st/esa/ser.a/352). Report, Department of Economic and Social Affairs, Population Division.

United Nations (2015). Sustainable development goal 11.

Victor, D. (2011). *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*. Cambridge University Press, Cambridge.

Wagner, M., Mager, C., Schmidt, N., Kiese, N., and Growe, A. (2019). Conflicts about urban green spaces in metropolitan areas under conditions of climate change: A multidisciplinary analysis of stakeholders' perceptions of planning processes. *Urban Science*, 3(1):15.

Willis, R. (2017). How members of parliament understand and respond to climate change. *Sociological Review*, 66(3):475–491.

Appendix

Number	Bureaucrats	Profession/Function
INT 1	City Council Mannheim	Employee of the climate headquarter
INT 2	City Council Mannheim	Project group conversion – city and regional planner
INT 3	City Council Mannheim	Department manager of zoning
INT 4	City Council Mannheim	Project group conversion – city planner
INT 5	City Council Weinheim	Department manager of city development, zoning and spatial development
INT 6	City Council Weinheim	Employee of the department for environment and green spaces
INT 7	City Council Weinheim	Department manager of zoning and climate protection
INT 8	City Council Heidelberg	Department manager and employee of technical environmental protection and water management
INT 9	City Council Heidelberg	City planner town and country planner
INT 10	City Council Heidelberg	Employee of the department of city development and statistical analysis, coordination office civil participation
INT 11	City Council Heidelberg	Department manager and employee of economic development
INT 12	City Council Heidelberg	Employee of the department of city development and statistical analysis, geographer

Number	Regional Representatives	Profession/Function
INT 13	Regional Association Rhein-Neckar	Regional planner
INT 14	Regional Association Rhein-Neckar	Head of climate change and regional development, head of regional development and spatial monitoring
INT 15	Administrative district Neckar-Odenwald	Climate protection manager
INT 16	Administrative district Rhein-Neckar	Climate protection manager
Number	**City and Party Affiliation**	**Profession/Function**
INT 17	Heidelberg, The Left	City Councillor, Environment and Building Committee
INT 18	Mannheim, Alliance 90/The Green Party	City Councillor, Environment and Technology Committee
INT 19	Mannheim, The Left	City Councillor, Environment and Technology Committee
INT 20	Heidelberg, Social Democratic Party (SPD)	City Councillor, Planning and Environment Committee
INT 21	Heidelberg, Alliance 90/The Green Party	Member of the Bundestag
INT 22	Heidelberg, Christian Democratic Union (CDU)	District Vice-Chairman
INT 23	Heidelberg, Alliance 90/The Green Party	City Councillor, Municipal Council Heidelberg
INT 24	Weinheim, The Green Party/Alternative List Weinheim	First Mayor

INT 25*	Worms, Christian Democratic Union (CDU)	First Mayor (CDU); Climate Mitigation Manager; Employee of the Environmental Services Directorate
INT 26	Walldorf, Christian Democratic Union (CDU)	Lord Mayor
INT 27	Leimen, Free Democratic Party (FDP)	Lord Mayor
INT 28	Speyer, Christian Democratic Union (CDU)	Lord Mayor

Table 4.1: Overview of interviews

* The interview was conducted with several interviewees; the party affiliation only concerns the First Mayor.