Knowledge Systems and Change in Climate Governance

Comparing India and South Africa 2007-2010

DISSERTATION

zur Erlangung des Doktorgrades der Philosophie an der Fakultät für Wirtschafts- und Sozialwissenschaften, Fachbereich Sozialwissenschaften
der Universität Hamburg

vorgelegt von

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aus Hamburg

Januar 2012

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Ort und Datum der Disputation:

Hamburg, 28. Januar 2013

Zusammenfassung:

Diese Dissertation legt eine umfassende Analyse des Wandels in der nationalen Klima Governance von Indien und Südafrika im Zeitraum 2007 bis 2010 vor. Sie identifiziert die relevanten Akteure, ihre Motivationen und ihre Verbindungen untereinander. Die vergleichende Perspektive auf die nationale und subnationale Ebene in beiden Ländern zeigt auf eine neue Art und Weise, wie Wissenschaft und Politik zusammenhängen und dass nicht nur von Wissenschaftlern produziertes Wissen für den Umgang mit dem Klimawandel relevant ist. Verschiedene Typen von Wissen, die in Praxisgemeinschaften produziert und ausgetauscht werden, sind für den Fortschritt in der Klima Governance wichtig.

Auf der Basis pragmatisch-konstruktivistischen Denkens in der Politikwissenschaft entwickelt diese Dissertation das Konzept des Klimawissenssystems und testet es durch eine Kombination aus quantitativen und qualitativen Methoden. In Indien konnten auf der nationalen Ebene Teile eines solchen Wissenssystems identifiziert werden, aber nicht auf der subnationalen Ebene. Insgesamt gestalten einfachere, privatwirtschaftlich-dominierte Netzwerke die Klima Governance in Indien. In Südafrika konnte ein einflussreiches Wissenssystem nachgewiesen werden, das aus mehreren kleinen, heterogen zusammengesetzten Praxisgemeinschaften besteht. Diese Praxisgemeinschaften treiben kollektives Lernen und die Bildung von Vertrauen und einer gemeinsamen Identität voran. In Südafrika ist der Einfluss der Wissenschaft stärker. In beiden Ländern hat der Wandel noch kein transformierendes Stadium erreicht, welches tiefere strukturelle Veränderungen und das kollektive Lernen neuer Normen und Werten beinhalten würde. Es bestehen jedoch Unterschiede zwischen Indien und Südafrika in spezielleren Teilen der jeweiligen Klima Governance.

Executive Summary:

This dissertation provides a comprehensive analysis of the change taking place in the domestic climate governance of India and South Africa between 2007 and 2010. It identifies the relevant actors behind it, their motivation and the connections between them. The comparative perspective on the national and sub-national levels in both countries shows in a novel way how science and policy connect and that knowledge relevant for dealing with climate change is not produced by scientists only. Different types of knowledge produced and exchange in mixed communities of practice matter for progress in climate governance.

Rooted in pragmatic-constructivist thinking within political science, this dissertation introduces the concept of climate knowledge systems and tests it through a combination of quantitative and qualitative methods. In India, parts of a knowledge system could be identified at the national level, but not at the sub-national level. Generally, simpler business-driven networks shape climate governance in India. In South Africa, an influential knowledge system composed of small, heterogeneous communities of practice exists. These communities promote collective learning, trust and identity-building. In South Africa, the impact of scientists on climate governance is stronger. In either country, change processes have not reached a transformative stage yet that would include structural shifts and the collective learning of new norms and values. Differences between India and South Africa exist in more specific parts of their climate governance.

Acknowledgements

It is a pleasure to thank those who helped to make this dissertation possible. I am particularly grateful for the continuous support of my supervisors, Cord Jakobeit and Miranda Schreurs, who guided me through the process in the past three years.

My thanks also go the Hamburg International Graduate School for the Study of Regional Powers and the University of Hamburg, the GIGA German Institute of Global and Area Studies and the German Academic Exchange Service for their financial, administrative and academic support. The pleasant work environment at the GIGA has been an important conducive factor for this dissertation to come to what it is now and the moral support of the 6th floor PhD students' group has been tremendous. I am very grateful for that.

I am obliged to many of my colleagues at GIGA who helped me with their ideas and criticisms. Among them, I would like to particularly thank Dirk Nabers, Wolfgang Hein, Joachim Betz, Alexander Stroh, Dennis Eucker, Sandra Destradi, Miriam Prys, Ina Peters and Natalie Hess.

I also owe many thanks to all my interview partners in India and South Africa who made this work happen in the end. The hospitality of Judy Smith-Höhn and her family made my research stay in South Africa all the more enjoyable.

This dissertation would not have been possible without the mentoring of the former president of the GIGA, Robert Kappel, who kept me on track whenever needed.

Finally, I am deeply grateful for the understanding, patience and great support of my parents, my sister and my friends, particularly Julia Vorhölter, Malte Gephart, Juliane Reich and Benjamin Klooß.

Contents

List of Tables

List of Figures

List of Abbreviations

ANC	African National Congress
AR4	Fourth Assessment Report of the IPCC on Climate Change
BASIC	Brazil, South Africa, India, China
BEE	Bureau of Energy Efficiency
BRICS	Brazil, Russia, India, China, South Africa
BUSA	Business Unity South Africa
CAP	Climate Action Partnership South Africa
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CII	Confederation of Indian Industries
CSAG	Climate Systems Analysis Group, University of Cape Town
CSE	Centre for Science and Environment, Delhi
CSIR	Council for Scientific and Industrial Research, South Africa
DEA	Department of Environmental Affairs, Government of South Africa
DA	Democratic Alliance
DoE	Department of Energy, Government of South Africa
DST	Department of Science and Technology, South Africa
FICCI	Federation of Indian Chambers of Commerce and Industry
GCCC	Government Committee on Climate Change, South Africa
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HDI	Human Development Index
IIT	Indian Institute of Technology
IITM	Indian Institute of Tropical Meteorology
INC	Indian National Congress
INCCA	Indian Network for Climate Change Assessment
INR	Indian Rupees
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IR	International Relations
IRP	Integrated Resources Plan
LULUCF	Land-Use, Land-Use Change and Forestry
LTMS	Long-Term Mitigation Scenario
MoEF	Ministry of Environment and Forests, Government of India
MNRE	Ministry of New and Renewable Energy
NAPCC	National Action Plan on Climate Change (India)
NBI	National Business Initiative South Africa
NCCC	National Committee on Climate Change (South Africa)
NERSA	National Energy Regulator of South Africa
NGO	Non-Governmental Organization
PPP	Purchasing Power Parity
REDD	Reducing Emissions from Deforestation and Forest Degradation
REFIT	Renewable Energy Feed-In Tariff
RPO	Renewable Purchase Obligations
SANBI	South African National Biodiversity Institute
SANERI	South African Energy Research Institute
SNA	Social Network Analysis
TERI	The Energy and Resources Institute
UCT	University of Cape Town
TISS	Tata Institute of Social Sciences Bombay
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wide Fund for Nature

1. Introduction

Climate change is a showcase for the often-stated relevance of knowledge and science for the governance of complex environmental problems. No other environmental challenge has received so much global attention, stirred such fierce controversies and put science as much into the spotlight as climate change has done in recent years. The shift towards low-carbon development in large developing countries requires not only different kinds of knowledge and innovative ideas and practices, but also processes of collective learning. This forms the framework of this study. It targets the influence of different kinds of knowledge and learning on change processes in climate governance by introducing the dynamic, actor-centred concept of "climate knowledge systems". It is a concept particularly suitable for the analysis of large developing countries or emerging economies. These countries are increasingly under pressure to reduce their rising greenhouse gas (GHG) emissions and to develop measures to adapt to the impacts of climate change, which could aggravate the situation of the poor.

Following the publication of the so-called "Stern report" (Stern 2006) on the economics of climate change in 2006 and the Fourth Assessment report of the Intergovernmental Panel on Climate Change (IPCC) in early 2007, global attention to climate change heightened. As international progress remains slow – recently illustrated again at the largely unsuccessful international conference in Durban in December 2011 – attention is shifting to change processes at other levels and with other actor constellations and linkages. This is primarily occurring on the domestic levels, including the private sector. It will be the focus of this dissertation to assess the extent of changes and the importance of different kinds of knowledge produced and diffused by a variety of actors.

A comprehensive body of research has shown that knowledge and science do indeed influence policy, but it remains insufficiently clear *how* exactly knowledge and collective learning influence change in the climate governance of large developing countries and whether this process differs to industrialized countries. In multi-level climate governance, the actor landscape that produces and diffuses the relevant knowledge is likely to be more diverse than epistemic communities (Haas 1992) composed of scientists only. Moreover, other types of knowledge apart from scientific knowledge are relevant for environmental governance (Ascher et al. 2010). Comprehensive, actor-centered conceptualizations are lacking that explain how exactly different types of knowledge, norms and power go together with actors' attitudes and practices at the domestic level in countries such as India or South Africa.

The development and exploratory test of such a concept is the goal of this study. The following research question results:

How do different types of knowledge and learning influence the change of domestic climate governance in large developing countries?

The study adopts an actor-centred perspective because knowledge production, diffusion and collective learning cannot happen without actors. It raises the question which actors matter exactly for change. This contribution seeks to close a research gap in climate governance research and adds to the broader literature on governance, inter- and multi-disciplinary works on networks and learning in the environmental field. It expands the constructivist literature on the social construction of climate change.

The present study provides a deductive, exploratory test of the concept "climate knowledge systems" on four cases: the national levels of governance in India and South Africa and one exemplary province or state in each country. For South Africa, this is the Western Cape. For India, it is Maharashtra. The sub-national level matters for two reasons. First, it is an essential part of the multi-level nature of climate governance. Second, India and South Africa both have federal-democratic systems in which sub-national entities exert specific functions and power.

The aim of the study is to contribute to the building of a mid-range theory for those large developing countries that are under high pressure to reduce their emissions, develop measures for the adaptation to the impacts of climate change and continue their development. Generally, this group of countries is also interested in securing a share of the developing markets in renewable energy, clean technology and green or eco-innovation. Given the danger of conceptual stretching between concepts for industrialized and developing countries as well as the dawning realization in political science that the time for general causal laws is over, this more moderate aim is simply more realistic. Additionally, an inductive comparison between the cases serves to generate new hypotheses. The cross-regional comparison also enhances knowledge in the Area Studies.

Therefore, the contribution is of interest to both political scientists and interdisciplinary researchers working on broader questions of knowledge, learning and networks in environmental governance. The empirical results may provide fruitful insights for practitioners who want to know more about the central actors in these countries, their motivations and the dominant political mind-sets in India and South Africa.

In order to provide a comprehensive understanding how dominant political mind-sets come about, I develop the concept of climate knowledge systems. It captures which actors develop and provide the new background knowledge that actors draw upon as well as what kind of dynamic order may derive from this. The concept uncovers the underlying knowledge paradigms that connect policy-makers, scientists, experts, civil society and business. It explains how this informal system changes through actor networks and collective learning of new knowledge and practices. For the development of my concept, I draw on and advance Emmanuel Adler's (2005; 2008) pragmatic-constructivist approach of cognitive evolution and communities of practice. Adler's approach seeks to explain collective learning and change in International Relations (IR).

Communities of practice are informal learning networks of actors with different professional background that together develop new ideas, knowledge and practices. Through this, they influence decision-making. Their relations are characterized by trust and a shared identity that grows over time. Since communities of practice can be composed of public and private actors, their development of new practices represents a flexible type of governance. It is embedded within the state rather than independent of it. Epistemic communities are a special type of community of practice in which all members have the same professional occupation in science.

Cognitive evolution describes the process of collective learning through which communities of practice influence and change the underlying mind-set or the conceptual categories actors refer to. In constructivist terms, this is their background knowledge. Here, knowledge means both individual knowledge – the information an actor possesses – as well as the intersubjective, shared background knowledge that builds the context in which rational action takes place. According to Adler (2005), several factors support the spread of new background knowledge such as the expansion of communities of practice and the passing of a “tipping point” after which a critical mass of actors has accepted the new knowledge. This advances cognitive evolution.

In summary, my concept captures dynamic actor networks, their knowledge and practices as well as their expansion through learning, power and a knowledge-related debate. In contrast to Adler's approach, the knowledge system more clearly delineates the boundaries of communities of practice (through a top-down knowledge focus) and includes power and the role of key individuals more explicitly. It specifically integrates feedback-loops.

I differentiate between communities of practice that primarily produce

knowledge and those that primarily carry and diffuse knowledge. Four types of knowledge form part of the system: scientific, technological, normative and pragmatic knowledge. The first three categories draw on Adler, while pragmatic knowledge is a new category. Pragmatic knowledge is an understanding of what is politically and practically feasible. For large developing countries, this primarily means an understanding of the balance of competing goals under particular financial constraints and under conditions in which the state and the bureaucracy do not perform well. These goals are likely to be poverty reduction, economic growth, development and environmental protection and responsibility for the protection of global public goods. Thus, pragmatic knowledge is the element of the concept that makes its application particularly apt for developing country contexts. Moreover, it allows for the integration of economic incentives and therefore, an element of rational choice into the knowledge system. Economic incentives can be one expression of pragmatic, co-beneficial knowledge.

Despite its focus on the domestic levels, the concept does not exclude inter- and transnational influences. Members of communities of practice may act on multiple levels themselves or be in close contact with inter- or transnational actors. The background knowledge they develop therefore is unlikely to be completely independent from inter- and transnational contexts.

Institutional and productive power (see Barnett/Duvall 2005) help communities of practice to diffuse their knowledge and ideas. By means of example, this could be that investments into concrete measures such as solar energy intensive schemes are useful for climate change and energy security reasons as well as for increasing electricity access for the poor (pragmatic knowledge). Community members' formal and informal engagement in a knowledge-related debate challenges previously dominant thinking and existing regulatory frameworks. This could be, for example, that climate protection is not important, no domestic governance mechanisms are required and that renewable energy is too costly or insecure a technology. Slowly, the new knowledge becomes more and more accepted through learning processes. It helps if key individuals in important positions – e.g. in a powerful government department – adhere to the communities' knowledge and ideas. They can use their position for further trust-building and convincing of other stakeholders. Feedback-loops emerge from stakeholder feedback, policies or projects, which may show that adjustments to the original suggestions are required (feedback-loop). For example, incentivising concentrated solar power instead of photovoltaics may be better in the local context. If the knowledge system expands successfully, the previously dominant mind-set changes

towards an automatic integration of climate protection into actors' underlying strategic thinking. It then becomes reflected in concrete actions. No direct connection of actors to the original communities of practice is necessary beyond this point. Actors and stakeholders have been influenced and connected by the new background knowledge and the underlying strong knowledge system. It exerts structural power.

Thus, I argue that such a climate knowledge system helps to change domestic climate governance. This concept will be tested according to five hypotheses. The first, most general and comprehensive hypothesis targets the whole knowledge system and its functions:

H1 : Climate knowledge systems provide a dynamic order that influences governance processes through the provision of knowledge, new ideas and practices. The more strongly developed the climate knowledge system is – i.e. the more knowledge and collective learning - , the higher the prospects for a change in climate governance.

The second set of hypotheses (H2a and H2b) targets the relations between the power of communities of practice, the role of key individuals and the spread of climate governance mechanisms. The final pair of hypotheses (H3a and H3b) concerns pragmatic knowledge, practical rationality and economic incentives and their relevance for cognitive evolution and the expansion of climate governance. These hypotheses will be introduced in greater detail after the development and in-depth discussion of the theoretical concept. The study will test the concept's explanatory power and its viability for further theoretical, methodological and empirical pursuit in political science.

In light of the political and economic momentum with respect to climate change, the study focuses on the period January 2007 to December 2010. Before 2007, little domestic climate governance activities took place in India and South Africa. Since 2007, international political attention to the topic has increased and economic risks and opportunities become clearer, for example in the clean technology market. Moreover, I limit the analysis of governance outside government to large national and transnational companies. In large developing countries, these are more likely to have the financial resources and the interest to engage in national climate governance than small and medium enterprises.

This study uses a mixed methods approach to test the hypotheses deductively derived from the concept of climate knowledge systems. It subsequently inductively generate new hypotheses based on the comparison of the four cases. The type of mixed methods approach is a parallel, qualitative-dominant triangulation that draws on both

quantitative and qualitative data. A parallel design means that data are collected and analysed roughly at the same time. In a qualitative-dominant design, the qualitative data receive more weight in the triangulation or meta-inference than the quantitative parts. The rationale for the mixed methods approach in this study is twofold. First, it allows an expansion of the database for the hypothesis-test so that more and potentially complementary data can be used to analyse the phenomena from different angles. Second, mixing methods increases explanatory power and validity as the disadvantages of individual data types and methods become more balanced.

The study draws on four types of data: first, on aggregate data on clean energy investments and Research & Development (R&D) expenditure in both India and South Africa; second, on descriptive statistics stemming from a survey of the Carbon Disclosure Project of the years 2008 to 2010. Third, it uses results from expert surveys or expert judgements, which are set between the quantitative and the qualitative method. Finally, a series of semi-structured, qualitative expert interviews generates a large part of the qualitative data. Parts of the interview transcripts will be quantified to improve the explanatory power of the interview content. Secondary and grey literature will complete the analysis, where necessary and possible.

Despite the pragmatic-constructivist positioning and the dominance of qualitative data, this study takes a variable-oriented approach. The dependent variable is the change in climate governance, while the independent variable in hypothesis H1 is the climate knowledge system. In the other four hypotheses H2a to H3b, the climate knowledge system differentiates into the independent variables of (i) power of communities of practice, (ii) key individuals, (iii) pragmatic knowledge and (iv) economic incentives. Since both change and the knowledge system have a process character, the dichotomous measurement of these variables is hardly possible. Furthermore, I understand change to be gradual, multi-layered and connected to a comprehensive understanding of learning – similar to Hall's (1992) orders of change. Therefore, the measurement of the variables from the different data sources is a gradual, more comprehensive expression as well. While such gradual measurement could be argued to be a mere approximation, it is likely to represent the political reality more closely.

The case selection combines two different sampling designs used in comparative politics. For the cases at the national level, I approximate the most-similar-systems with different outcome – design (Lauth, Pickel & Pickel 2009).

The sample constitutes the group of roughly ten large developing countries that are facing increasing global responsibilities due to their GHG emissions, while also

confronting severe impacts of climate change.[1] Several criteria guided the case selection. For example, cases should have a similar political system and similar projected impacts of climate change, among others. India and South Africa are both highly coal-dependent in their energy use with corresponding rapidly rising GHG emissions. In addition, they will most likely have to deal with increasing water shortages and impacts on agricultural yields as global and local temperature rise. Moreover, they have similar federal-democratic systems. Differences in the state and foci of the change process in climate governance could be safely assumed at the beginning of the study, even though no sufficient empirical studies were available to determine the expression of the dependent variable "change" before the data collection. What these differences are will become clear throughout the study.

For the cases at the sub-national level, I apply the "most likely"-case selection method often used in qualitative case studies (Gerring 2007). The most likely province in South Africa to do something about climate change and show a change process in climate governance between 2007 and 2010 was the Western Cape. In India, it was the state of Maharashtra.

The aggregate and quantitative data of the Carbon Disclosure Project (CDP) survey are available for the years 2007-2010 and 2008-2010, respectively. The standardized expert survey and a series of semi-structured interviews were conducted during research stays in both countries in 2010. In South Africa, 35 interviews were conducted and 13 experts took part in the standardized survey. In India, 30 interviews were conducted and 10 experts completed the survey. The CDP data and the expert survey are analysed using SPSS. Applying the method of content analysis, the notes taken during interviews are coded, quantified and analysed with the help of the mixed methods software QDA Miner.

The study is divided into ten chapters. Chapter 2 discusses and summarizes the state of the relevant strands of literature. These concern governance and networks research as well as contributions on knowledge, learning and the social construction of climate change. Studies by constructivist political scientists and researchers from other disciplines are taken into account. The chapter includes a brief overview of existing studies on India and South Africa that derive either from the environmental governance literature and related disciplines, or the area studies and comparative area studies. The chapter concludes with a summary of the identified research gaps.

Chapter 3 is dedicated to the theoretical arguments and development of the concept of climate knowledge systems. The first section in this chapter classifies the

1 Argentina, Brazil, China, Democratic Republic Congo, India, Indonesia, Iran, Mexico, South Africa, South Korea.

study in terms of its meta-theoretical position. Its roots lie in both philosophical pragmatism and social constructivism. The resulting type of pragmatic constructivism is analytical eclecticism in the sense of Katzenstein and Sil (2008). The careful combination of elements of theoretical traditions (here: constructivism with an element of rational choice theory) and mixing of methods of the quantitative and qualitative kind is by no means random. In this study, it provides the most suitable way for testing the hypotheses and answering of the research question as several elements of the concept of "climate knowledge systems" are hard to capture directly. The second section of the chapter explains and criticizes Adler's approach of communities of practice and cognitive evolution. The third section introduces the concept of climate knowledge systems in more detail, discussing its elements and how they relate to each other. In both these sections, central terms such as knowledge, power, learning or practice will be defined. The chapter concludes with a more detailed presentation of the five hypotheses.

Chapter 4 is the methods chapter. It explains the mixed methods design with a particular focus on the steps of the mixed methods research process. Additionally, it addresses the advantages and disadvantages commonly associated with such mixed methods research. The case selection and variance of the variables receive a more in-depth coverage, followed by a detailed description of the data collection and methods used for data analysis. The chapter closes with an assessment of the validity and reliability of the findings and discusses methodological limitations of the study.

To provide the reader with an overview of the national context of India and South Africa with respect to climate change and its governance, Chapter 5 contains a descriptive introduction. An overview of the GHG emission profile and the projected impacts of climate change on India and South Africa helps to understand the nature and scope of their climate change challenges. The chapter then briefly describes the main actors, policies and other climate governance initiatives in both countries. An assessment of the regulatory density and intensity in both countries in January 2007 compared to December 2010 presents the first measurement of the extent of change in this time period. Since my understanding of change is a gradual, comprehensive one, different pieces to the puzzle of the dependent variable will be provided throughout the following sections.

The subsequent three chapters all provide the empirical material, differentiated along the methodological lines of the data types. Each of them relates the evidence to the concept, answers the specific qualitative or quantitative questions and provides tests of one or more of the hypotheses, thus preparing the triangulation.

Chapter 6 completes the bridge between the descriptive introduction of the cases' context and the analytical sections that test the concept and hypotheses. Here, I present and discuss the aggregate data and descriptive statistics of the CDP survey. Due to restricted data availability, the calculation of measures of association between key data such as the risk perception and the engagement of companies with policy-makers, is only possible for the South African CDP survey of 2008. The data give insights into developments and change in the corporate world. Also, it allows the identification of driving factors and actions taken, relating them to each other (explanatory value).

The results of the expert judgements are summarized and discussed in Chapter 7. It is structured around the different themes addressed in the expert survey. The first section discusses the comparative performance of India and South Africa and identifies drivers and challenges in the climate governance in both countries. This is followed by the experts' judgements of different actors' knowledge concerning climate change and its governance. The last section targets the existence and power communities of practice as well as different aspects of change.

Chapter 8 is a comprehensive section that contains all the qualitative empirical data. For ease of reading, the presentation of the results is split into different sub-chapters for each country. These are structured in the same way and each treat the two cases within each country together. The first section in each sub-chapter inductively identifies the drivers and challenges associated with climate governance in India and South Africa. This serves the inductive generation of hypotheses and simultaneously avoids a theory-bias in data collection and analysis. The subsequent deductive, concept-oriented sections identify communities of practice – where possible – and assess their power in both the national and the sub-national cases. Potential key individuals within and outside the communities of practice will be identified as well. The analysis of knowledge, collective learning and potential processes of cognitive evolution forms the last section of the respective country chapters. Here, quantifications of both coding frequencies and code co-occurences provide further insights. The chapter concludes with a summary of the results for the different hypotheses. It indicates differences and similarities that become clear through a comparative perspective.

In Chapter 9, I triangulate the results from the different chapters and draw meta-inferences for the hypotheses. Here, the explanatory power of the concept “climate knowledge systems” will become clear. The sections of the chapter are structured according to the hypotheses. The chapter closes with a comparative section

that links the different inductive results and forms three new hypotheses based upon the empirical material.

The final Chapter draws broader conclusions on the theoretical implications and contributions of the results of this study to the existing body of research. It also discusses possibilities for alternative and future research in this area. The final section discusses the implications that can be drawn from the results for the practice of climate governance.

2. State of the art

2.1 Introduction

The literature on different aspects of climate policy and governance, actor linkages and their power as well as on drivers of change in environmental governance is vast. The focus of this literature review lies on three broad bodies of research that are relevant for this study: a) governance and policy change research, b) networks-based approaches to environmental governance from a variety of disciplines and c) constructivist research on knowledge and climate change. I will indicate which of the approaches discussed fit into more than one of these groups. In this chapter, it will become clear that there is a research gap regarding the connection between networks, learning and change in climate governance that should prove useful to close. Some additional introductory arguments can be made now that I take up again throughout the chapter.

Generally, four major theoretical approaches compete in the policy change literature. The advocacy coalition framework (Sabatier & Jenkins-Smith 1993; Sabatier 1999), the multiple streams model (Kingdon 1984), punctuated equilibrium theory (Baumgartner & Jones 1993) and the more large-N focused diffusion theory (Berry & Berry 1999) belong to the classics in public policy research. The development and change of policies in the environmental field has attracted a lot of research in the past decades. While the advocacy coalition framework and policy diffusion have been applied in environmental policy research with some success (Davidsen 2007; Litfin 2000; Sewell 1996); (for an overview see Jacob & Jörgens 2011), two major limitations to the implementation of these approaches exist.

First, they take a mostly positivist stance and therefore exclude the influence of ideas, norms and discourse proposed by constructivists and post-positivists. The advocacy coalition approach has been explicitly criticized for this shortcoming (Hajer 1995; Dudley et al. 2000). Various contributions stress that climate change and our

reactions to it are, at least partly, socially constructed. The production of knowledge and policy overlap and different norms, values and discourses shape both the perception of and the reactions to climate change (Pettenger 2007b; Fogel 2007; Cass 2006; Kütting & Lipschutz 2009a). These arguments are convincing, particularly because normative arguments and framing are often-used strategies in the debates about climate change.

Second, the classic frameworks on policy change focus on policy, not governance and are thus state-centric from the outset. Such a view falls short in capturing the actions or various types of measures that actors already take across different levels and scales. As the international climate regime has trouble to deliver, alternative mechanisms and agency constellations on various levels gain ground. To begin with, these developments have fuelled the debate about the content and meaning of global climate governance, its fragmentation and the appropriate level of action (Biermann & Pattberg 2008; Okereke, Bulkeley & Schroeder 2009; Hoffmann 2005). Now the variation between national responses to climate change is increasingly coming into focus and network approaches are gaining in popularity (Harrison & Sundstrom 2010; Broadbent 2010). The connection between networks, learning and change is a promising one for climate governance, as contributions by natural resource management scholars have shown (Olsson et al 2006; Armitage 2008; Pahl-Wostl 2009).

Taking a governance perspective instead of just focusing on public policy seems useful, even though governance research has a lot of open questions left as well. Despite a high number of governance concepts available, such as multi-level governance (Hooghe & Marks 2003), networked governance (Parker 2007) or reflexive governance (for an overview see Leach et al 2007), the question who governs what, how and on whose behalf is still open in climate governance research (Newell, Jenner & Baker 2009). Since Northern concepts may not fit for areas of limited statehood such as South Africa (Risse & Lehmkuhl 2006), the analytical challenge here is even greater. In the next three sections, I take up these introductory arguments again one by one.

2.2 Governance and policy change research

The analysis of policy change has been a central research topic of political science for a long time. However, it is only in the 1990s that governance approaches gained in importance. They may be seen as alternative research strands with differing assumptions and foci, but they also overlap in many areas. This sections will show this.

I first summarize the most important concepts and findings of environmental policy change research. I then show why a governance approach is more useful for this study by reviewing the state of governance research. Finally, I discuss the state of the art of both climate policy and climate governance analyses for large developing countries, with a focus on India and South Africa.

Policy change research focusing on environmental policy

Studies on environmental policy change has largely focused on policy diffusion and change in regulation patterns, as well as an analysis of the determinants for change. The number of concepts and studies targeting developing countries is rather limited, including the large developing countries. This particularly applies to actor-centred approaches to change. With respect to the change in climate policy, this is also the case.

One of the few models targeting environmental policy change in both industrialized and developing countries was developed in the 1990s by the "Berlin school", notably Martin Jänicke and Helmut Weidner (Jänicke & Weidner 1997; Jänicke, Kunig & Stitzel 1999). Their model compares the explanatory factors that lead to the success of environmental policy in industrialized and developing countries. The model emphasizes the (environmental) problem structure, i.e. the resulting political ability to solve the problem. Further relevant factors are the strength and strategic aptitude of environmental advocates to advance their goal in a specific environment. This environment consists of certain stable, systemic conditions, such as the economic structure of a country and other, fluent conditions contingent to the situation. Combined, they constrain opportunities to act (Jänicke, Kunig & Stitzel 1999:78).

The model certainly does provide some important insights. It demonstrates that there is a high variety of factors and specific context conditions that need to be considered in different cases, complicating conceptualization. Miranda Schreurs and Elizabeth Economy (1997) show this as well. They underline domestic political structures, policy processes, traditions and international linkages as important factors for effective environmental policy (Schreurs & Economy 1997:15). Hence, they explicitly connect international and domestic sphere. The model of the "Berlin school" also takes international influences into account. However, this is not done sufficiently where incentives for the development of individual actor strategies are concerned. The actors themselves and the drivers of their behaviour are completely neglected.

However, specifying actor constellations, their actions, power and behaviour is important. The advocacy coalition framework (Sabatier & Jenkins-Smith 1993) and the

concept of discourse coalitions (Hajer 1995) illustrate this for policy change in general and for environmental policy in particular. Even though discourse coalitions also belong to constructivist literature (Section 2.4), I discuss the concept here to compare it to the advocacy coalition framework.

The advocacy coalition framework

The advocacy coalition framework proposes that policy change comes about through competing advocacy coalitions in a policy subsystem. The advocacy coalitions are groups of public and private actors "who (a) share a set of normative and causal beliefs and (b) engage in a non-trivial degree of coordinated activity over time" (Sabatier 1998:103). The belief system has three levels: the deep core of basic ontological and normative beliefs or world views; policy core beliefs that define basic, political strategies and present the glue of coalitions; and secondary aspects concerning policy implementation (Sabatier 1998:103f.; Sabatier & Jenkins-Smith 1993). Deep core beliefs are very unlikely to change. The policy core and secondary aspects are somewhat easier to alter through learning within a coalition and among different advocacy coalitions, if very solid empirical evidence exist (Sabatier & Jenkins-Smith 1993). Despite a high number of applications in policy analysis research, the belief system that advocacy coalitions have remains somewhat fuzzy and hard to measure empirically.

The advocacy coalition framework further assumes that "policy-oriented learning can change secondary aspects of a coalition's belief system, changes in the policy core aspects of a governmental program require a perturbation in non-cognitive factors external to the subsystem" (Sabatier 1998:105). Policy changes are therefore dependent on external socio-economic changes or turnover in personnel, for example after elections, and generally require a decade or more to be substantial (Sabatier & Jenkins-Smith 1993). This somewhat limited view on learning excludes normative and discursive aspects as well as more fluid forms of learning, as has been criticized by Harriet Bulkeley (Bulkeley 2000) and Andrew Jordan and John Greenaway (Jordan & Greenaway 1998). Furthermore, policy learning is rather conceptualized as individual than social learning and knowledge production is understood as largely external to the policy sub-system. But social learning and collective learning are very relevant in environmental policy and governance. Here, it again becomes clear that a governance perspective is more fruitful in environmental and climate governance studies.

One of the most comprehensive critiques of the advocacy coalition framework has been brought forward by Maarten Hajer (1995), who presents his concept of

discourse coalitions as a post-positivist alternative to advocacy coalitions. His major criticisms are that Sabatier neglects the intersubjective ways in which beliefs and interests are constructed together with and through (social) practices and that the relevance of discourse for learning is not taken into account. These arguments are convincing, even though Hajer tends to overrate the overall relevance of discourses somewhat. For many discourse analysts, a discourse becomes the vehicle and nearly the only acceptable explanation for any political development.

Discourse coalitions

Discourse coalitions are more loosely coupled groups of actors who do not have to share deep beliefs, but they share certain terms and concepts. Hajer calls them "storylines" applied to institutional and political settings (Hajer 1995, Hajer 2008). These storylines create meaning in the policy process. New or altered storylines create political change through altered, re-ordered meanings that actors draw on (Hajer 1995:56). Interests and beliefs relating to a specific policy issue are not necessarily agreed on by all members of a discourse coalition, as is the case in advocacy coalition. Therefore, they allow for negotiations of meaning and learning by engagement with each other. The downside of this is, as Joseph Szarka argues, that Hajer "blunts the cutting edge of the coalition idea as concerted action" (Szarka 2004:319). Still, Szarka understands advocacy coalitions as a powerful sub-set of discourse coalitions. This seems incompatible with the ontological premises of each approach. Moreover, Szarka's empirical application to climate change and wind power in Europe does not make sufficiently clear how the contradictions and different foci of the two approaches can be fruitfully combined for future research.

Both the advocacy coalition framework and the discourse coalition approach have their merits and give important insights into the policy process. When the focus lies on knowledge and change in the cross-cutting climate governance, however, they are not sufficiently suited to capture the variety of actors and their relations as well as the practices inside and outside of governmental policy that lead to change. Taking a governance lens as analytical perspective, as opposed to limiting analysis to policy change, is therefore more useful in this study.

Governance approaches

The number of definitions and conceptualizations of governance is extremely high (Risse & Lehmkuhl 2006; Benz et al 2007; Jordan, Wurzel & Zito 2005; Peters, Pierre & John 1998; Rosenau & Czempiel 1992). Definitions vary from a narrow

understanding that focuses on public-private, new modes of governance and excludes state regulation (Rhodes 2001) to a wide understanding that includes all production of social order both by markets and coordinated actors (Williamson 1975). I follow a mid-range definition of the term: *Governance thus includes public, public-private and private activities and processes that produce social order with a minimum of intentionality (Risse 2007:5).* This definition combines the understanding of governance as an activity and as a process. The interpretation of either activity or process has created a dividing line, particularly in the understanding of practitioners (Hyden, Court & Mease 2003). The condition of intentionality excludes contingent governance products, when governance develops by accident. But the definition includes all forms of the often-used distinction between governance by, with and without government brought forward by Rosenau and Czempiel (1992).

Apart from a minimal consensus that governance includes some sort of steering, neither conceptual clarity nor analytical- empirical depth can be considered sufficient yet: studies often remain descriptive (Schuppert & Zürn 2008). Thus, more analytical precision of the above governance definition for climate governance is necessary. The realization that state-centric approaches focusing on climate policy only do not capture the current developments adequately enough has led to a re-scaling of climate governance in research and practice (Andonova & Mitchell 2010). Approaches such as multi-level climate governance (Brunnengräber & Walk 2007), polycentric governance (Ostrom 2001), adaptive governance (Olsson et al 2006; Folke et al 2005) and a comprehensive project on earth system governance (Biermann 2007) followed.

The re-scaling of climate governance means that the level at which climate change as an environmental problem is dealt with is being shifted upwards (to a supranational level), downwards to local levels, or to transnational levels. In consequence, different actor constellations and forms of agency become relevant (Andonova & Mitchell 2010). This phenomenon is also captured by the term polycentric governance, implying multiple centres of authority and multiple approaches to climate governance (Ostrom 2001). Climate change is often said to be one of the few true global commons – it is therefore hardly surprising that private and public-private initiatives and alternative actors linkages that cross geographical and institutional boundaries matter both practically and analytically.

Climate governance, more precisely, the governance of climate change, can therefore be defined as "all purposeful mechanisms and measures aimed at steering social systems toward preventing, mitigating, or adapting to the risks posed by climate change" (Jagers & Stripple 2003:388). This definition corresponds well to the

above general definition of governance because it also emphasizes the condition of intentionality. Furthermore, it clarifies once more why a restriction to (governmental) public policy change would only capture a part of the current developments, the driving factors and actors behind these changes.

In an effort to conceptualize and better explain the top-down, bottom-up and cross-level dynamics, multi-level governance approaches have gained in popularity. Multi-level governance originated in regional policy and federalism research on the European Union (EU) to explain the dispersion of authority away from central government. However, there is a consensus that the concepts for the EU are not suitable for analysing the complex global relations of climate governance. Traditional policy analysis or traditional comparative politics do not fit either because developments relate to the underlying transformation of the state (Brunnengräber 2007:333; Görg 2007). Given the complexity of climate governance, this is a reasonable conclusion.

Multi-level governance approaches emphasize the connections between different areas of action and therefore the importance of international and domestic linkages. This point has been stressed by environmental policy research (Economy & Schreurs 1997; DeSombre 2000), climate regime (Stevenson 2011; Fisher 2004; Andonova 2008; Fogel 2004) and norm research (Cass 2006; Fogel 2007). Hence, it becomes clear that any study in climate governance needs to take the reciprocal influences between different levels into account. There is likely to be more than a two-level game (Putnam 1988) at play. I focus on two levels in this study – the national and the sub-national/province level concerning state and non-state action– but allow for influences of the trans- and international sphere as well.

Multi-level climate governance approaches are supposed to, firstly, question the dominant construction of climate change as an environmental problem that has to be solved economically and, secondly, help identify dynamics, restrictions and "blind spots" in regulation (Brunnengräber 2007:208). Despite their valuable efforts to re-invent theoretical concepts, multi-level approaches in climate governance thus far largely fail to fulfil their promises: they remain programmatic (Brunnengräber & Randeria 2008) or show considerable flaws where clear operationalization and definition of the theoretical content of multi-level governance is concerned (Dietz 2007; Dietz & Scholz 2008; Betsill & Bulkeley 2004, Betsill & Bulkeley 2006). Identifying a new form of governance and emphasizing its multi-level character, like Betsill/Bulkeley do in their analysis of the Cities for Climate Protection Program, is not enough. Some contributions to multi-level governance show the limits of the direct

transfer of governance concepts from industrialized to developing countries. The perception of climate change in these countries may differ. In developing countries people perceive it as a part of a new "ecological imperialism", in the industrialized world people understand it as a global problem threatening the planet (Brunnengräber & Randeria 2008:24). Unfortunately, the authors do not give their source or empirical test of their observation here. They simply declare multi-level governance approaches to be most suitable for the analysis of interdependence between the levels, actors and their strategies, discourses, problems and power relations. Despite this mere assertion, power relations and interdependencies between actors and their interests do require attention. Multi-level governance approaches have an analytical quality apart from a problem-solving approach, as Brunnengräber and Randeria (2008) argue as well.

The argument that climate change may be perceived differently in developing countries is valuable because it draws attention to the problem of transferability of concepts from industrialized to developing countries. This transferability or travelling of existing governance concepts is not assured – especially in areas of limited statehood and including environmental governance (Risse 2007:13–15). In an area of limited statehood, the state is only partly able to take political decisions and enforce or implement them (Risse 2007: 10). This often corresponds to the weakness of political institutions, a lack of capacity and the state's generally limited ability to exert its functions. Both India and South Africa count as areas of limited statehood in some political fields (Risse & Lehmkuhl 2006). Similar to the state of the art in policy analysis, domestic climate *governance* and its change in developing countries is only slowly being taken up as a research topic.

Studies on large developing countries/ India and South Africa

Despite the fact that developing countries are major players for dealing with climate change, their domestic and sub-national climate governance has not been sufficiently investigated yet (see Schreurs 2008). The majority of studies still focuses on inter- and transnational issues and questions relating to OECD countries (see Fuhr, Lederer & Schröder 2007). It is not clear why certain developing countries change their strategies while others do not and how the strategies translate into action. Looking at state and non-state actors, it is also not yet understood why and how some of them engage in climate governance, while others do not and why they act in some fields and not others. Here, several research gaps exist that apply to India and South Africa as well.

Research on climate policy and governance in both countries is biased towards energy questions and the discussion of different mitigation options (Winkler, Jooste &

Marquard 2010; Goldblatt 2010; Upadhyaya 2010; Tyler 2009; Shukla et al 2008), the Clean Development Mechanism (Niemack & Chevallier 2010; Benecke 2007; Kim 2004) and international regime questions (Vihma 2011; Nhamo 2010; Rajamani 2009; Ochs Dezember 2007; Korppo et al 2009; Jacobsen 1998; Rajan 1997). Only recently, some political science studies have begun investigating the *change* in the Indian negotiation position and the interplay of international and domestic factors and actors that led to it (Stevenson 2011; Michaelowa & Michaeolowa 2011). Similar and recent analyses of South Africa do not exist. The different actor groups and linkages at domestic level, including first analyses of adaptation, are coming increasingly into focus in both countries (Jairaj November 2010; Dubash September 2009; Vogel 2009; Koch, Vogel & Patel 2007). A few studies of local, bottom-up adaptation initiatives exist as well (Mukheibir & Ziervogel 2007; Thomas et al 2007).

Navroz Dubash and Lavanya Rajamani identify three types of actor groups in India that influence both the Indian position in the international negotiations and domestic actions on climate change: growth first stonewallers, progressive realists and progressive internationalists (Dubash September 2009; Rajamani 2009). Growth first stonewallers put domestic economic growth first, supporting an unconstrained model of growth. They take China in the 1980s and 1990s as a role-model. In addition, they see climate change as a geopolitical threat to Indian interests and connect it to equity concerns (Dubash September 2009:9). For both India and South Africa, actors' understanding of development/economic growth and environmental protection as opposites has been identified as a general hindering factor to environmental and climate governance (Roberts 2008; Korppo et al 2009; Roy, Tisdell & Sen 1995). Whether this is changing with an increase in climate governance measures and the opportunities connected with it, and if so, which actors exactly changed their attitude and practices for what reasons remains unclear.

Both progressive realists and progressive internationalists support co-beneficial approaches and recognize climate change as a problem India needs to deal with domestically in an equitable way. The main difference between these two groups is that the former proposes to de-link domestic and global positions and actions (with a focus on domestic action); and the latter proposes to link domestic and global actions and agenda (Dubash September 2009:9ff.). A closer analysis of who belongs to these groups, how actors are related and what kind of power and knowledge they have is essential.

This is also true for the interactions between business and government in both countries. The business sector in both countries slowly increases its participation in

climate governance, but seems to have a long way to go, especially in terms of adaptation to the impacts of climate change (Vogel 2009; Jairaj November 2010). Comprehensive, up-to-date research on the institutional dynamics, actors networks and particularly the influence of knowledge and science on climate governance are lacking, even though previous research has identified the importance of scientific institutions (Biermann 2002) and collaboration between departments, science and civil society (Koch, Vogel & Patel 2007).

The provincial or federal state level has largely been left out as a unit of analysis in studies on climate governance in India and South Africa thus far. Yet this level is particularly interesting, both from a multi-level governance and a federal systems-perspective. States may surpass their national governments in climate governance actions due to a perceived first mover advantage, political image reasons and a window of opportunity, such as in California (Mazmanian, Jurewitz & Nelson 2008). They may also respond mostly to economic incentives of different kinds (Qi et al 2008).

In developing countries, economic incentives may play a central role, as Ye Qi et al. (2008) have shown for China's provincial governments. Their article explains the sudden rise of climate change on the agenda of provincial governments in 2007. They identify the distribution of power and financial resources by the central government as a key factor for explaining the extent of provincial leading groups on climate change (Qi et al 2008:390). The second important factor are local needs, basically referring to co-benefits from combined measures targeting energy saving, pollution reduction and climate change. However, local governments aim to reduce energy consumption rather than actually cut emissions. The third major factor presents local governments' response to international and domestic market incentives, primarily of the CDM. Secondary factors are actual climate change impacts (relevant in the more affected western provinces), capacity and awareness (generally rather low) and leadership in low-carbon initiatives in single cities such as Boading (Qi et al 2008:392–394).

The concept as well as the findings of this article contribute substantially to the advancement of the research field. By emphasizing the role of motivational factors and incentives, actors come more into focus. Power distribution and institutional constraints address the process side. The findings imply that processes and actors should be regarded in a more integrated way to get the complete picture. Moreover, the motivation of actors should be more extensively scrutinized, especially concerning theoretical background. Here, the authors only scratch the surface. Three other critical remarks have to be made. Firstly, the underlying research method (i.e. source of data, systematic connection and evaluation of variables) is not made very clear. Secondly,

the role and impact of non-state actors such as businesses and NGOs as well as possible impacts of donor agencies are not taken into account. These should be integrated even if the state focus is deliberate because transnational NGOs do have an impact on changing climate politics in China, primarily via information sharing processes (see Schröder 2008). Thirdly, possible linkages between the international and domestic sphere apart from the CDM should be more closely analysed.

There is a need to investigate the drivers for behaviour and outcomes in more depth – not only in California or Chinese provinces, but for other sub-national governments changing to a pro-active climate governance position as well. The integration of the provincial level as one or more cases in a study is of particular interest in federal systems, such as India or South Africa, because the sub-national entities usually have certain rights and powers that enable potentially independent dynamics from the national level.

In sum, there are no studies yet that provide comprehensive analysis of South Africa's and India's climate governance on both national and sub-national level or that combine adaptation and mitigation. None of the studies reviewed above dissect how climate change-specific potentially co-beneficial measures actually are, what actions take place at which level and who drives them for which reasons. This section also made clear that analysing the *change of governance* is more useful than taking a policy change perspective only. In addition, the links between different kinds of actors, their knowledge, power and practices need to be taken into account. The next sections underline this as well.

2.3 Networks research

Network analysis is a fast growing field in political science (Ward, Stovel & Sacks 2011). Network approaches present an alternative for capturing the fragmented, dynamic actor landscape in the changing climate governance and are a challenge to coalition-based approaches such as advocacy coalitions (Sabatier & Jenkins-Smith 1993; Sabatier 1999) and discourse coalitions (Hajer 1995).

Generally, networks can be described as a set of ties between a set of actors that may change over time; network analysis is thus interested in relations and structures (Wasserman & Faust 2008). The meaning of the ties between actors has to be clearly conceptualized in network analysis approaches. Networks can be formal or informal.

There are two broad groups of network analyses—formal social network

analysis (SNA) and more descriptive approaches—that have been criticized for using networks as a "heuristic device" (Christopoulos 2008) and for not sufficiently distinguishing between networks, networked governance and governance (Parker 2007; Christopoulos 2008).

SNA is primarily interested in explaining the relations between actors and/or network developments through structural characteristics — at the level of ties between two actors, through group structure or positional measures and the impacts of attitudes that ego (the actor in focus) and its alters (the actors ego is related to) have. SNA is interested in what happens *inside* the network and how this may explain the development of networks over time. The number of applications of SNA to climate policy and governance is rather small, but growing (Compston 2009a; Broadbent 2010; Hirschi 2011). Descriptive approaches to various aspects of transnational climate change networks (Andonova, Betsill & Bulkeley 2009; Bäckstrand 2008; Betsill & Bulkeley 2004) can rather count as analyses of networked governance than network analyses in the strict sense. Some of these metaphorical-descriptive approaches of networks have taken the whole network as an actor (independent variable), in order to analyse their impacts on policy (Keck & Sikkink 1998; Kahler 2009). Here, a combination of SNA with another method would be necessary to improve causal explanations. SNA incorporates non-structural characteristics of the network through actor attributes and covariates, while keeping the overall network structure.

The application of formal SNA to political science contexts can be useful for a variety of questions (for an overview see Ward, Stovel & Sacks 2011), but it requires some adjustments and additions, for instance in constructivist research interests such as the influence of identity building, knowledge and trust as well as concerning the central political science concept of power. SNA targets questions of identity and trust as well, but — if not combined with other methods — is often based on the rational-structural argument of networks being based on resource exchange and dependency (for example, (Compston 2009b). This conflicts somewhat with constructivist arguments, as it may (but does not have to) imply a competitive, even game-theoretical situation within the network. Community based-approaches such as epistemic communities and communities of practice, create a group characteristic of trust, identity or "we feeling" (Wenger 1998)(Adler 2005; 2008).

Trust in SNA is usually measured at the dyadic level between two actors and in some studies as an expression of general trust in colleagues or in an organization as a whole (Luo 2005). Collective-level trust or the cultural element of trust have not received enough attention in SNA (Levin & Cross 2004; Adler & Kwon 2002). This is a

difference to communities of practice. Trust at the dyadic level relates to tie strength and is relevant for information and knowledge exchange (Levin & Cross 2004), as well as for the building of social capital (Adler & Kwon 2002). Evidence for the relevance of strong or weak ties, types of trust and knowledge is mixed (Granovetter 1973; Levin & Cross 2004). Most of these approaches start from the understanding that a specific actor within the network wants knowledge from another actor within the network (one-way), instead of allowing for the coproduction of knowledge as well. The underlying understanding of learning may be slightly different here than in communities of practice. The building of background knowledge that eventually spreads beyond communities of practice is a concept that seems to be hard to measure through quantitative-based network approaches. This will become clearer later when Adler's communities of practice are discussed in detail (see Chapter 3.2).

Identity-building in SNA is measured through tie strength and attribute-based measures such as homophily or closure/transitivity when looking at a shared norm, for example. Since identity is a rather fluid concept, this could be a helpful addition to communities of practice and other constructivist approaches (Hafner-Burton, Kahler & Montgomery 2009). However, shared attributes of actors or affiliations do not guarantee a common identity in political science terms, so applications would have to be made with care.

The conceptualization of power in SNA and in other types of network approaches in political science is not unanimous (Kahler 2009; Compston 2009b; Jansen 2004; Jansen & Schubert 1995; Bonacich 1987). On the one hand, power in SNA is related to an actor's resources (e.g. information) and structural positions *within* the network only, not to an action or outcome. Centrality measures such as betweenness and concepts such as “brokerage” and “structural holes” (Burt 1992) are relevant here. This again resembles a competitive, almost game-theoretical situation, which seems somewhat contradictory to potentially benign, constructivist concepts. On the other hand, understanding power as relational and as a dyadic or triadic capacity to influence others is a useful addition to power concepts in political science. It could be applied from institutions research to International Relations phenomena, as David Lazer (2011) argues. For climate governance analyses, this means that a differentiated view on actor constellations, their links and a multi-layered concept of power are advisable.

The results of some studies that take networks rather as heuristic concept or describe them qualitatively only are helpful for explaining learning and change. In social-ecological systems research and resource management theory, the concepts of

shadow networks (Olsson et al 2006), adaptive networks (Noteboom 2006) and a framework for adaptive capacity and learning analysis in resource governance regimes by Claudia Pahl-Wostl (2009) provide promising connections of networks, learning and change. The shifts towards adaptive governance and adaptive co-management (Folke et al 2005; Armitage 2008) in these disciplines has made clear that flexible, polycentric and learning-based approaches may be necessary for effective management of ecosystems in a changing social world. The same could apply to climate governance. An adaptive governance system refers to a self-organizing, cross-level system that shares rights and power. It is constituted of actor networks that draw on various knowledge systems, learning and trust to develop a common vision for policies and other measures to deal with a given environmental problem. The leadership of key individuals and their functions as knowledge generators and carriers as well as their role in trust building among network members support these processes (Folke et al 2005:454, 463). Thus, they help the system to respond to change or crises in a flexible way.

In line with this thinking, Per Olsson and co-authors argue that

> "a successful transformation toward adaptive governance seem to be preceded by the emergence of informal networks that help to facilitate information flows, identify knowledge gaps, and create nodes of expertise of significance for ecosystem management that can be drawn upon in critical times" (Olsson et al 2006:18).

The emergence of these bottom-up, self-organizing shadow networks is triggered by a social or ecological crisis, the authors contend and can therefore not be planned. In this conceptualization, the process of learning and potential production of new knowledge or practical reactions to the preceding crisis remain unclear. The authors merely argue that the nodes in the network can become sources of collective knowledge and memory as they help to re-organize existing social capital in governance structures (Olsson et al 2006). The informal, self-organizing nature of shadow networks lets them float largely independent of policy and governance processes that involve government.

By contrast, both Noteboom's adaptive networks and Pahl-Wostl's framework connect to and include policies and governmental circles. Adaptive networks consist primarily of policymakers who engage in the development of innovative ideas and visualize a direction towards more sustainable policies (Noteboom 2006). These adaptive networks are invisible, but members know about a second set of networks – openly visible power networks – and are able to use the tensions in these power networks for their purposes. Noteboom emphasizes both learning and trust as conducive to the success of adaptive networks and uses the notion of "shared foresight" (Noteboom 2006:183) to describe a common idea that unites the network members.

His approach is comparable to Pahl-Wostl's (2009) and Adler's (2005; 2008) approaches of communities of practice in this respect, thus making clear that learning, trust and shared ideas or values are relevant factors in environmental governance.

Pahl-Wostl does not focus on policy-makers only, but develops a framework that is applicable to multiple levels of environmental governance. Another advantage of Pahl-Wostl's framework over both shadow networks and adaptive networks is her clearer conceptualization of learning as social and loop-learning.

Management and organizational theory differentiates between single, double and triple loop learning. Single-loop learning involves a simple change of strategy to achieve better outcomes without questioning routines and underlying assumptions. Double loop-learning refers to a reframing that allows for a change of underlying assumptions, goals and priorities but within structural constraints (Pahl-Wostl 2009). Whereas single-loop learning does not necessarily involve collective social learning, douple-loop learning relies a lot more on it. Triple-loop learning is not possible without social interaction and, therefore, a collective learning process. It involves the transformation of the context, beliefs, values and understanding of reality that determines the frame in which action takes place (see Hargrove 2002; Pahl-Wostl 2009).

Pahl-Wostl makes the conceptual connection between triple-loop learning and informal networks, empirically supporting it with insights from water governance. She lists three conditions which a process has to fulfil in order to be a learning cycle that supports double and triple-loop learning: (1) the network must be at least partially informal with regular meetings (this could be somewhat contradictory to Adler's communities of practice, see section 3.2); (2) the networks must have issue-specific activities; and (3) it has to qualify as a community of practice (after Wenger 1998). From its conceptual outset, triple-loop learning involves feedback-loops and reflexivity. This is both an advantage over and a difference to cognitive evolution, as will become clearer later (Chapter 3.2). Even though Pahl-Wostl does not make clear either how exactly the informal networks of the learning cycle react to feedback or the outcomes of their activities, it can be safely presumed that it is not a one-way process.

Moreover, she provides a comprehensive, very valuable characterization of loop-learning, listing the changes expected in resource governance regimes for each type of loop-learning. She does this for the categories institutions (generally and specific for regulative, normative and cultural-cognitive institutions), uncertainty, actors networks, multi-level interactions and governance mode (Pahl-Wostl 2009: 360). For example, in single loop-learning, the improvement of performance takes

place within established governance modes. When double-loop learning occurs, the dominant governance type is called into question and other types start to become more visible and/or are discussed, for example market-based instruments, if absent before. Once triple-loop learning occurs, new governance types are implemented and established types substantially challenged (Pahl-Wostl 2009: 360). Since this characterization provides useful analogies for climate governance as well, I explicitly draw on it in my own concept of climate knowledge systems and its empirical application (see Chapters 3.3 and 9).

What unites these three approaches from natural resource management research (Olsson et al., Noteboom, Pahl-Wostl) is their emphasis of the informal connection of actors, knowledge development and learning as well as some form of trust as drivers of change. They differ in terms of their specification of each term. All three fail to develop and test comprehensive sets of hypotheses based on their concepts.

Generally, this overview of networks approaches has shown that the concepts developed and applied in different areas of research become quite similar. The pursuit of this direction at the crossroads of learning, networks and change may prove useful for climate governance research.

2.4 Knowledge, power and the social construction of climate change

Knowledge plays an important role in environmental governance, in particular in climate governance. Here, knowledge may indeed be the cross-cutting theme that is relevant for all kinds of actors on all governance levels, as proposed in the broad approach of earth system governance (Biermann 2007). Even though the relations between knowledge and power have been in the focus of research for a long time, there is still no consensus how exactly different kinds of knowledge influence climate governance and which actors and concepts capturing them are most viable. While the connections between science and policy at the national and international levels are still not sufficiently conceptualized (Lahsen 2007), two central findings of recent studies further shape current research beyond the science-policy interface:

First, science, knowledge and power can hardly be separated in climate governance, as science and facts claims as well as expert commissions become politicized. Climate change is socially constructed in this respect (Lahsen 2007; Grundmann 2007; Miller 2001; Jasanoff & Wynne 1998). Second, different kinds of

knowledge apart from pure scientific knowledge and other knowledge producers and transmitters than scientists are increasingly relevant in climate governance (Ascher, Steelman & Healy 2010; Kütting & Lipschutz 2009b; Guston 2001).

The notion of social construction of climate change and the emphasis of knowledge have been brought forward in different ways by three major branches of research in the field that can be roughly associated with constructivism: (1) epistemic communities studies, (2) norm- and (3) discourse-oriented scholars. I first summarize the basic assumptions of constructivism in political science, before turning to each of these branches in more detail.

Constructivism, in short, is concerned with the origin of actors' interests and identities. These are not regarded as given, but as dynamic and shaped by ideas, norms, knowledge and widely shared, intersubjective beliefs. In constructivist understanding, agents and structure interact and co-constitute each other and material and ideational factors are interdependent (see Checkel 1998; Adler 1997; Fearon & Wendt 2002). Scholars working in Comparative Politics tend to use the approach in a more pragmatic, eclectic way than IR researchers, for instance in comparative identity research (Finnemore & Sikkink 2001:405). The International Regimes Database found for the climate regime that actors choose options conforming to a dominant knowledge system and discourse and that they neither follow a logic of consequences or a logic of appropriateness(March & Olsen 1998) in a clear-cut way (Breitmeier, Young & Zürn 2007:55f.). A pragmatic, carefully eclectic approach in a constructivist, knowledge-based study on climate governance may therefore prove useful.

The works on (1) epistemic communities have been profoundly influenced by Peter Haas (1992, 1990). Epistemic communities are networks of professionals with recognized expertise in a particular domain and an authoritative claim to policy-relevant knowledge within that domain. Members share a set of normative and principled beliefs in the verity and applicability of particular forms of knowledge or scientific truths (Haas 1992:3). The definition draws on Ernst Haas' notion of consensual knowledge (see Haas 1990). The definition of membership also rests on the commitment to shared political values or a common political perspective. Studies of epistemic communities analyse how these transnational expert networks influence state interests, primarily in IR and how they help decision-makers overcome uncertainty and contribute to the formulation of policies. In this agency-based concept, knowledge and power are thus linked through expert advice. The Intergovernmental Panel on Climate Change (IPCC) counts as an epistemic community and has been analysed as such (Newell 2000).

There is reason to believe that the impact of scientific advisory institutions on developing countries differs from that on industrialized countries (see Biermann 2002; Lahsen 2007). In a well-structured article, Biermann identifies three main reasons for this: lower expert participation in epistemic communities, lower research potential and lower issue prominence in countries of the South (Biermann 2002:197). He finds that the Indian government primarily relies on the advice of national scientific advisers rather than on IPCC reports. Similar to the Brazilian case (see Lahsen 2007; below), there was an initial lack of trust in the IPCC in India because it is dominated by researchers from the North. In India, this resulted first in lobbying for increased participation of scientists from the South, then in the actual increase of Indian scientists' participation. Certain "counter-assessments" (Biermann 2002:207) have directly resulted from IPCC proceedings, for example concerning a US study on methane emissions, leading Indian researchers to shape their agenda in a way to verify or refute the findings of Northern assessment (Biermann 2002: 207.). Despite these developments, the IPCC has had little direct effect on the Indian governmental policy, Biermann argues. This was due to the dominant understanding of actors in India that industrialized countries caused the problem and therefore need to supply the solution. Therefore, most actors agreed that as long as per capita commitments are not converged, India should not undertake any commitments in the near future (Biermann 2002: 208). The actor group that dominated the political scene at the turn of the millennium would therefore belong to Dubash's "growth first-stonewallers" (Dubash September 2009), see Chapter 2.2. It is neither clear whether Biermanns assessment still applies after the strong increase in global attention towards the climate change problem in 2007, nor what effects knowledge has outside the direct area of influence of epistemic communities.

There are various critiques to the concept of epistemic communities. First of all, as already indicated, the exclusive focus on scientists and scientific knowledge may fall short of grasping the full spectrum of the relation between knowledge, actors and change in climate governance. There is reason to believe that different forms of knowledge such as traditional and local knowledge (Briggs & Sharp 2004; Riedlinger & Berkes 2001), tacit knowledge (Howells 1996), or informal knowledge produced by other types of (non-scientific) experts such as the civic expert (Karvonen & Brand 2009) matter for climate governance as well.

Moreover, the differences and tensions between members of an alleged unified epistemic community are not considered. This may be especially relevant at the national level, as Lahsen has shown for Brazil (Lahsen 2004, 2007). Discourse analysts

criticize the separation and dichotomization of interests/power and knowledge in the epistemic community concept (see Litfin 1994; Miller 2001; Jasanoff & Martello 2004). The processes of how ideas come to be shared are not looked at because knowledge and shared ideas are simply declared as independent variables – the source of power is not taken into account (Miller 2001:248; Jasanoff & Martello 2004). Karen Litfin (1994) argues that the conceptualization of knowledge in Haas' concept is not coherent. By identifying knowledge as the source of power of epistemic communities, their power is thereby rendered mysterious (Litfin 1994:47).

While there is certainly some truth to these claims concerning the source of power and its relation to knowledge and vice versa, it may be more helpful to understand epistemic community and discourse approaches as complementary. They may, indeed, simply look at different elements of a process. Understood this way, studies on epistemic communities help to identify areas where expert networks exert influence and how this occurs, while discursive approaches can shed light on how these networks come about and why they share certain ideas. Concerning the concept and content of knowledge, there seems be more to it than just the pure scientific knowledge. The requirement of shared political values implies a certain normative or ideological element. Haas himself gave another possible specification of the content of knowledge in a later contribution: “usable knowledge”. Usable knowledge is the relevant body of scientific knowledge that policy-makers can apply and draw on in their work (Haas 2004:574). This definition may serve practitioners to increase the production of relevant knowledge, but a more encompassing concept is necessary to enable the analysis of the links between various forms of knowledge and political action.

The normative branch (2) of the constructivist environmental literature focuses on the construction, salience and diffusion of climate and environmental norms (see Cass 2006, Cass 2007; Hattori 2007; Schröder 2008; Fogel 2004, Fogel 2007; Kollman 2008). It is set within the broader field of norm-centered or soft constructivism that leans more towards rationalism and a positivist methodology (Pettenger 2007a:9).

Actors and norm entrepreneurs in climate policy may frame and use norms strategically to pursue both material and ideational interests, while the role of material factors is crucial (Cass 2007:25). Therefore, the separation of the material and ideational that many scholars still propose is not useful in this field. The initial framing of the climate change issue in combination with pre-existing political norms affected the speed of domestic norm salience in the US, UK and Germany (Cass 2007:46). Frames are “specific metaphors, symbolic representations and cognitive cues used to

render or cast behaviour and events in an evaluative mode and to suggest alternative modes of action“ (Barnett 1999:15). In media analysis, framing means the specific way of presenting a topic in the press (Cramer 2008, see Chapter 8.3.3).

Due to the high relevance of economic growth and development goals in (large) developing countries, the factor “economic incentives” and its framing has to be carefully integrated in a study targeting climate governance in these countries. Domestic institutional structures and perceptions of an international norm are relevant as well, Cass argues. Whether this is true in the same way in developing countries' context of climate governance has not been analysed yet. The perception of the norm relates to questions of legitimacy and understanding of the problem at stake. It could be understood as a part of normative knowledge in the sense of Adler (Adler & Bernstein 2005:300). This understanding has to be further refined and empirically tested in the light of climate governance, as will be done in the course of this study.

A second contribution of the norm-centred branch relevant for this study highlights a different aspect of what normative knowledge could constitute: knowledge about regulatory and constitutive norms. While regulatory norms are those adopted by actors under coercion, constitutive norms are those internalized by the actor due to true concern about the issue (Fogel 2007:116). The connection of regulatory and constitutive norms with the institutionalization of a discourse gave rise to progressive climate change norms in the United States in the early 2000s (Fogel 2007). Discourse institutionalization means that discourses solidify into institutions through policies, organizational practices or dominant ways of reasoning (Hajer 1995:61).

Similar to Karin Bäckstrand and Eva Lövbrand (Bäckstrand & Lövbrand 2007), Cathleen Fogel bridges norm-centred and discourse-oriented approaches. She also underlines the importance of economic opportunities of climate protection and the economic costs of inaction as a frame that helped spread climate change norms in the US. Opponents used the economic costs of action as a frame, but the human and economic costs of hurricane Katrina (2005 in the southern states of the US), coupled with an increasing number of high profile corporations that took action on climate change worked in favour of the former (Fogel 2007:116). This shows again that material and ideational factors coincide in leading to actors' activities. It does neither become sufficiently clear, however, if a certain way of framing matters or not, nor what it draws on and whether it connects to national, local or global problems and pressures.

One set of possible explanatory factors here are the perception and understanding of the problem or, more general, the actors' knowledge and beliefs. The

strength of belief in climate change and knowledge about adaptation options may indeed be a relevant factor for an actor's decision to take climate governance measures, as Kristina Blennow and Johannes Persson found for the Swedish forest sector (Blennow & Persson 2009). Moreover, a combination of scientific knowledge and normative principles have driven the debate about the ratification of the Kyoto protocol in several countries (Harrison & Sundstrom 2010:269). The strength of decision-makers' normative commitments impacted the ratification process (Harrison/Sundstrom 2010: 270). These finding needs to be systematically followed up to find out whether and to what extent different kinds of knowledge, norms, perceptions and debates drive change in climate governance, how exactly these need to be combined to advance change processes and which actors matter.

The discursive branch (3) of constructivist research on environmental and climate policy stresses the relation between knowledge and power through discourses (see Lahsen 2007; Bäckstrand & Lövbrand 2007; Paterson & Stripple 2007; Jasanoff & Martello 2004; Miller & Edwards 2001; Lipschutz & Mayer 1996; Hajer 1995; Litfin 1994). In general, the field of discourse theory and analysis is not clear-cut. There are at least four dimensions of discourse analysis that are relevant in the environmental field (Bäckstrand & Lövbrand 2006). These are: (1) discourses as shared meaning of phenomena, (2) discourses in their relation to the production of power through knowledge/discourses as knowledge regimes, (3) the relations of power and policy through argumentative discourse struggles (4) discourses with a notion of agency via concepts such as knowledge brokers (Litfin 1994) or discourse coalitions (Hajer 1995), as discussed above.

The inclusion of the notions of perception and trust seems to be relevant in developing countries context to identify the relations of knowledge construction, its use and power (see Lahsen 2004, 2007). In her ethnographic study of the Brazilian climate science community, Myanna Lahsen shows that, on the one hand, Brazilian policy-makers perceive a domination of the IPCC by scientists of the North due to Brazil's own lesser scientific capacity. The policy-makers associate this with a simultaneous domination of Northern ideas and interests. Science in this view becomes situated knowledge and a vector for hegemonic power (Lahsen 2007:186). On the other hand, a considerable lack of trust exists between scientists and policy-makers at the national level because the distrust in the IPCC is transferred on mostly Northern-educated Brazilian climate scientists (Lahsen 2007:189).

Lahsen support her findings well through qualitative methods and shows convincingly that different considerations and processes between science, knowledge

and policy may take place in developing countries. Yet generalizations are hardly possible from looking at just one case. The lack of trust in *national s*cientists does not seem to be the case in India, as the above discussion of counter-assessments of Indian scientists indicates. Hence, Lahsen's results need to be systematically analysed across cases – like she indicates herself – and with a a stronger political science view that goes deeper into the relations between perceptions, trust and political agendas and outcomes. Moreover, similar to many constructivist studies in the field, Lahsen's study is state-centric through its focus on policy-makers. The role of trust and perception for non-state actors is equally important.

It is clear that the need for credibility of scientific claims among internationally diverse audiences is high in order to achieve global governance. Scientific information is likely to be effective in influencing governance processes if it is perceived as credible, salient and legitimate (Cash et al 2003). There may be moral choices connected to these claims, particularly with respect to credibility and trust (Miller 2001). Miller argues for a more reflective approach in theorizing the relationship between knowledge and ideas and social and political institutions (Miller 2001:248). While he certainly stresses an important and viable point of critique to taking science as truth as such, his suggestion implies taking dominant ideas and discourses as a dependent variable. This is not the focus of this study.

It is uncontested that scientific knowledge plays a central role in shaping processes and outcomes. Therefore, it also exerts a certain power. The critique of the epistemic community concept has led some discursive scholars to develop alternative notions of agency, power and knowledge (Litfin 1994; Hajer 1995). Discursive power in this respect means the framing and interpretation of information according to perceived interests (Litfin 1994:12). Once knowledge is produced, knowledge brokers make use of these discursive practices to promote certain policies (Litfin 1994:188). Hence, a decisive element of contingency comes in, contradicting the consensual knowledge conception of epistemic community approaches. Knowledge brokers function as intermediaries between scientists and policymakers and they are "especially influential under the conditions of scientific uncertainty that characterize most environmental problems" (Litfin 1994:4). The knowledge entrepreneur (Ascher, Steelman & Healy 2010) and boundary organizations fulfil roughly the same intermediating function of communicating, translating and framing scientific information, but with slightly different goals. Knowledge entrepreneurs have political goals and attempt to control the flow of knowledge in order to set or shape the agenda in their interests (Ascher, Steelman & Healy 2010:76), whereas boundary organizations

can consist of both scientists and non-scientists and professional mediators between them. Successful boundary organizations not only mediate in a way accountable to both science and politics, but they are also a site of co-production of knowledge and policy or social order (Guston 2001:401).

All three branches of literature concerned with the social construction of climate change highlight the role of specific actors and small groups of actors that initiate change, similar to the approaches to policy change and networks discussed in the previous sections. The norm entrepreneur (Cass 2007) and the knowledge entrepreneur (Ascher, Steelman & Healy 2010) are both subsets of the policy-entrepreneur (Kingdon 1984). They have roughly similar functions as the knowledge broker (Litfin 1994), key individuals in adaptive governance (Folke et al 2005), shadow networks (Olsson et al 2006), adaptive networks (Noteboom 2006), or "change agents" in a wider social systems perspective (Kristof 2010). Even though the criteria for the qualification as one of these pioneer-type actors differ somewhat between the concepts – if they are made explicit at all – they all share an interest in inducing change, bring forward innovative ideas, knowledge and norms and transform the dominant political mind-set through their activities. In most cases, these include trust-building and social or collective learning. For climate governance research that is interested in change in large developing countries, a comprehensive conceptualization that includes the different elements of the social construction of climate change, the role of key individuals in informal communities or networks and an inductive approach to local context factors is required.

2.5 Conclusion: Research gaps

There are several research gaps of both theoretical and empirical nature with respect to the change of climate governance in large developing countries. Innovative governance concepts are required that are, firstly, sensitive to potentially differing contexts of developing countries. Here, the tensions between economic, development and climate protection goals are particularly relevant. Secondly, concepts have to be able to account for multi-level influences and informal, network-type connections of actors. As of now, a comprehensive, actor-centred conceptualization that fulfils both requirements and contributes to understanding and explaining the relation between knowledge, learning, practice and change in climate governance is lacking. Looking beyond the boundaries of a discipline is useful here. Integrating the findings of different research schools, traditions and disciplines helps designing better concepts, as long as careful

combination occurs.

Empirically, the extent of governance research on the national and sub-national levels in developing countries, including large developing countries such as India and South Africa, is far from sufficient: the incentives and motivations of actors appear to be a suitable point of departure to embark upon the analysis of determinants and mechanisms of climate governance in these countries. A growing body of constructivist literature in the field has produced some valuable findings. Yet its is not clear if changes in the domestic climate governance of large developing countries occurred, how far-reaching they are, which actors are behind them and what kinds of knowledge are involved. Scientific and technical knowledge are not sufficient to achieve a transition towards low-carbon development, as different studies have shown. Normative considerations, local forms or contents of knowledge and trust seem to be relevant as well as certain key individuals or pioneers embedded in a network or community. Research that draws on these current empirical and theoretical developments,that advances it to a clear and comprehensive concept and tests it for large developing countries is lacking.

The research question of this study, *how different kinds of knowledge and learning influence the change in the domestic climate governance of large developing countries* targets these different research gaps. Constructivist knowledge-based approaches with a governance lens present the most suitable way to tackle the problem. But the integration of the findings of network-based research and the environmental policy change literature is useful. The next chapters develop such a theoretical approach by first introducing Adler's approach of cognitive evolution and communities of practice and, second, by advancing it to my concept of climate knowledge system which takes the findings of the literature more closely into account.

3. Theorizing knowledge, practice and change in climate governance

3.1 Meta-theoretical foundations: pragmatic constructivism

Ontological and epistemological premises build the meta-theoretical foundations of a study. Generally, their clarification sets the research into a broader theoretical context, defines what kind of added value can be expected from the findings and how to interpret them. In this contribution, the discussion of the ontological and epistemological implications of pragmatic constructivism has three further, more specific purposes.

First, it is required to fully understand Adler's approach of communities of practice and cognitive evolution. Adler explicitly uses pragmatic constructivism as the starting point for his arguments and as a tool to position himself in the major meta-theoretical debates ongoing in IR. In a way, it it is one of the "selling points" of his approach. In a nutshell, these debates in IR revolve around the conflict lines of the primacy of ideational or material factors, of structure vs. agency and the epistemological problem of the nature of knowledge and truth, including the methodological approaches to knowledge generation.[2]

Second, understanding the basics of pragmatism and pragmatic constructivism helps to fully grasp my advancement of Adler's approach, including my differing use of pragmatic constructivism. I connect it more closely to methodological issues, as will become clear below.

Third, relating to the previous point, the use of pragmatism as an explicit meta-theoretical base supports the mixing of methods and helps to overcome the divide between proponents of either quantitative and qualitative methods. Philosophical pragmatism offers clear reasons and justifications for mixing methods, even though the debate about its concrete applications is ongoing in the mixed methods literature (see e.g. Biesta 2010, also Chapter 4).

I now summarize the basics of philosophical pragmatism, on which pragmatic constructivism rests, before turning to a discussion of Adler's and my own meta-theoretical foundations. I include a short discussion of the general use of pragmatic constructivism for climate governance analysis.

2 For an overview of the debate in IR, see for example Battistella 2003; Wight 2007; Friedrichs & Kratochwil 2009.

Philosophical pragmatism

Pragmatism as a philosophical tradition has existed for more than a century, but its renaissance and increasing application in political science only date back roughly a decade. All forms have their roots in the American philosophical pragmatism, drawing on the major proponents of the pragmatic philosophy: Charles S. Peirce, William James and John Dewey. Some basic principles unite all variants of contemporary pragmatism in political science: (a) a critique of Descartes' quest for certainty and the spectator theory of knowledge, (b) a critique of Kant's secpticism, (c) the move beyond a correspondence theory of truth and (d) the consequences of these principles for the conduct of research.

Pragmatists (a) reject Descartes idea of finding a new philosophical truth or certainty by casting doubt on all former beliefs (Garber 2003). By contrast, they say that "every proposition concerning truths is really in the last analysis hypothetical and provisional" {Dewey 1998: 8). Here, truth and therefore all beliefs and theories may be subject to change at a later point in time when new studies and/or new experiences arise. Given the fast, dynamic-evolutionary character of modern science in which even some natural scientific laws do not seem to last forever, this proposition holds an immediate appeal.

Descartes further assumes a strict duality of the mind and the material world outside of it – the "mind-world-scheme" (Biesta 2010:105f.). According to it, there is either an objective fixed base of knowledge, or subjective chaos and uncertainty. This spectator theory of knowledge holds that the knower is separate from the world and can observe it without engaging with it. For Dewey, knowledge results from an active problem-solving process in which the knower engages with the world, connecting him or her to reality, so that doubts can be overcome this way. Knowledge is, in other words, "concerned with the relations between actions and consequences" (Biesta 2010:108) and it therefore involves an inference process that always has some uncertainty to it (Biesta 2010). Classical pragmatists therefore oppose the spectator theory of knowledge.

While Descartes' starting point is the doubt of everything, he does not belong to the group of scepticists in philosophy, with its prominent member Immanuel Kant. Anti-scepticism (b) is a second feature most pragmatists share (Festenstein 2009). Skepticism assumes that "knowledge may not be possible because we may not be able to get outside of our own mind" (Biesta 2010:105). Skepticists therefore deny or at least doubt any claims about reality and truth based on (empirical) evidence. By contrast, pragmatists argue that doubt is necessary to start research or any inquiry, but

it is not possible to doubt everything at once. Thus, even though everything can be doubted as such, there has to be some reason for casting actual doubt on the issue at stake. An important point for current political science applications is that all classical pragmatists take a stronger empiricist view, connecting truth and knowledge claims to experiences and practices. Practices and action present an intermediary to overcome doubt and therefore help constitute new beliefs (see Dewey 1998; Pape 2004).

Pragmatists (c) move beyond a correspondence theory of truth. In correspondence theory, truth is what agrees with or corresponds to reality. According to James and Dewey, however, truth is connected to practice and experience, it is "what works" (James 1995 [1907]). Peirce is more cautious with relying on practices only, by saying that truth is what researchers or analysts accept at the end of an inquiry (Pape 2004:16): in other words, a scientific consensus about a specific problem such as climate change. This rejection of correspondence theory is explicitly taken up by current IR researchers like Friedrichs and Kratochwil, who state that ontological realism[3] and correspondence theory are untenable (Friedrichs & Kratochwil 2009: 703). Adler follows pragmatism's emphasis of practices. He sees practices not only as a suitable analytical unit for research, but also claims that they connect structure and agency. For him, they show a way out of the meta-theoretical impasse that IR is in (Adler 2008).

I agree with pragmatism's view that truth has no claim to eternity. It remains a "working" truth until other, better methods or different data – i.e. different knowledge – become available. I negate neither the subjective nor the objective, but accept that at times objective realities and at other times subjective interpretations prevail. A climate change-related example may clarify what I mean:

A farmer may experience changing rainfall patterns or droughts and therefore adjust planting times or fail to plant at all – before learning about climate change (objectivity prevails). A climate change denialist may ascribe the same events to contingency but recognizes they happen (subjectivity prevails, but intersubjectivity is there). A person who believes climate change is happening may ascribe these events to climate change even though science can perhaps not yet definitely attribute them to climate change (subjectivity - intersubjectivity). However, none of the three would deny that the farmer cannot plant his crop at the same time he/she has as all the years before.

This example shows that reality is not clear-cut. Lifting the perhaps overly strong restrictions of an *a priori* ontology and epistemology could therefore be useful.

3 Ontological realism assumes that the world exists independently from the observer and is constituted by facts.

Knowledge in this respect becomes both an access to "working truths" and a tool to interpret and manage social reality - potentially in parallel to practices. As we will see later, knowledge has multiple functions containing both structure and agency elements (see chapter 3.3).

A final feature characterizing both classical pragmatism and modern pragmatic political science approaches concerns (d) the consequences of the above for conducting research: in pragmatic studies, no explanation is rejected a priori for ontological or epistemological reasons. The primacy of practice (Festenstein 2009:148) and the production of practically relevant knowledge make overly abstract ontological principles obsolete. Theoretical knowledge should be grounded in experiences or "real-life" actions taken by actors. There is no fixed method with which a temporary, problem-solving truth can be achieved. For the political scientist, this removes the methodological restrictions of quantitative or qualitative methods, allowing for the most suitable method or method combination to explain a given problem or question.

Contemporary applications in political science: Adler and beyond

Contemporary pragmatic approaches in IR and beyond prioritize and extend different aspects of these principles, including Adler (Adler 2008; Adler & Pouliot 2009; Hellmann 2009; Haas & Haas 2009; Friedrichs & Kratochwil 2009; Katzenstein & Sil 2008; Moravcsik 2003). With the exception of Gunther Hellmann (2009), all pragmatic political scientists concur that pragmatism is not a complete, substantial theory usable in political science by itself. I agree with them because pragmatism simply holds more convincing arguments about the research process than about the concrete interplay of norms, identities, institutions or external influences of other agents, for instance.

Adler draws on pragmatism to move practices into the centre of his research. They play a more central role than in earlier articles that take a stronger communitarian perspective, leading Adler and Vincent Pouliot to call for a practice turn in IR (Adler & Pouliot 2009). They suggest a re-focusing of IR research on practices because most theories even of opposing traditions address them in some way, making practices a cross-cutting, connecting "gluon"(Adler & Pouliot 2009). Re-focussing on practices for them means also re-focussing on what is actually being done, instead of getting lost in theoretical debates on ontology and epistemology. In his work on communities of practice and cognitive evolution, Adler connects elements of rational choice and constructivism through practices, while keeping to his overall constructivist view of the world (see Chapter 3.2). By doing that, he indicates a way to connect agency and structure in one approach. Structure is provided through

communities of practice and agency through what they practice (see below). However, Adler does not go deeper into the methodological implications of pragmatism to his work.

With respect to epistemological-methodological implications, other political science approaches range from analytical eclecticism (Katzenstein & Sil 2008; Sil 2009), via more far-reaching methodological propositions such as abduction, used both in IR (Friedrichs & Kratochwil 2009) and grounded theory (Strübing 2008), to proponents of theory synthesis (Moravcsik 2003). Without going into further details of these approaches, I follow analytical eclecticism (AE) as proposed by Peter Katzenstein and Rudra Sil (2008; 2009) because it is the most convincing and the most suitable approach for this study.

AE is arguably the easiest approach to accept for researchers who are more inclined to deductive or mixed methods. Katzenstein and Sil reject standardized methods for a verification or falsification of truth claims which – given pragmatism's understanding of truth – cannot serve as a definite, lasting fact in the first place. Instead, they emphasize the advantages of combining different methods, concepts, logical principles and possibly research traditions for explaining complex phenomena in a problem-driven way (Katzenstein & Sil 2008; Sil 2009):

> "AE takes on the messiness of a given "real world" problem in all its complexity, seeking to take advantage of usable elements [..] drawn from separate research traditions but integrated in novel, recombinant analytic formulations designed to be responsive to particular problems" (Sil 2009:649).

AE downplays meta-theoretical concerns somewhat by focusing on a given problem and a context-dependent understanding of the relations between agency, structure and identity (Sil 2009:651). Moreover, AE is about engaging with different research traditions and non-scholarly knowledge. It is not about theory synthesis or about denying a research tradition its right to existence.

The careful, problem-driven combination of different elements proposed in AE appears suitable when its is clear from the outset that a single theory or single method would be insufficient to grasp the scope of the research problem, or to provide an answer to the research question. To avoid an "anything goes" or "hotchpoch" (Wolf 2010) approach which might come to mind, I propose an application of 10 steps identified by Collins et al. (2006) in the mixed methods literature. This should increase methodological rigor (see Chapter 4).

The use of pragmatism in modern political science and of AE in particular, has a lot of potential to better explain complex phenomena such as multi-level climate governance that may otherwise be only partially understood. But it has to be applied

very carefully in terms of both theory and methodology, possibly requiring more justifications for each step than in conventional studies. I now go on to give more specific reasons why starting out from pragmatic constructivism is useful for climate governance analyses in general and for this study in particular.

In this study, pragmatic constructivism means a combination of constructivism's general principles and research interests with analytical eclecticism as a from of pragmatism. The core of constructivism builds the understanding that the world is socially constructed and intersubjective (neither objectively always "there", nor only subjectively existent through interpretation). Therefore, accounts of reality are always influenced by social or ideational factors such as identities, socialization, norms, rules or (constructed) material factors such as money. Structure and agency co-constitute each other.

The notion "strategic social construction", introduced by norm research, presumes that "actors strategize rationally to reconfigure preferences, identities or social context" (Finnemore & Sikkink 1998:888). Here, Martha Finnemore and Kathryn Sikkink take a step towards pragmatic constructivism by combining the formerly opposing research traditions of rational choice and constructivist norm research under a still constructivist umbrella.

In his approach of cognitive evolution and communities of practice, Emanuel Adler explicitly uses strategic social construction as a base for his version of pragmatic constructivism (see also Chapter 4.1). For him, the social construction of rationality takes place via the means of practice, therefore "bridging the agential and structural elements of the constructed rationality" (Adler 2008:221).

I understand pragmatic constructivism to have two sides that complement each other. On the one hand, it roots in constructivism's understanding that norms, ideas and knowledge matter. On the other hand, it draws on pragmatism's understanding of truth, more specifically, analytical eclecticism's view that elements of theories, research traditions or methods may be combined. I do not completely disregard questions of ontology and epistemology, therefore, but I argue that as long as sufficient reasoning for combinations particularly of different methods are given, the benefits to research results will be greater than alleged dangers inherent to mixing. However, it does make sense to keep the combination of theoretical elements limited. A combination of more than two theories or elements of research traditions does not seem wise. Also, if theoretical elements are combined and not only methods, it may prove useful to keep one theoretical base dominant. In this respect, constructivism remains dominant in this study and pragmatism comes into play in terms of a combination of methods and

my understanding of truth and knowledge generation. In my application of AE, the integration of economic incentives as an element of the research tradition "rational choice" completes my constructivist concept of knowledge systems (see Chapter 4.2). I do agree with pragmatism's argument for giving practice and experience more value. But given the overall state of climate governance in my country sample (see Chapters 5 and 6), I do not put as much emphasis on practices as Emanuel Adler does.

Taking such a pragmatic-constructivist position is useful for research on climate governance in general because the uncertainty and dynamics of climate change and its governance, therefore, correspond well to the perspective of all truth being provisional. In light of the current developments, new knowledge and diverse actions (and inaction) in climate governance, the acknowledgement of the limits of a particular social scientific study for producing lasting knowledge and truth increases its credibility and quality. Moreover, both the multi-level, multi-actor setting of climate governance and its cross-cutting nature in terms of governance fields raise the probability that more than one method – and potentially more than one theoretical path – may be necessary to grasp even partial aspects of it.

For this study, the concrete advantages of pragmatic constructivism are two-fold: Firstly, it allows for a theoretical advancement that includes the test of the independent variable "economic incentives" within a constructivist concept, which, in a strict constructivist, post-positivist approach would have to be excluded (see Chapter 3.3). Secondly, it enables the use of quantitative and qualitative methods for significance enhancement – this is the mixing rationale of the mixed methods design of this study (see Chapter 4). The direct measurement or observation of central parts of my concept "climate knowledge system" – particularly knowledge and cognitive evolution – is hardly possible. It is therefore imperative to diversify methodology and reach an empirical approximation to the core of my theoretical argument via as many suitable ways as possible. To give a coherent presentation of my theoretical concept, I indicate the correspondence and reasons for my choice of combinations in line with pragmatic constructivism and analytical eclecticism in particular, in Chapter 4.

In sum, pragmatic constructivism and AE build a suitable theoretical-philosophical foundation for achieving the goals set in this study, with direct positive impacts on the mixed methods design. The discussion of the ontological and epistemological premises of pragmatism and pragmatic constructivism provided the background to Adler's approach of cognitive evolution and communities of practice, which we now turn to.

3.2 Adler's approach of cognitive evolution and communities of practice

3.2.1 Introduction

In this chapter, I explain and criticize Emmanuel Adler's approach of cognitive evolution and communities of practice, which is the starting point for the development of my concept climate knowledge systems (Chapter 3.3).

In essence, the approach of communities of practice and their cognitive evolution give a theoretical account of the process of collective learning and its role in bringing about political change. Developed by Adler as a communitarian approach to IR over a period of nearly thirty years, its most current form argues that communities of practice function as carriers of social structures (Adler 2008: 196). In terms of ontology and epistemology, Adler has recently moved from communitarian-constructivism to pragmatic constructivism, as I explained in the previous section.

Generally, Adler uses a lot of different terms, concepts and sometimes jargon, which does not make his arguments easily comprehensible. It may be one of the reasons why the cognitive evolution approach has hardly been taken up by other researchers, in contrast to his concrete example of a community of practice in international security policy (Adler 2008). Additionally, it is not quite clear whether cognitive evolution and communities of practice fully qualify as a theory or not, even though Adler himself argues that they do. I discuss this in the following sections. Before introducing communities of practice and cognitive evolution, I clarify what Adler means by the central terms "Practice" and "Knowledge".

Practices are first of all the actions or measures actors actually undertake. From a broader perspective, they also constitute "socially meaningful performances which are embodied in knowledge, discourse and material objects." As performances, practices do not exist in a material way outside of their execution. Practices are both action and process and they are both material and ideational because an action or use of a technology always requires some knowledge or idea of what to do as well as actual material things to act on or with. Like other authors in IR (see Neumann 2009), Adler makes a connection between practice, knowledge and discourse. In contrast to Iver Neumann (2009), however, he does not focus explicitly on narratives or stories as mediators between discourses and practice. In the concept of communities of practice, knowledge, discourse and practice can spread together (Adler 2008:198f.). Discourses and language merely present one side of communities of practice.

In line with constructivism, k*nowledge* is "more than the individual

information that people carry in their heads" (Adler 2005:4). It also entails an intersubjective dimension, a sort of underlying background knowledge that forms the "context of expectations, dispositions and language that gives meaning to material reality and consequently helps explain the constitutive and causal mechanisms that participate in the construction of social reality " (Adler 2005: 4). In other words, background knowledge captures the underlying conscious and sub-conscious foundations for decisions and the shared consensual knowledge in society that actors rely on. In a recent article, Adler draws on Bourdieu's notion of habitus to explain background knowledge: on the one hand background knowledge can only be understood as embedded in practice, on the other hand it represents the subjective interpretations of shared norms and practices (Adler 2008: 202). In this view, background knowledge has a strong element of sub-conscious, every-day routine to it. This moves Adler's understanding closer to the "logic of practicality" (Pouliot 2008) and to practice oriented post-structuralists.[4]

I argue for a slightly more contingent understanding of background knowledge which has a stronger bond to a particular time and context. While sub-conscious routines certainly represent an important aspect of everyday life as well as of everyday implementation of governance action, I believe that it is also the context of the situation and therefore, a minimum of contingency, that makes change possible. As Adler says himself, background knowledge provides the context in which rational action takes place (Adler 2008: 202), both for members of communities of practice and those who join them through a process of learning at a later stage. Rationality in this respect results from a combined inference of an actor's background knowledge and a context-bound analysis of the concrete situation to be dealt with.

Moreover, in an article with Steven Bernstein, Adler differentiates between four types of knowledge: scientific, technological, normative and ideological knowledge (Adler & Bernstein 2005). This sets him apart from other approaches to knowledge, as discussed in Chapter 2, such as tacit knowledge (Howells 1996), traditional or indigenous knowledge (Briggs & Sharp 2004; Riedlinger & Berkes 2001), usable knowledge (Haas 2004) and informal knowledge by non-scientific experts (Karvonen & Brand 2009). In climate policy and governance research, the role of traditional, indigenous or local knowledge[5] has been stressed, particularly for multi-level processes, equity reasons and with respect to developing adaptation measures to the

4 For a discussion and differentiation of Bourdieu/post-structuralist and pragmatic-contingency types of practice-oriented theories, see Büger & Gadinger 2008.

5 The debate about what traditional or inidgenous knowledge about climate change really is and what relevance it truly has for climate governance is ongoing, especially in anthropological literature. See for example Johnson 2009.

impact of climate change. The primacy of scientific, more top-down knowledge that does not take local observations into account therefore cannot be simply assumed. Even though Adler's categories technological, normative and ideological knowledge could be applicable or inherent to traditional knowledge as well, it makes more sense to understand them as rather top-down dimensions of knowledge.

A clarification of Adler's knowledge dimensions and a potential adaptation for climate governance analysis is necessary (see Chapter 3.3). In the following sections, I explain further central terms in Adler's approach: learning, power, identity, interests, boundaries and key individuals.

3.2.2 Communities of practice

The concept of communities of practice was first introduced by Jean Lave and Etienne Wenger in 1991 (Lave & Wenger 1991). Since then it has received a lot of scholarly attention in management and organizational research (for an overview see Borzillo, Aznar & Schmitt 2011). It has also been put into practice in many businesses and organizations, including the World Bank (Adler 2008). Adler draws mostly on Wenger's basic conceptualization, but additionally develops his own understanding of communities of practice in the transnational political sphere.

In short, communities of practice are informal learning networks that additionally build relations of trust and an identity or "we feeling" among group members. Apart from the learning of new ideas, knowledge and practice, communities of practice influence and change the dominant political mind-set. They come about informally over time through members' own actions. In some companies, management may install them formally with incentives for employees with the goal of increasing creativity and knowledge exchanges (Borzillo, Aznar & Schmitt 2011), but this is not the type Adler has in mind. He is interested in the self-organizing, informal communities of practice in the political realm. In terms of the major debates of IR explained above, Adler argues that communities of practice act as central mediators between agents (individuals, the state and their actions) and social structures and systems. They provide the epistemic and normative ground for action, but their members are also real people that affect political, social and economic outcomes through their actions (Adler 2008: 199). The concept is therefore situated "where structure and agency overlap and where knowledge, power and community intersect" (Adler 2008: 199). This advances the constructivist project.

Communities of practice fulfil several functions. Drawing on Wenger (1998) and Snyder (1997), Adler defines communities of practice as a group of "people who

are informally as well as contextually bound by a shared interest in learning and applying a common practice“ (Adler 2008: 199, after Snyder 1997). This community more specifically consists of “a *domain of knowledge* that constitutes like-mindedness, a *community of people* that 'creates the social fabric of learning' and a *shared practice* that embodies 'the knowledge the community develops, shares and maintains” (Adler 2008: 199 after Wenger et al. 2002: 28f.). A domain of knowledge could be a policy field, a business sector, or a seemingly general goal such as climate protection. It lets members of a community of practice develop a “sense of joint enterprise” when they engage with each other. The resulting community develops, negotiates and shares its own knowledge, practices and language. The community's capabilities (the knowledge and practices) are thus based on shared repertoires of communal resources (Adler 2005). Wenger (1998) specifies them as routines, sensibilities, styles or shared vocabulary developed over time. While these shared repertoires are an aspect in Adler's concept that remains somewhat fuzzy, it nevertheless indicates the central function Adler ascribes to discourse and language, alongside knowledge and practices.

An informal network character is central to the concept: Communities of practice are flexible in membership. Members do not have to have the same institutional affiliation, but can come from different levels of society and cross-cut organizational and geographical boundaries. This presents an advantage over Haas’ (1992) epistemic community concept. The same member of a community of practice may act on domestic as well as transnational or international levels. Thus, the concept is particularly suitable for multi-level governance fields such as climate change. While Adler does not raise this point explicitly, it can be safely inferred that members do not have to be aware that they constitute a community of practice – at least, not under this label. Awareness of being a group of like-minded people may exist, as members are bound by a sense of joint enterprise, but they do not have to know all other members of the community personally.

Since communities of practice can be composed of public and private actors, their development of new practices and of governance measures presents a flexible type of governance that works rather with the state than completely independent of it. If a member of an important community of practice works for the Department of Environment, for instance, the connection between state and non-state actors automatically exists, as long as the community is otherwise diverse in membership. This point is a clear advantage of the concept over the advocacy coalition framework that looks at policy sub-systems only and over more narrow network conceptualizations.

Mutual engagement of members implies interaction with each other, but it does not mean that members always have to agree. The sense of joint enterprise can be understood as a sort of "we feeling", or generally "being on the same page" with somebody concerning a specific issue area – in this study concerning climate change issues. Even though Adler does not use the term 'trust' explicitly, members' relationships in communities of practice are characterized by it. Trust and identity formation differentiate communities of practice from other types of networks.

Despite these characteristics, the picture both Wenger and Adler draw remains somewhat unclear unless some further aspects are pointed out and discussed. In the basic version developed by Wenger, communities of practice exist in all parts of society and every individual belongs to a number of them – inside and outside of the political arena. The informality and dynamics conceptually ascribed to communities of practice immediately lets the question of *boundaries* arise. According to Adler, boundaries form around practices and members' knowledge, identity and discourse associated with these practices (Adler 2008: 200). Since it is possible that several communities of practice compete and/or even overlap while shaping governance processes and social structures, empirical precision may be hard to achieve here.

Moreover, Adler contends that communities of practice support "the learning of new identities via the negotiation and reification of meanings" (Adler 2008: 201), when *identity* means the sense of joint enterprise in a "we". Without further explanation, such negotiations and reifications of meanings, so, the practices ascribed to and executed in reality, remain somewhat abstract. Adler gives the example of the environmentalist community whose diverse members engage with each other in developing norms and ideas of how to protect the environment, align behind this shared idea and imagine and believe in a "we" of this common purpose (Adler 2005:23ff.). In this way, a sense of joint enterprise emerges in spite of their different professional background (scientists, anti-globalization activists etc). Over the years, the environmentalist community therefore developed a transnational identity (Adler 2005). For Adler, communities of practice can consist of both small or larger groups of people, or even of whole states, for example in his case study of the North Atlantic Treaty Organization as a security community (see Adler 2008).

In constructivism, identities are central to the formation of interests. *Interests*, especially group interests, develop within communities of practice and become political when communities of practice expand and when conflicts in political campaigns or collective action uncover their real content: "interests arise when people have to bargain about meanings, justify their aptness to particular situations and

create narratives through which they can control their social environment" (Adler 2005:27). While the arguments that the real content of interests is clearly named in negotiations and that group interests emerge within communities of practice make sense, Adler transforms meanings and the language used to describe interests to an interest in themselves. Here, he is over-stressing the constructivist argument because economic interests and incentives, employment or housing concerns, for instance, may be come clearly voiced in such a process, but they also exist independent of the ideas or narratives attached to them: a company's interest in investing in energy efficiency to keep costs down, for example, exists independent of a climate change, energy security or competitiveness narrative attached to it. In this particular point, Sabatier's general criticism of constructivist approaches that they fail to connect ideas to socio-economic conditions (Sabatier 1999) applies.

In addition, Adler argues that the addition of key policy-makers to communities of practice helps to shape national interest(s) (Adler 2005:26). Here, the question 'who's in and who's out' of theses communities of practice comes to mind, whether it matters who is a member and whether there could be an internal structure to communities of practice despite their informal, flexible character. For Adler, communities of practice consist of three concentric circles. The inner circle contains their core, where new knowledge and practices evolve. In the middle circle are members who primarily help the diffusion of the background knowledge or practice through their expertise or normative commitment. The outer circle is made up of experts and practitioners who promote the implementation of these practices beyond their original function and geographical boundaries (Adler 2005: 24f.).

Contrary to this general outset, management research has further refined Wenger's (1998, 2002) core-periphery idea and identified criteria for moving from the core to the periphery (Borzillo, Aznar & Schmitt 2011). In Adler's concept, the core-periphery perspective helps to generally understand the structure of communities of practice, but the question of boundary is not totally solved. While he defines the boundary of communities of practices via their knowledge, identity and practice, this does not mean that empirical fuzziness is avoided. Moreover, he has not solved the problem of overlapping communities of practice apart from stating that individuals belong to a number of them – what role does multi-membership play for the formation of background knowledge and identity? Does it lead to conflicting interests and if so, how is this solved?

An additional problem concerns the clarification as to which stage of identity formation is required, or how strong a "we feeling" has to be to qualify a network as a

community of practice. In terms of empirically measuring or testing the concept, there are additional problems. According to Adler, members of communities of practice do not necessarily all have to know each other personally – or even be aware that they act as a community of practice. It is therefore unclear, how a community of practice can be identified with *all* its members. This would be required for a complete formal network analysis. Adler uses many terms and elements which are not clear-cut and hard to measure directly, such as identity or even knowledge. The dynamics inherent to communities of practice, both in terms of membership and in their activities or influence, have to be addressed with care when dealing with empirical data. Otherwise, the explanatory power gets lost to too much flexibility.

Adler acknowledges the empirical difficulties of communitarian approaches in IR, such as the vagueness in the nature and extent of the communities, indistinct boundaries due to overlapping membership and potential relativism because values and truth are limited to the community under study. But he argues that his concept of communities of practice meets most of the criticisms and problems (Adler 2005:5). I would only partly agree here. In any case, more clear steps and criteria for an empirical identification of communities of practice and their influence is required, but without jeopardizing the conceptual advantage of its flexibility and cross-cutting nature, which makes it particularly apt for climate governance research.

In comparison to other coalition- and network-type approaches (see Chapter 2), some aspects of communities of practice overlap, some differ. Adler suggests that communities of practice serve as an umbrella concept, under which epistemic communities, transnational advocacy networks or discourse coalitions can fit as variations or sub-sets. A differentiation remains valuable if the practices carrying the community are not in the centre of the research (Adler 2005, 2008).

I agree with Adler here, but a line between communities of practice and networks still exists, as we have already seen in Chapter 2.3. Networks usually remain within the same institutional affiliation(s) and/or do not develop an identity. The social communication and interaction that make out the sense of joint enterprise and, in the end, lead to a collective identity are a core feature of communities of practice only. Network analysis concentrates on the identification of actual individuals, their relations to each other and their respective position of influence within the network. Analyses drawing on communities of practice and cognitive evolution are rather interested in the influence on overall processes of change in governance or policy.

Similar to the concepts of adaptive networks and shadow networks, “key individuals” are relevant for communities of practice and cognitive evolution: Power

and key individuals present facilitating factors for the spread and institutionalization of background knowledge within the process of cognitive evolution, as will become clear in the next section.

3.2.3 Cognitive evolution

Cognitive evolution is defined as the process of collective learning that takes place both within communities of practice and through their actions in society. It captures how communities of practice influence change processes or "how communities of practice get established, how their background knowledge diffuses and becomes institutionalized, how their members expectations and dispositions become preferentially selected and how social structure spreads" (Adler 2008:202). Cognitive evolution explains how ideas and knowledge become practices and why those ones and not others. Collective learning presents the key here. The collective learning process – initiated in and through communities of practice – changes background knowledge at the macro-level as well as the general set of conceptual categories people use to give meaning to reality. This, in turn, changes expectations and dispositions of individual actors at the micro-level and finally, the strategies and activities of individual actors (Adler 2008). Thus, change has a direct effect on individual actors through the alteration of the contours within which an actor takes decisions and anchors his rationality.

For climate governance, this perspective implies that cognitive evolution and its new background knowledge embed global climate governance and shape domestic climate governance simultaneously. An international negotiator can be member of a domestic or transnational community of practice himself, for instance, or be affected by domestic cognitive evolution that shapes the position pursued in the international negotiations.

Learning as collective learning in cognitive evolution means first of all a social process. It involves more than what Popper called "the bucket theory of science", where new information is simply added into an originally empty bucket. In cognitive evolution, collective learning refers to the development and adoption of new interpretations of reality and background knowledge via communities of practice. Background knowledge begins as critical knowledge generated by communities of practice. As new members of the community adopt the new knowledge and practices, they learn. The collaborative development and sharing of knowledge by multiple actors are important for both individual and collective social learning (Armitage 2008; Nilsson & swartling 2009). Adler's definition of learning is similar to triple-loop

learning or third-order change (Pahl-Wostl 2009; Hall 1993), targeting the transformation of underlying intersubjective structures (see Chapter 2).

From its conceptual outset, triple-loop learning involves feedback-loops and reflexivity (see Chapter 2). This is both an advantage over and a difference to cognitive evolution. In her conceptualization of communities of practice and triple-loop learning, Pahl-Wostl does not sufficiently clarify how exactly the informal networks of the learning cycle react to feedback or the outcomes of their activities, but reflexivity is part of it. In cognitive evolution, only new understandings and practices which are added to collective experience and therefore to a sort of collective memory, are irreversible. But Adler doesn't make the next step as to what this actually implies for cognitive evolution processes seen over a longer time span. It is not clear to what exact extent communities of practice are reflexive, if and where feedback loops run and whether background knowledge drives practice, vice versa, or both ways.

Cognitive evolution involves the phases innovation, selection, diffusion and institutionalization of new expectations, background knowledge, values and practices (Adler 2005). In the innovation phase, communities of practice develop new ideas, knowledge and practices. Through a political process in which different communities of practice (with different, sometimes opposing ideas) and other actors engage with each other, the new background knowledge is selected. Since Adler targets IR, the diffusion and institutionalization of new background knowledge means a diffusion to other states, so that one society learns from another (Adler 2005: 77).

The expansion of communities of practice supports cognitive evolution processes. According to Adler, primarily the selection and institutionalization of background knowledge are facilitated by meaning investment – the fusion of identity and interests (based on meanings) with authority and "naturalness of the kind that may only come with practice" (Adler 2008: 203). He understands meaning investment as a kind of macro mechanism that decides which new practices establish themselves in the end.

Here, Adler over-complicates his argument by using unclear, laborious formulations. He tries to describe how interests and identities merge with new ideas and how they then spread by using it as an actual governance mechanism or new political practice, once power is added. However, even re-formulated this way, the addition of several ambiguous terms and a tendency to over-emphasize discourse and language makes its potential empirical test and support into a challenge. For explaining change in climate governance, "meaning investment" underestimates the factor knowledge.

Adler lists several factors that support the expansion of communities of practice and cognitive evolution (Adler 2008: 203f.; Adler 2005):

- Cognitive authority (Antoniades 2003: 29) – the power to impose particular worldviews and discourses and make a particular practice seem more legitimate than others.
- Domestic coalitions and government networks accept new practices – this heightens the probability of their institutionalization. The addition of key policy-makers to communities of practice increases their chance of success in inducing lasting change.
- Communities of practice cross of a cognitive threshold or tipping point – this involves more than the mere number of members. The construction of what the new knowledge or practice is as well as the success of the practice matter for reaching this tipping point. Since individual expectations are mutually dependent on each others' expectation, it is possible that a change of a small group of key people leads to an overall change of background knowledge and, therefore, to structural change.
- Background knowledge becomes part of routines in organizations and bureaucracies. This increases legitimacy and supports the spread of background knowledge and practices.
- Timing and rate at which new meanings get adopted and diffused with additional resources.

These factors become more clear when putting them in context with Adler's understanding of key individuals and power. These are elements that are central to other approaches seeking to explain political change in environmental governance as well (see Chapter 2).

With respect to *key individuals*, Adler concedes that the addition of key policy-makers to a community of practice can turn the community's knowledge and practices into a national interest, which is in line with his above argument on government networks as facilitators for cognitive evolution. In addition to that, he only claims in a general fashion that “a small number of key individuals may become self-reinforcing and lead to changes of background knowledge and practices and thus to structural change” (Adler 2008: 203). Compared to other approaches in the literature, key individuals remain remarkably under-conceptualized in Adler's approach. In shadow networks, adaptive networks and adaptive governance (Olsson et al 2006; Noteboom 2006; Folke et al. 2005), they play a more prominent role. In knowledge-centred

concepts, individual actors and small actor groups come into focus such as change agents (Kristof 2010), knowledge brokers or knowledge entrepreneurs (Litfin 1994; Ascher et al. 2010). Here, key individuals are the central analytical unit.

To suit cognitive evolution and communities of practice more to an analysis of climate governance, especially regarding the knowledge focus of this study, it is essential to advance the understanding of what key individuals are and do in communities of practice and what their role is in change processes. I come back to this in my own conceptualization in the next section.

Power comes up at several points within the approach of cognitive evolution and communities of practice. In most of his work on communities of practice, Adler does not make clear what definition of power he uses. He links power to cognitive authority and meaning investment. He even argues that members of communities of practice exert one of the highest forms of power by negotiating meanings and developing practices based on them (Adler 2008:201). This fits into the dimension productive or discursive power in the power definition of Michael Barnett and Raymon Duvall (Barnett & Duvall 2005) that Adler draws on more explicitly in an article on global governance (Adler & Bernstein 2005). Adler does not make explicit use of these dimensions and does not connect them with the different elements of cognitive evolution and communities of practice. However, this would strongly benefit the approach. This is what I do in my concept of climate knowledge systems, where I also discuss the definition of power in more detail (see next section).

A final aspect that is relevant for understanding cognitive evolution concerns the catalytic potential of crises. According to Adler, these may serve as a "cognitive punch" (Adler 2005: 75), making clear to governance actors that both an institutional and behavioural change is necessary to adequately deal with a situation. A crisis is "an environmental incentive to hasten the process of re-evaluation and change from one set of collective understandings or 'paradigm' to another" (id.). Whether climate change qualifies as a crisis is questionable, at least at the current point of climatological research and uncertainty. Some events such as the publication of the Fourth Assessment report of the IPCC in 2007 may have had a brief air of crisis surrounding it. During the course of this study, it will become clear which factors contribute to change in climate governance.

Finally, the question whether cognitive evolution and communities of practice present a complete theory in the strict sense derives partly from the fuzziness of many terms and concepts Adler uses, such as "identity" or "idea" and partly from his failure to provide concrete sets of hypotheses that can be tested and potentially falsified. I

understand it as an approach, but not a theory.

A political science theory systematically connects different concepts, empirical propositions, assumptions and hypotheses in a way that is logically consistent, has sufficient explanatory power on a wide variety of cases and enables propositions about future developments (see Schmidt 1995). Adler's approach does not fulfil these criteria. He does connect the key elements communities of practice, learning, knowledge, practice, ideas, identity and power to explain change, but does not provide clear hypotheses and enough empirical evidence on a variety of cases. Cognitive evolution and communities of practice can count rather as a set of theoretical arguments, a meta-theoretical position and several concepts (e.g. communities of practice) bound together in a communitarian approach – but without clearly ascribing one or several methods for empirical work – or a framework, particularly if referring to Adler's concrete study of security communities. In the literature, the terms approach, framework and theory are often used interchangeably and Adler also uses both 'approach' and 'theory'. I stick to the term 'approach' throughout the study when referring to cognitive evolution and communities of practice and provide a conceptual advancement based on Adler's approach.

Summing up, the advantages of Adler's approach are its flexible, informal conceptualization of actor networks composed of public and private actors, experts and civil society that takes trust and identity building into account. His approach is therefore particularly suitable for multi-level governance and it connects structure and agency, thus providing a bridge between approaches advocating for a primacy of either, especially in IR debates. In addition, the approach can be rather easily complemented by concepts from environmental governance and networks research, thereby improving it (see next section). Finally, Adler provides a valuable combined perspective of the constructivist elements knowledge, ideas, discourse as well as learning practices and their role in bringing about political change.

Problems and areas for improvement in his approach are, first of all, the fuzziness of several terms and concepts of the theory which makes them hard to measure empirically, such as “identity” or “idea”. Reflexivity and feedback loops are not included. It is not clear whether knowledge influences practice, the other way around, or both ways. Adler fails to connect his theory to the debate on learning in other disciplines. Moreover, the question of overlapping membership in different communities of practice and its relevance for changing political strategies and outcomes is not sufficiently addressed. Finally, the boundaries of communities of practice remain fuzzy. Adler defines them through the knowledge, identity and

practices that communities of practice share. But for fruitful empirical application, further clarification seems useful. The next section introduces the concept of climate knowledge systems that aims to meet these challenges.

3.3 Theoretical advancement: Climate knowledge systems

3.3.1 Introduction

The concept of climate knowledge system seeks to both extend and focus the approach of cognitive evolution and communities of practice for climate governance analysis. It does not present a theory in itself, but is a conceptual advancement based on the theoretical propositions outlined above. This section shows how a more pragmatic, knowledge- but less practice-oriented perspective helps to clarify theory and allows for fruitful empirical application in climate governance. It demonstrates the relevance of a comprehensive but flexible concept for an understanding of what global climate governance builds on, how domestic change can happen and, to some extent, who governs in what way.

While I keep most of Adler's definitions and ideas, I put more emphasis on knowledge than on discourse and practices because of the overall research interest of this study – the role of knowledge, actor groups and collective learning in changing climate governance processes. Moreover, there are some reasons deriving from the current state of climate governance that underline why a focus on knowledge is useful:

Decision-making and governance processes in climate governance are characterized by a higher degree of uncertainty than other governance fields. This is due to the modelling uncertainties in the down-scaling of global climate models to predict local climate change impacts and to a variety of technological and political uncertainties in both mitigation and adaptation processes. My concept seeks to explain how political change comes about in spite of this uncertainty, so, in a way, how it is overcome. Since climate governance mechanisms are only currently being developed or have only recently been put into place in many large developing countries (see Chapter 2), it does not, however, seem useful to start looking for new routine, habitual practices yet like Adler proposes.

In addition, there is reason to believe that those actors who develop and put the climate governance mechanisms into place (e.g. scientists or bureaucrats) are different ones than those who will actually practice them (e.g. investors and users of renewable energy, or companies reporting their emissions and water use). It is possible that there

are different communities of practice at work here. Here, a more differentiated conceptualization of the types of communities of practice than Adler proposes is useful. In contrast to Adler, I understand communities of practice to be composed of rather small, potentially expanding groups of actors only, not also as states.

I follow Adler in his understanding that background knowledge begins as critical knowledge generated by communities of practice, which then expands (Adler 2005, p.21). However, I argue that the development and institutionalization of new practices (potentially building on first practices already in place) becomes more important later. In the current stage of climate governance in large developing countries, the development of new knowledge and ideas of how climate governance measures could be shaped and improved are likely to be more relevant in the short term. New practices are established and preliminary, "trial" actions are consolidated while continuously altering and improving them. In the climate knowledge system, this happens in a typical feedback loop.

The next section now explains in more detail what a knowledge system consists of and where similarities and differences to Adler's formulation exist.

3.3.2 Knowledge and collective learning in a dynamic system

The production, diffusion and internalization of new knowledge and its potential for changing climate governance through cognitive evolution build the core of the climate knowledge system. First, I discuss and set out my understanding of knowledge and its dimensions, before turning to the other elements of the system such as communities of practice and power.

In the climate knowledge system, knowledge includes both individual and background knowledge. Moreover, I draw on Adler and Bernstein's (2005) differentiation of scientific, technological, normative and ideological knowledge, but replace the category ideological knowledge with my own category pragmatic knowledge.

In climate governance, *scientific knowledge* means the models, projections and information climatologists and other scientists provide about climate change. It includes understandings that build scientific consensus at a given point in time – this may be what scientists believe to be true or, in other words, the "working truth" of pragmatism. *Technological knowledge* refers to the available tools, understanding of technology and options for mitigative and adaptive measures - the actual technical understanding how to do something. *Normative knowledge* is grounded in beliefs about what is good or bad for society. In the case of climate change, this would be an

understanding of which measures are "good" or "bad", e.g. that managing the global warming of the atmosphere is good and desirable. These designations for the climate change field are in line with Adler, even though he does not elaborate on his understandings in his publications.[6]

While the definitions of scientific and technological knowledge are rather straightforward, the content of normative knowledge needs some further explanation. It is the knowledge *about* norms (acknowledgement of their existence and understanding of their content), if a norm is in the ideal case accepted as a structuring rule by the overwhelming majority of the political, economic or social groups it targets. Norms can be social, legal, cultural and moral and they may be formally codified (for example in legal texts). They may also be informal, making no statement about binding force or compliance.[7] However, the concrete meaning of a norm enfolds in its use and enactment in a special context, including processes of contestation (Wiener 2009). These aspects form the dual quality of norms: structuring on the one hand and constructed by socio-culturally embedded practices on the other hand (Wiener 2007:63).

In my understanding, knowledge about norms also encompasses "what should be". Normative knowledge additionally comprises the subjective *interpretation of* these norms – the relation of what is good or bad for society to their individual enactment, or the connection between "what should be" and "what does this mean for my actions". This, in turn, guides concrete decision-making. Antje Wiener argues that individuals resort to background knowledge or their normative baggage, if the legitimate interpretation is not clear (Wiener 2009:6). Here, developing normative knowledge through collective learning in communities of practice may help. Moreover, the development and negotiation of normative knowledge could contribute to norm-building that leads to more formalized, codified norms in the end.

Adler's fourth dimension, i*deological knowledge* goes further than normative knowledge. It refers to a basic "green" or "non-green" ideology: a system of beliefs that structures understandings about the way humans and nature should live together, or about the primacy of the environment or the economy. I do not negate that ideologies and, therefore, ideological knowledge may have an influence on policy and governance processes in general. However, ideological knowledge is a more fuzzy term than normative knowledge and will be hard to dissect in the actual empirical research

6 I clarified the meaning of the four dimensions in an email exchange with Emanuel Adler in spring, 2009. He defined the meaning of the dimensions for climate change that I give here.

7 The discussion about the meaning of norms in IR and how they come about in norm-building processes is ongoing. For an overview see Jakobeit, Kappel & Mückenberger 2010; Krook & True 2010; Wiener 2009, 2007.

process, especially in trying to separate it from normative knowledge. Adler does not make clear how this should work either. Moreover, the necessarily dogmatic character of ideological knowledge calls both its development through negotiation, mutual engagement and learning within communities of practice and its translation into actual governance outcomes into question. This point becomes even more relevant when feedback-loops are possible. Hence, ideological knowledge is not part of the climate knowledge system. Instead, I include a different dimension in the concept: *pragmatic knowledge*.

Pragmatic knowledge is an assessment and understanding of what is actually possible and feasible in terms of governance, both politically and practically. It is defined by a form of bounded rationality that I call practical rationality. It is bounded not only because of incomplete information, uncertainty and complexity of the environment (Simon 1957; Dequech 2001), but also due to the influence of scientific, technological and normative knowledge.

Pragmatic knowledge connects the developments and doings within communities of practice to the political, economic and social context outside of them. It therefore meets positivists' criticism of constructivist approaches. For large developing countries, pragmatic knowledge primarily means an understanding of how to balance different goals under particular financial constraints and under conditions in which the state and the bureaucracy do not perform well. These goals are likely to be poverty reduction, economic growth and development on the one hand, and environmental protection and global responsibility for the protection of global public goods on the other hand. The goals may be perceived as antagonistic by some actors – pragmatic knowledge helps to overcome this view. Thus, pragmatic knowledge is the element of the concept that makes its application particularly suitable for developing country contexts.

While actors in industrialized countries may have pragmatic knowledge as well, for example about how to best satisfy their electorate, I argue that the content of pragmatic knowledge concerning climate change there is radically different, starting at a wholly different level. Developing countries, including large developing countries, struggle with catching up on development and are called to leap-frog towards a low-carbon society. By contrast, industrialized countries and their actors set out from a higher level of development, from a largely functioning bureaucracy (even though it may not always work well either) and a generally higher budget. Moreover, industrialized countries have both committed to emission reductions (even if the Kyoto Protocol is at jeopardy in the international negotiations) and many of them have long-

standing records of green parties and an electorate pushing for environmental governance. This makes the starting point, the content and exertion of pragmatic thinking there a totally different story than in developing countries, where pragmatic knowledge may be necessary to make ends meet on a largely different scale. Its concrete content in the Indian and South African context will become clear through empirical work.

Moreover, pragmatic knowledge and practical rationality allow for the integration of economic incentives and therefore, an element of rational choice into the knowledge system: economic incentives are one possible expression of pragmatic, co-beneficial knowledge.

Pragmatic knowledge can be both individual and intersubjective. I argue that pragmatic knowledge not only backs strategic social construction (see Finnemore/Sikkink 1998), it is the foundation of it: pragmatic knowledge is what makes strategic social construction possible in the first place. It has several functions beyond the characteristics explained above.

First, it presents a connection between individual and intersubjective knowledge. An individual actor puts an idea, piece of knowledge or a practice into perspective with background knowledge by pragmatically evaluating others' actions, expectations and interests as well as structural constraints such as the financial resources available. This entails a balancing act between individual, subjective information and interpretation and the overall prevailing background knowledge, especially if they are conflicting. Pragmatic knowledge may facilitate the learning process within communities of practice, therefore also connecting the individual and the intersubjective.

Second, pragmatic knowledge builds the bridge to existent or previous background knowledge that may still influence new members of communities of practice as well as the political arena outside communities of practice. This bridge supports change processes because the new background knowledge does not appear as radical, if no crisis or cognitive punch occurred. For example, previous background knowledge may have been that economic growth and industrialization have to be favoured under all circumstances, regardless of the environment. Actors with pragmatic knowledge in this respect could highlight branding or image advantages to companies or indicate green growth alternatives, instead of radically advancing “environment first” as the new background knowledge.

Third, pragmatic knowledge contributes to making knowledge actionable. Here, the communication and learning of each other's pragmatic knowledge is

important. Pragmatic knowledge could be an essential factor for the expansion of communities of practice into government and the institutionalization of cognitive evolution.

Finally, pragmatic knowledge presents a conceptual toehold for feedback-loops and reflexivity of communities of practice and the overall climate knowledge system. It entails the recognition of which practices work and which do not. This can happen both in a longer-term process or within the co-constitution of knowledge and practice within communities of practice.

The inclusion of practical rationality as an element of pragmatic knowledge implies that I add an element of another theoretical tradition (rationality and rational choice) to my concept of knowledge and climate knowledge systems. This is in line with my position of pragmatic constructivism in general and AE in particular. The mixing rationale and purpose here are theory improvement and an increase in explanatory power of the concept. I expect a better explanation of climate governance and a more coherent, encompassing answer to my research question. Norm research (Finnemore & Sikkink 1998; Cass 2007), collective action theory (Ostrom 2000) and contributions on the mitigative capacity of countries (Winkler et al 2007) have realized that a combination of rational calculation, material and ideational interests and factors jointly produce political outcomes. For collective learning theory, Adler already took a first step in this direction as well. My introduction of practical rationality is a more distinct step outside of the usual "one-way theorizing", towards the analysis of a research problem from different angles within the same concept.

Now that the knowledge dimensions and their functions are defined, a clearer definition of the central concept climate knowledge systems can be given. I define a *climate knowledge system* to include:

- Individual and background knowledge: scientific, technological, normative, pragmatic knowledge, including practical rationality and economic incentives as a possible expression of co-beneficial, pragmatic thinking.
- Different communities of practice that advance cognitive evolution. These split into a) the producers of knowledge (primarily scientists and epistemic communities, non-academic experts[8] and R&D staff of companies) and b) the users and carriers of this knowledge who support its diffusion as well.

  Communities of practice can be a mix of both types and may produce new ideas connected to this knowledge and attach them to potential practices.

  Communities of practice can have opposing ideas and differ in their knowledge

8 For example: experienced consultants, think tanks or civil society organisations that are well-established in the field.

and practices proposed.

- Critical key individuals within communities of practice who are active at the science-policy interface: These key individuals are considered important for advancing climate governance by the other members of a particular community of practice and/or by other stakeholders and actors. Key individuals distinguish themselves through a particularly strong vision or concrete idea, knowledge or their capacity to build trust and convince other actors outside the community of practice to join, or through a power position.[9]
- Power: primarily institutional and productive power, especially of communities of practice, and structural power (Barnett/Duvall 2005) of the whole knowledge system through the institutionalization of new background knowledge that translates into changing governance.
- Knowledge-related debate: This debate takes place within communities of practice and in the engagement of a community of practice with other actors and stakeholders, e.g. about the credibility and content of the IPCC AR4.
- Feedback-loops or reflexivity through double and triple-loop learning: This reflexive understanding of collective learning gives the system a dynamic character. Loop-learning and pragmatic knowledge are strongly connected.

With respect to power, a short discussion of my definition is necessary here. In the previous section, I showed that Adler draws on the power definition of Barnett and Duvall (2005) in an article on global governance, but without actually connecting it to his approach of communities of practice. I also follow Barnett and Duvall and show which dimensions is relevant at which particular point in the knowledge system.

For Barnett and Duvall, power is generally both resource and process-based, meaning that it incorporates both hard and soft power. This allows for a differentiated view on various forms and influences of power. Power is made up of the four dimensions compulsory, structural, institutional and discursive power (see Barnett/Duvall 2005). Compulsory power entails the direct control over others via material or symbolic resources. Institutional power refers to the indirect control through rules, processes and institutions. Structural power concerns the structures and constitutive relations (e.g. inter - and transnational) that define actors' self - understanding, social capacities and interests. This is also what Stephen Lukes means with his often-cited "third dimension" of power (Lukes 1975). Finally, productive

9 These characteristics correspond to the literature on key individuals in adaptive governance and shadow networks and similar to change agents (see Chapter 2). The concrete criteria for an individuals to qualify as a key individual are deliberately left open as they derive primarily from the perceptions of actors and stakeholder. This requires an inductive method.

power (also called discursive or ideological power) is “the constitution of all social subjects with various social powers through systems of knowledge and discursive practices of broad and general scope”(Barnett/Duvall 2005: 20).

Adler's cognitive authority (see previous section) fits primarily into the dimension productive power. The addition of key policy-makers and the expansion of communities of practice into governmental circles and the spread of their ideas, knowledge and practices into policies, strategies and other measures gives communities of practice particular institutional power. If different communities of practice with conflicting ideas or knowledge exist, or if other actors and stakeholders with opposing interests try to influence governance as well, institutional power becomes decisive. Productive or discursive power of communities of practice matters here as well. Through their engagement in the knowledge-related debate and its shaping, communities of practice exert productive power. The overall process of change through cognitive evolution can be associated with structural power. Here, the climate knowledge system exerts structural power through the institutionalization of new background knowledge, originally produced by communities of practice, that guides decisions and shapes climate governance practices.

The background knowledge produced by the communities of practice and spread through the climate knowledge system needs to pass the *tipping point* of cognitive evolution, or the cognitive threshold, in line with Adler. Adler does not qualify this tipping point in any more detail. I cannot give any quantitative or definite, measurable steps to be reached either because it makes more sense to produce empirical data first and proceed inductively here. Instead, I solve this in an analogous way to Finnemore and Sikkink in their conceptualization of the life cycle of norms (Finnemore & Sikkink 1998). The tipping point is reached when a critical mass of actors has accepted the new background knowledge that has come about through the climate knowledge system and acts according to this new knowledge. How many actors build a critical mass and what kind of actors are required is a question for a variety of empirical studies and may differ from case to case.

The systemic character of the climate knowledge system results from the make-up and functioning of communities of practice: primarily the orientation members of communities of practice receive and an inward-bound sense of joint enterprise. The production and institutionalization of new background knowledge extends the systemic influence to other governance actors and finally the majority of society. In short, climate knowledge systems provide a dynamic order that influences governance processes through the provision of knowledge, new ideas (for practices) and practices

themselves. Collective learning and, more specifically, double and triple-loop learning entails the ability to reflexive self-renewal. Thus, change builds a core feature of a climate knowledge system. Generally, I understand change to be a gradual, non-dichotomous process, in line with the concept of loop-learning explained above. In the empirical chapters, I will draw on Pahl-Wostl's (2009) characterization of loop-learning and her list of factors that define each type (see Appendix VII, also Chapter 2).

The systemic character and the ordering function of the climate knowledge system do not impede the flexibility of the concept. Fully developed, the knowledge system could not only function as a driver of climate governance, but also be a base to revert to for policy-makers and private governance actors. Both the knowledge system and the (new) background knowledge it provides become connecting factors between actors in the allegedly fragmented climate governance architecture. The power of communities of practice would thus include a certain governance or steering function. An example may clarify these assumptions.

Let us imagine that a community of practice develops a set of ideas and knowledge on how to combine electricity and water saving in production cycles and households in a way that benefits climate protection. This new knowledge and certain normative connotations that comes with it (e.g. that saving water and electricity is good for climate change reasons), are then taken up and diffused by other, overlapping communities of practice and spread further into political and business circles through collective learning, trust-building and convincing. This may take some time as opposing communities of practice argue that climate change is irrelevant, or that combined adaptation and mitigation practices as those suggested are technically not feasible. Maybe the original combination of measures does not survive a first practical test and local context factors such as electricity pricing issues for the poor parts of the population or transaction costs of companies have to be taken more strongly into account. This feeds back into the communities of practice, who learn again collectively and increase their pragmatic knowledge. The new set of measures and the knowledge attached to it are discussed, adjusted and pushed forward by powerful key individuals. It then trickles into concrete policies and voluntary business actions, spreads again and companies, policy-makers and other stakeholders slowly internalize them until any new decision in the field is taken in the context of the new electricity and water-saving combination without questioning it fundamentally: new background knowledge and change has come about through cognitive evolution and the underlying knowledge system.

Given the nature of communities of practice, the climate knowledge system is

highly flexible and dynamic and, in the ideal case, has no fixed boundaries per se. Still, some boundaries are provided through a) the boundaries of communities of practice as given by Adler (the knowledge and practices developed and shared), b) the focus on knowledge and the exclusion of other knowledge types apart from the four dimensions mentioned, c) the rather "top-down" approach: in the climate knowledge system (indigenous knowledge and local communities of practice are excluded) and in the empirical focus of this study on governance on the national and provincial levels, while allowing for multi-level influences.

Apart from overlapping membership in communities of practice, the production of scientific knowledge in climate governance may happen in transnational epistemic communities such as the IPCC. It is then taken up by domestic or cross-level communities of practice with domestic influence. Normative knowledge may help in developing, diffusing and institutionalizing climate protection norms through processes of collective learning. Since communities of practice in climate governance can cut across levels and normative knowledge is not restricted to domestic norms, a basic receptivity for inter- and transnational norm-building influences is inherent to the concept.

In sum, the climate knowledge system provides a comprehensive pragmatic constructivist concept to explain how political change comes about and how different actors, knowledge, ideas and economic incentives are related in an informal, reflexive and dynamic system. It builds the base for climate governance processes.

3.4 Conclusion: Hypotheses

In this chapter, I have outlined Adler's approach of cognitive evolution and communities of practice. It has several strengths and advantages for an analysis of climate governance dynamics. Among the advantages are the cross-cutting, flexible nature of the approach, the focus on knowledge and its intersection with power, or its overall capability to explain change through collective learning. But there are also some weaknesses calling for an improvement or extension when looking at climate governance. These include the vagueness inherent to a lot of the conceptual terms complicating empirical work, the question of clearer boundaries and the integration of feedback-loops.

The concept of climate knowledge systems advances Adler's approach by more explicitly integrating key individuals and power, by clarifying boundaries and by introducing feedback-loops and loop-learning. Moreover, the concept introduces

pragmatic knowledge as a relevant knowledge category for developing countries. Its ontological and epistemological roots in pragmatic constructivism and AE in particular. This clarifies the claims of the study (to produce a working truth), enables the integration of practical rationality and economic incentives into the concept and paves the way for the mixed methods approach. This will be explained in the next section. The following hypotheses can now be generated from the theoretical propositions and concept of climate knowledge systems:

H1 (general): Climate knowledge systems provide a dynamic order that influences governance processes through the provision of knowledge, new ideas and practices. The more strongly developed the climate knowledge system is – i.e. the more knowledge and collective learning - , the higher the prospects for a change in climate governance.

This hypothesis is the most comprehensive one and targets the whole system with all its functions, as the independent variable. The dependent variable here is the change process in climate governance, understood as gradual, non-dichotomous. In the following hypotheses, the dependent variable remains the same, but it is specified in wording or the part of the change process targeted, e.g. the passing of the tipping point in cognitive evolution.

H2 (power):
a) The more productive and institutional power climate communities of practice have, the greater the prospects that climate governance mechanisms are selected and diffused.
b) The more key individuals in positions of power are members of communities of practice, the higher the prospects for the diffusion and spread of new background knowledge and change in climate governance.

This set of hypotheses targets the parts of the knowledge system that deal with power and key individuals, making the difference to Adler explicit. Therefore, the independent variables are the power of communities of practice and key individuals with a combination of certain attributes (members of a community of practice, in a power position).

H3 (practical rationality):
a) The more pragmatic knowledge there is and the more practical rationality

communities of practice exert, the greater the chance that cognitive evolution passes the tipping point (cognitive threshold).
b) The more pragmatic knowledge and practical rationality include economic incentives, the more extensive climate governance mechanisms become.

Here, the independent variables are the degree of pragmatic knowledge and practical rationality exerted by a community of practice (H3a) and the degree of pragmatic knowledge and practical rationality related to economic incentives (H3b). The exploratory test of these hypotheses will show the use of the concept and answer the research question how knowledge and collective learning influence change in climate governance. The test of the different hypotheses requires a combination of different methods of the qualitative and quantitative kind. The theoretical propositions of the concept, the different variables as well as the methods and different kind of data all give rise to a number of specific questions for the qualitative and quantitative parts of the study. These questions do not replace the central research question, but contribute to answering it. In addition, they support the measurement of the independent and dependent variables. Thus, instead of embedding them in this theoretical chapter from which they derive as well, I name and connect them more strongly to the explanation of the methodological proceeding of this study.

4. Methodology

4.1 Mixed methods design

This chapter outlines the general methodological considerations and the mixed methods design of this study. I conduct a deductive, exploratory theory-test on four cases through a parallel, qualitative-dominant triangulation. The comparison of the national level of climate governance and one province/state in India and South Africa, respectively, also aims at the inductive generation of new hypotheses based on the differences and similarities that will become clear during the course of the study. The dependent variable is the change in domestic climate governance. The climate knowledge system is the independent variable that splits into further elements and additional independent variables in the different hypotheses tested (key individuals, power of communities of practice, pragmatic knowledge, economic incentives, see previous section). The climate knowledge system and its elements include both parts of the research question – knowledge and the process of collective learning. The reasons for choosing the two countries and four cases within them will be outlined in the next

part (4.2). Descriptions of the processes of data collection and analysis (4.3) and the validity, reliability and limitations of this study (4.4) build on the present section.

Mixed methods designs usually consist of at least one qualitative and one quantitative part, even though some authors argue that using more than one method of the same type counts as a specific type of mixed methods approach as well. The typology of designs and their characteristics vary in the literature (Teddlie & Tashakkori 2009; Onwuegbuzie, Slate & Leech 2007; Creswell & Plano Clark 2007; Greene, Lehn & Goodyear 2001; Denzin 1989). I come back to this below.

Mixed methods approaches have been criticized for a variety of reasons, most importantly for a lack of clarity and analytical rigour (eg Wolf 2010). To counter these criticisms, I explain my design and the reasons for it by following the steps of the mixed methods research process proposed by Kathleen Collins, Anthony Onwuegbuzie and Ida Sutton (Collins, Onwuegbuzie & Sutton 2006) and – similar – R. Burke Johnson and Onwuegbuzie (Johnson/Onwuegbuzie 2004).

The goal of this study and the research objective (*steps 1 and 2*) are the closure of a theoretical and empirical research gap: the explanation of how knowledge and collective learning influence change in climate governance and the development and test of a concept. For the latter, the objective is the contribution to building a mid-range theory for a group of large developing countries that are under particular pressure in terms of both mitigation and adaptation to climate change and have an (economic) interest in engaging in climate governance. The research interest has both a deductive and an inductive element. The comparison of cases in India and South Africa also seeks to enhance knowledge in the area and comparative area studies. The research objectives are a) the *exploration* of the use of the concept of climate knowledge systems and the hypotheses derived from it, b) the *description* of the actor networks in India and South Africa, their relations, actions, motivations and knowledge and c) the *explanation* of how political change comes about in climate governance from a knowledge- and learning-centered perspective.

The research question and its formulation (*step 3*) drive the selection of methods. Teddlie and Tashakkori have coined the expression of the "dictatorship" of the research question in mixed methods studies (Teddlie & Tashakkori 2009:20). The central research question how knowledge and collective learning influences the change of climate governance has a process character. The identification of a causal relationship behind the process is not based on whether knowledge and learning exert an influence – this has been established by previous research – but rather whether a causal relationship between the concept of knowledge systems and the change process

can be identified. There are both “what” and “how”-questions embedded in this research question, roughly reflecting quantitative and qualitative type of questions (Teddlie & Tashakkori 2009:133). Within the research question, there is also a “why” question in disguise, since it implicitly asks why the change of climate governance (dependent variable) has the scope and nature it does and to what extent the degree of expression of the knowledge system can explain it.

To answer the research question and identify the value of the dependent and the independent variables, several other aspects need to be analysed, resulting in specific questions for the quantitative and qualitative parts (again “what” and “how” questions). These questions do not replace, but contribute to answering the central research question. The specific quantitative questions are:

– Has there been a shift in companies' awareness and knowledge?
– Is it accompanied by a shift in activities?
– What drives climate protection actions or non-actions, particularly of companies?

These questions support the identification of the nature and scope of change (dependent variable) and the motivations for actors' behaviour and how they relate to the independent variables knowledge (of different dimensions, H1 and H3) and economic incentives (H3). Answering these qualitative questions supports the measurement of all variables and the testing of all hypotheses, therefore. The specific qualitative questions are:

- Which factors influence climate governance? What role do economic incentives play?
– Is there a climate knowledge system and what role does it play?
– Are processes of collective learning/cognitive evolution taking place?
– Has there been a shift in climate governance and what does it consist of?
– Are there communities of practice and if so, how much power do they have?

The final decision for a combination of quantitative and qualitative methods and not only of different qualitative methods, results from an empirical-practical perspective. Some parts of the concept are hard to measure directly, such as collective learning and identity formation, so that an approximation from different methodological starting points is helpful. Moreover, the governance perspective taken in this study includes the big business sector. It is composed of a large number of companies whose reasoning for taking or not-taking climate protection measures would require an extensive amount of qualitative work, particularly to enable generalizations from the sampled companies. Using quantitative methods to facilitate overall data collection and counter

the challenges concerning the generalization of qualitative results is helpful.

The determination of the mixing rationale and purpose *(step 4 and 5)* are closely connected to the research question. Collins and co-authors identified four rationales – participant enrichment, instrument fidelity, treatment integrity and significance enhancement – and 65 purposes through a content analysis of articles in education research (Collins, Onwuegbuzie & Sutton 2006). Other reasons for mixed methods research given in the literature are similar (e.g. Teddlie & Tashakkori 2009:113f.). The mixing rationale of this study is significance enhancement, meaning the enrichment of data that facilitates their interpretation (Collins, Onwuegbuzie & Sutton 2006:76).

There are several, connected purposes for mixing methods. In this study, the purposes are the increase in explanatory power and validity as well as complementarity and expansion. My aim is to expand the breadth of inquiry and generate more data targeting the same phenomenon, from which results can be integrated in a more comprehensive way. I discuss the advantages and criticisms of triangulation below.

Since an explicit aim of using multiple lenses in AE is "to make research more relevant to the practical and normative concerns of real-world actors" (Katzenstein & Sil 2008:117), I insert another step into my mixed methods process (*step 7*): the determination of the practical use of the study and its outcomes. The results generated here provide more knowledge and points of departure for a range of national and inter-/transnational actors and practitioners, including NGOs and aid organizations, seeking to enhance climate protection activities and/or build capacity. This is made possible through a) a better understanding of the drivers and problems existing in climate governance at the national and sub-national level in India and South Africa, including knowledge gaps, b) an identification of the relevant actors and c) the identification of processes and ways that advance collective learning and change in society. This helps to target investments.

Even though Collins et al. (2006) treat the case selection and sampling design first (*step 8),* the selection of a mixed methods design builds the next step here *(step 9)*. For ease of reading, I discuss the design selection here and deal with sampling and case selection in the next section. In general, the quantitative and qualitative parts of a study can have equal importance, or one of them can be dominant. There is an additional difference between parallel and sequential designs. In a parallel design, all types of data are collected simultaneously or with a small time lapse and at least fairly independent of each other. The results from different data are then merged at a later stage. In a sequential design, the parts build on each other so that each step informs

the next, e.g. the results of the quantitative survey inform the questions in qualitative interviews.

The type of design of this study is parallel and qualitative dominant. The qualitative data has more weight than the quantitative and some of the qualitative data will be quantified. The often-used notation for this type of design in the mixed methods literature is QUAL+quan (Teddlie/Tashakori 2009). The quantitative data are descriptive statistics taken from a survey of the Carbon Disclosure Project of the years 2008 to 2010. Additionally, clean energy investment and R&D investment data on the aggregate level are used for both countries, where available. Results from an expert survey or expert judgements will be analysed. Expert surveys are set between the quantitative and the qualitative method. Finally, a series of semi-structured, qualitative expert interviews generates a large part of the qualitative data. Parts of the interview transcripts will be quantitized to improve the explanatory power of the interview content – many researchers use adjectives such as “most” or “few interview partners” when summarizing interview results. Quantification is more rigorous and will also help to understand the connections between codes and categories of content analysis (see 5.4).

The choice for this design was taken on the grounds of data availability in both countries, the nature of the research object as well as the concept features of climate knowledge systems. These can be measured more easily through qualitative methods in an exploratory test. To answer the research question and support or falsify the hypotheses of this study, the results of the different types of data will then be integrated in a triangulation or meta-inference.

Triangulation is the most-often used from of mixed methods research and is often treated as if its meaning were clear and universally accepted (Hammersley 2008:22). This is not the case, as, for instance, Hammersley shows by identifying four different meanings: triangulation as validity checking, indefinite triangulation, triangulation seeking complementarity and triangulation as epistemological dialogue (Hammersley 2008). In this study, triangulation serves both as a means for complementarity that helps to test the hypotheses and for validity checking through inference validity (see 5.4). Integrating results from different methods to test hypotheses corrects the bias implicit in each method's findings (Goerres & Prinzen 2010:9). Triangulation also offers the possibility to connect levels of analysis, namely aggregate data and individual-level data. If done carefully, triangulation counters the dangers of inferencing from individual level to the aggregate level as well as the opposite way, commonly known as ecological inference problem (Przeworski & Teune

1969; Lauth, Pickel & Pickel 2009). However, multiple pitfalls exist, such as a higher chance of not meeting the methodological standards of each method for wanting to connect results.[10] The design of integrative inference validity frameworks for mixed methods research is still in its infancy (see section 5.4).When applying a mixed methods research design to cases from differing regions of the world and with differing cultural contexts, more reasons for caution exist because the challenges associated with Comparative Area Studies (CAS) apply, in particular concerning small-N cross-regional comparisons (Basedau & Köllner 2007). I come back to this point in Section 4.4.

Triangulation has been criticized for its claim to increase validity through offsetting biases of different methods with different ontological and epistemological assumptions that may even target different realities (Blaikie 1991; Flick 1992), for a discussion see Erzberger & Prein 1997; Hammersley 2008). According to this critique, a test or (dis-) confirmation of hypotheses would not be possible. More recent applications of triangulation prefer using triangulation for complementary information on the same research object, or in a combination of both complementarity and increased validity. Here, the challenge of knowing which data source will provide the most desirable information and the sometimes inherent assumption that complete knowledge of a phenomenon is possible remain (Hammersley 2008:27).

In line with my position of pragmatic constructivism, I argue that complete knowledge of the collective learning and change processes in climate governance in terms of a finite, absolute truth is not necessary. The findings or the resulting truth from this study present a "working truth" that is valid until better concepts, data and methods of analysis are available. This does not mean that the theory-test is obsolete and the support or falsification of hypotheses is meaningless – my understanding simply takes a realistic view of the social sciences and the durability of (exploratory) results. The careful interpretation of data targeting different levels of analysis and their integration in a meta-inference process is suitable for a theory- and hypotheses test of a complex phenomenon. Results will be more fine-grained than in a mono-method approach and therefore have a higher explanatory power. Despite some authors' reservations about triangulation, it is still the most appropriate way to proceed here.

The mixed methods design includes a comparative, hypothesis-generating part justified through the exploratory character of the study and the current state of the art concerning research of this type for India and South Africa. Additional, refining empirical data should not be lost through overly strong deductive limits of the concept. The series of specific qualitative and quantitative questions which will be asked of each

10 For an overview of different advantages and disadvantages, see Lauth et al 2009: 202.

case provide enough structure, while also being open in their formulation and specific operationalization, particularly in the semi-structured interviews (see Section 4.3). The research question and concept as well as the delineation of the cases in terms of actors, objects and time-frame provide a focus (see Section 4.2). The inductive-comparative part of the study is thus similar to the method of structured, focused comparison (George/Bennett 2005).

Coming back to the mixed methods research process, the remaining steps proposed by Collins et al. and Johnson/Onwuegbuzie will be treated in the next chapters. I outline the selection of the mixed methods sampling designs together with the case selection procedures common in comparative politics research in the next section (step 8). Data collection and analysis *(steps 10 and 11)* follow in section 4.3 and a discussion of validity, reliability and limitations of the study *(step 12)* in section 4.4. The final steps of the mixed methods research process, interpretation of data, report writing and reformulation of research questions build the remainder of this study.

4.2 Case selection and variance of variables

Mixed methods sampling strategies include case selection, material sampling and other elements such as units of time or processes (Teddlie & Tashakkori 2009:181). In political science, the sampling of other units, especially of time, geography and policy field, are part of the case selection and their delineation. Mixed methods researchers generally differentiate between purposive and random sampling and have come up with a wide number of different sampling techniques corresponding to either category across the social sciences (Onwuegbuzie & Collins 2007). For sequential mixed methods design, Lieberman's nested analysis (Lieberman 2005) and Rohlfing's suggestion of regression-based and case-study-based nested analysis (Rohlfing 2008) are useful sampling design fitted to political science. Since the mixed methods design here is parallel, nested analysis is not applicable. Equally established triangulation methods for parallel designs suited to political science are not available.

In the terminology of mixed methods research, the sampling of this study is purposive and theory-led, as it sets fixed case selection criteria. Yet my case selection draws on more established techniques in comparative politics. The most common methods here are the most-similar-systems with different outcome design (MSSD), the most-different-systems design (MSDS) and the method of structured, focused comparison. Alls of these are controlled comparisons requiring clear criteria for case selection. A number of challenges exist in this study that make a rigorous application of

the ideal-type of the MSSD or the MSDS nearly impossible – a practical problem that many research projects face and solve by approximating either design, or even combining them (Lauth, Pickel & Pickel 2009:73). In my design, the following challenges exist: First, the required variation in the dependent or independent variable is somewhat difficult given the limited amount of information on both the domestic change processes in climate governance in the target population and the existence and impact of learning networks on the change. This is a common problem in case identification through MSSD.

Second, the exploratory character of the study and the process characteristics of both the dependent and independent variables make a dichotomous decision on the presence or absence of variables (and their expected assessment before the conduct of the project) difficult. Indeed, both the research question and the independent variable "climate knowledge system" entail potential causal mechanisms (Falleti & Lynch 2009): "learning" and "collective learning". Since the debate about the status and measurement of causal mechanisms and their difference to variables is ongoing, I refrain from using the concept to avoid further complication. Instead, I provide a gradual, "softer" measurement of the variables drawing on different data, as will become clear in Chapter 9.

Third, the combination of deductive and inductive research interests already suggests that a purely deductive, variable-oriented case selection might not capture the comprehensiveness of the research question and objectives. This challenge is connected to the elements of cognitive evolution that would require an assessment of learning and new or old background knowledge across different levels of governance and society. While a somewhat reductionist approach is inevitable in practice, the analysis of different governance levels (cases) seems advisable, even though some difficulties in terms of the independence of cases exist here (see below).

For the cases at the national level of governance, the case selection therefore roughly approximates the MSSD-method. The following criteria[11] are kept similar (context variables) and thus guide selection:

1. Significant emissions of greenhouse gases, i.e. the country is a „top-20 emitter".[12] This implies pressure to act in mitigation.

11 These criteria were set at the beginning of this study in 2008, when the failure of the international climate negotiations had not been as clear yet. The economic interests and technological interests that have become more obvious in the past couple of years, for example in the renewable energy market, could now be added as conditions for follow-up studies.

12 See Netherlands Environmental Agency, http://www.pbl.nl/en/dossiers/climatechange/faqs#vraag9 (accessed 23/06/2011); World Resources Report 2005, http//www.wri.org/publications, (accessed 23/06/2011).

2. Ratification of UNFCCC and Kyoto-protocol but no mandatory emission reductions in the first commitment period till 2012 (Non-Annex I country)
3. Similar projections concerning the impacts of climate change, high degree of overall vulnerability of the society (IPCC 2007). This implies pressure to act in adaptation.
4. Similar form of political system and administration (eg democratic and federal)
5. A certain weight and activity in the international climate negotiations : this should guarantee a minimum of interest into a political handling of climate change and a clear positioning of government.

If the first three conditions are taken together, a population of about ten countries results: China, Brazil, Indonesia, India, Mexico, South Korea, Democratic Republic Congo, South Africa, Argentina and Iran. The exact number depends on the baseline year for the measurement of emissions, the inclusion or exclusion of land-use, land-use change and forestry (LULUCF) as well as the similarity of projections about the impacts of climate change and the vulnerability of a society towards them. Only six of these countries have shown a continuous engagement in the international climate negotiation process.[13] These are China, Brazil, Indonesia, India, Mexico and South Africa.[14]

Of the six countries that fulfil the selection criteria, China would be the only non-democratic country in this group and therefore has to be discarded. It appears useful to compare cases which face a similar bundle of problems both in terms of mitigation and adaptation, i.e. where similar governance fields are affected. For instance, it does not make sense to compare a country harbouring a vast amount of rain forest with a country that hardly has any forest left in a small-N comparison. Moreover, there has to be sufficient reason to assume variance in the variables of the cases. This leaves us with the possible comparisons between Brazil and Indonesia, or Mexico, South Africa and India. Brazil and Indonesia may be special cases within the sample due to the particular relevance of forest management and the set of instruments included in REDD.[15] For an exploratory, hypothesis-generating approach, the comparison of two cases appeared sufficient. The comparison of two countries that

13 Earth Negotiations Bulletin of UNFCCC negotatiations, various years, http://www.iisd.ca/voltoc.html (accessed 01/11/11).

14 There is a debate about the increasing power of these countries in global governance and their status as emerging economies, rising or regional powers (for an overview see Nolte 2010). Single contributions have also asked whether specific countries constitute climate powers in the international system Stolte 2010; Ochs Dezember 2007. Due to the deviant focus of this research, I do not include case selection criteria drawing on this debate.

15 Reducing Emissions from Deforestation and Forest Degradation (REDD) is a special area in climate governance. It is a mechanism under the UNFCCC that seeks to reduce emissions through market and financial incentives and has recently been extended to include other sustainable forest management initiatives (REDD+).

form part of the BASIC-group in the international negotiations seemed reasonable. Even though this may be a certain selection bias, Mexico was thus excluded from comparison.

The time period under observation is restricted to the beginning of the year 2007 to the end of the year 2010. The publication of the so called Stern report (Stern 2006) and the IPCC AR4 (IPCC 2007) have led to an increase of international attention to the topic of climate change. It can be safely assumed that neither India nor South Africa were exempt from this increase in attention, debate and pressure in the UNFCCC negotiations. South Africa had a reputation for a more progressive standing in the international negotiations, whereas India's position was often described as blocking (Ochs Dezember 2007). The publication of central documents in both countries in 2008 that build the ground for concrete domestic governance mechanisms for the first time – the Long-Term Mitigation Scenario in South Africa (LTMS) and the National Action Plan on Climate Change (NAPCC) in India – gave enough reason to believe in some sort of change going on at the beginning of this study. The different position in the international negotiations as well as the differing policy and strategy landscape in 2007 (see Chapter 5.2) were sufficient to expect a variation in the change processes.

Since I employ a governance perspective, not only the change of governmental actions, but non-state governance actors and their behaviour are in focus as well. I restrict the analysis to large and transnational companies. Given that both countries are large developing countries or emerging economies (depending on terminology), these companies are more likely to have both an interest in climate protection and the resources for action, as opposed to small and medium enterprises. These restrictions in terms of the time period and governance actors also apply to the sub-national cases that I discuss in the following.

To increase explanatory power and for a more comprehensive understanding of the potential impact of knowledge systems on change across governance levels, I select one additional exploratory case at the sub-national level in each country. Given the federal system of both India and South Africa and the functions and powers associated with provinces/federal states within this system, it is plausible to select one province (South Africa) and one state (India) instead of the municipal or district level. Here, I choose the “most likely”-case, a case selection method typically associated with case studies (Gerring 2007). The reasoning here was simple. In 2007, the progress of sub-national climate governance was rather moderate even in most industrialized countries, apart from single leaders such as the state of California. At the beginning of

this study, little was known about any sub-national climate governance activities, their change and the reasons for it in either India or South Africa. For both countries, the selection of the province/state was discussed with local experts during the field research trips and finalized then.

The “most-likely”-case for South Africa was the Western Cape Province because it already had published a strategy for climate change in March 2008. It hosts some of the most well-known universities and research centres on climate change questions in South Africa. The progressiveness of the Western Cape compared to other South African provinces was confirmed during the expert interviews in Pretoria and Johannesburg (see section 5.3), justifying and confirming the selection. In India, the most-likely case could not be determined before the research trip. Possible cases after a review of the literature and Indian media were Maharashtra, Gujarat and Himachal Pradesh. Through the expert interviews in Delhi, Maharashtra was selected as one of the most advanced states in India. Experts' reasoning was grounded on Maharashtra's political reputation concerning renewable energy and the CDM and the location of India's commercial capital Mumbai. The city hosts many large and transnational companies. Moreover, Maharashtra is home to several well-known NGOs and think tanks, such as Prayas in Pune.

In a way, my approach is both a within-case comparison for each country (between national and province) and a small-N comparison for theory-testing and development across four different cases (two Indian, two South African cases). The comparison between the two sub-national cases across the regions also serves the generation of hypotheses. Despite the “most likely”-case design, sufficient differences can be assumed given that Maharashtra has a strong history of renewable energy policy, while the Western Cape has only one prototype wind farm. Moreover, the Western Cape is governed by the opposition party Democratic Alliance (DA), whereas Maharashtra and the Indian central government were both governed by the same party during 2007-2010: the Indian National Congress (INC), commonly known as the Congress Party.

The assumptions on differences and similarities lead us to the variance of variables, as required by the MSSD-method. I have pointed out the challenges with the dichotomous presence or absence of variables with respect to the climate knowledge system and its elements (independent variables) and the change of climate governance (dependent variable). The climate knowledge system will be assessed in terms of its general existence or non-existence and – more refined – its degree of expression and its expansion. It will be measured via the number of communities of practice, their

power and the diffusion of new background knowledge produced by them through collective learning processes. This can only be done in a narrative way.

The definition and the measurement of power are still contested in political science and therefore also the identification of institutional and productive power. Barnett and Duvall give no indication of how to measure the dimensions of their taxonomy and proceed themselves in a narrative way in their examples. Some authors such as Stefano Guzzini even argue convincingly that no objective measure of power is possible because power is multidimensional and relational (Guzzini 2009).

Thus, the elements of the knowledge system, including power, will be measured in a combination of qualitative data interpretation and expert judgements.[16] This will become clear in the next section. Results or values for the variables may be gradual and sometimes relational, for example concerning the power of different actors or communities of practice compared to each other and they are also subject to the author's interpretation. Dealing with this openly instead of constructing power indicators that rely on interpretive, qualitative work appears more suitable.

Key individuals and their position will be identified through the (inductive) perception of interview partners. Interviewees will identify by themselves whether key individuals have a particularly strong vision or concrete idea, whether it is their knowledge or their capacity to build trust and convince other actors outside the community of practice to join them that makes them special. This way, they can also present other relevant qualities of a key individual that makes him or her particularly important for domestic climate governance.

Pragmatic knowledge, practical rationality and economic incentives will be measured through the triangulation of qualitative and quantitative data (see Chapter 4.3). I construct no hard threshold values or quantitative indicators for the independent variables because it does not seem useful in this particular mixed methods setting. It would over-stretch and over-complicate measurement.

The MSSD-method requires the variation in the dependent variable to enable the isolation of causal relationships. Recall that my understanding of change follows the stages of loop-learning and ordered change (Pahl-Wostl 2009; Hall 1993), which is more encompassing than a simple increase in policies or governance measures. The exact degree of variation between the cases and countries could not be determined before the conduct of the study. It will be shown and discussed based on the empirical data – a) with respect to the shift regulation density and intensity between 2007 and

16 My choice to measure the power of communities of practice and the structural power of the knowledge system in a narrative way drawing mostly on qualitative data is in line with other examples in the field that take whole networks as an actor (see for example {Broadbent 1998).

2010 (Section 5.4); b) in the presentation of the quantitative and qualitative results (Chapters 6-8); and c) particularly in the meta-inference chapter that triangulates the different pieces of the puzzle (Chapter 9). At the beginning of the study, a sufficient degree of variation in the depth of change in domestic climate governance could be assumed, as indicated above.

4.3 Data collection and analysis

The differentiation between methods of data collection and methods of data analysis is particularly important in mixed methods designs because mixing can, but does not have to occur in either phase with different techniques and implications. In the following, I describe each type of data source, its level, how and why it was collected as well as how I proceeded for its analysis. The section closes with a table depicting which type of data serves the testing of which of my hypotheses.

I use two types of quantitative data: the first are aggregate data and the second type are survey data. First, the national expenditure on clean energy and, more generally, national spending on R&D provide insights into the interest and actions of government to move towards a low-carbon economy. In turn, this helps to assess the degree of change in climate governance on the aggregate level. The data on clean energy investment are taken from Bloomberg New Energy Finance (BNEF 2010) and further illustrated through the new Climate Competitiveness Index of AccountAbility (AccountAbility 2010). At the time of writing, these were the only data of this kind available for the countries and years targeted. The same applies to gross domestic expenditure on R&D. No specific data on climate change-specific R&D was available. Data here was taken from the Battelle Institute/R&D Magazine (Battelle 2010). Both clean energy and R&D investment will be analysed through comparative descriptive statistics over time for 2007-2010, or those years for which figures were available. These aggregate data also serve as a bridge between the descriptive-introductory chapters on India and South Africa and the empirical, hypotheses-oriented chapters.

The second type of quantitative data stems from the Carbon Disclosure Project survey of the years 2008 to 2010. The CDP survey sample contains the top 100 companies listed at the Johannesburg Stock Exchange for South Africa and the top 200 companies listed at the Bombay Stock Exchange for India. The samples thus adequately represent the large and transnational companies targeted in this study. The CDP is a voluntary disclosure instrument that asks each company a range of questions concerning their risk and opportunity perception with respect to climate change, their GHG emissions and energy intensity and other governance actions taken within the

company. The CDP survey generates both macro-level and micro-level data. Due to differences in the survey sample size between the years 2007 and 2008, only the years 2008 to 2010 are analysed. Descriptive statistics of the frequencies on key trends and indicators relevant for the research question serve as approximations of the knowledge, awareness and actions of companies – and their change over time. Additionally, the survey answers of 2008 will be analysed through some cross-tabulations and measures of association, using SPSS. Here, I seek to find out whether a higher level of risk or opportunity perception, which serve as an approximation for an increase in knowledge, can be associated with an increase in governance actions. Since the answers to the survey were nominally scaled, no further statistical analyses were possible.

The third type of data are the results of an expert survey, an instrument set between the quantitative and qualitative methods. Expert judgements or surveys provide a consensus opinion on a phenomenon or problem otherwise hard to observe or analyze directly (Benoit & Wiesehomeier 2009), such as the nature of change, collective-learning processes and group-level identity-building. The selection of experts — and their actual expertise and authoritative knowledge — is more important than the number of participants. The validity of expert judgements can be assessed by comparing the results to existing studies. However, no such studies exist on either South Africa or India. Thus, the expertise, accounted for by setting benchmarks, provides the validity of the survey (Benoit & Wiesehomeier 2009). In this survey, the number and quality of publications, activities and reputation of experts served as benchmarks. These were assessed beforehand. In addition, a number of questions in the survey with regard to the participant's years of experience in the field, major events in the respective country's climate policy developments and projected climate change impacts completed the evaluation of the level of expertise of each participant (for a further discussion of validity and reliability, see section 4.4). Overall, the expert survey contained 14 questions addressing different aspects of the research question, the specific qualitative and quantitative questions as well as the central concepts and categories of this study (see Appendix I).

The expert survey was pre-tested with a number of peer researchers. Originally, it was an online survey. But since the number of responses to the online version was very small – even though participants were invited individually – the survey was conducted during field research with those experts who reside in India and South Africa, respectively. The number of respondents in India (10 experts) and in South Africa (13 experts) surpassed the minimum number of five experts set in other expert surveys (e.g. Ray 1999). Of the thirteen experts on South Africa, eight are academics

(both social scientists and natural scientists), four are consultants and one has a legal background. The professional background of Indian experts is similar: six are academics, three are experts from think-tank-type NGOs and one is a consultant. The results will be analysed in a combination of using SPSS for the assessment of the mean or consensus opinion, and through qualitative interpretation.

Finally, the qualitative data of the study are collected through semi-structured interviews. The semi-structure of the interviews (see Appendix II) was produced via the group-brainstorming technique "S^2P^2", developed by Kruse (Kruse 2009). Between January 20 and March 13, 2010, 35 interviews were conducted in South Africa. In India, 30 interviews were conducted between October 8 and November 25, 2010. Anonymity has been agreed on with each interviewee. Interviewees were members of the government and administration, large and transnational companies and business associations, environmental civil-society groups, consultancy groups and academia. A list of interview partners is provided (see Appendix III). In South Africa, eleven respondents of the expert survey were also interviewed before answering the questionnaire. The same applies to nine respondents in India. During interviews, I took extensive notes but refrained from using a recorder as not to intimidate the interview partners or influence their statements through the creation of a more formal atmosphere. I typed the notes directly after the interviews and added further information and impressions fresh from memory. This allowed me to recall the meaning of certain statements and notes during analysis at a later stage.

For analysis, interview notes were coded with the mixed methods software QDA Miner, using the inductive-deductive method of content analysis proposed by Mayring (Mayring 2003). This method requires a thorough analysis of the interview transcripts or notes at least three times. I coded the interview notes for South Africa first and used this codebook as a base for the interviews on India, while allowing for additional codes and categories. The code-books are provided in the Appendix (Appendix IV). To provide a more accurate analysis of shared statements across interviews, some of the codes were quantified using QDA Miner. Frequencies of codes and some code co-occurences using Jaccard's coffiecient will be reported. The latter serves to identify the similarity and connections between the different dimensions of knowledge (each dimension resulted in a code) as well as between the knowledge dimensions and governance activities described. This procedure supports the identification of interview partners' line of thinking and different states of knowledge and learning across groups. Official documents, grey literature and academic literature were used to cross-check interview results, where possible.

Since there is no unanimity in the literature on how to measure change, I asses the change of climate governance by using the proposed method of Knill et al. who measure the regulation density and the regulation intensity over time (Knill, Schulze & Tosun 2010). Thus, I measure the regulatory density and intensity at the beginning of 2007 and at the end of 2010. However, this type of measurement does not capture the gradual, more extensive understanding of change I employ. Therefore, the above described other types of data collection all include questions and means to further uncover the state and nature of change as well. These will be triangulated. Table 1 illustrates which data type addresses which one of my hypotheses.

Table 1: Hypotheses and Data Sources

Hypothesis	Data type	Data source			
		Aggregate data	CDP survey	Expert survey	Interviews
H1: The existence of a climate knowledge system poses a necessary but not sufficient condition for both the change of climate governance. The more strongly developed and expressed the climate knowledge system is – so the more knowledge and collective learning - , the higher the prospects for change in climate governance.	QUAL +quan	x	x	x	x
H2 a) The more productive and institutional power climate communities of practice have, the greater the prospects that climate governance mechanisms are selected and diffused.	QUAL +quan			x	x
H2b) The more key individuals in a power position are members of communities of practice, the higher the prospects for the diffusion and spread of new background knowledge and change in climate governance.	QUAL				x
H3 a) The more pragmatic knowledge there is and the more practical rationality communities of practice exert, the greater the chance cognitive evolution passes the cognitive threshold.	QUAL				x
H3 b) The more pragmatic knowledge and practical rationality include economic incentives, the more extensive climate governance mechanisms become.	QUAL +quan	x	x	x	

4.4 Validity, reliability and limitations of the study

The assessment of the validity and reliability of the data and the findings is imperative for any scientific study. In a mixed methods design, the validity and reliability not only concern the quantitative and qualitative parts of the study, but also the inference quality and the inference transferability of the triangulation, or meta-inference, itself (Teddlie & Tashakkori 2009; Dellinger & Leech 2007). This chapter addresses these issues and discusses further limitations of the study concerning the generalization of results and the independence of cases. It also considers the pitfalls of comparative area studies that may be relevant here. First, I assess the validity and reliability of each of the four data types and their results. Then, I discuss the inference quality and transferability of the triangulation or meta-inference.

Some qualitative researchers, mostly post-structuralists and post-modernists, have reservations concerning the concept of validity. Numerous other terms have been suggested instead, such as credibility, trustworthiness or legitimation (Dellinger & Leech 2007:212). Despite the ongoing controversy about "what the nature of social inquiry ought to be, [..] and what might be the basis for criteria within a projected transformation" (Lincoln & Guba 2005:206), I keep using 'validity' to assess the instruments applied in both the quantitative and qualitative parts of the study. I assume that this is the term the reader is most familiar with for this assessment.

Concerning the aggregate data (1), the data availability and the insufficient specificity of those data available challenges the validity of the instrument to some extent. Since the aggregate data have the least weight within the mixed methods design and for the testing of the hypotheses, I argue that this is rather unproblematic. The aggregate data can be considered reliable, as they are publicly available to any researcher wishing to replicate the study.

The descriptive statistics and the measures of association based on the CDP surveys (2) would have to meet the more specific requirements of validity checks common in quantitative research. The descriptive statistics used to identify trends in risk and opportunity perception as well as companies' activities relating to climate change are based on nominally-scaled questions. Hence, validity checks associated with metrics scales, such as the calculation of internal consistency coefficients, were neither possible nor necessary. The reporting of effect sizes is another way of checking the validity in inferential statistics. Given the nominal scales of the CDP survey, Phi and Cramer's V serve both as indicators for associations between risk/opportunity perception and company governance actions, such as GHG measurement or their

engagement with policy-makers and as indicators for the effect size. Without anticipating the results too much here, it can be said that the effect size varies according to the associations hypothesized. A high number of missing values for some questions made the calculation of associations impossible for some items.

The surveys did not contain explicit questions on adaptation activities of companies, so there is a certain mitigation-bias inherent to the data. Also, disclosure of information does not directly equal action and risk and opportunity perceptions do not equal knowledge. Still, the descriptive statistics of the CDP are both a sufficiently valid and reliable means to identify trends in perceptions and activities of large and transnational companies, which serve as approximations for the development of knowledge and awareness and more generally, the scope of change. The validity of the measures of associations is very limited, even though the replication is easily possible. Metric data would make the instrument more useful. In the light of these limitations, it already becomes clear that triangulating different data types for complementarity and to increase validity is a suitable strategy.

The proceedings for the validity assessment for the expert survey (3) were already outlined in the previous section. It should be added here that in South Africa, one expert selected for participation in the survey did not take part and in India, three experts envisioned for participation did not take part due to absence or no reaction to the query.

Since expert judgements or surveys are set between the quantitative and qualitative method, reliability cannot be measured using standard statistical techniques. Rather, the challenges associated with reliability of qualitative research apply. Approximating the internal consistency measurement, I analysed the individual responses to identify experts deviating strongly from the consensus opinion on more than one core question. There is no objective standard for this. I looked at the individual responses, the mean and the median, where applicable. Answers that were one point off were scrutinized again closely. In the expert survey on South Africa, there were several respondents who deviated substantially on one to three of the questions. However, this did not affect the core questions on communities of practice and the state of knowledge. Concerning the survey on India, results seem to be less reliable since responses were scattered on more items and questions and there were more missing values or experts answering “I don't know” than in the South African survey. The deviations and range of answers on the questions will be taken up in the results section (Chapter 7). In the survey, one question asking for a ranking of the most relevant actor groups (see Appendix I) had to be eliminated from analysis due to highly

differing interpretations of this question by the respondents. In India, two experts strongly disagreed with a number of questions in the survey on the grounds of a "Northern bias" inherent to my questions, which they had also identified in my open questions asked during the preceding interview. To some extent, their concern seemed to be due to a generally very critical perspective concerning climate change-related research on India conducted by a researcher from an industrialized country.

Finally, the challenges connected with the validity and reliability of qualitative, interpretive methods apply to the last data type, the qualitative expert[17] interviews (4) and their interpretation. Semi-structured expert interviews rely on the interpretation of the researcher and are by nature somewhat time- and context- bound. The strategy of using inter-coder agreements or the path model (Oleinik 2011) and thus more than one researcher to assess the reliability of the content analysis of interviews was not possible. The inductive-deductive method of content analysis and the provision of the code book provides some transparency. Additionally, I calculate and report effect sizes, more specifically the frequency (manifest) effect sizes (Onwuegbuzie 2003) suitable for qualitative data. They are provided in detail in the results sections and in Appendix V, supporting the assessment of validity.

"Frequency (manifest) effect sizes are obtained by calculating the frequency of each theme [..]" (Onwuegbuzie 2003:397). No creation of a separate inter-respondent matrix was necessary because QDA Miner directly calculates the frequencies (total count of a code), percentage of overall codes and the number and percentage of cases (case = interview partner here) from the coded interview transcripts. I do not conduct a factor analysis on such an inter-respondent matrix, because spurious results could emerge, especially since the information in the matrices would have to be binarized. Instead, I interpret the percentage of cases (here: interviewees) using the respective code as the most relevant manifest effect size here, because it indicates a complementarity or even redundancy of information. Interpretation of the frequencies can be done in a similar way to quantitative effect sizes: 10-30% indicates a low effect size, 30-50% a medium effect size and 50% and more a high effect size.

This reporting of effect sizes from qualitative data also supports the concept of saturation (Glaser & Strauss 1967; Strauss & Corbin 1990; Guest, Bunce & Johnson 2006). Before field research, the point of saturation, when hardly any new information can be gained from more interviews, was estimated to be at roughly 5-10 interviews per group (NGOs, Government/Administration, Academic/Experts, Companies). I did not fix a number of interviews beforehand, however and determined the point of saturation

17 The term „expert" here refers to all groups of actors and actors interviews (see Section 4.3).

openly during the research trip. The overall number of 30 and 35 interviews reflect the mean and roughly corresponds to the most common sample size of 20 and 30 interviews found in a recent study of interview saturation in dissertations (Mason 2010).

Apart from the validity and reliability checks for each type of data, mixed methods studies require an assessment of the quality of meta-inferences: the inferences drawn from both qualitative and quantitative data and an assessment of the inference transferability. In the integrative framework by Teddlie and Tashakkori (2009), the inference quality is determined by design quality and interpretive rigor. For them, design quality splits into the dimensions appropriateness and adequacy of the design, within-design consistency and analytic adequacy (Teddlie & Tashakkori 2009:301). Interpretive rigor splits into the research criteria interpretive and theoretical consistency, interpretive agreement, interpretive distinctiveness, integrative efficacy and interpretive correspondence (id.). It will become clear throughout the study how these criteria are met apart from the validity and reliability checks described above. Generally, both the design quality and the interpretive rigour are sufficient for an exploratory test of the concept and hypotheses, but follow-up studies would need refinement both in terms of hypotheses and methodological research design (see in more detail Chapters 9 and 10).

The transferability of inferences means the extent to which conclusions can be transferred to other settings (ecological transferability), other people or entities (population transferability) and to the future (temporal transferability) (Teddlie & Tashakkori 2009:311f.). The ecological transferability of the concept is limited to large developing countries (sample of mid-range theory envisioned) and would possibly need some refinement in terms of the content of knowledge dimensions and the weighting of different elements of the knowledge system (see Chapter 9). The conceptualization of discourse in the climate knowledge system requires a more encompassing discourse analysis that could not be done here. Moreover, the time period of analysis is rather short. Going further back into time would not have made sense for the reasons already explained above. A follow-up study on the same cases in a few years could shed further light on the final outcome of the change processes, when implementation of measures under planning now should have happened. This corresponds to the (meta-)theoretical claims of this study. The same applies to population transferability, which is generally possible within the limits or claims already described.

The temporal transferability of the concept and results is only restricted in the

way any social science study's claims to make predictions about the future are limited (see Chapter 10). It may be useful to analyse longer time periods to more adequately grasp change processes in the mid to long-term.

From a methodological point of view, a final limit concerning the independence of the cases needs to be discussed. To some extent, it resembles the problem of globalisation effects in large-N studies (Galton's problem). In this contribution, a learning effect across the countries may be possible. South Africa and India are both members of the BASIC-group that, among else, seeks to enhance best practice exchanges. Policy diffusion as identified in other areas of environmental policy seems also possible – but both these challenges are rather unlikely for the time period of analysis, because domestic climate governance has been in the initial stages, not only in the BASIC-countries, but nearly everywhere. Some insecurity about what to do and how in both countries still exists.

5. The national context for climate governance in India and South Africa

5.1 Introduction

The national context matters for the domestic governance of climate change in India and South Africa, as in any other policy field. The national context comprises the landscape of institutions and actors as well as policies and other governance mechanisms. For the governance of climate change and its analysis, the domestic emission profile and the projected impacts of climate change on India and South Africa are relevant. The following chapters will therefore introduce the reader to this context and provide the background for the cases.

Before turning to these more climate change-specific issues, some general introductory remarks are useful. Both India and South Africa are often treated within the same group, for example in the BASIC, or in other political contexts as emerging economies or BRICS. In terms of the socio-economic conditions prevailing in each country, they share many characteristics, but also differ.

First, the size of the population is very different. India has approximately 1,3 billion inhabitants, while South Africa has a population of 49 million people. Their overall state of development, captured by the Human Development Index (HDI), is similarly low. South Africa ranked 110th and India 119th of 169 countries captured in the

HDI 2010.[18] The level of income inequality is also roughly similar, even though the income is even less equally distributed in South Africa than in India: South Africa's income Gini coefficient for 2010 was at 57,8 and India's at 36,8 (0 = total equality, 100 = total inequality). However, India's economy is much larger than South Africa's economy and it grows at a much higher rate.[19] South Africa's GDP per capita was at 10, 140 US dollar (PPP) and India's at 3,354 US dollar (PPP) in 2010. In World Bank terms, South Africa therefore belongs to the group of higher middle income countries and India belongs to the lower middle income countries.[20]

Both countries substantially restructured their economy in the 1990s, including a trade liberalization. In India, policy-makers and companies shifted from "Nehruvian developmentalism to neoliberal globalism" (Stevenson 2011: 1009). India's first president Jawaharlal Nehru sought to establish an economically self-reliant nation, which became the paradigm for India's economic policy until the 1990s. Neoliberal globalism led Indian companies towards a greater participation in global markets and trends, setting the goal of achieving global competitiveness (Stevenson 2011). In South Africa, the end of Apartheid meant the end of the international trade embargo. Following trade liberalization and a number of economic reforms, the country managed to attract foreign investors and increase its absolute (pro-poor) growth (Kappel 2010). In spite of these developments, the integration of South African companies into global value chains remains at a comparably low level (id.).

Furthermore, both countries have federal democratic political systems. Since the end of Apartheid, the ruling part in South Africa is the African National Congress (ANC). Since December 2007, Jacob Zuma is President, following Thabo Mbeki. In the Indian general elections in 2009, Prime Minister Manmohan Singh and his Congress Party got elected for a second term in office.

While these similarities and especially the differences do not disable the comparative element of the study, they should nevertheless be kept in mind when reading the following chapters. The next section (5.2) sums up the emission profiles and climate change projections for India and South Africa and thus provides a rough natural science-context on climate change in both countries. The second section (5.3) deals with the institutional landscape that is concerned with climate change issues and climate governance and the final section gives an overview of policies and other climate

18 UNDP, Human Development Report 2010, http://hdr.undp.org/en/reports/global/hdr2010/ (accessed July 5, 2011).

19 International Monetary Fund, World Economic Outlook 2011, http://www.imf.org/external/pubs/ft/weo/2011/01/index.htm (accessed July 5, 2011).

20 See http://data.worldbank.org/about/country-classifications/country-and-lending groups#Lower_middle_income, accessed May 30 2011.

governance initiatives and mechanisms. The chapter closes with an assessment of the change in regulatory density and intensity, which is one part of the assessment of the dependent variable "change of climate governance". Except for this last part which is written in an integrative way, all sections treat India and South Africa separately.

5.2 Emission profile and climate change projections

5.2.1 India

India's economy is growing fast, with a growth rate around 8 percent in the last five years. To counter poverty and reach the millennium development goals, India needs to sustain an economic growth of around 9 percent over the next twenty years.[21] To ensure this growth rate, the Integrated Energy Policy Report estimates that primary energy supply needs to increase four to five times and electricity generation six to seven times compared to 2004.[22] The challenge in this from a climate change perspective immediately becomes clear by looking at the GHG emission sources: the economy is largely based on electricity produced from coal of low quality, leading to high GHG emissions.

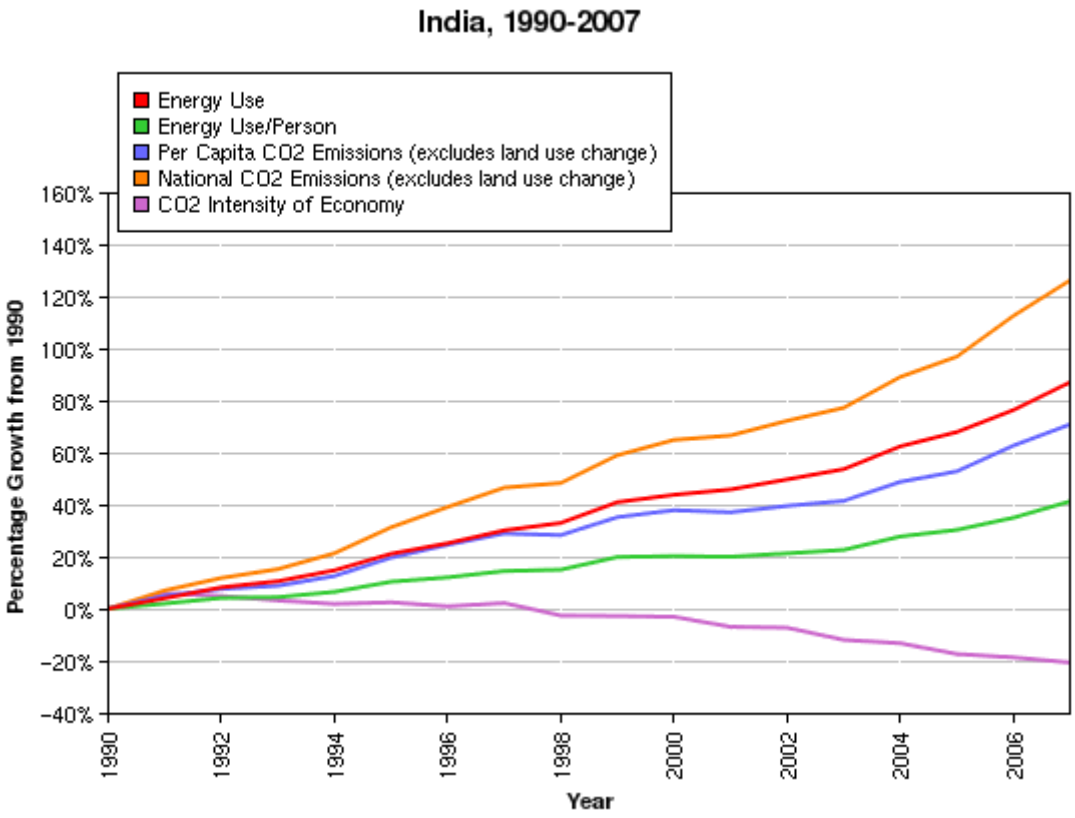
The latest data on India's emissions are of 2007 and are published in a report by the Indian Network for Climate Change Assessment (INCCA). To assess the GHG emissions, the report used the guidelines provided by the IPCC. In 2007, Indian net GHG emissions were at 1727.71 million tons of CO_2 equivalent (eq) and per capita emissions at 1.5 tons CO_2eq/capita, both including LULUCF. Electricity generation accounts for the bulk (38%) of India's emissions, followed by industries (22%) and in particular iron, steel and cement industries and agriculture (18%). If we only focus on carbon emissions, electricity generation accounts for 51% of emissions, the different industries for 39% and transport for 10%. These figures indicate that the key to mitigation for India lies in electricity generation and industry. Despite these high figures, the carbon intensity of the Indian economy has already declined and continues to decline from 1990 onwards (see Figure 1). The energy use and carbon emissions have increased during the same period, both cumulative and per capita. Given the acceleration of the Indian economy in the last two decades, this could be expected. India already has 20 nuclear power plants, compared to just one in South Africa and envisions the share of nuclear power in electricity generation to increase up to 25% by

21 Integrated Energy Policy, Report of the Expert Committee, Government of India, Planning Commission, August 2006.

22 id.

2050.[23]

Figure 1: Trends in Emissions and Energy Use in India



Source: World Resources Institute, CAIT-Tool, accessed 30 May 2011.

Projections for future GHG emissions vary in the literature because of the different baselines and models used. The Interim Report of the Low Carbon Expert Group calculates two scenarios, "determined effort" and "aggressive effort" (see Chapter 5.3.1). If the Indian economy grows steadily at 8%, emissions under "determined policy effort" scenario would be at 3,537 million tons CO2 eq (without LULUCF) and at 3,071 million tons CO2 eq (without LULUCF) under the "aggressive efforts scenario" in 2020 (Low-Carbon Expert Group 2011:108).

Generally, a lack of specific local data makes the down-scaling of Global Circulation Models difficult and therefore, the production of robust local projections of the climate change impacts in India. India has many different climatic zones which will be affected differently by climate change. The following summary draws on IPCC Ar4 and the sectoral and regional analysis of the INCCA of November 2010 (INCCA 2010). The latter uses the regional PRECIS- model developed by the Hadley Centre, UK, as

23 World Nuclear Association, http://www.world-nuclear.org/info/inf53.html; (accessed July 5, 2011).

well as the IPCC Ar4 scenarios. Projections of the INCCA are for the 2030s, with the baseline years 1961-1990. The annual mean temperature across India is expected to rise by 1.7-2.0°C in the 2030s compared to baseline. Both the daily maximum and minimum temperatures may increase in the 2030s, with day time warming expected more for central and northern India (INCCA 2010: 12).

The Himalayas and their glaciers harbour large parts of the world's fresh water resources. In January 2010, the IPCC confirmed its statements of the AR4 that widespread losses of glaciers and reductions in snow cover will accelerate, but withdrew the paragraph about the recession rate in the AR4 report (IPCC 2007). The latter had led to controversy in December 2009.

Annual precipitation is expected to slightly increase. For the coastal regions, for example, models project an increase of 6-8%. The frequency of rainy days is likely to decrease in all parts of India, while the intensity of the rains increases by the 2030s. Precipitation and temperature are connected to agricultural yields. Here, the production of irrigated rice is likely to decrease by 4% and for rain-fed rice by 10% in general. Parts of Karnataka and Kerala (Southern India) are likely to benefit in terms of their yields. Maize and sorghum production may drop up to 50%, depending on the region (INCCA 2010: 18). Coconut production may also increase by up to 30%, depending on the increase in rainfall and small temperature rises. Apple production in the Himalayan region, more specifically Himachal Pradesh, has already been decreasing since 1982 due to increasing temperatures (INCCA 2010:20). This development is expected to accelerate, so that a shifting to higher regions may become necessary. According to the IPCC AR4, the gross per capita water availability in India will decline from about 1820 m^3/year in 2001 (which is already low), to as low as 1140m^3/yr in 2050.[24]

According to the IPCC, seal-level rise and flooding may affect India in those coastal areas where human settlements have destroyed natural ecosystems adapted to flooding and in the delta of West Bengal and aquacultures there. In the INCCA modelling, flooding varies from an increase of 10-30% by 2030, which has a severe impact on existing infrastructure and populations living in those areas affected.

Forest ecosystems are vulnerable to climate change in the short-term even under a moderate scenario, with projections for forest changes ranging from 8% in the North-Eastern regions and up to 56% of forest grids in the Himalayan region. Finally, concerning health risks, The IPCC and INCCA both expect the transmission periods for vector borne diseases such as malaria or dengue to be longer.

This summary of the projected climate change impacts has to remain quite

24 IPCC AR4 (2007), Working Group 2, Impacts, Adaptation and Vulnerability, Chapter10, page 480.

broad and underlies the data and modelling constraints, as I have already mentioned. Yet it still shows that the variety of climate change impacts and their regional differences across India presents a particular challenge both to policy-makers and the individual having to adapt to these impacts. Water stress, impacts on agriculture and flooding as well as the sensitive Himalayan ecosystem are areas that deserve a higher priority in adaptation governance.

5.2.2 South Africa

The emission profile of South Africa is strongly linked to its economic structure and electricity generation from coal. While the coal in South Africa has higher quality than in India, 88% of electricity is generated from it. In India electricity is also largely generated from coal, but also from oil, nuclear and renewable energy sources.[25] Generally, electricity in South Africa is cheap. Industrial production is very energy- and GHG intensive: 843 million tons CO2 eq per million US dollar (PPP) of the GDP.[26] The metals industry is the most energy intensive, followed by non-metallic minerals, chemicals and petrochemicals and mining and quarrying (2006 data, see Winkler, Jooste & Marquard 2010).

In 2000, South Africa's national net GHG emissions were at 415 million tons CO2 eq (LTMS 2008), of which 78% came from energy (fuel combustion, also in the industries and fugitive fuels), 14% from industrial processes, 6% from agriculture, land use and forestry and 2% from waste. In 2000, GHG emissions per capita were at 9,25 tons - well in the ranks of an industrialized European Union country. Figure 2 shows the trend for energy use, emissions and carbon intensity of the economy from 1990 to 2007.

Only the national energy use and the national carbon emissions have increased, while the per capita emissions, per capita energy use and carbon intensity of the economy are falling (see Fig. 2). More current data than 2007 were not available. The variations may be due to differing dynamics in economic development and the introduction of some energy saving measures (see Section 5.3.2).

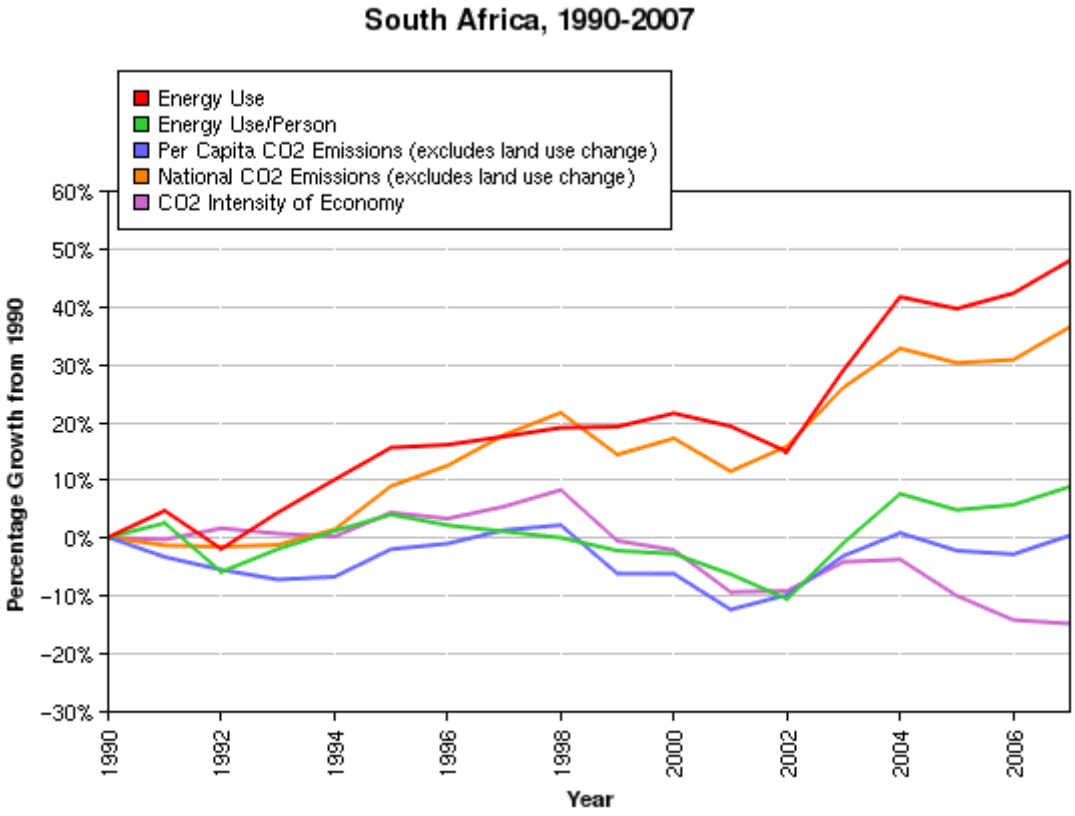
Projections for emissions according to the Long-Term Mitigation Scenario (LTMS) of the South African Department of Environment calculate an increase of emissions up to approximately 1500 million tons of CO2 eq till 2050 with the development plans as of 2007. The LTMS report (see section 5.4.2) modelled different

25 International Energy Agency, statistics by Country for 2008; http://www.iea.org/stats/electricitydata.asp?COUNTRY_CODE=IN; accessed 31 May 2011.

26 World Resources Institute, CAIT-Tool, data of 2005; accessed 31 May 2011.

scenarios with moderate to severe efforts, similar to the Indian modelling explained above. Under the moderate scenario, absolute emissions would continue to rise to about 1000 million tons, well over double of the baseline year 2003.[27] The option "Use the market", which would require considerable efforts, would halve South Africa's emission till 2050 to about 620 million tons CO2 eq. No short-term projections till 2030 were available.

Figure 2: Trends in Emissions and Energy Use in South Africa



Source: World Resources Institute, CAIT-Tool, accessed 30 May 2011.

Projections of the impacts of climate change are subject to similar data constraints and modelling difficulties as in India. Scenarios differ according to the model and data taken. The following summary of projections draws on the South African Risk and Vulnerability Atlas of 2010 (Akoon et al 2010) and the IPCC AR4.

Currently, South Africa has a sub-tropical climate which is semi-arid in the western regions of the country. The Southwestern Cape receives the bulk of its rainfall during winter, while winter rainfall in the interior regions of South Africa are sparse

27 Department of Environmental Affairs and Tourism, Government of South Africa, Long-Term Mitigation Scenario, 2007, p. 14.

(Akoon et al 2010:2). Generally, the sectors with the highest vulnerability to the impacts of climate change are most likely to be water, biodiversity, agriculture, health and some coastal areas that will be affected by sea-level rise, flooding and change of currents.

Temperatures are likely to increase about 3°C by 2070 -2100 in the central and northern interior regions compared to a baseline period of 1975-2000 (Akoon et al 2010). Temperatures are projected to rise less in the coastal regions (2°C), but more in the central interior of the country (4°C). Rainfall is likely to decrease in the winter rainfall regions in the Cape and most of the summer rainfall regions are projected to become drier during spring and autumn. Eastern South Africa is thus likely to have summers with more intense rainfalls. These projections reported in the South African Risk and Vulnerability Atlas are in line with IPCC Ar4 projections.

South Africa is a country that is already water-stressed, with only 8,6% of its freshwater resources available as surface water. This problem will aggravate with climate change. Western regions of South Africa may have to face a decrease of 30% in water availability (Akoon et al 2010: 23).

Changes in temperature, water and rainfall will impact agriculture. When temperature increases by 2°C and rainfall decreases by 10%, then wheat and maize yield may drop by up to 0.5 tons per hectar. In the marginal zones of the winter rainfall areas, wheat yield may drop by 15-60% (Akoon et al 2010: 29). The IPCC AR4 even projects agricultural yield losses of up to 90%, mostly affecting small-scale farmers.[28] Temperature increases will also affect fruit and wine production, potentially forcing producers to shift to other regions or higher altitudes, if possible.

With respect to biodiversity, impacts are projected to be most severe in the west and south west of South Africa, where many unique species and biodiversity "hotspots" are. Projections for the Fynbos and succulent Karoo biomes expect 51-65% losses (IPCC AR4). Losses in Biodiversity can also affect tourism, which is an important source of income for many South Africans. Health risks connected to climate change are expected to come directly from more frequent extreme weather events such as heat waves or floods and from the spread of vector-borne, water-borne and food-borne infections and diseases, including a spread of Malaria into South Africa from the North. Here, more detailed projections are not available yet.

This brief description of South Africa's emission profile and projected climate change impacts shows that the country faces a largely similar bundle of problems to India, while some differences in terms of the energy sources and energy mix as well as concerning adaptation needs exist.

28 IPCC AR4 (2007), Working Group 2, Impacts, Adaptation and Vulnerability, Chapter 9, page 448.

5.3 Actor landscape

5.3.1 India

A complete overview of all major actors in India's domestic climate governance is hardly possible because the number of stakeholders and participating institutions is relatively high. In the following, I point out the most relevant government departments and public institutions and the major players in business. In addition, I will indicate some relevant research institutes and civil society organisations. I do not claim to give a complete description of all actors across India.

The number of ministers in the Indian central government is traditionally very high. After the elections in 2009, the number of cabinet ministers stood at 33. Prime Minister Manmohan Singh heads an additional six ministries and departments himself.

The Prime Minister's Council on Climate Change was set up in 2008 to coordinate India's assessments and actions on climate change, both for mitigation and adaptation. It prepared the National Action Plan on Climate Change (NAPCC), published in June 2008. The leading government department for India's international and domestic climate policy is the Ministry of Environment and Forests (MoEF); until July 2011 it was chaired by Jairam Ramesh. The MoEF coordinates the implementation of the NAPCC and is responsible for the implementation of the Green India Mission, which focuses on afforestation and forest management. Each of the eight missions of the NAPCC have been assigned to one or more nodal ministries for a translation of the general mission statements into concrete measures and their implementation.

India is one of the few countries in the world that has a separate Ministry of New and Renewable Energy (MNRE). The MNRE is responsible for the solar mission under the NAPCC and has the general aim to deploy and develop new and renewable energy across India, including the support of R&D and incentive programmes.

The Ministry of Power and the Bureau of Energy Efficiency (BEE) are also both important for India's energy policy and the regulation of the energy and electricity sectors, as well as the promotion of energy efficiency in industry, transport and society more generally. The BEE has been successful in designing and implementing a series of measures and mechanisms concerning energy efficiency and is therefore responsible for the National Mission on Energy Efficiency under the NAPCC.

The Department of Science and Technology within the Ministry of Science and Technology coordinates both the Strategic Knowledge Mission and the Mission for Sustaining the Himalayan Ecosystem under the NAPCC (see chapter 6.4). The

Knowledge mission aims a) to map existing knowledge in the field and identify gaps, b) strengthen the ties between researchers and institutes already working on climate change and c) create new research centres. The Department also allocates funds for solar and water technology research. Further funds for meteorological research are allocated by the Ministry of Earth Sciences.

The Ministry of Water Resources has the task to revise the National Water Policy of 2002, developing and implementing the Water Mission under the NAPCC. The mission of Sustainable Habitat lies with the Ministry for Urban Development and the mission for Sustainable Agriculture with the Ministry of Agriculture.

None of the major political parties at central level and in Maharashtra explicitly focus on environmental issues. In 2010, the Green Party of India was established, but it has no political significance thus far. The most important parties in the Indian party system at the national level are the Indian National Congress (INC) and the Bharatiya Janta Party (BJP), but there are also a variety of smaller regional parties active at the state level, such as the Shivsena in Maharashtra.

In January 2010, the central government established an expert group on a low-carbon strategy for inclusive growth (hereafter called Low-Carbon Expert Group) with 26 members from government, academia and civil society. The group has the task to develop a roadmap for Indian low-carbon development. Its assessments and recommendation will feed into India's Twelfth Five Year Plan, the central economic planning instrument of the Planning Commission.

In Maharashtra, the Department of Environment develops and coordinates the state's policies and measures on climate change. The Energy and Resources Institute (TERI) currently assesses the vulnerability and develops adaptation measures for Maharashtra together with the United Kingdom Meteorology Office (see chapter 6.4).

In the private sector, there are several actors engaging in climate change advocacy and activities. The two major business associations for large companies, the Confederation of Indian Industries (CII) and the Federation of Indian Chambers of Commerce and Industry (FICCI), both have climate change teams or task forces. CII also established a Green Business Centre that focuses on the information about climate change and promotion of climate protection among businesses as well as in other related areas such as energy efficiency, water saving and green buildings. Generally, large corporations such as the Tata Group and the Reliance Group influence economic and industrial policy in India. Their behaviour and engagement in climate change actions is important for the behaviour in the whole private sector.

Moreover, the wind and solar industries play an important role by underlining

the positive effects of further developments of renewable energy in India, both for business and for climate change reasons. Among them are leading companies such as Suzlon (wind energy) or MoserBaer (photovoltaics). Finally, the large CDM industry, composed of the Designated National Authority, project developers and consultants, are relevant actors and a driving force of further developments in the Indian climate governance.

The academic landscape is large and scattered in India. Many research institutes, think tanks, universities and individual academics work on climate change, meteorology and climate change-related issues. The INCCA connects 120 institutes working on climate change issues. Moreover, several of the think tanks are set somewhere between a research institute and an NGO or even a consultancy, such as TERI.

TERI does a mix of research and consultancy work on a range of environmental and energy questions. Headed by Rajendra Pachauri, the president of the IPCC, the institute is well-known in climate change circles and has long had both a reputation and considerable influence on India's climate and energy policy (see Chapter 8.2). Since 1998, TERI also has a university attached to its institute.

Substantial parts of the research on meteorology and climatology in India are undertaken at the Indian Institute of Science in Bangalore, the two Indian Institutes of Technology (IIT) in Delhi and Madras and the Indian Institute of Tropical Meteorology (IITM) in Pune. The latter is an autonomous body under the Ministry of Earth Sciences. The Tata Institute of Social Sciences (TISS) in Mumbai and the Centre for Policy Research in Delhi provide social scientific insights on climate change in India.

With respect to the think tanks that are simultaneously doing research, produce reports, run projects and campaign for climate protection, the Centre for Science and Environment (CSE) in Delhi and Prayas in Pune are the most well-known and established ones. The Centre for Social Markets also has a climate change team, but is primarily a civil society organisation that collaborates a lot with international donors. Finally, the Institute of Green Economy in Delhi is publishing reports on various climate change-related questions relevant for India domestically and engages in information and awareness raising.

The number of NGOs and consultancies that are working on climate change at the national level is relatively high. Apart from the well established organizations Prayas and CSE, the transnational NGOs World Wide Fund for Nature (WWF), Winrock International and Greenpeace are campaigning, raising awareness and running local projects on climate change. The directors of the non-profit organisation

IRADe, the couple Kirith and Jyoti Parikh, are well-known in the domestic climate change scene. Kirith Parikh chairs the Low-Carbon Expert Group and Jyoti Parikh is a member of the Prime Minister's Council on Climate Change. Moreover, the Delhi Science Forum is a non-profit organization with members from civil society and academia that informs and works at the science – society interface and covers a range of issues, including climate change. Smaller NGOs such as Development Alternatives have also taken up the climate change issue. Finally, a number of donor agencies belong to the actor landscape at the national level, for example the UNDP, GIZ or the Swiss Agency for Development. They run climate change and energy programmes and provide funding for local NGO projects.

In Maharashtra, finally, there are several environmental NGOs that are slowly taking up climate change as an issue, such as the Conservation Action Trust and the Bombay Natural History Society. Furthermore, there are individual environmentalists advocating for climate protection who have established a reputation in the field across India, such as the journalist Bittu Saghal.

5.3.2 South Africa

In South Africa, the major government departments concerned with climate change at the national level are the Department of Environment (DEA) and – somewhat less – the Department of Science and Technology (DST). The DEA and more specifically, its climate change directorate, coordinates the evolving national climate policy and leads international delegations and processes under the UNFCCC. The DEA also chairs the National Committee on Climate Change (NCCC), which includes representatives from government, business, NGOs as well as some experts. It is a stakeholder forum that advises the DEA in the development of a national climate change policy. Several interviewees, however, criticized the forum for being too big to function properly and the process for being very government-driven rather than a two-way consultation.[29] There is also the Government Committee on Climate Change (GCCC) that coordinates the ministries towards a common position and advises the climate change directorate within the DEA in terms of responsibilities relating to the UNFCCC.

The DST has an important role in South Africa's domestic response to climate change, particularly in adaptation. It promotes and finances research and programmes concerned with climate change under its “Global Change”- programme that addresses five grand challenges. One of them relates explicitly to adaptation to the impacts of

29 Interview with Business 3, 01/02/2010; NGO 1, 21/01/2010.

climate change and one to mitigation and energy security. This strategic programmes form part of DST's Ten Year Innovation Plan (2008-2018).

With respect to the mitigation of GHG emission, the Department of Energy (DoE) is a major player in South Africa. It drives government policy and action in energy efficiency and renewable energy and decides upon the future energy mix through its integrated energy plans. The Central Energy Fund is intended to be the implementing body of the DoE. Moreover, the mandate of the National Energy Regulator of South Africa (NERSA) rests on policies and regulations issued by the DoE. NERSA is a regulatory authority set up in 2004 to steer the regulations for the gas, petroleum and electricity industries. It also sets the electricity prices.

Due to its budget allocation function, National Treasury has an impact on climate policy as well. Trevor Manuel, former Minister of Finance and now head of the National Planning Commission, counts as the driving force behind the debate about and first steps leading towards an environmental fiscal reform (see chapter 6.4.2). The impact of the National Planning Commission on South Africa's climate change policy was unclear till the end of 2010. The Planning Commission is composed of 25 members from government, civil society and academia. It has been set up to develop a long-term strategic plan on central challenges for South Africa and give concrete recommendations on how to achieve their vision. Climate change has been acknowledged as such a challenge in a first "diagnostic" document published in June 2011.[30]

Finally, the Department of Trade and Industry, the Department of Agriculture and the Department of Water Affairs are minor players that feed into the overall climate policy primarily developed by DEA. All these departments have climate change teams or appointees. While the Department of International Relations and Cooperation belonged to these minor players in the period of 2007 to 2010 as well, it seems to have gained in importance in December 2011 when its minister Maite Nkoana-Mashabane took over the presidency of the international climate conference in Durban.

The South African party system has been dominated by the African National Congress (ANC) since the first elections after the end of the Apartheid regime in 1994. The ANC put climate change on its agenda in 2007 (see Section 5.4.2), as has the major opposition party Democratic Alliance (DA). No green party exists at the national level. The DA governs the Western Cape Province, where delegates of the small opposition party Independent Democrats have become vocal on climate change issues in the

30 The National Planning Commission, „Diagnostic overview", published online June 10, 2011, http://www.npconline.co.za (accessed June 20, 2011).

media. There used to be a green party in the Western Cape, the Green Party of South Africa, but it did not even participate in the 2009 provincial elections any more, after receiving only 0,2% of the vote in the provincial elections in 2004.[31]

In the Western Cape, the responsibility for climate policy lies with the Department of Environmental Affairs and Development Planning. Due to a shortage in staff, the work of consultancies such as OneWorld has been important in the past, for example for the draft of the Western Cape's response strategy to climate change.

Important players from business that are primarily active at the national level are the two major GHG emitting companies, the parastatal electricity provider, Eskom, and the petrochemical company, Sasol. Eskom and Sasol account for the bulk of South Africa's GHG emissions. Together with other energy-intensive companies, Sasol forms the Energy Intensive Users Group. It is an interest group that is primarily active in energy policy, trying to keep the electricity tariffs for industry low. The National Business Initiative (NBI) is another voluntary group of leading national and transnational companies that seeks to promote climate protection activities within the private sector, organises workshops and exchange platforms.

The general employers' and industry association Business Unity South Africa (BUSA) is also taking an interest in climate change and representing its members interests, for example in the NCCC. The trade union Cosatu is very active in social and labour issues, but had not taken much interest in climate change matters up to the time of writing. The National Mineworkers' Union supports a firm stance for emission reduction and lowering pollution levels and advocates for a carbon tax and against expanding nuclear energy.[32]

Several South African research institutes and universities are very well-known for their work on climate change and related fields. They therefore require a brief introduction. The University of Cape Town hosts two research centres that have an important role in the climate change-related research landscape: the Climate Systems Analysis Group (CSAG) provides the climate modelling not only for South Africa, but for other parts of the African continent as well. The CSAG also seeks to translate the findings of climatological research for policy-makers and society by taking an interdisciplinary approach. The Energy Research Centre at the University of Cape Town focuses on mitigation and energy-related aspects of climate change from multiple disciplines. It has been central to the Long-Term Mitigation Scenario Process

31 Electoral Institute for the Sustainability of Democracy in Africa, http://www.eisa.org.za/WEP/sou2004results9.htm (accessed July 4, 2011).

32 Parliamentary Monitoring Group, Public Hearing on National Climate Change Response Policy Green Paper, http://www.pmg.org.za/report/20110316-national-climate-change-response-policy-green-paper-2010-public-heari (accessed July 5, 2011).

(see chapter 6.4) and does a lot of economic and energy modelling.

Concerning energy questions, DST established the implementation agency South African Energy Research Institute (SANERI) in 2004. Even though it is an implementation agency, it functions more as a networking platform, publishes reports and provides bursaries for students. It is envisioned to dissolve into the South African Energy Development Institute (SANEDI), merging it with the National Energy Efficiency Agency. The creation of SANEDI was set out in the Energy Act of 2008 (see Chapter 5.4) and has the central task of promoting more efficient and renewable energy across the country. In 2007, SANERI set up a hub for renewable energy research at Stellenbosch University, which now has a Centre for Renewable and Sustainable Energy Studies.

Another governmentally-funded research institute that is strongly involved in climate change research is the Council for Scientific and Industrial Research (CSIR). The CSIR has been involved in South Africa's National Communication to the UNFCCC and has also initiated the African Centre for Climate and Earth System Science. Scientists at the CSIR focus more on adaptation and the impacts of climate change. They have developed the South African Vulnerability Atlas (see chapter 5.4).

Concerning the understanding of the impacts of climate change, the South African National Biodiversity Institute (SANBI) has an important role. SANBI has been involved in South Africa's National Communication as well. Several other research groups such as the Water Research Commission or the Agricultural Research Council as well as individual researchers at the Universities of the Witwatersrand and University of Pretoria also contribute to climate change research in South Africa.

Finally, a brief discussion of civil society groups shall complete this overview of major actors and institutions in South Africa's climate governance. The South African Climate Action Network connects different NGOs and individuals interested in working on climate protection, similar to Climate Action Networks in other parts of the world. The transnational NGOs WWF and Greenpeace are both present in South Africa as well and actively campaign for climate protection. Greenpeace established its office in Johannesburg only in 2007.

The Johannesburg-based NGO Earthlife Africa is a vocal group that campaigns and publishes reports on climate change, energy and biodiversity issues. The Climate Action Partnership (CAP) is a coalition of different conservation-oriented NGOs such as Conservation International. Apart from advocacy, its goal is awareness raising and information about climate change.

A non-profit organization that has been important in the LTMS-process is Cape

Town-based SouthSouthNorth. The organization has also supported the development of South Africa's first CDM project and advanced CDM methodologies. A number of smaller NGOs also promote climate protection, renewable energy or have single projects with climate change-components, such as Groundwork, the South African Wind Energy Association or the Environmental Monitoring Group in Cape Town. In sum, the number of civil society organisations active on climate change is relatively small compared to the number of organisations active in other issues areas in South Africa.

5.4 Policies, strategies and governance initiatives

5.4.1 India

This section introduces the range of policies, strategies and governance mechanisms that form India's domestic climate governance. They work either directly or through co-beneficial effects on climate governance. I focus on the years 2007 to 2010, but indicate relevant developments outside this period.

Internationally, India supports the global carbon-budget approach (also supported by the German government) and has shown a strong interest in technology transfer questions and the CDM in the post-2012 negotiations under the UNFCCC. Similar to the other countries of the BASIC group and the least developed countries, India stresses the principle of "common but differentiated responsibility", outlined in the UNFCCC. Traditionally, India's environmental foreign policy framed environmental protection and economic development as opposing goals. For a long time, India was the most vocal country claiming that industrialized countries need to pay for and solve the climate change problem, because they caused it in the first place (Stevenson 2011). The refusal of any mitigation commitments and an insistence on financial support by the industrialized countries also belonged to this set of arguments – until 2009, when the new minister of environment, Jairam Ramesh, began to soften the rhetoric (Vihma 2011:75). At the Copenhagen conference, India announced that it will reduce the carbon intensity of its economy by 20-25% until 2020, compared to 2005 levels.[33] Following a meeting with representatives from 35 countries in Delhi in November 2010, the Indian delegation advocates for a technology mechanism that includes the set-up of a technology exchange committee and climate technology centres

33 Copenhagen Accord, information provided by India, http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/indiacphaccord_app2.pdf (accessed June 29, 2011).

and networks.[34] Since the behaviour of the Indian delegation in the UNFCCC negotiations is not the prime interest here, I refrain from discussing it further.

For the beginning of 2007, no comprehensive domestic Indian climate policy can be identified. In October 2007, the MoEf, Ministry of Power and BEE published a paper discussing issues of energy security and climate change and how existing programmes benefit adaptation to climate change.[35] This paper outlines that 2% of India's GDP is already spent on measures and programmes that are co-beneficial to climate governance. While this may be the case, some doubts remain. Agricultural crop research programmes, for instance, would have to draw on recent local climate change impact projections to be sound – these were not available yet.

The NAPCC, published in June 2008, was India's first domestic climate governance document. As already indicated above, it is a strategy that outlines eight broad missions rather than concrete policies and measures. In December 2010, the end of the period of analysis here, the missions on energy efficiency and solar energy had advanced the most. This concerns both the development of concrete measures and their implementation, including financial investments. Both these missions draw on existing policies and initiatives. The energy efficiency mission includes a star rating system for appliances and the Performance, Achieve & Trade -Scheme. It is a market-based mechanism that enables the trading of energy saving certificates among large industries. Both measures are based on the Energy Conservation Act of 2001. The other missions under the NAPCC were in different stages of planning and finalization as of November 2010.

There are several other measures and policies on energy efficiency and renewable energy that are co-beneficial to climate governance. Contrary to what one may think, India has a comparably long history of increasing energy efficiency, reducing the energy intensity of its economy as well as fostering renewable energy to diversify its energy mix and reduce its reliance on coal and imported oil. Despite India's large coal reserves, supply does not meet demand and the poor quality of the coal aggravates the situation. The power tariffs that Indian industry and commerce face are among the highest in the world in terms of PPP {Bhushan 2009: 14), so that Indian entrepreneurs are forced to reduce their energy consumption in order to stay competitive. Since 1980, the energy intensity from 0.3 kg per US dollar PPP of GDP to 0.16 kg per dollar PPP in 2009. In May 2007, an energy conservation building code

34 Earth Negotiations Bulletin, UN Climate Change Conference in Cancun: 29 November – 10 December 2010, http://www.iisd.ca/climate/cop16/compilatione.pdf (accessed July 5, 2011).

35 India: Addressing Energy Security and Climate Change. Ministry of Environment and Forests, Ministry of Power and Bureau of Energy Efficiency, October 2007.

was launched that sets standards for the optimization of energy demand of new commercial buildings. The state of Delhi has already put it into effect, with other states due to follow. Since March 2007, large energy-consuming companies have to conduct energy audits, annually report energy consumption and conservation annually and employ an energy manager.

There is no overarching law governing renewable energy in all of India, but there are several initiatives of both central and state governments with co-benefits to climate protection. The Electricity Act of 2003 introduced renewable purchase obligations (RPO) that require state electricity commissions to buy electricity from renewable sources at a subsidized price. Tamil Nadu has the highest RPO among the Indian states at 13% of all electricity produced (Arora et al 2010). Additionally, the Central Electricity Regulatory Commission has set out the conditions for the introduction of a system of trade for renewable energy certificates among the states in September 2010, so that all states can reach their RPO goals and surplus can be traded. RPO and generation-based incentive (GBI) schemes, subsidies and credits with low interest rates given by government are supposed to support investments of both domestic and foreign companies in renewable energy.

> "Newer policies, such as GBIs and RPOs, encourage independent power producers and private investors to establish large-scale, commercial wind plants that enable wind to be a more significant part of the power mix. Based on experiences in other countries, both GBIs and RPOs are generally considered to be positive steps towards encouraging the development of wind power." (Arora et al 2010:31).

In 2009, India ranked 5th globally in installed wind capacity with about 12 Giga Watt installed. In June 2010, 70% of India's renewable energy came from wind energy (Arora et al 2010). The Solar Mission under the NAPCC envisions an expansion of solar energy that will lead to grid parity of electricity produced from wind and solar sources by 2022. The mission sets a target for an additional 10, 000MW of electricity produced by photovoltaic and concentrated solar power technology by 2022. The Central Electricity Regulatory Commission has established a feed-in tariff of 40 Indian cents per kwh for grid-connected photovoltaic electricity and 29 INR cent per kwh of concentrated solar power. These tariffs will remain in place for 25 years and decline over time[36]. In June 2011, the cabinet of the central government approved a fund of 4,86 billion INR (approx. 108 million US dollars) in support of the solar

36 Makhijani, Shakuntila, „Putting the „Green" in Green Energy: Indian Government approves fund in support of amibitious solar electricity targets", June 13, 2011, Revolt,The Wolrd Watch Institute's Climate and Energy Blog, http://blogs.worldwatch.org/revolt/putting-the-%E2%80%9Cgreen%E2%80%9D-in-green-energy-indian-government-approves-fund-in-support-of-ambitious-solar-electricity-targets/ (accessed June 26, 2011.)

mission[37].

In 2009, the Ministry of Environment and Forests published a document outlining 20 initiatives that are co-beneficial to climate governance.[38] The measures on energy efficiency already outlined above are mentioned as well as several initiatives in forestry, such as the expenditure of 125 million US dollars (Rs 600 crore) in a forest management programme and 2.5 billion US dollar (Rs 11,700 crore) on a programme for forest conservation, regeneration and management of existing wildlife habitats. With respect to research, several plans for surveillance of the Himalayan ecosystem and reports produced by the INCCA and the Low-Carbon Expert group fall under these twenty initiatives. In May 2010, the MoEF published India's Greenhouse Gas Inventory of 2007, produced by the INCCA.[39] The INCCA published another analysis of climate change in November 2010, modelling regional climate change impacts in four major Indian regions (INCCA 2010). The submission of an interim report of the Low-Carbon Expert Group to the Planning Commission was expected for March 2011, but published in May 2011.[40]

Apart from the electricity and energy regulations outlined above, state-level activities on climate change focus on the development and implementation of state action plans on climate change that are aligned to the NAPCC. In August 2010, the MoEF hosted a national consultation workshop to discuss state level strategies and developed a framework for state action plans on climate change. The states that had already published these plans as of December 2010 were Delhi and Orissa. Most of the states, including Maharashtra, partnered with either TERI or an international donor agency such as UNDP, DFID or GIZ to help them in developing their action plans and policies on climate change. Gujarat is the only state that has set up a separate department for climate change, announced in 2009. In the same year, Himachal Pradesh was the first state announcing the goal to become a carbon neutral state, mostly by investing in afforestation and participating in the international REDD mechanism. However, it is unclear to what extent these announcements have been followed by action.

Apart from government-driven activities, the good functioning of the CDM and the growing renewable energy business sector imply that India’s approach is mainly

37 id.

38 India: Taking on Climate Change. Twenty Recent Initiatives Related to Climate Change, Ministry of Environment and Forests, Government of India, 1st September 2009.

39 Ministry of Environment and Forests, Government of India/ INCCA: India: Greenhouse Gas Emissions 2007, May 2010.

40 Interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth, Planning Commission, Government of India, May 2011.

business-oriented. The number of CDM projects has increased from 83 registered projects in 2007 to 650 projects[41] in 2010 – only China hosts more. Private climate governance initiatives apart from the CDM exist as well. India's 200 largest companies take part in the Carbon Disclosure Project, but response rates are rather low compared to South Africa, even though these increased between 2007 and 2010 (see Chapter 6). CII is currently developing another voluntary, disclosure-based instrument for its members, the Green Rating System. It is supposed to become a holistic instrument for the assessment of companies' environmental performance on a range of issues, including climate change relevant information such as GHG emissions. CII also offers training programmes for its members to develop corporate climate change strategies. Since 2002, CII gives an annual award for leadership and excellence on health, environment and safety. Both FICCI and CII have published a number of reports on climate change and are raising awareness among their members by conducting workshops. To inform and attract investors, FICCI compiles a Solar directory that lists all companies in India active in solar energy.

Individual companies have also also engaged in climate governance initiatives. In collaboration with USAID, India's largest power company NTPC has set up a Centre for Power Efficiency and Environmental protection that develops technologies and measures to reduce GHG emissions per unit of electricity generated by coal-fired plants. Several other companies such as the Tata Group or Wipro and Infosys (both information technology companies) have taken climate change into their corporate social responsibility strategies. Indian corporations with a business interest in wind energy (such as Suzlon) or solar energy (such as MoserBaer) invest heavily in their sectors to secure a share in both the Indian and the global market. MoserBaer, for example, started building a 1 MW solar power plant in Maharashtra in 2010. Suzlon's headquarters in Pune are completely powered by renewable energy and received the prestigious Leadership in Energy and Environment Design platinum award for this in 2010. Other Maharashtra-based companies such as Thermax (Pune) develop less energy-intensive and less GHG- intensive products. Thermax produces energy- and GHG emission-saving boilers and heating systems and advertises for low-carbon solutions in energy services.

Generally, the private sector in India engages in energy efficiency, renewable energy and other climate governance mechanisms when it makes business sense to them. An analysis of the driving factors for (private) climate governance will shed more

41 UNFCCC, http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html (accessed December 15, 2010).

light on this (see Chapters 6 and 8). Summing up, the number of co-beneficial policies and governance mechanisms seems to be quite high in India, while concrete domestic climate change policy is still under development. First steps are being taken.

5.4.2 South Africa

South Africa had its first National Climate Change Strategy in 2004 (South Africa 2004), but no concrete measures were implemented. The first national climate summit with a range of stakeholders took place in Midrand in 2005, which resulted in the Midrand Plan of Action.[42] This plan listed a number of activities that were supposed to lead the country's climate change programme, but it was largely a statement of intent. Actual political momentum only occurred from roughly 2007 onwards. It is safe to assume that the publication of the IPCC AR4 in early 2007 triggered a lot of global attention, from which South Africa was not exempt.

Internationally, the South African negotiating team at the UNFCCC Conference of the Parties (COP) has a good reputation. Marthinus van Schalkwyk, minister of environmental affairs from 2004-2009, was well-known and respected among international climate negotiators and had positioned South Africa as a credible negotiation partner at the COPs (Masters October 2009:21). Among the BASIC, South Africa counts rather as a driver than a blocking force and has signalled that it would undertake measures to reduce GHG emissions earlier than the other BASIC countries (Ochs Dezember 2007). This difference especially to the Indian and also the Chinese position may be due to South Africa's significantly higher per capita emissions. The hosting of the COP 2011 in Durban put the spotlight on South Africa's international as well as domestic climate governance efforts.

In December 2007, the ANC adopted a declaration on climate change for the first time.[43] While not a concrete policy step, this lifted climate change onto the ANC agenda and certainly raised awareness among ANC policy-makers. In the same year, DST also publishes a synthesis report assessing South Africa's technology needs for an adequate response to climate change.[44]

In July 2008, the Long-Term Mitigation Scenario[45] was published. The LTMS is

42 Government Republic of South Africa, Action for Climate Change, Conference Statement 20 October 2005, Midrand, http://www.ccsummit2009.co.za/Downloads/Conference_Statement.pdf (accessed 17.05.2011).

43 ANC's resolution on Climate Change at Polokwane, African National Congress 2007, http://www.anc.org.za/ancdocs/his¬tory/conf/conference52/; (accessed 19 April 2010).

44 South Africa's Climate Change Technology Needs Assessment. Synthesis Report, DST, 2007.

45 Long-Term Mitigation Scenarios: Strategic Options for South Africa. Department of Environmental Affairs , 2008.

a scientific document that lays out different options for mitigating South Africa's emissions. Based on the LTMS, the cabinet decided on a “peak, plateau and decline”-trajectory for South Africa's emissions that corresponds to the South African pledge in the Copenhagen Accord: an emission reduction of 34 percent by 2020 and 42 percent by 2025 compared to a 'business as usual scenario'.[46]

In March 2009, the second national climate change summit took place with about 900 participants. This summit formally launched the policy process for the development of a domestic climate change policy that was supposed to lead into a Green Paper by April 2010, a final White Paper by the end of 2010 and the translation into a concrete legislative, fiscal and regulatory package by 2012.[47] The Green Paper was published six months late in November 2010.[48] The White Paper following it was published in October 2011.

Since this study looks at 2007-2010, I only summarize the Green Paper here. It is based on several principles: the principle of common but differentiated responsibilities, the precautionary principle, the polluter pays principle, a people-centred approach, inter-generational rights (in line with the South African constitution) and a principle of informed participation. This means enhancing the understanding of climate change science and technology on all levels of society. The Green Paper also identifies key sectors for adaptation and mitigation that are highly relevant in the short to medium term. For adaptation to the impacts of climate change, these are water, agriculture and human health. For mitigation, they are energy, industry and transport. There are no concrete mitigation targets in terms of numbers in the paper. Further important sectors named are disaster risk management, natural resources including biodiversity and human livelihoods and services.

Treasury introduced a small carbon tax on new vehicles in October 2010 and published a discussion paper for the introduction of a wide-spread carbon tax in December 2010. In terms of co-beneficial policies, there is also a national biofuels industrial strategy (since 2007) and a cleaner production strategy for industry, developed in 2004.[49] Since these are strategy papers and not concrete policies or legislation, their implementation faces some difficulties.

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46 Copenhagen Accord,information provided by South Africa http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/southafricacphaccord_app2.pdf, (accessed 29 June 2011).

47 Cabinet's approved way forward for the development and implementation of South Africa's climate change respone, online at http://www.ccsummit.co.za; (accessed June 28, 2011).

48 National Climate Change Response Green Paper 2010, Department of Environmental Affairs, Pretoria.

49 Biofuels Industrial Strategy of South Africa, Department of Minerals and Energy, 2007; National Cleaner production Strategy, Government of South Africa, 2004.

Given its emission profile, policies and governance of energy and electricity are an important part of climate governance in South Africa, similar to India. The South African energy sector has always been structured in a way to provide bulk supply in a centralized way. Following massive electrification programmes after the end of apartheid, the spatial legacy of supply patterns concentrated on areas with white inhabitants was somewhat overcome (Tyler 2009:6). The White Paper on Energy of 1998, one of the central documents on energy, promotes that 30 percent of power should be supplied by independent power producers (IPP) to diversify South Africa's energy mix and break up the monopolistic position of Eskom. As of December 2010, this had not happened.

The White Paper on Renewable Energy of 2003 is a second important policy document, especially regarding its co-benefits for climate governance. It introduced a target of 10 000 GWh of electricity to be produced from renewable energy by the end of 2013. This goal will most probably not be met (Edkins, Marquard & Winkler 2010:iv). The renewable energy feed-in tariff (REFIT) guidelines published in March 2009 came as a reaction to the widespread power blackouts in 2008. They made clear that alternative energy sources are necessary for both energy security and climate protection reasons. REFIT guarantees power producers a fixed price rate (per kWh produced), thus overcoming the financial barrier that had long impeded any renewable energy production (Edkins, Marquard & Winkler 2010). The electricity tariff of 2 South Africa cent/kwh – introduced in June 2009 on power generated other than by renewables – is in fact the first carbon tax in South Africa. While not making a real financial impact on Eskom, it may be the gateway to further mitigation measures in this area. Public consultations for the second Integrated Resources Plan (IRP) are ongoing. The IRP2 is expected to outline different scenarios on how to integrate energy, climate and development objectives in energy governance.

In 2005, a public-private Energy Efficiency Accord was concluded. This example of governance with government has been signed by 44 companies.[50] While the accord was originally set up to counter the energy supply and demand problems, it has co-benefits for climate change mitigation as well. In May 2010, the DoE also published a policy to support energy efficiency and demand side management.[51]

Another public-private initiative related to climate governance concerns the

50 National Business Initiative, Energy Efficiency Accord Signatories 2005-2008, http://www.nbi.org.za/__documents/SF_EE/eeaccordsignatories2005-2008.pdf (accessed 20 February 2011).

51 Policy to support the Energy Efficiency and Demand Side Management. Program for the Electricity Sector Through the Standard Offer Incentive Scheme, Department of Energy, http://www.energy.gov.za/files/policies/Standard_Offer_Policy.pdf (accessed 8 December 2010).

technology development of Carbon Capture and Storage (CCS) and its use in South Africa. The carbon-intensive companies Eskom, PetroSA and AngloAmerican have invested two million Rand (292, 000 US dollars) for the development of a CCS atlas together with SANERI, which identifies possible sites in South Africa. Reservation against CCS is by far not as strong as in European countries and it is "included within the climate change policy framework without significant debate" (Masters 2009: 10).

At sub-national level, the Western Cape was the most advanced province during the period of interest here, as it already had a climate change response strategy in 2008.[52] The strategy identifies and discusses a range of options to keep the Western Cape's comparably low emissions of GHG at the current state and to facilitate adaptation. The priority areas for adaptation measures identified in the strategy are integrated water resource management, the establishment of clear links between livelihoods, land and the economy and establishing a focused climate change research and weather information programme.

The provinces Gauteng and Kwa Zulu Natal had also started to develop a climate change action plan or response strategy in 2010. Generally, municipalities and local communities are more active in climate governance than the provinces. The municipalities of Durban (eThekwini), Cape Town and Johannesburg have developed and started to implement concrete climate governance measures.

Contrary to India, the CDM has not attracted as much interest in South Africa. Despite the initial hopes and potential invested in the CDM when the mechanism was first initiated in 2007 (Winkler & van Es 2007), only 17 CDM projects had been registered as of August 2010.[53] At the beginning of 2010, only five of these were actually up and running according to a South African expert.[54] The types of projects include biomass, energy efficiency, renewable energy, fuel switching and landfill gas capture. Among the project developers are some of the big emitters within business, such as Eskom, Sasol or the pulp and paper manufacturer Sappi.

South Africa's big business sector also reports to the CDP with high response rates and increasing initiatives within and by companies (see Chapter 6). The Climate Change Leadership Award, first awarded in 2010, is another mechanism to stimulate awareness and action among business and to reward voluntary action in society. It is sponsored by a group of large companies and NGOs. The 2010 winners in the

52 A Climate Change Strategy and Action Plan for the Western Cape, Department of Environmental Affairs and Development Planning, Western Cape, March 2008.

53 Department of Energy, South Africa's CDM Project Portfolio, http://www.energy.gov.za/files/esources/kyoto/South%20Africa%27s%20CDM%20project%20portfolio%20up%20to%2012%20August%202010.pdf (accessed 12 August 2010)

54 Interview with Academic/Expert no. 2, January 2010.

corporate category were Nedbank in financial services and the retailer Woolworths. Nedbank, for instance, has targets for the company's carbon emission reduction (12% till 2015), water and paper use, as well as electricity saving. Other large companies also engage in individual, voluntary climate governance. The insurance company Santam, for instance, not only has an emission reduction target for the company, but additionally collaborates with UCT and CSIR to advance research on systemic and climate change risks. The two major GHG emitting companies, Eskom and Sasol, also have climate change action plans and climate change management committees or teams. Sasol financially supports solar thermal research at Stellenbosch university and has both energy efficiency and emission reduction targets. The company aims to reduce its GHG emission intensity target by 15% by 2020 (compared to 2005) and absolute GHG emissions by 20% for all new power plants commissioned before 2020. Eskom plans to change the energy mix and simultaneously decrease GHG emissions by increasing nuclear power to 20 000 MW and renewable energy to 1600 MW by 2025.[55] The company also runs a subsidized solar water heater programme and has several energy efficiency and electricity saving campaigns.

This overview shows that the climate governance landscape in South Africa is still much under development, similar to India. The initiatives and voluntary measures taken by business, as illustrated by the examples given here, underline that taking a more comprehensive governance lens that incorporates more than policies and legislation is useful.

5.4.3 Measurement of change: regulatory density and intensity

The previous chapters introduced the major actors and central policies and other relevant governance mechanisms targeting the domestic governance of climate change in India and South Africa. This section provides a first measurement of the change processes between 2007 and 2010 that build the research interest of this study. It focuses on one dimension, policy change and its measurement by assessing the regulatory density and the regulatory intensity in both India and South Africa. For a more complete understanding of the nature and scope of change – in line with my comprehensive definition of change – results will be integrated with the other empirical data on change at a later stage (Chapter 9).

The debate about the exact conceptualization and measurement of policy

55 Eskom's Climate Change Commitment – The 6 Point Plan, http://www.eskom.co.za/content/GI0004_6_POINT_PLAN~2.pdf (accessed 29 June 2011).

change is ongoing in the literature (Capano & Howlett 2009). Knill et al. (2010) have proposed measuring policy change based on regulatory density and regulatory intensity. The density of regulations indicates how much governmental action, steering and legislation exists in a given policy field or sub-field (Knill, Schulze & Tosun 2010:419). Regulatory density has two sub-dimensions: the density of policies, to be measured in the number of policies over time (increasing/decreasing) and the density of instruments, to be measured by the number of instruments over time (id.). The regulatory intensity captures the severity or strength of regulation. Knill et al. use the level of regulation, for example emission caps and the scope of regulation over time as indicators. Using the density and intensity of regulation to measure policy change counters the difficulty of linking environmental outcomes or change to a concrete policy. Despite doubts about their reliability, these outcome data are often used as indicators for environmental policy change. Another advantage of measuring policy change in the way proposed by Knill et al. lies in the possibility to capture the direction of change, including the abolition of policies or conflicting effects of instruments (Knill et al 2010: 415ff.).

The exclusion of public-private or private governance and therefore a limited perspective of the change processes in a given country, presents a disadvantage. Moreover, the assessment of the level and scope of regulation over time may be difficult because on the one hand, it would require a comparison between peer countries – here, data availability poses a problem. On the other hand, an adequate assessment of the scope and level of regulation presupposes its implementation and control, at least to some extent. However, the implementation of policies and regulation and potential sanctioning for non-compliance presents a big challenge in many developing countries and emerging economies.

When a policy field and its regulation is still evolving, the authors argue that "the adoption of new policies will be more important for an increase in regulatory density than diversifying instruments and therefore fine-tuning policies"[56] (Knill et al. 2010: 421). This may be the case for India's and South Africa's domestic climate governance, so that a stronger focus on the amount of policies instead of the amount of instruments might be useful.

Table 2 compares the number of policies, strategies and instruments in India and South Africa in January 2007 and in December 2010, based on the description in the previous sections. The table differentiates between policies and strategies directly targeting climate change and co-beneficial policies – to some extent, the exact number

56 Translation by the author.

of the latter is a matter of interpretation. I used the declaration of the respective government as a guideline for counting the policy or strategy as co-beneficial to climate governance.

The table shows that the regulatory density increased in both countries between 2007 and 2010, with a stronger increase in co-beneficial strategy papers and policies. In Maharashtra, no change in terms of numbers of policies or instruments directly addressing climate change can be measured for this time-period, but a state action plan is being developed, as previously discussed. The RPO, the Wind State Policy of 2008 and the implementation of the national energy act can count as a co-beneficial policy change. In the Western Cape, the number of policies and strategies increased from zero to one between 2007 and 2010.

Table 2: National regulatory intensity India and South Africa 2007/2010

	India 1/2007	India 12/2010	South Africa 1/2007	South Africa 12/2010
National climate policy (White Papers, Green Papers, Acts)	0	(1)*	0	1
Co-beneficial policies and strategies	5	7	4	4
Strategy papers on climate change	0	3	1	3
Instruments	1	3	0	2
Total	*6*	*13 (14)*	*5*	*10*

* NAPCC, counting as policy depends on whether the more concrete energy efficiency and solar missions sufficiently qualify it as a sort of Green Paper.
Source: Author's own compilation.

Overall, the regulatory density in India and South Africa has increased between 2007 and 2010. While South Africa had a national climate strategy already in 2007, India had more policies and strategies that turned out to be co-beneficial to start with. The regulatory density thus seems to be slightly higher in India, but there is hardly any difference in terms of direct, comprehensive policies and instruments targeting climate change. The regulatory intensity shows a tendency towards more severe regulation in that there is now regulation, but at a generally low level, especially if compared to a highly regulated country such as Germany. The carbon tax in South Africa is very moderate, for example. The expert survey will show how India and South Africa are rated to perform among their peers, as this is a more adequate comparison to judge the level of regulation or policy performance (see Chapter 7).

The increase of the regulatory density in both countries gives sufficient reason to believe that a change has taken place between 2007 and 2010 and is still ongoing. However, it does not tell us enough about the degree or the order of change, which I expect to differ. The following chapters assess the nature and scope of change in the domestic governance of climate change in India and South Africa from different angles.

6. Quantitative data

6.1. Introduction

This chapter is the first one that presents empirical data to answer the central research question how knowledge and collective learning influences the change in climate governance. Here, a quantitative lens is used to search for and analyse evidence for the central categories of this study – knowledge, learning and change – with an emphasis on the private sector. The chapter seeks to answer the specific quantitative questions of this study: Has there been a shift in companies' knowledge and awareness? Is it accompanied by a shift in activities? What drives companies' climate protection actions (or their inactivity)? Connections to the theoretical concepts and the central research question will be made where the data allows it.

The first part of the chapter (6.2) serves as a bridge between the descriptive-introductory chapters on India and South Africa and the quantitative data on disclosure of big companies. The figures on national clean energy investment and gross domestic expenditure on Research and Development (R&D) introduce a quantitative perspective on climate governance. They account for the relevance both government and business give to the shift towards a low-carbon economy and clean technology as a future market and therefore support the measurement of the dependent variable "change in climate governance". The identification of differences and similarities between the countries helps to generate hypotheses – the comparative element of this study.

In the second section (6.3), I analyse descriptive statistics of the CDP in order to focus on large and transnational companies in each country. The development of the disclosure information and its relevance for a shift in companies' awareness and actions forms the centre of discussion here. This part directly addresses the research questions of this chapter, as does the third section (6.4). It additionally gives some cross-tabulations and measures of associations for the CDP data. Here, the goal is to find out the reasons for companies' action or inactivity, or what drives it. Concluding remarks sum up the results of the chapter.

6.2 Clean energy investment data and R&D spending

Data on investment in climate change-related technologies and R&D on climate change-related questions are sparse for both India and South Africa. To give the reader a general understanding about the differences between the Indian and the South African investments in clean energy and R&D spending, I give a brief overview about those data available. Unfortunately, no complete comparison over time is possible due to a lack of data.

According to Bloomberg New Energy Finance, clean energy investment in India dropped back from 3.4 billion US dollars in 2008 to 2.7 billion US dollars in 2009 (BNEF 2010). The greater reluctance of banks to lend to renewable energy projects during the global economic recession is the reason for that (BNEF 2010:48). Investments are expected to have risen again in 2010 when the global recession had passed. At the time of writing, these figures were not available yet. Of the 2.7 billion US dollars, one billion is asset financing of wind energy and another 0.5 billion comes from public market investments in wind energy. Private equity and venture capital only accounts for 4% or 0.1 billion US dollars of clean energy investment in India (BNEF 2010: 48). In South Africa, clean energy investment amounted to 0,1 billion US dollars in 2009 in total. Here, 93 million US dollars stem from the Evolution One Fund for the financing of wind and hydro projects. In the BNEF report, the Evolution One Fund is counted as a private equity fund, however one of the principal investors is the International Finance Cooperation – a member of the World Bank group. The Evolution One fund should thus be rather understood as a public-private fund, since the IFC is government-funded through the World Bank. Data for 2008 were not available.

Regardless of the exact amount of investment in all years relevant for this study (2007-2010), these few figures already show the great discrepancy between India and South Africa. On the one hand India's economy is bigger than South Africa's, but on the other hand South Africa's general level of development is somewhat higher than India's, when taking the GDP and the HDI as indicators. The clean energy investment figures underline the importance the Indian government and Indian companies ascribe to clean technology and renewable energy. In addition, the differences might indicate a different perception and approach of the Indian and South African governments, resulting in different focal points in their climate governance. I come back to this in Chapter 8.

The Climate Competitiveness Index is another useful comparative measure that combines a qualitative and a quantitative assessment of clean energy investments and

performance of 95 countries with respect to the development of their climate governance. It was published for the first time in 2010 by the consultancy AccountAbility. It is composed of an accountability and a performance index. The Climate Accountability Index entails the areas national leadership, strategy and coordination, investment promotion and business support and citizen engagement. The four areas dissolve into 13 indicators and draw on over 150 qualitative data sources.[57] The Climate Performance Index uses mostly quantitative information and statistics from a variety of sources, among them the World Bank, International Energy Agency, Gallup and Swiss Re. There are again four areas and 13 indicators: incentive and price signals, awareness and risk management, access to clean electricity and intensity and emission trends.[58] For both India and South Africa, complete datasets exist.

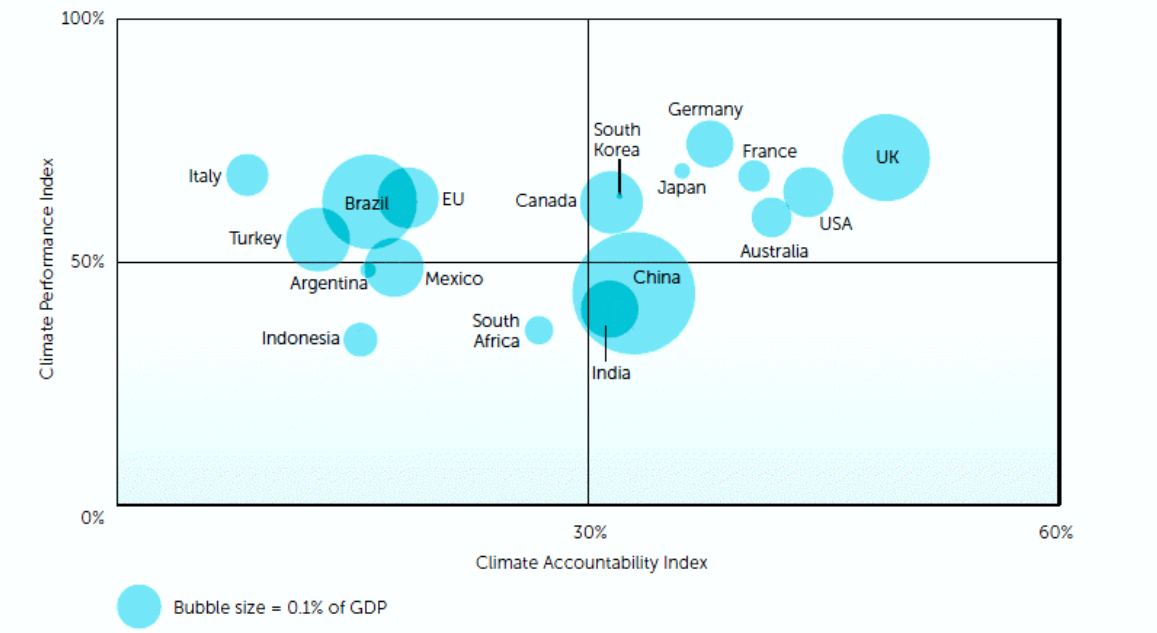
Figure 3 shows the position of India and South Africa in terms of their climate accountability and their climate performance, combined with their investments in clean energy (indicated by the bubble size).

According to AccountAbility, the climate performance of both countries is similar, but India does more in both climate accountability and with respect to the national clean energy investments. The analysts of AccountAbility saw an increase in India's accountability particularly after the UNFCCC conference in Copenhagen 2009 (AccountAbility 2010). The higher accountability in India points towards a more participatory type of climate governance, which by itself does not say much about the scope or nature of change. Roughly the same climate performance of both countries shows that neither country is a leader or laggard, so that a change process may be limited in its depth or scope. However, as no comparative data over the years are available such a conclusion is highly tentative. Since the raw data and the qualitative judgements of the analysts are not publicly available, these data are taken as such for the moment. They will be critically reviewed again in the meta-inference chapter that triangulates the quantitative and qualitative results.

57 See Appendix VI for a list of indicators.

58 See Appendix VI for a list of indicators.

Figure 3: Climate Competitiveness Index and Clean Energy Investment 2010



Source: AccountAbility (2010): The Climate Competitiveness Index 2010.

Some results of the Climate Competitiveness Index are of general interest and do not particularly relate to India and South Africa only. First, climate competitiveness is not forcibly tied to income level. No evidence for a "climate Kuznets curve"[59] exists (AccountAbility 2010b: 28), meaning that a higher income level of a country does not necessarily lead to more or improved climate competitiveness and that countries with middle or lower income can outperform highly industrialized countries. Thus, the income levels of India and South Africa do not constrain or support the development of low carbon strategies per se.

Second, private climate governance actions are important for climate competitiveness and "companies and countries are scrambling to win a share in new markets" (AccountAbility 2010b: 30). These findings call for a careful analysis of the business interests of both government and companies as a possible driving force in climate governance and its influence on background knowledge. They further justify the inclusion of the big business sector in this study and indirectly also support the

59 The environmental Kuznets curve proposes that environmental degradation first rises and then falls with income per capita in an inverted U-shaped function Grossman & Krueger 1995. The debate about this is ongoing with mixed results for both environmental degradation in general and for a CO2-Kuznets curve in particular Stern 2004; Galeotti, Lanza & Pauli 2006.

formulation of hypothesis 3b that incorporates economic incentives.

Finally, research and innovation are important for the switch to a low-carbon economy and thus to the spread to climate governance as well. Looking at gross domestic expenditure on R&D of India and South Africa will therefore give an idea about the relevance both government and business attribute to these issues. Moreover, the development of expenditure over time indicates the extent of change in this area and the comparative priority of R&D expenditure within the whole change process. Unfortunately, at the time of writing, no specific compilations for public and private investments for R&D in climate change/energy-questions were available for 2007-2010. Figure 4 therefore shows the development of gross domestic expenditure on R&D (GERD) in both countries between 2007 and 2010.

What is striking here is the great difference between India and South Africa with respect to the GERD-PPP, but their overall similarity in terms of the percentage of their GDP spent on R&D.

Figure 4: Gross Domestic Expenditure on R&D 2007-2010

	GERD* 2007	% of GDP 2007	GERD* 2008	% of GDP 2008	GERD* 2009	% of GDP 2009	GERD* 2010	% of GDP 2010
India	20.620	0.7	26.706	0.8	28.148	0.8	33.273	0.9
South Africa	4.296	0.9	3.654	0.7	3.552	0.7	3.611	0.7

* GERD-PPP, in billion US dollars. Percentage of GDP-PPP.

Source: Battelle/R&D Magazine (various years), Global R&D forecast.

India shows an increase of investments with each year, whereas South Africa's investments were highest in 2007 and show a bit of variation with a slight increase again in 2010. Expenditure compared to fully industrialised countries is lower when taking the percentage of GDP-PPP as a measure of comparison. The US, for instance, spent 2,8% of their GDP on R&D and Germany 2,4% in 2010 (Battelle 2010: 5).

The governments of both India and South Africa are planning to increase their investment into climate change-related R&D. In 2009, the Indian DST envisioned an investment of 750 million Indian Rupees for the remainder of the 11th five year plan (through 2012) and 250 billion INR for the 12th five year plan (2013-2018) to fulfill the

objectives of the knowledge mission under the NAPCC.[60] The objectives can be broadly classified as R&D. The South African Green Paper of November 2010 also emphasizes an increased investment in R&D on climate change in several articles, but no concrete figures are given.[61] The R&D expenditure behaviour of India and South Africa can thus be described as somewhat similar, but different as well: the same in terms of proportional investments of GDP, but very different in terms of the actual amount of money invested. Changes this far have been gradual, so that a deeper change in terms of loop-learning and an emphasis of R&D in climate change and clean energy as a high priority probably did not happen between 2007 and 2010 but is likely to change in the future.

Overall, the quantitative measures introduced here give mixed results. India invests more into clean energy than South Africa and also more in R&D in overall numbers. The percentage of GDP expended is roughly the same, with a stronger tendency towards an increase of expenditure in India. In both countries, private funding for clean energy is rather low. In this respect, there is no shift discernible in companies' activities in either country between 2007 and 2010. However, the results presented give reason to assume a general and growing interest in innovations at the broad climate change/energy nexus and the existence of strong business interests in clean technology and renewable energy. The latter is greater in India than in South Africa. Whether these observations are related to a collective learning process cannot be explained through the quantitative data available and presented here. The next two sections provide further insights into the developments concerning large and transnational companies.

6.3 Carbon Disclosure Project Data: Frequencies

Disclosure is a voluntary instrument of regulation or governance that is typically introduced by NGOs or business itself and therefore constitutes a form of private governance of climate change. Disclosure of information, however, should not be simply equalled to actions that reduce emissions or that help adapting to the impacts of climate change. The existence of an emission reduction target for a company can be interpreted as an indicator that the company does actually try to do to reduce its emissions, but careful inferencing is required here.

60 Department of Science & Technology, Government of India: National Mission on Strategic Knowledge for Climate Change under National Action Plan for Climate Change, Mission Document, July 2010.

61 Department of Environmental Affairs, Government of South Africa: National Climate Change Response Green Paper, November 2010.

This section compiles and analyses the descriptive statistics of answers given to the CDP surveys between 2008 and 2010. The focus lies on the frequencies of those questions and key trends that are relevant for the research questions of this study. The analysis of the frequencies supports the identification of discernible trends in awareness, perceptions of climate change and governance activities of large and transnational companies in India and South Africa. I assume that the risk and opportunity perceptions of companies depend— at least to some extent —on the different dimensions of knowledge.

Due to variation in sample size,[62] I only look at India's and South Africa's CDP results of 2008, 2009 and 2010 (excluding 2007). For India, the Carbon Disclosure Project takes the top 200 companies listed at the Bombay Stock Exchange in the respective year; for South Africa it is the top 100 companies listed at the Johannesburg Stock Exchange. Use of the same questionnaire and methodology for both countries as well as looking at frequencies in percent makes a comparison possible. The data presented below are only representative for these groups of large and transnational companies.

In South Africa, the response rates increased each year from 59% in 2008, to 68% in 2009 and 74% companies in 2010 (percentage equals number of companies, as sample size = 100). In India, the response rate varied from 25% (51 companies) in 2008 to 22% (44 companies) in 2009 and back to 25% in 2010. These differences suggest that South African companies have a higher interest in climate change and climate governance, or at least that they are more willing to invest time and effort into responding to a complex survey like the CDP than their Indian counterparts. Indian analysts of the CDP see a positive trend in terms of the comprehensiveness and depth of the information provided by Indian companies (CDP Report India 2010:11). Taking this judgement a step further, it suggests that a rather small number of companies responded. However, those that did gave comprehensive information that suggests a good level of knowledge. The following results may give more insights.

The perception of risks and opportunities associated with climate change is further differentiated into regulatory risks/opportunities resulting from the change of domestic and/or global policy shifts and physical risks/opportunities resulting from climate change. More Indian companies identified physical risks than regulatory risks in all three years, but for 2010 the percentage of regulatory risks increases to 44%, while the perception of physical risks dropped back to 67% (see Figure 5). The most frequently cited risks were extreme weather events, weather-related disruptions of the

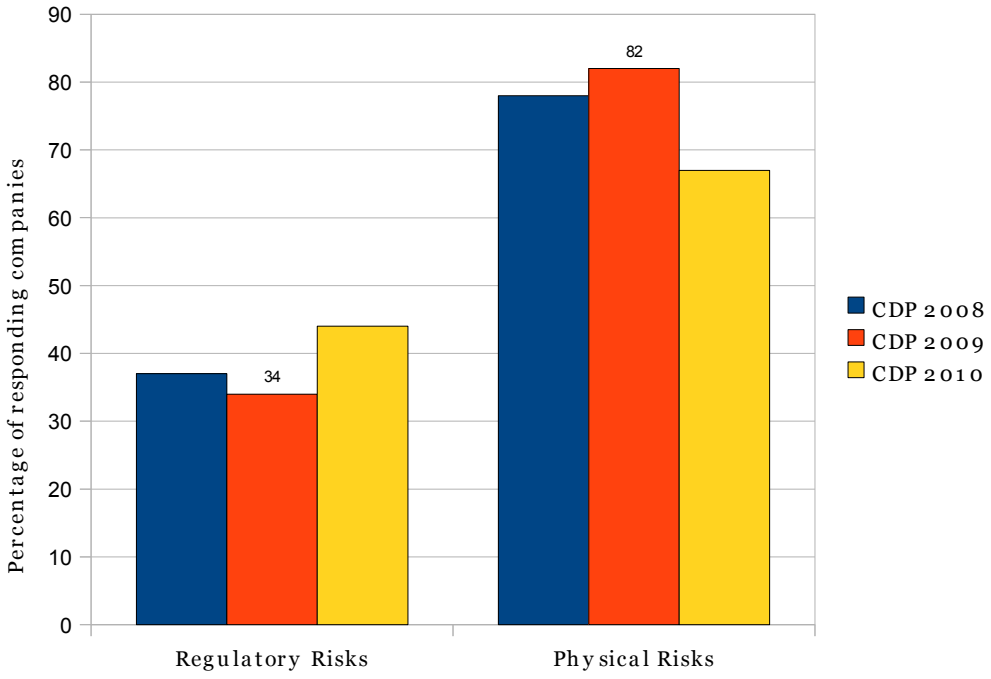
62 In 2007, only 40 companies were asked to respond to the questionnaire. In the following years, the sample was increased to 100 companies.

value chain and increases in utility and fuel overheads (CDP India 2010: 26).

In comparison, the percentage of South African companies that identify regulatory risks is much higher than for India in all three years, ranging around 75% (see Figure 6). Almost all responding companies identified physical risks of climate change for their business (89%); this dropped back slightly in the following years. Still, more South African companies perceived risks in both areas and all years than their Indian counterparts.

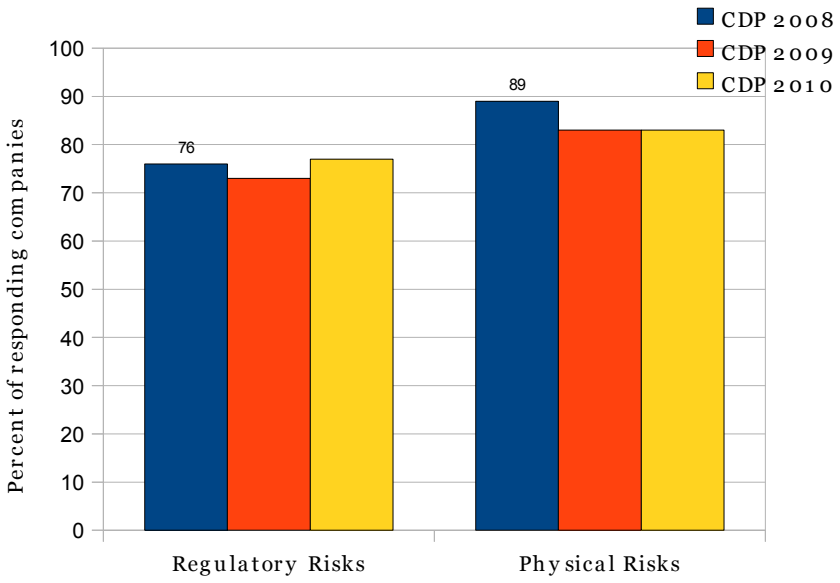
Regulatory opportunities include opportunities through the CDM or subsidized clean production, for example, and physical opportunities could present advantages through an increased need for products supporting adaptation to climate change, for example water supply products (CDP Report India 2010:30). For Indian companies, there are frequencies available for other opportunities perceived by companies, but these data were not available from the CDP reports for South Africa for all years. High percentages of companies in both countries identified regulatory opportunities in all three years (see Figures 7 and 8). The category "other opportunities" primarily refers to reputational benefits and market opportunities (CDP Report India 2010:30).

Figure 5. Risk perception of Indian companies



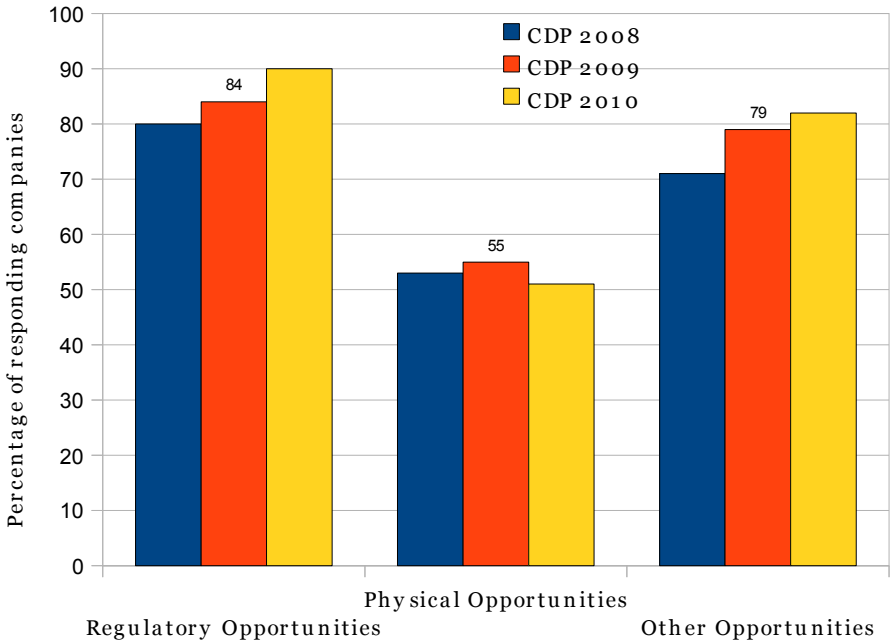
Source: CDP Report India (2010).

Figure 6. Risk perception of South African companies



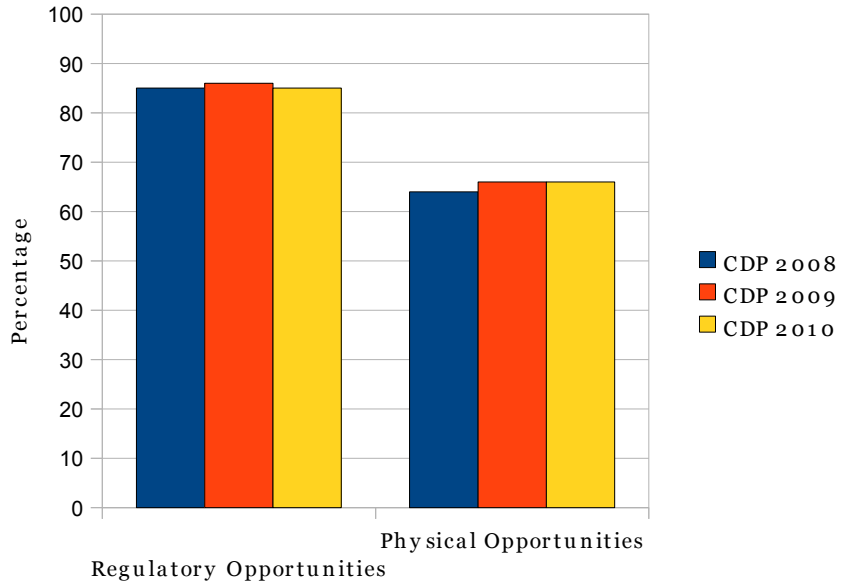
Source: CDP Reports South Africa, various years.

Figure 7: Opportunity perception of Indian companies



Source: CDP Reports India 200, various years.

Figure 8: Opportunity perception of South African companies



Source: CDP Reports South Africa JSE 100, various years.

In India, companies increasingly see regulatory opportunities associated with climate policy, with the percentages going up from 80% in 2008 to 90% in 2010. In South Africa, opportunity perception is similarly high at around 85%, but there is almost no change between the years. About half of the responding companies in India see physical opportunities through climate change for their business – less than in South Africa, where percentages went up from 64% in 2008 to 66% in both 2009 and 2010.

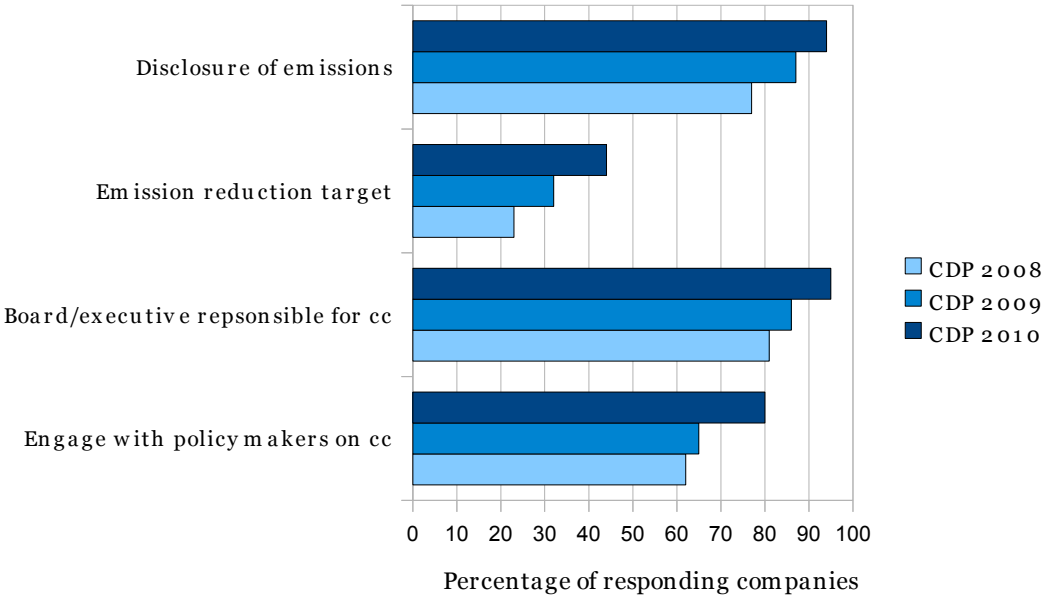
For a sound judgement whether physical risks and opportunities exist for a company, a minimum of scientific knowledge and technological knowledge is necessary, depending on the business sector. The data presented therefore lead to the conclusion that both Indian and South African companies are in general increasingly aware of the risks and opportunities connected with climate change. This, in turn, indicates an increase in knowledge in general and in scientific and technological knowledge in particular. The lower percentages of regulatory risks perceived by Indian companies reflects their assessment of the current policy developments and the way policy could impact them. While the slow progress of international negotiations may affect the perception of companies in both countries, it is possible that South African companies expect more severe domestic regulation impacting them than Indian companies. If we presume that risk and opportunity perception are at least partly driving companies' climate governance behaviour, the data presented point towards a

stronger driving force of physical risks and regulatory and other (image/market) opportunities for Indian companies. South African companies' climate governance behaviour is driven by a combination of regulatory and physical risks as well as more regulatory opportunities.

But is this trend towards more awareness and knowledge of companies accompanied by a shift in action? When a company takes some form of action, it seems possible that a minimum of normative knowledge (that something should be done about climate change) accompanies the business interests that are likely to otherwise underlie activities. The key trends depicted in Figures 9 and 10 serve as approximations to a measurement of climate governance activity in the private sector.

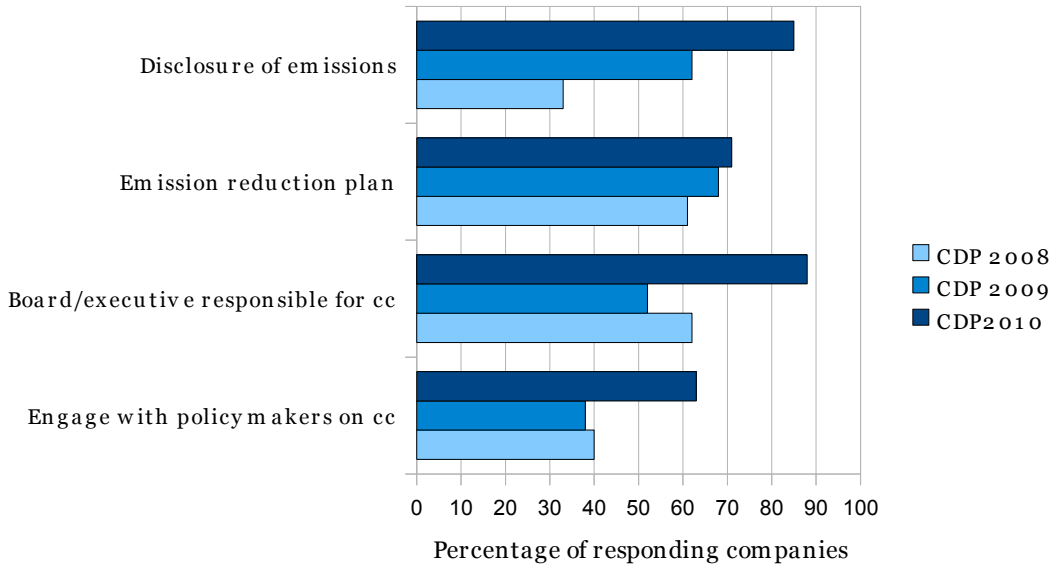
In both countries, there is a general increase in governance activity over time as companies integrate climate change into their regular corporate governance activities. In South Africa, almost all responding companies (94%) disclosed their GHG emissions in 2010. This is an increase of 17% over three years. The percentage of companies with an emission reduction target almost doubled from 23% in 2008 to 44% in 2010, but these figures also show that changing something in the way the particular company works or produces towards a low-carbon path may be more difficult. In India, only 33% of responding companies had an emission reduction target in 2010 (CDP Report India 2010), but more had an emission reduction plan (see Fig. 10).

Figure 9: Key trends South African companies



Note: „cc“ denotes climate change. Source: Carbon Disclosure Project Data.

Figure 10: Key trends Indian companies



Note: „cc“ denotes climate change. Source: Carbon Disclosure Project Data.

In both countries, responsibility for climate change actions generally lies at the board or executive level of a company, reflecting the importance given to climate change. For South Africa, top management responsibility for the issue had been high from the beginning, so that there have been only gradual increases (from 80% to 86% to 95% in 2010). However, these figures have to be treated with care. In many South African companies, risk management generally lies within the responsibility of the executive board. Since most companies classify climate change as a risk, it automatically becomes a board issue (CDP Report South Africa 2008).

In India, there was a sharp increase from 2009 to 2010 from 52% to 88% of responding companies that treat climate change as a board level issue. Analysts of the CDP India conclude that “climate change is no longer a fringe concern but an important core issue requiring the attention of senior management” (CDP Report India 2010: 39). Additionally, companies create climate change cells within their company to report to the board (id: 39). While it may be true that climate change is no longer a fringe concern for some Indian companies, the overall low response rates to the survey do not allow this rather enthusiastic conclusion. Here, a follow-up with a different method of data collection seems useful, as will be undertaken in Chapter 9.

Finally, there is another difference between the big business sectors of the two countries concerning their companies' engagement with policy-makers on climate

change. In South Africa, more companies engage with policy-makers than in India. Levels rose each year, with a notable increase from 65% to 80% of responding companies collaborating with policy-makers from 2009 to 2010. There is also a significant increase in India between 2009 and 2010, from 38% to 63% of responding companies engaging with policy-makers on climate change issues.

Two points need to be made here. First, the dichotomous questions that result in percentages do not differentiate between kinds of collaboration, i.e. lobbying through business associations, direct contact, set-up of public-private partnerships, or other kinds. Second, engaging with policy-makers does not necessarily lead to concrete governance measures. Therefore, these frequencies can only serve as rough indicators of awareness and interest in climate governance by companies.

Moreover, the frequencies as such do not tell us much about possible associations between risk and opportunity perceptions and governance activity. For South African companies, the increase in GHG/energy reduction plans and targets is not mirrored by a clear increase in regulatory risk and/or opportunity perception. They remain at roughly the same high level, which makes an inference on the driving factors behind the increase in governance activities difficult. For Indian companies, the increase in opportunity perception may be related to the increase in key trends.

Looking only at these frequencies, the picture is not entirely clear. There is a trend towards more disclosure and more activities both concerning internal procedures within companies and concerning their engagement with politicians. Taken together with a growing – or already high – level of knowledge and awareness among responding companies in both countries, it seems reasonable to conclude that a shift in knowledge and awareness is taking place and that an increase in actions is at least partly happening. This seems to apply more to large and transnational companies in South Africa than in India, but responses in South Africa also suggest that the depth of understanding still varies significantly (CDP Report South Africa 2009: 38). For instance, a lot of companies refer to the threat climate change presents to water and energy supply in South Africa, indicating they understood the general predictions of the IPCC and national scientific advisory institutions. However, they fail to generate a specific risk analysis for their company (see CDP Report South Africa 2008; 2009). The same can be assumed for Indian companies. Prospective reputational risks are often referred to because companies see public awareness of climate change rising (see CDP Report India 2009).

The frequencies presented by do not allow for an analysis of the drivers of these developments by themselves and cannot show whether risk and opportunity

perceptions are related in a causal way with companies' governance actions. The next section targets these questions with a quantitative approach.

6.4 Carbon Disclosure Project Data: Measures of association

In this chapter, I additionally analyse some cross-tabulations and look at measures of association on the nominal scale (Phi, CramersV). The goal is to identify what kind of relation exists between companies' perception and their actions regarding climate change. CDP answers of 2008 are used as a data base. For India, 36 companies made their data available for public use in 2008, but many did not fill out the CDP questions properly or provided information in a different form. Thus, the number of missing values was high. The problem remains the same for 2009 and 2010, so choosing a different year would not have made any difference. Cross-tabulations of cases were only possible for some measures and for a maximum of 22 cases which is below the normally used threshold of approximately 30 valid cases in statistical analyses. Therefore, no cross-tabulations and no measures of associations could be calculated for India.

For South Africa, the analysis had to be restricted to the publicly available answers of companies due to privacy and data security reasons. This reduces the sample size to 47 companies. Moreover, a lot of missing values increased the difficulty of analysis. Still, some tests were possible. When taking the number of companies that identify regulatory risks as independent variable and the existence of a GHG reduction plan as an indicator for governance activity as the dependent variable, an association can be assumed with a high level of significance (see Tables 3 and 4).

Table 3: Cross-tabulation Regulatory Risks/GHG reduction plan (count)

		GHG reduction plan		
		Yes	No	Total
Regulatory Risks	Yes	18	14	32
	No	3	3	6
Total		21	17	38

Source: Author's own calculation.

Table 4: Symmetric Measures Regulatory Risks/GHG reduction plan

	Value	Approx. Sig.
Phi	,046	,778
Cramer's V	,046	,778
N of valid Cases	38	

Source: Author's own calculation.

This reflects the perception of companies – given in the open-ended questions of the CDP questionnaire - that the regulatory environment will change in the near future. Some companies specifically mentioned the Copenhagen conference and the LTMS (see CDP Report South Africa 2009). The association test between the companies that identify physical risks due to the impacts of climate change and those having a GHG reduction plan is also very high (,87). This points towards the interpretation that an understanding of the problem of climate change and its impacts (scientific knowledge) leads to climate governance activity, at least for mitigation efforts such as the establishment of a GHG/energy reduction plan as a first step.

Furthermore, it could be assumed that those companies which identify regulatory risks (independent variable) also engage with policy-makers in some way to exert influence (dependent variable). Yet levels of significance for this association are low (,29). This is different for a presumed association between those companies that see physical risks for their company and the interaction with policy-makers (see Tables 5 and 6). Here, a middle level of confidence for the association exists.

Table 5: Cross-tabulation Physical Risks/Engage with policy-makers (count)

		Engage with policy-makers		
		Yes	No	Total
Physical Risks	Yes	28	11	39
	No	1	1	2
Total		29	12	41

Source: Author's own calculation.

Table 6: Symmetric Measures Physical Risks/Engage with policy-makers

	Value	Approx. Sig.
Phi	,103	,509
Cramer's V	,103	,509
N of valid Cases	41	

Source: Author's own calculation.

How about the identification of opportunities? With the state of climate governance being as it currently is and the Copenhagen conference approaching at the time of data collection, it seemed reasonable to assume that those companies which identify regulatory opportunities (independent variable) engage in interaction with policy-makers (dependent variable). Due to a high level of missing values (20), this association could not be tested – a misleading picture would result. The same goes for the variables physical opportunities and general opportunities.

The association between risk and opportunity perception of companies and the measures they take is not quite clear, but the results presented here encourage the pursuit of the question from a different (methodological) starting point. The drivers of climate governance activity of large and transnational South African companies appears to be somewhat influenced by knowledge. Scientific knowledge in terms of the understanding of the problem matters and normative knowledge seems to play a role as well, both in the regulatory and reputational area. These results by themselves do not give any definite answers about the drivers of climate governance or the existence and influence of climate knowledge systems. They merely serve as a point of departure, or one piece of the puzzle.

6.5 Conclusion

The results presented do not give an entirely clear-cut answer to the research questions posed for the quantitative data. Some trends in awareness, perception and activity can be identified by looking at the frequencies of the CDP data. There is a growing level of awareness and scientific knowledge among companies, both in India and South Africa. South African companies seem to have a higher level of awareness than Indian companies, when taking the different answers to the CDP as indicators. Yet responses differ in comprehensiveness and quality, suggesting that the depth of understanding still varies significantly.

There are indications that the increase in knowledge and awareness is beginning to be accompanied by a shift in companies' activities as well, as some companies take first steps in this direction. More companies have GHG/energy reduction plans and targets, underlining the focus on mitigation and energy efficiency in both countries. Since the CDP survey focuses on mitigation, no conclusion for knowledge and actions on adaptation can be drawn from the quantitative data.

The fact that climate change is increasingly becoming a board or executive level issue in companies indicates that climate change has taken a more prominent place in companies' strategic thinking – here, a shift can be identified for companies in both

countries between 2007 and 2010. Taken together with the other results, it implies that some sort of learning process is taking place in the private sectors of India and South Africa. Looking at the disclosure results, South African companies seem to be a step ahead of their Indian counterparts, but private investment in clean energy is generally rather low in both countries. Increases have been gradual this far, allowing for the conclusion that a change process in this area is only slowly taking place.

Two further reasons for caution exist: First, the comparably low response rates of Indian companies to the CDP surveys. Second, the difference between company activity captured by the CDP and actual investments into R&D, emission reduction or adaptation. Here, the Indian government seems to follow a different strategy than the South African government. The apparent relevance of business opportunities and their potential different perceptions by the respective governments and companies is a point that needs to be kept in mind for further analysis. This also applies to a follow-up of a potentially different motivation and background knowledge that Indian and South African companies may draw on. Here, the quantitative lens is not sufficient.

7. Expert survey results

7.1 Introduction

In this chapter, I present the results of the expert survey for both India and South Africa. The aim of the expert survey is to build a consensus opinion of leading experts concerning those aspects of my approach which are hard to measure directly. These are primarily the state of knowledge of different actor groups and a judgement of communities of practice and their power, with a more direct use of the concept itself in the questioning. Additionally, questions on the drivers and hindrances as well as the more concrete nature of the change in the respective domestic climate governance are included. The survey contributes to testing the hypotheses on the general impact of the knowledge system and collective learning (H1), the productive and institutional power of communities of practice (H2a) and – partly – the hypothesis on the relevance of economic incentives as proposed in H3b on practical rationality. Both the specific qualitative and the quantitative questions will be addressed (see Section 5.1) because expert judgement are set between qualitative and quantitative methods.

For India, 10 experts have participated in the survey, for South Africa, 13 experts took part. Recall that the sample size does not matter in expert surveys the way it does in ordinary surveys. Still, comparison of the survey results is made easier because approximately the same number of experts took part. The survey comprised 14

questions, with the first one serving as an icebreaker question, the last one as a knowledge test (see Appendix I). These only have secondary relevance. Moreover, one of the questions cannot be used for analysis because respondents interpreted it very differently (Question 6, see Appendix I). For most results, I use the mean as a statistical tool to identify a consensus opinion, but I indicate outliers and differentiate answers for questions with higher relevance. The reliability and validity of this expert survey were discussed in the chapter on research methods (see Chapter 4).

I structure the chapter according to thematic blocks and present the findings for both countries in an integrated way. The first section concerns the overall performance of the respective country in climate governance as well as drivers of and obstacles to the development of climate governance. The second section addresses actors' state of knowledge. The third section treats the existence and power of communities of practice, the climate change discourse and the content or nature of change in climate governance. The concluding section summarizes the results and put relates them to the hypotheses and the research question.

7.2 Performance, drivers and obstacles for climate governance

The first set of questions in the survey target the performance, drivers and barriers in climate governance. In addition to addressing the corresponding qualitative question on the drivers of climate governance, some of the categories given in the survey questions reflect the different dimensions of knowledge and parts of the knowledge system. In this respect, the results of this chapter contribute to testing the general hypothesis of the climate knowledge system, which proposes that more knowledge and learning increase the probability of a change in climate governance. Moreover, the judgements will show whether the theoretically-derived answer-categories are sound or whether they are based on a misconception. To make sure that ideological knowledge is indeed not as relevant as I assume, I let experts rate the relevance of ideological factors as well. Pragmatic knowledge and practical rationality are indirectly included through the other categories, especially economic opportunities. Apart from that, they are left to be added by the experts as well (as additional categories in Question 3 or in the comments section of the survey). Since pragmatic knowledge is a new category, this proceeding helps to avoid a conceptual bias forced upon the experts here and later in the interviews (see Chapter 8).

The rating of overall climate governance efforts compared to other emerging economies serves the understanding of the relational level of activity. It shows in which

overall frame the following results need to be seen. Questions were asked using a five-point Likert-scale, with possible answers ranging from „very advanced“ to „unsatisfactory/poor“.

South Africa's state of planning compared to other emerging economies is, in the mean, rather advanced, while the state of implementation was rated as average. India's state of planning and the state of implementation are both rated as average when using the mean as a statistical device, but opinion was a bit more split across the scale than for South Africa. In terms of adaptation efforts, the consensus opinion sees South Africa's adaptation efforts as rather poor compared to other emerging economies, while India was rated to be between average and rather poor. For both India and South Africa, their respective mitigation efforts were rated to be average compared to other emerging economies. These results show that neither country counts as a clear leader or laggard among its peers.

One of the specific qualitative questions of this study targets the drivers of climate governance. Respondents were asked to rate different factors that may influence climate governance, derived from my theoretical approach and the literature. Respondents could add other factors to the list. Results are presented in Table 7.

Table 7: Drivers of climate governance in South Africa and India

(expert rating in percentage of answers)

Relevance of driver	Very much		Much		Somewhat		Not so much		Not at all	
	India	South Africa	India	South Africa	India	South Africa	India	South Africa	India	South Africa
Technological knowledge about mitigation/adaptation options	10	23	50	23	40	38	-	15	-	-
Economic opportunities	40	38	20	53	10	8	20	-	10	-
Governmental sanctions/incentives	10	38	40	61	20	-	20	-	10	-
Actor's belief that climate change is happening and that it is good to control it	10	15	30	31	40	38	20	15	-	-
Actor's green ideology	-	-	20	23	40	31	40	38	-	8

Source: Author's own compilation.

In both countries, economic opportunities and governmental sanctions or incentives are considered as strong driving forces. Thus, integrating economic incentives into the concept of climate knowledge systems as well as in climate governance practices is reasonable. In India, the technical knowledge about mitigation and adaptation options is more relevant as a driver, with 60% of respondents rating it as very much and much influential, compared to 46% for South Africa. An actor's belief that climate change is happening and it is good to control it represents one possible form of normative knowledge. Most experts on either country considered this factor to be at least somewhat driving and about 30% of experts on either country gave it much relevance. A green ideology is not a relevant driver of behaviour, neither in South Africa, nor in India. Two experts on India added other factors to the list: An environmentally friendly brand image was rated as much influential by one expert and the need to fulfil international commitments as a somewhat influential driver by another expert.

When identifying drivers of climate governance, it is useful to cross-check for barriers as well: to better understand the overall climate governance landscape, to potentially identify obstacles for far-reaching change for later analysis and – procedurally – to see whether respondents answer in a consistent way for the two questions on drivers and barriers. Again, a list of possible factors was given, derived from the theoretical approach of this study. To induce respondents to give a more concise answer and to bring some variation into the way of questioning, the scaling of the question was reduced to three categories of scale. Results are shown in Table 8.

Table 8: Barriers to climate governance in India and South Africa

(expert rating in percentage of answers)

Relevance of obstacle	Very much		Somewhat		Not at all	
	India	South Africa	India	South Africa	India	South Africa
Lack of financial resources	30	38	60	61	10	-
Understanding that climate protection measures hinders economic growth	50	46	50	46	-	8
Lack of awareness and understanding of the problem	20	61	50	15	30	23
Lack of technological knowledge about mitigation/adaptation options	-	31	80	69	20	-
Understanding that climate change is a problem that industrialized countries need to solve	70	8	20	69	10	23

Source: Author's own compilation.

Respondents answered in a consistent way – no contradictions could be found.[63] In contrast to the answers on drivers of climate governance, clear differences between ratings on India and South Africa emerged. Experts on India identified the understanding that climate change is a problem that industrialized countries need to solve – which is one possibility of normative knowledge – as one of the major obstacles. It is followed by the understanding that climate protection hinders economic growth (70% and 50% ratings of „very much relevant", respectively). For the latter barrier, a similar percentage of expert ratings came out for South Africa. But the lack of awareness and understanding of the problem has the highest relevance among the listed factors: 60% of experts on South Africa rated it a "very much relevant" obstacle and another 15% "somewhat relevant", compared to no ratings and 80% in the same categories by experts on India.

Finally, the often-stated argument in the international climate negotiations that developing countries and the BASIC countries as well need financial assistance seems to be not as relevant as the debate suggests: Only 30% of experts on India and 38% of experts on South Africa identified the lack of financial resources as a substantial barrier and roughly another 60% as somewhat of an obstacle.

What do these results mean for the research question and hypotheses? To begin with, the limited number of additions to the categories of driving forces shows that the theoretically-deduced pre-categorization captures the bulk of relevant factors. In terms of the different knowledge dimensions, several conclusions are possible. The irrelevance of an actor having a green ideology confirms my decision to exclude Adler's ideological knowledge from the concept from an empirical side. On the one hand, a certain kind of normative knowledge matters to some extent for progress in climate governance, but on the other hand, a contradictory form of normative knowledge (that industrialized countries need to do something) is a major problem in India's climate governance. These judgements do not contradict each other, they simply imply that different kinds of normative knowledge exist in India and that there may be a controversy there that slows down learning or change processes.

A lack of a basic scientific knowledge seems to be a greater problem in South Africa and it may be one reason for a slow progress. In turn, it seems reasonable that more scientific knowledge supports the spread of climate governance. This may sound trivial, but it nevertheless supports the hypothesis underlying this chapter. Technological knowledge is wanted and matters as a driving force in both countries – this indirectly supports the hypothesis that more knowledge and learning drives

63 Given the small number of respondents, this check was done manually while entering the data in SPSS.

change. Given the relevance of economic opportunities and governmental sanctions and incentives, knowledge is not the only factor and maybe not even be the most important one. This again indirectly supports the formulation of the general hypothesis on the climate knowledge system that the existence of a knowledge system – and hence, the different kinds of knowledge – is a necessary but not sufficient condition for the emergence and change of climate governance. The different kinds of knowledge do not have to exist within a knowledge system, so that the results presented in this chapter do not allow a direct causal inference towards a confirmation or falsification of the hypotheses. More information on the state of knowledge is required. The following section provides it.

7.3 Actors' state of knowledge

The aim of this section of the survey is a stocktaking of the general state of actors' knowledge about climate change issues. Roughly, the question is: Which actor groups know what and how much? This kind of assessment has not been done this way before and it is imperative to find out if learning has occurred already or not – even if the state of knowledge gives no direct answer whether collective learning and cognitive evolution are taking place. The general hypothesis on climate knowledge systems (H1) is also based on the depth of knowledge actors have. An analysis of actors' knowledge therefore provides a further piece of evidence for or against this hypothesis.

Questions in this section of the survey targeted both state and non-state actors, differentiating between the national and the sub-national level for the former and between different types of actors for the latter. Both the general perspective and examples of specific governance fields – water management for adaptation and energy efficiency for mitigation – were part of the survey.[64] All questions asked whether a sufficient level of understanding, either scientific or technical, to deal with climate change exists, while deliberately leaving the interpretation of what “sufficient” or “enough” means open. My intention in doing this was two-fold: Given that it is contested in the literature how much scientific information and how much knowledge is required for action in climate governance, I did not want to decide this controversy by giving my own definition. This would have possibly led to irritation or, in the worst case, to the refusal of experts to answer those questions. Since the theory-test addresses countries of different cultural areas, conceptual stretching is a danger.

64 I chose energy efficiency and water management as examples of specific fields because they correspond to the climate change projections, priorities in mitigation and first steps taken in both countries (see Chapter 5).

Leaving room for the experts' own interpretation means meeting this problem to some extent, even if comparability decreases slightly. Still, some experts commented that they were unsure of what I meant by "sufficient" and "enough".

By limiting the choice of answer categories to "yes" or "no", experts were forced to decide rather than choosing the – very likely – easier answer that some companies have the scientific and technological knowledge, while others do not. This could be assumed beforehand, so by forcing a dichotomous answer, clearer tendencies can be identified. The following sums up the main findings of this section of the survey.

Generally, the *scientific knowledge of state actors* at the national level in *India* is sufficient – 80% of experts agreed on this. For *South Africa,* there is disagreement whether state actors generally have enough scientific understanding to deal with climate change or not. Some of the experts commented that it is hard to come to a general predication because some members of government do have a good understanding of the science, while others do not.

The picture is more clear when it comes to specific governance or policy fields, with the majority of experts agreeing that state actors at the national level in *South Africa* have sufficient scientific understanding when it comes to energy efficiency (mitigation) and water resources management (adaptation). At the sub-national level, the opposite applies: about 50% said that scientific knowledge is insufficient in both fields, while about 20% of respondents did not know. With respect to specific governance fields in *India*, 80% of experts consider the knowledge on energy efficiency (mitigation) to be sufficient on both national and sub-national levels. Ratings were split on water resources management (adaptation). Since a significant number of experts also admitted they did not know the answer to these questions on adaptation (30% for the national level-question, 40% for the sub-national level), no clear assessment is possible. Scientific knowledge about adaptation seems less widespread in India than knowledge about mitigation. Adaptation is thus a side of climate governance that is not well known and possibly underdeveloped in India.

Concerning the *technological knowledge of state actors* in *South Africa*, there are only two rather clear sets of answers: Most experts agree that the technological knowledge concerning mitigation/energy efficiency is sufficient at the national level. With respect to the sub-national level, generally, a lack of technological knowledge exists. In all other questions (general state of technological knowledge at the national level, energy efficiency at the sub-national and adaptation on all levels) there is disagreement among experts. An almost even number of experts assessed sufficient or insufficient technological knowledge (and two to three, depending on the question,

who did not know).

For *India*, there exist only two clear sets of results as well, but different ones to those of South Africa: 90% of experts considered the general level of state actor's technological knowledge sufficient at the national level and 80% for energy efficiency (mitigation) at the national level. The general technological knowledge at the sub-national level was rated as insufficient by 60% of experts. For all other questions – on energy efficiency at the sub-national level, water resource management/adaptation on both the national and sub-national levels – results were spread almost evenly among those who assessed sufficient or insufficient technological knowledge and those who did not know.

The interim conclusions we can draw from this are that, first of all, building a consensus opinion among experts on this topic is more difficult than expected. In both countries, national governments are more likely to have more extensive knowledge than sub-national entities and more specific knowledge on mitigation and energy efficiency. Here, a learning process can be assumed, as the depth of knowledge is consistent with a greater amount of strategies and governance activities at the national level and on mitigation/energy efficiency described in Chapter 5. Moreover, there seems to be a tendency towards special or compartmentalized knowledge. More governmental actors are likely to have knowledge in a specific governance field related to climate change than having a broad overview over the science and technology in both mitigation and adaptation.

The same questions targeting scientific and technological knowledge were also asked for *non-state actors*, focusing on companies. Results are presented in Tables 9, 10 and 11. The following overall trends can be identified: In both India and South Africa, transnational and large national companies have higher ratings for a sufficient scientific understanding than small and medium enterprises. For the latter, about 90% of experts agreed that no sufficient scientific knowledge exists. There is higher agreement that large companies in India have sufficient scientific knowledge (70% of ratings) than in South Africa, where opinion is split in half. Experts on South Africa commented that some large national companies do have the required scientific understanding to take action, while others do not. With respect to concrete governance fields, there is a tendency for greater knowledge on energy efficiency. This is similar to state actors. In general, about 60% of experts assessed non-state actors to have sufficient scientific understandings in energy efficiency in both countries, while 80% of experts on India saw a clear lack of this in water resources management/adaptation. Opinion was split on this in South Africa.

The picture is quite similar when it comes to non-state actors technological knowledge about mitigation options (see Table 10). Again, transnational and large national companies got higher ratings for sufficient technological knowledge than small and medium enterprises, with almost all experts attesting insufficient knowledge for them. As for the scientific understanding of large national companies in South Africa, expert opinion is split almost in half. An interesting difference between India and South Africa exists concerning the general assessment of non-state actors' technological knowledge on energy efficiency: while 50% of experts on India rated it as sufficient, 54% rated it insufficient in South Africa, while the ratings for the respective opposite were rather low. These results point towards a higher technical knowledge base in general in the big business sector. Also, non-state actors in India generally know more about energy efficiency than their South African counterparts.

The results of the expert survey for non-state actors technological knowledge on adaptation options are rather distinct (see Table 11), even though three experts on India did not know the answers to this question and one expert's rating was missing. For South Africa, one to three experts chose the answer „I don't know“, varying in the rows. While this clearly limits the robustness and explanatory power of the data, those answers given already indicate that technological knowledge on adaptation options is not sufficient for any actor group. Here, the results of the qualitative expert interviews may shed additional light.

Table 9: Sufficient scientific understanding of companies in India and South Africa (expert rating in percentage of answers)

	India		South Africa	
	Yes	No	Yes	No
Transnational companies	50	20	61	23
Large national companies	70	20	46	46
Small and medium enterprises	-	90	-	92
Non-state atctors in general in energy efficiency (mitigation)	60	30	61	15
Non-state actors in general in water resource management (adaptation)	10	80	38	38

Note: Numbers not adding up to a 100% are due to missing values and experts answering with “I don't know”.

Source: Author's own compilation.

Table 10: Sufficient technological knowledge about mitigation options in India and South Africa

(expert rating in percentage of answers)

	India		South Africa	
	Yes	No	Yes	No
Transnational companies	50	20	61	23
Large national companies	70	20	46	54
Small and medium entreprises	10	80	8	92
Non-state atctors in general in energy efficiency (mitigation)	50	30	15	54

Source: Author's own compilation.

Table 11: Sufficient technological knowledge about adaptation options in India and South Africa

(expert rating in percentage of answers)

	India		South Africa	
	Yes	No	Yes	No
Transnational companies	20	40	23	61
Large national companies	30	40	15	77
Small and medium entreprises	-	60	8	85
Non-state actors in general in water resource management (adaptation)	-	60	15	70

Source: Author's own compilation.

The tendencies resulting from the survey imply the following for the hypothesis on knowledge and learning: If more knowledge increases the chances of more governance actions, then the Indian central government would have to be more active than state governments and more so in mitigation and especially concerning energy efficiency. Roughly, this seems to be true (see Chapter 5). The results will be discussed in more depth and together with the results from other data sources in Chapter 10. Transnational and large companies in India should also be more prone to action than small and medium enterprises and – when taking just the knowledge as the base – be more active in energy efficiency, especially the technicalities of it. Indeed, this applies for certain areas such as energy efficiency measures and renewable energy developments (see Chapters 5.3.1 and 8.2).

While the South African government should also be more likely to do something about climate changed based on their scientific and technological knowledge than provincial governments, the split of expert opinion could imply that a)

knowledge varies a lot between departments or individual policy-makers, b) that acquisition of knowledge or learning is limited, or c) that experts are unsure of the current situation. The same goes for the other answers where expert opinion is split. An inference concerning the hypothesis H1 is thus constricted. Yet the expert judgements on South Africa tend to support it. A closer connection to the concept of climate knowledge systems is not possible from these data alone.

7.4 Communities of practice, discourse and change

The dynamic features of climate knowledge system and the specific characteristics of communities of practice make a direct, distinct identification and measurement of communities of practice difficult. In addition, no complete dataset in the sense of a SNA could be expected. Thus, a combination of qualitative questions in interviews and expert opinion in a survey makes a test of the concept 'communities of practice' more reliable. This section presents the survey results on communities of practice, the climate discourse and the nature of change in India and South Africa.

The expert survey gave a short description of the concept and core features of communities of practice. Experts were then asked to choose one of three statements that most closely reflects the current situation in their country of expertise. The first of these states that there are no communities of practice, allowing for a choice that negates the concept or denies it any relevance in the respective country. The second statement acknowledges the existence of communities of practice, but attributes them a lack of power for a diffusion of their ideas and practices, while the third one identifies this power and ascribes communities of practice a significant role for the change of climate governance and the background knowledge that it is based on (see Question 5, Appendix I).

For South Africa, consensus opinion lies between statements two (46% of experts) and three (54% of experts), with a tendency towards the expansion and growing power of communities of practice. Some experts also emphasized this tendency in the comments-section of the survey. For India, two thirds of experts (70%) chose the second statement confirming the existence of communities of practice and attesting them insufficient power and one third of experts (30%) saw an increase in both the existence and the power of communities of practice in India.

A cautious interpretation of the results is required, because the small circle of key actors in South Africa (see Chapter 8) impacts the reliability of the expert survey results. Firstly, the communities of practice probably do not have an extensive number

of members and there are not that many communities overall either. Secondly, since the number of participating experts in the survey was rather small as well and it can be assumed that "everybody knows everybody" in the climate field in South Africa, a certain bias may exist regardless of the expert's effort to give objective answers. Even though the number of experts on India is not greater either, the reliability is not impaired. The number of actors in India's climate governance is much higher and actor circles are not as close-knit (see Chapter 8).

A knowledge-related debate forms part of the climate knowledge system as well. In the expert survey, I asked more generally whether a dominant climate change discourse exists, whether it varies between actor groups and levels, or whether there is no climate change discourse at all (Question 13a). I assumed that experts can more easily and reliably judge this then a specific knowledge-related debate, which would be a part of the general discourse. Those experts who say that there is a dominant discourse were then asked to briefly describe its main elements (Question 13b). The reasoning behind this is that the existence of a dominant discourse – which could be related to communities' of practice activities through the qualitative data – shows both the discursive power of communities of practice and the spread of new background knowledge. For India, most experts (80%) judged that the climate change discourse varies between actor groups and levels (national/state-level). Experts on South Africa were split on this. Almost half of them identified a dominant climate change discourse that, first, centres on how much South Africa should cut emissions given that poverty reduction and economic growth need to be secured; and second – related to the first point – concerns energy security and the future energy mix in South Africa. One expert identified a dominant sub-discourse[65] concerning the costs of adaptation. The other half of experts judged that the discourse varies between actor groups and levels (one missing answer).

For both countries, these results imply that communities of practice have limited discursive power and that their new background knowledge has probably not spread widely across the countries (and cases). South African communities of practice may be a step ahead here in establishing a dominant discourse. if it can be linked to them. This might explain experts' disagreement. It is also possible that different communities of practice exert discursive power in the four different cases, causing the variations. The qualitative data analysis needs to follow-up on these tentative conclusions.

With respect to the change of climate governance, results are clear-cut.

65 The expert used this term „ sub-discourse" in the survey.

Participants agreed that a change in South Africa is taking place or has already taken place concerning (1) the general attitude towards climate change, (2) the definition of actors' interests, (3) the self-understanding of South Africa in climate governance and (4) its position in the international climate negotiations. There was only one deviant opinion concerning the definition of actors' interest. The consensus of experts see a change happening from about 2007 onwards, with an acceleration in the run-up to the Copenhagen conference in December 2009. The publication of the Fourth Assessment report of the IPCC, the ANC declaration in Polokwane and the LTMS process which led to publication in mid-2008 count as milestones for this process of change.

All but one expert on India also agreed that (1) a change is taking place concerning the general attitude towards climate change. For (2) the definition of actors' interests and (3) India's self-understanding, 70% of experts saw a change and 30% did not. Concerning a change in India's position in the international climate negotiations, ratings were evenly split between “yes” and “no”. These results imply that only some actors changed their positions and that it is not clear yet how deep the on-going shift is and what areas of climate governance it affects. In the open-ended section (Question 12) asking to give a year, event or months since when the observed changes occurred, some experts wrote that changes were gradual so that a clear identification of a turning-point is hardly possible. Most agreed, however, that the change occurred in the last two to three years, from about 2008 onwards. Acccording to the experts, milestones in the development of India's climate governance given included the NAPCC process and the Indian government's promise to reduce emission intensity as well as some natural disasters and weather phenomena that increased awareness (e.g. floods and monsoon changes).

The expert judgements on communities of practice thus support the general theoretical approach of this study as well as the hypothesis that communities of practice and their power are relevant for the spread of new ideas and practices and the change in climate governance. The near unanimity of experts' opinion on the nature of change in South Africa's climate governance points towards a potentially more far-reaching process than in India where opinion is split. Whether these results indicate a difference in terms of a collective learning process or cognitive evolution is hard to tell from this data only, but it does seem likely.

7.5 Conclusion

Letting experts judge major theoretical categories and concepts in terms of their empirical content presents a means for a qualified evaluation of my approach and

underlying hypotheses. Also, data are collected that are not easily accessible otherwise. The three sections of this chapter addressed the drivers and challenges of India's and South Africa's climate governance as well as the nature of its change, the state of knowledge of different actor groups in different governance fields and communities of practice and their power. The aim was to contribute to testing three of the hypotheses of this study.

Summing up the results from the different parts of this chapter, the general hypothesis H1 on knowledge, learning and knowledge systems can be supported for the part that relates more knowledge and learning to an advancement or change of climate governance. The support of the hypothesis is stronger for Indian state actors than for companies. It is also clearer for India in general than for South Africa. More scientific and technological knowledge is conducive to a progress in climate governance in both countries. Normative knowledge matters as well, but a bit less. In India, contradictory kinds of normative knowledge seem to exist and may hamper collective learning.

The experts of both countries gave support to the hypothesis H2a that communities of practice and their power matter for the change in ideas and practices and of climate governance in general. Since expert opinion was somewhat split in both countries on whether communities of practice have enough power or not, the collective learning process may not be complete yet. More experts on South Africa saw the power of communities of practice and their influence on change processes growing. This points towards a more advanced stage of cognitive evolution there than in India, if we follow the logic of cognitive evolution. No clearly dominant climate change discourse could be identified for either country, putting the element 'knowledge-related debate' of the knowledge system into flux for the moment.

Finally, the relevance of governmental sanctions and incentives as well as economic incentives as driving forces indirectly support the inclusion of economic incentives into hypothesis H3b on practical rationality.

8. Empirical results: Qualitative data

8.1 Introduction

In this chapter, I present the results for the qualitative part of the study. Apart from the guiding research question how collective learning influences change processes in climate governance, all specific qualitative questions are addressed. They target the factors that influence climate governance, including economic incentives, the existence and role of knowledge, learning and the different elements of the knowledge system.

Moreover, they provide a further assessment of the shift in India's and South Africa's climate governance. These questions structure the chapter. The qualitative data enables the test of all hypotheses.

Instead of treating the results for the countries and cases in an integrated way as in the previous chapters, the analysis will be split into two broad chapters, one for India, one for South Africa. The first section of each of these country chapters (8.2.1 and 8.3.1) targets the identification of influential factors on climate governance and the challenges that may slow down progress. Here, a first identification of the role of economic incentives becomes possible. This part enables an open identification of drivers and challenges which may also account for alternative explanations of the change processes – a deductive bias is thus avoided.

The next sections in the respective country chapter (8.2.2 and 8.3.2) identify communities of practice, where possible, and analyse their power. The sections will be differentiated along the cases – national level and province/state level. The qualitative questions and hypotheses on communities of practice and the existence of a climate knowledge system overall are addressed here. The final sections of the chapters on India and South Africa each sum up and discuss the results for the knowledge different actor groups have and the collective learning and potential cognitive evolution taking place. These sections give further insights on the nature and scope of change. The conclusion summarizes the results for the research questions and the respective hypotheses they address.

Since confidentiality has been agreed on with each interview partner, references to concrete interviews are anonymous, but roughly indicate the professional background. A list of interviewed people is provided in Appendix III; the semi-structure of the interview questions in Appendix II. Additional information from other qualitative sources such as policy documents and "grey literature" (e.g. reports or newspaper articles) refine the results and argumentation or put them in context.

8.2 India

8.2.1 Drivers and problems of climate governance

This section gives an overview of the drivers and challenges in India's climate governance landscape. While this general information does not directly answer the „how" - question of the change process, it provides the context in which it takes place. Therefore, it indicates which structuring, facilitating and/or inhibiting factors to collective learning exist. The section serves the inductive identification of hypotheses-

generating differences between the cases as well. Additionally, it gives room for the identification of alternative explanations for the developments in India's climate governance. The specific qualitative questions targeted are: Which factors influence climate governance? What role for economic incentives? As far as potential elements of the climate knowledge system are concerned, e.g. key individuals or increased knowledge as drivers, I only indicate these, but discuss them in more detail in the following sections that deal with the climate knowledge system.

The following interview questions addressed the drivers and challenges in India's climate governance: What climate governance measures are taking place in your country/company? How and why did you decide for those specific measures? In your view, what needs to happen in your country to have an effective, successful climate governance? Who are the most important actors in climate governance in your country? Who drives, who blocks? Answers to other questions contributed to the results presented here as well, when interview partners came back to a point made before, or talked about several issues while answering just one question.

There are three groups of driving forces for climate governance in India that are largely similar to South Africa (see Section 8.3.1). First, there are a number of *events* that helped in raising awareness and started some governance processes. Second, there are several *key individuals and groups* that push for climate governance – here, the relations and exchanges between actors comes into play as well. I refrain from using the lens of communities of practice in this section in order to avoid an interpretation bias. Third, there is a set of drivers which I call *strategic and knowledge-related drivers*, meaning both companies' activities for competitiveness or market reasons and actors' increased awareness and understanding of climate change. The structure of the groups of drivers and challenges presented in this chapter is roughly the same in the corresponding section on South Africa (8.3.1), while allowing for additions and deviations. Overall, content analysis of the interviews shows that the strategic drivers as well as the pushing force of key individuals and groups are more important than the other drivers in India.

Several *events* have supported the developments in India's climate governance. They are a combination of international and domestic events. The publication of the IPCC 4th Assessment report in 2007 and the increase of international attention as well as – somewhat less – the increase of media attention attached to the international negotiation process matter. Several interviewees also referred to the increase of international pressure on India in the course of the negotiations. But these factors only developed their driving force together with domestic events and in combination with

the other groups of drivers. In terms of domestic political events, interviewees highlighted the publication of the NAPCC as the most important factor for the advancement of the policy process. Different extreme weather events and natural phenomena increased the awareness about climate change, irrespective of the actual causes of these events, again paralleling South Africa (see Chapter 8.3.1). Here, interviewees cited the more frequent occurrence of floods in the region of Ladakh, the major floods in Maharashtra in 2005 and the shifting monsoon seasons and rainfall patterns in several parts of India which have begun to affect agriculture.

In July 2005, different parts of Maharashtra were flooded due to heavy rainfall, resulting in 500 casualties and financial damage of about two billion US dollars (Hallegatte et al 2010). From a climatological perspective, the heavy rainfalls cannot be attributed to climate change with absolute certainty. The extent of the disaster in Mumbai was due to a combination of other factors, such as poor infrastructure and human settlements that block natural drainage paths (Hallegatte et al 2010:15). Still, the Mumbai floods increased awareness of climate change and the need for action all over India, but particularly in Mumbai. A representative of a Delhi-based NGO concedes that "now there is a general understanding, a consensus that climate change is happening because parts of India feel the impacts already."[66] While the discussions with the other interview partners and a review of literature and media cast some doubts on the extent and actual strength of this consensus, the conclusion that these different events are supportive in terms of awareness raising and triggering governance actions is nevertheless possible.

Key individuals and groups, the second set of drivers, are crucial forces for both the national level and Maharashtra. Concerning the national level, most interview partners stressed the importance of the change of staff in the Ministry of Environment and Forests after the general elections in April and May 2009. The new minister, Jairam Ramesh, counts as progressive and committed to his portfolio. He has brought in a new team of advisers, thus breaking the long-standing influence of several bureaucrats and advisers who stood for India's old, reactive position in the international negotiations and a preference of growth over environment in all cases. Ramesh himself took over the position as chief negotiator in the UNFCCC negotiations in March 2010 after a fall-out with the former chief negotiator Shyam Saran, who chose to quit his job. Interview partners also identified Ajay Mathur, the head of BEE, as another key figure driving the energy efficiency part of climate governance. He was described to be "one of those people who actually gets things done and implements

66 Interview with NGO 6, 04/11/2010, Delhi.

them."[67]

Parts of business and parts of civil society also count as driving forces. Among them are individuals companies such as Intel or Wipro, parts of the Tata Group and the climate change team of CII. In civil society and research, the presence of environmentalists such as Sunita Narain of CSE in the press, the role of Rajendra Pachauri as head of the IPCC and the activities of the well-known couple Parikh support the debate on climate governance in India. Kirit Parikh heads the Low-Carbon Expert Group and his wife Jyoti the NGO IRADe.

In Maharashtra, a new minister of environment was appointed in November 2010 during the research stay of the author in Mumbai. First commentaries by interview partners then were tentatively optimistic regarding the commitment of the new minister to push for climate governance in Maharashtra. The Secretary of Environment was also described to be interested and committed by a couple of interview partners, but these were only first impressions at the time, so they should be treated with care.

Equally important to these individuals and groups, if not even more important, are *strategic and knowledge-related drivers*. These are, first of all, market and competitiveness considerations: Business opportunities through the CDM and concerning clean technology and energy efficiency and, most prominently, wind and solar energy. There is also a strong logic of co-benefits that seems to results from a combination of the identification of (new) business opportunities and an increased awareness of climate change as a problem. In contrast to South Africa, however, market considerations do not seem to include the fear of losing European consumers because of unsustainable products (see Chapter 8.3.1). This may be due to the different structure of the Indian economy and its exports as well as the size of the domestic market. For companies, the co-benefits of switching to less energy-intensive production forms may only be a secondary motivation for the mitigation of emissions. High electricity prices and the insecurity of electricity and energy supply drive energy efficient behaviour of companies as well as a general interest in and the switch to renewable energy sources, both in the short- and long-term.

After this sketch of the driving factors of climate governance in India, an equally brief summary of current problems is required to understand the overall context of learning processes. The main problems in India's climate governance can be grouped into three rough sets as well. First, there are a number of *cross-cutting problems* which affect almost all governance actors and processes in some way. Second, there are specific obstacles concerning the *government*, with differences concerning the scope of

67 Interview with NGO 1, 13/10/2010, Delhi.

these problems for the central government and the Maharashtran government. Third, there is a set of problems that slows down progress in *business*. The same groupings as in the chapter on South Africa are used, but the information gained in the interviews showed that an additional group, simply called "further problems", is required.

The *cross-cutting problems* characterize large parts of the current climate governance, but do not affect every actor or process. A lack of awareness and understanding of climate change presents one of these cross-cutting problems, even though the awareness has already increased, as we have seen. Parts of government and business as well as large parts of the population, namely the poor, are not aware or do not really understand what climate change is and how it affects them. Interview partners attributed this lack of understanding more to state and local levels of government and administration than to the central government. Also, both government and business were said to have a good awareness and understanding of energy efficiency, but not of other fields related to climate change, especially adaptation issues. Here, the lack of understanding correlates with a lack of science and local studies on adaptation to climate change. IPCC reports and other global studies tend to treat India as a whole, or even together with Bangladesh and Nepal (see IPCC 2007). Several interview partners said that governance actors have largely ignored adaptation up to now. One civil society member states:

> "Business doesn't know or do much about adaptation because it isn't talked about, not talked about by government, so business does not see why they should start doing something about it if there is no consensus within government."[68]

Interestingly, interview partners in both academia and government said that it would not take too much money for India to adapt and that India can most probably come up with these financial resources itself. Some interviewees pointed out that financial resources are an issue on state and local levels where actual implementation of measures takes place. In general, however, financial resources are not emphasized as a problem the way they are in South Africa (see Chapter 8.3.1). The implementation of measures is a wide-spread problem for laws, policies and voluntary measures taken by business. A lack of control and sanctions as well as a high level of corruption hinder compliance and implementation.

Two more cross-cutting problems exist that are to some extent related: first, a lack of will or the rift between knowledge and action and second, the debate and reasoning connected to equity issues. The gap between the knowledge about climate change and doing something about it presents the same kind of challenge as in South Africa and concerns both governance actors and individual/society behaviour. The

68 Interview with NGO 6, 04/11/2010, Delhi.

upper class and growing middle classes in India have a higher chance of knowing about climate change, but a change of lifestyle is a different story – similar to societies in industrialized countries. In India, the lack of will may be connected to international equity considerations in some cases. For a long time, India held the position in the international negotiations that climate change is a problem industrialized countries have caused and therefore have to deal with and that India has a "right to growth" and development (see Stevenson 2011). Even though this "blame game" is not advocated as strongly any more and perceptions and attitudes are changing, there are still enough voices and actors in India sticking to this position.

Let us now turn to the *government-related problems*. Despite the fact that the NAPCC explicitly involves various ministries and departments, there is a lack of coordination and collaboration between departments and also within the cabinet. The missions of the NAPCC have been designated to a department each and these mostly work in isolation on their mission. The Prime Minister's council on climate change, which used to have a coordinating function, is now somewhat detached from the current policy process.[69] Ramesh has been pushing for climate governance measures, similar to his counterpart in the MNRE, Farooq Abdullah, but there are clear power struggles within government that hinder collaboration. Many interview partners said that Ramesh has insufficient backing within government. Sometimes, Ramesh makes bold statements and concessions, but they do not reflect a consensus opinion of government, so that he has brought parts of government up against him quite quickly. This may be the (tactical) background to the move of Ramesh into the rank of a full cabinet minister as minister of rural development in July 2011.

A second challenge for government is the need to balance different policy goals and different needs of the people (and the voters!). Poverty and inequality are even higher in India than in South Africa and almost all interview partners said that a trade-off between growth/development and environmental protection is inevitable in this situation. For instance, reducing poverty or providing housing are likely to be perceived as more pressing problems by a state policy-maker who has a restricted budget. This challenge exists for both central and state governments.

The final major challenge with respect to government concerns a lack of transparency. Interview partners identified this problem for both central and the Maharashtra government – for the latter, even more strongly. Decision-making processes and developments in the field are only partly transparent. Lavanya Rajamani criticizes that, generally, "the climate policy making processes do not encourage civil

69 Interview with Academic/Expert 4, 03/11/2010; Embassy 1, 05/11/2010, Delhi.

society participation" (Rajamani 2009:355f.). Further, she says that the NAPCC has "emerged from a curtain of political secrecy", quoting the consultant and journalist Rahul Goswami (Rajamani 2009: 356). In Maharashtra, civil society is hardly consulted in climate change questions before the Department of Environment takes decisions, even though they are heard on other conservation issues.[70] These findings underline that developments in Indian climate governance and the actors and processes behind it are not very clear even to local experts (see also the following chapter) and that the participation and influence of civil society is limited.

The third group of problems concerns the *private sector*. There is still a lack of awareness, especially among small and medium enterprises. Interview partners from administration and civil society voiced their concerns about how to get the bulk of India's economy in terms of people on a low-carbon growth trajectory and foster innovation in this sector. In the big business sector, interviewees identified a lack of interest and will to action. Apart from those companies associated with clean technology or the CDM and a handful of progressive transnational companies, the interest of business in taking action and investing in climate governance measures may be somewhat limited at this stage.

Finally, three challenges outside these groups exist. First, the fragmentation of the science landscape has been identified as an obstacle, mostly by interview partners with academic backgrounds.[71] The number of researchers, institutes and universities working on one or more climate change question from a natural science or social science approach is high and the diversity of opinions on what to do and how is big.

Second, there is no strong, concerted civil society voice. NGOs pointed this out themselves and gave it as one reason for their (perceived) limited influence on government and policy.[72] Both the relation of scientists and environmental civil society to government will be discussed in more detail in the next section.

Third, actors' difficulties in agreeing on concrete measures and solutions, for example in the transport sector, slow down progress in India's climate governance. Whether the drivers and challenges outlined in this section are specific to India and whether new hypotheses can be drawn from these will become more clear through the comparison with South Africa (see Chapters 8.3.1 and 9.4).

70 Interviews with NGO 8, 22/11/2010; Academic/Expert 11, 25/11/2010, Mumbai.

71 E.g. Interviews with Academic/Expert 7, 10/11/2010, Delhi; Academic/Expert 10, 24/11/2010, Mumbai.

72 Interviews with NGO6, 04/11/2010, Delhi; NGO 9, 22/11/2010, Mumbai.

8.2.2 Communities of practice and their power

The identification of the key driving forces and key challenges in India's climate governance has built the background of a potential knowledge system and its influence. The next step is the analysis of the existence of communities of practice and their power, in line with the specific qualitative questions targeting them. It is the goal of this section. Hypotheses addressed in this section are the general hypothesis on climate knowledge systems and their function (H1) and the hypotheses on communities of practice and their power (H2a and H2b). The following interview questions targeted the identification of communities of practice: "Who are the most important actors in climate governance in your country? Who do you collaborate or exchange with on climate change questions and practices? Are the contacts personal, regular or not? How would you describe these exchanges? Do you feel that you are engaging for the same thing/are on the same page?" Additionally, at the end of the interview, each interviewee was asked to recommend other key people in the field worth interviewing. Thus, the technique used to identify communities of practice approximated the interview and snowballing methods used in social network analysis as well (see Wasserman & Faust 2008).

I give some general findings from the interviews first, before turning to specific actor relations and their implications. Compared to South Africa, the number of actors at the national level is much higher in India. Moreover, relations between actors and their positions are not as clear-cut as in South Africa (see Chapter 8.3.2). Not only is the number of actors higher, but interview partners also highlighted that there is strong disagreement between actors and actors groups on what to do and how in climate governance. This relates to the fragmentation of the science landscape and, to some extent, the fragmentation of civil society described in the previous chapter. While most interviewees affirmed the existence of some sort of networks between governance actors, there are not just a handful of small, clear circles as in South Africa. The formation of actor constellations, networks and – potentially – communities of practice seems to be much in flux still. One expert described the situation as "confusing"[73], while another summarized it this way:

> "In the next few years we'll see what the actor networks really are that put policies into place, pushed for stuff to happen, it's so much under development still, I wouldn't be able to tell at the moment"[74]

Yet several interview partners from civil society and with academic/expert background stated that if they or another researcher has influence on government and governance

73 Interview with Academic/Expert 9, 19/11/2010, Mumbai.

74 Interview with NGO 1, 13/10/2010, Delhi.

processes, then it is because of informal, trust-based relationships, or in an ad-hoc way. These basic results build the background for the identification of networks, actor relations, their qualification as communities of practice and the distribution of power among actors. Let us now look at the data and information retrieved from the interviews in more detail.

Communities of practice at the national level

First, the change in staff that helped to advance climate governance is connected to the diminishing influence of a group of bureaucrats and ex-bureaucrats who dominated the Indian climate policy for many years. Internationally, this group is responsible for a defensive, even blocking position in the climate negotiations, coined "porcupine attitude" by some authors (see Michaelowa/Michaelowa 2011). Key figures here were Nitin Desai, Prodipto Ghosh, C Dasgupta and the former international chief negotiator Shyam Saran. Also, the influence of TERI used to be stronger. Desai and Dasgupta are now fellows at TERI and Ghosh is now head of the climate change team of FICCI. It can be assumed that they built a community of practice before the shift, but, as noted, the time period before 2007 is not the focus of this study.

What is relevant for our analysis here is that the networks or communities of practice among this group of bureaucrats and climate diplomats exerted a high productive or discursive power. They exert it by stressing international equity, India's low per capita emissions and a certain right to catch up and therefore blocking any Indian commitments internationally. In turn, this hindered a more differentiated domestic discourse on Indian climate change policy or even made it obsolete. They also possessed a lot of institutional power as well – namely, in blocking and postponing institutional rules and policy changes domestically that would produce a specific domestic climate change policy for a long time. Ghosh, Dasgupta and Desai are all three members of the Prime Minister's Council on Climate Change and Desai is also a member of the Low-Carbon Expert Group. Several interview partners said that Desai continues to have an influential voice, but others denied this. In any case, the power of their networks/communities of practice is broken now.

The Prime Minister's Council on Climate Change has been important for the draft of the NAPCC, but lost some of its importance soon after the publication of the NAPCC in 2008. Some interview partners said they were not sure whether the PM council still really exists and not only on paper, while others spoke of a devaluation of its role or even a disconnect from actual climate governance processes. This was attributed to the stronger role of Ramesh and his new team of advisers and the set-up of the Low-Carbon Expert Group.

Whether the Low-Carbon Expert group can count as a community of practice is unclear – it may be true for parts of the group, but a "we feeling" or identity building for the whole group of 26 experts is uncertain. Trust seems to exist more at the dyadic level and within subgroups. Members identified a like-mindedness in the group, meaning a climate change-perspective on even economic or technical aspects.[75] The group split up into different teams targeting specific questions and chapters for the report to the Planning Commission. A higher degree of agreement exists among these teams, but the chapters at the draft stage reflected very different ideas, because each team had its own opinions and strategies.

The fragmentation of the scientific community in India leads to the question whether there is one or more epistemic communities, or other communities of practice including scientists or not. Given that there are over 120 institutions concerned with research on climate change,[76] an exhausting answer to this question cannot be given here. The INCCA is a network of scientists working on India's second national communication to the UNFCCC. In a document of the DST, it is openly said that the INCCA is a simple re-naming of the National Communication Process (DST 2010: 5).[77] Since this is a big process with many scientists taking part, the INCCA can hardly count as a community of practice – it is a simple, big network for the time being.

There are, according to the interviews, cooperations between the IITs, especially Delhi and Madras, CPR, Prayas and TISS Bombay. Moreover, the well-known Indian Institute of Science in Bangalore host the Divecha Centre for Climate Change, which is partly funded by the UK-based Grantham foundation – here, strong transnational collaborations between researchers are likely to exist. It did not become clear, however, whether these networks qualify as an epistemic community (as a form of community of practice) and whether more networks exist. Given the number of researchers and institutes, the latter can be assumed, but no sufficient, encompassing amount of data could be acquired here.

The influence of scientists on government is mostly informal and often ad hoc and depends on individual people according to the academics and experts interviewed. Some experts stated that the influence of particular scientists may change with those in power.[78] These findings point towards the type of relations proposed in a climate knowledge system. In other policy fields, such as economics, research has a lot more

75 For example, interview with Academic/Expert 3, 28/10/2010, Delhi.

76 Government of India, Department of Science and Technology: National Mission of Strategic Knowledge for Climate Change, Mission Document, July 2010, New Delhi.

77 id.: 5.

78 Interviews with Academic/Expert 10, 24/11/2010, Mumbai.

influence on government and policy and relations between scientists and government and bureaucracy are much stronger.[79] In climate policy, there are also scientists working within the ministries who are supposed to bring up the science aspects of an issue as well. Interviewees neither mentioned this as a factor hindering the influence of other scientists, nor did they say anything about the image or place of scientists in society, and whether this matters for governance (as it possibly could in French administration, for example).

Moreover, various interview partners stressed the importance of Ramesh and that he is surrounded by a team of younger assistants – access to these circles was not possible. Hence, no closer analysis whether and what kind of community of practice surrounds him is possible. In their analysis of the domestic policy background for India's changing negotiation strategies, Katharina and Axel Michaelowa (2011) also stress the importance of Ramesh as a driving force who has managed to broaden the camp of "progressive internationalists" (Dubash September 2009) that he belongs to himself. Drawing on interviews and a quantitative content analysis of the Indian press, they ascribe the rise in media attention to and the stimulation of the domestic public debate on climate policy partly to the UNFCCC conference in Copenhagen. Largely, they adhere to Ramesh and his ties to journalists that helped place his views and activities in the press. This points towards the particularly productive or discursive power of Ramesh and his team (see also Chapter 8.1.3):

> "As the strong minister himself led to more discussion of the core policy fields under his responsibility in the media, the perceived relevance of these topics increased, thereby raising domestic awareness of climate change and the related national and international challenges" (Michaelowa & Michaeolowa 2011:17).

These findings tentatively support the idea of a community of practice surrounding Ramesh and the beginning process of a cognitive evolution (see Chapter 9.13). In any case, Ramesh clearly qualifies as a key individual according to the general criteria of a climate knowledge system and in line with inductive methodological proceedings.

Many leading experts, bureaucrats, or even civil society members working on climate change issues have at one point in their life worked at TERI. This shows the standing that the institute has, or at least used to have, in the field. On the one hand, interview partners pointed out that TERI is close to business and business interests because it does a lot of consultancy work for them. On the other hand, TERI's influence on climate governance seems to have diminished in recent years.[80]

Ramesh and Rajendra Pachauri, director of TERI and the IPCC, are reported to

79 Interview with Academic/Expert 10, 24/11/2010, Mumbai.

80 Interview with NGO 3, 18/10/2010, Delhi.

have had their differences over the NAPCC prior to the Copenhagen summit. A serious fall-out followed over a controversy about the IPCC and Indian reports on the melting of the Indian Himalayan glaciers in January 2010. Ramesh called the IPCC "alarmist," while Pachauri called the MoEF report on Himalayan glaciers "voodoo science".[81] Different positions and struggles characterize the knowledge-related debate on climate change in India, even at the highest level. While a shift in discourse happened, there was disagreement about what exactly to do, in what way and by drawing on which scientific contributions. An expert also stressed that the acceptance of scientific information is higher if it has been "validated in India"[82] or produced by Indian scientists – this also impacts the way knowledge and science are debated in India. Ramesh later backed Pachauri to keep his presidency of the IPCC. But the influence of Pachauri and TERI on India's domestic climate policy considerably weakened after this, which led to the cessation of communication between Ramesh and Pachauri.[83]

But this rather diffuse evidence does not mean that there are no identifiable communities of practice at all in India. There is a community of practice between individuals of the WWF and the MoEF and individuals of the CSE and MoEF. According to some sources, Ramesh is even called "NGO minister" by business, because he listens more to civil society than the previous minister did.[84] However, other interview partners stressed the influence of business on national climate governance. There seems to be another community of practice between CSE and MNRE, but the data this conclusion draws on does not include an interview with a member of MNRE. Due to the ongoing debate and the high degree of contestation among different actors and actor groups, it is clear that the power of these two communities of practice is limited, both in terms of their institutional and productive power.

Almost all interview partners identified the greater influence of big business on climate governance, but the means of influence are not clearly discernible, which makes a relative but specific measurement or identification of their power difficult. This is partly due to do with the way lobbying is perceived in India. Several interview partners said that lobbying as a concept does not exist openly the way it does in Europe because it has a negative image in India. Both CII and FICCI deny that they are lobbyist organizations — the president of CII said "we are not lobbyists, we are

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81 *The Hindu*/Press Trust of India 2010 *Himalayan Glaciers Controversy: Jairam Ramesh says India vindicated*, 18/01/2010, online: <www.thehindu.com/sci - tech/energy - and - environment/article82061.ece> (6 May 2011).
82 Interview with Academic/Expert 9, 19/11/2010, Mumbai.
83 Interview with Embassy 1, 05/11/2010, Delhi.
84 id.

advocates"(Khandelwal 2010). A debate about lobbying has started in India, leading journalists to make a call to "take lobbying out of the closet" (Srinivasan 2010).

Other governance fields such as industry or economic governance may be of higher interest to big corporate groups such as the Tata Group and Reliance —relations between Tata, Reliance and the central government are said to be very close, even though hard evidence on their relationships is not available. During the course of investigating a large corruption case in the telecommunications sector, the so called "2G spectrum scam"[85], the connections between corporate lobbyist Niira Radia and the Tata Group and Reliance came to the open. Both the Tata Group and Reliance were clients of Radia's company and telephone conversations between Ratan Tata and Radia had been caught on tape by the Income Tax Department. Even though telecommunications has nothing to do with climate change, the entanglement between business and government gives backing to general claims made by interview partners that a lot of India's policy is run as much by government as it is by the Tata family and the Reliance brothers. One of the Reliance brothers was said to de-facto make the oil price in India and Prime Minister Singh once intervened in a quarrel between the brothers to keep the oil price steady.[86]

There are networks and potentially different communities of practice between pro-climate protection parts of CII, FICCI, single leading companies and the MoEF, including support for voluntary commitments under the CDM/Kyoto Protocol. There are also networks of those advocating for the opposite — the protection of economic growth interests under all circumstances. Members of the CII, FICCI, single companies, individuals at the Ministry of Industry and at the Ministry of Power also form a network and could form another community of practice. Ghosh, the head of the climate change task force of FICCI, stands more for the old course of Indian climate policy—reflected in his former position in the Indian climate negotiations team.

There are also networks between wind energy companies, such as Suzlon and the Ministry of Renewable Energy and between some companies such as Intel, HSBC and the BEE. Whether these form communities of practice could not be determined from the data obtained. While Abdullah, Minister of New and Renewable Energy, has been said to label solar energy developments as his personal political achievements,[87] Mathur, the director of BEE, is likely to advocate for co-beneficial policies because he

85 Court proceedings of this corruption case are ongoing. A number of politicians and industrialists are under investigation. The telecommunications minister A. Raja had to step down and has been arrested in February 2011 for taking bribes and giving certain telecommunication companies licenses for 2G airwaves below market price in 2007/8 (Various articles in The Hindu, Hindustan Times, Times of India and Frontline over several months).

86 Interview with Business 1, 08/10/2010, Delhi.

87 Interview with NGO 1, 23/10/10, Delhi.

and his team genuinely believe in energy efficiency and the necessity to mitigate climate change. Mathur contributed to several IPCC reports and used to head the Climate Change team of the World Bank in Washington. His co-beneficial thinking and attitude is therefore not surprising. The BEE and Mathur were also said to be open to civil society contacts.[88]

The exact membership of these networks in terms of individuals and whether these networks qualify as communities of practice, could not be determined as data on the relationships remained fuzzy. Content analysis of the interviews indicates more relationships based on simple, resource exchange-based networks in the business sector than identity-building communities based on group and dyadic level trust.

For the research question and the hypotheses of this section, these findings for the national level of climate governance in India imply that the number of communities of practice is somewhat unclear and rather small. More 'simple' networks without identity-building exist at this stage. Up to December 2010, the power of those communities of practice existing has been limited – both in terms of institutional and productive/discursive power. The high number of other actors and groups promoting differing positions and alternative approaches are the reason for the difficulties of new or small communities to successfully influence governance processes. Business networks or communities of practice incorporating business interests are more successful here.

The implications for the hypothesis on the strength of the climate knowledge system is unclear as no clear system building on the existing communities can be identified, but it could be under development. The data gathered did not give sufficient insights here. Hypotheses 2a and 2b can be partly supported, since some communities of practice with some power exist (even though it is limited) and key individuals and their entourage are very important for initiating change.

Communities of practice in Maharashtra

In terms of the number of actors concerned with climate change, there is not much difference between Maharashtra and the Western Cape. However, Maharashtra is significantly behind both in terms of planning and in implementation of climate governance measures. For the time period under observation, no communities of practice could be identified. There may be one community evolving between TERI researchers of the Mumbai office and the Secretary of Environment and her team in the Ministry of Environment of Maharashtra. The change of staff mentioned at the

88 Interview with Academic/Expert 4, 03/11/10, Delhi.

beginning of this chapter as well as the early stages of the collaboration between TERI and the Ministry of Environment for the formulation of a State Action Plan on Climate Change make this a preliminary assessment.

The non-existence of communities of practice, however, does not mean that there are no NGOs, companies, researchers and administration interested in or working on climate change issues in Maharashtra. They simply do not have much influence on governance and/or do not collaborate much. Civil society is not integrated into the policy process as it is on the national level:

> "We are not aware what's happening in Maharashtra because government doesn't talk about it. The Department of Environment puts up a lot on their website, but then decisions have already been taken."[89]

The number of civil society organisations working on environmental issues in general is relatively high, but, apart from Prayas, none of them specializes on climate change but have taken it on their agenda as an additional issue. Prayas is more active on the national level, but influences electricity tariff-setting in Maharashtra, which has a co-beneficial effect on climate governance.[90]

Businesses based in Maharashtra increasingly invest into clean technology and are therefore seen to be more active in climate governance than the Maharshtran government by both experts and NGOs.[91] However, no ties among these companies exist that resemble a community of practice.

Finally, with respect to science and research, a similar fragmentation to the national level exists – there is no epistemic community of Maharashtran researchers that is developing a form of identity. Individual scientists are approached by the Maharashtran government from time to time, but no close ties exist.[92] As indicated above, a community of practice may be evolving between the Secretary of Environment, her team and TERI Mumbai, but this remained unclear till the end of 2010. In sum, the hypotheses on communities of practice and their power cannot be supported in Maharashtra for the time period analysed. Since communities of practice are the central element of the climate knowledge system, the hypothesis on the existence and influence of a climate knowledge system does not apply to Maharashtra either, but further data will be discussed in the next section.

8.2.3 Knowledge and collective learning - cognitive evolution?

89 Interview with NGO 8, 22/11/2010, Mumbai.

90 Interview with NGO 9, 22/11/2010, Mumbai.

91 Interviews with eg NGO 7, 16/11/2010 and Academic/Expert 11, 25/11/2010, both in Mumbai.

92 Interviews with Academic/Expert 10, 24/11/2010 and Academic/Expert 11, 25/11/2010, both in Mumbai.

This section addresses the existence of the different knowledge types in the climate knowledge system. It seeks to identify and connect individual and shared background knowledge to potential learning processes in India. To assess whether a collective learning process has taken place, it is necessary to identify whether new background knowledge has developed and spread. First, I analyse how much and what kind of knowledge actors have at the end of 2010 compared to 2007, treating each knowledge dimension separately. This shows whether evidence for the knowledge types that compose the climate knowledge system exists and whether a learning process on a general level has taken place or not.

Second, I discuss the evidence for learning processes in more detail. Here, I draw on the knowledge processes identified, the discursive developments and the communities of practice and networks identified. In this respect, this section provides further insights into the institutional and productive power of the identified communities of practice and other networks and the structural power of a potentially developing knowledge system. Therefore, this section addresses the general hypothesis H1 on climate knowledge systems as well as H 3a and H3bb on pragmatic knowledge and practical rationality.

Complex processes such as collective loop-learning as well as its origins are difficult to measure empirically in all their nuances. I therefore use a variety of techniques to carefully interpret the pros and cons of the evidence. These technical tools for analysis are a content analysis of the interviews and a qualitative interpretation of the interview data that puts findings in relation to other studies, documents and grey literature. I also use code frequencies to get a general idea of the prevalence of different knowledge types.[93] The calculation of Jaccard's co-efficient that measures code co-ocurrences and text similarity gives further insights on the connections of different codes in interview partners' line of thinking. This could be, for instance, between specific knowledge types and the information they provided about the national policy process. It serves as an approximation to interviewees' underlying reasoning about the topic, or their associations between knowledge and governance that rely on background knowledge.

In general, awareness and knowledge about climate change have increased in India in the past few years, as the majority of interview partners conceded (57 %). Particularly the business angle to climate change is “really the buzz since 2007 and

93 I coded the interview material on South Africa first in a way that avoided theory bias concerning pragmatic knowledge (see Chapter 9.3). Since this already provides sufficient justification for this knowledge category, refrain from undertaking this procedure here again. The reverse presentation of the cases results from the overall logic of the chapters.

even stronger since 2009."[94] Moreover, an interview partner from the private sector said that business has learnt now that there are risks attached to climate change that they have to deal with in their company.[95] Before 2007/8, hardly anyone was truly aware of climate change and understood its consequences. Knowledge seems to have been limited to a small number of experts, academics and diplomats representing India in the international climate negotiations. There is a distinct difference to 2010, as will become clear throughout the section.

From interviewees' statements, it can be concluded that climate change-related issues and -knowledge did not figure in the background knowledge underlying the major governance actors reasoning before 2007, both at the national level and in Maharashtra. Since it was not possible to undertake a research trip at the beginning of 2007 to assess the state of knowledge of central actors, I have to rely on these retrospective statements by interview partners here. The domestic debate about climate change has both increased significantly and changed in terms of its content from about 2007 onwards as well (see also Michaelowa/Michaelowa 2011). I come back to the debate and its connection to a learning process below.

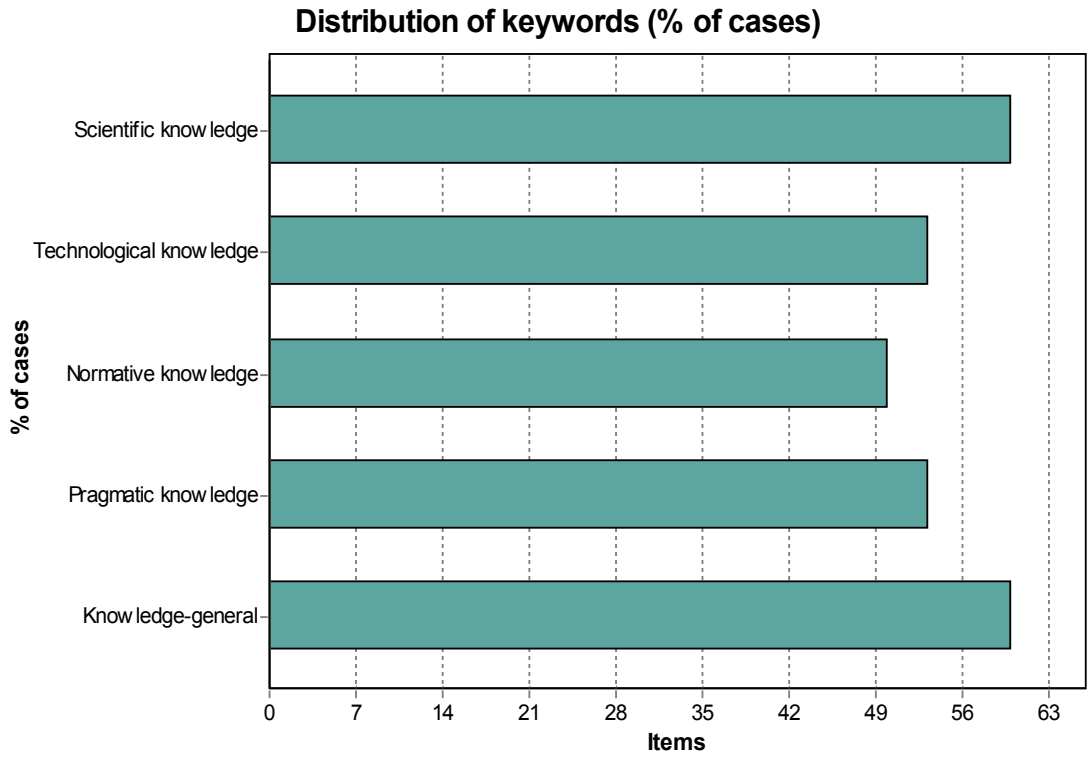
First, let us turn to the knowledge types in more detail to make the contrast to January 2007. For India, evidence for all four types of knowledge proposed in the concept of climate knowledge systems could be found, justifying my content-analytical categorization.

Figure 11 shows the percentage of interview partners (in the figure: cases) that made statements fitting the four specific knowledge categories and talking about knowledge about climate change in general. The percentage of cases indicate the frequency (manifest) effect size of each knowledge type (see Chapter 4). All categories have at least a medium effect size of 30-50% and general as well as scientific knowledge have a high effect size of over 50%. Yet the code frequencies should not be overrated – the content of each knowledge category or code is more important to find out who knows what and how much learning occurred in the past years, if any.

94 Interview with NGO 3, 18/10/2010, Delhi.

95 Interview with Business 2, 12/10/2010, Delhi.

Figure 11: Frequencies of different knowledge codes (India)



Source: Author's own compilation.

Now, I analyse the concrete meaning of each knowledge dimension. The scientific knowledge of those actors working directly on climate change issues exists on at least basic levels, with higher knowledge for academics and other experts. Interview partners showed more knowledge in terms of mitigation themselves, for example on GHG emission levels and their effects. They also said that in general, more is known about mitigation than about adaptation in the Indian climate governance landscape. The same applies to the technological knowledge for mitigation-oriented measures, e.g. in energy efficiency. Both the high number of CDM projects in India as well as the relative success of the energy efficiency and solar missions of the NAPCC confirm this.

Many interviewees voiced their concerns about the insecurity of data and lack of local studies concerning concrete impacts of climate change on India and adaptation to these impacts. Non-academic interview partners recognized the diversity of impacts across India, thus showing a basic scientific knowledge. Priority areas mentioned included changing monsoon patterns and connected stress on agriculture and the Himalayan ecosystem, corresponding to the climatological projections in the IPCC Fourth Assessment Report of 2007.

Concerning the spread of scientific and technological knowledge which would indicate a learning process, interview partners assessed a general increase, but also

stressed that the picture is diverse both across actor groups, thematic fields and across levels (central and states). Given that the number of clearly identifiable communities of practice is very limited on the national level, a comparison between these communities' knowledge and intersubjective knowledge to account for the origins of collective learning and its contents becomes more difficult. I therefore summarize the statements of interviewees about the general state of knowledge to find out what kind of intersubjective knowledge dominates in India, both at the national level and in Maharashtra and what kind of learning process may have begun between 2007 and 2010.

With respect to scientific knowledge, a few interview partners realized that their perspective on what is known about climate change in India may be somewhat limited or biased: "It's difficult to know because in the areas, circles we work people are aware, so it's difficult to know what the whole picture looks like."[96]

A basic understanding of the science of climate change seems to exist in government at national level, but a deeper understanding varies between ministries and departments. The business associations and big companies increasingly develop some understanding of the science and also technological knowledge.

These results do not, however, mean that this scientific and technological knowledge constitutes intersubjective, shared background knowledge in the majority of society. The middle class and educated youth were said to have at least a basic understanding of what climate change is, even if it may be less clear what the impacts on India and/or their life may mean. Several interview partners said that the poorer parts of the population, especially outside of the cities, lack this knowledge. Others stated that farmers indirectly have some knowledge through observations of changing rainfall and cropping patterns – but making the connection to a global phenomenon such as climate change may be hard. They just know that something is wrong.[97]

In Maharashtra, the situation is similar in terms of a general knowledge or awareness of climate change. Concrete scientific and technological knowledge of actors is more wide-spread in business. A local expert said that "civil society organisations are not much aware, knowledge doesn't run deep because they simply attach their previous campaigns to climate change now." Interviews with environmental civil society organisations in Mumbai only partly confirmed this judgement. Similar to the national level, it seems to be true that those actors and people who work directly on climate change-related issues (also on renewable energy and CDM) have at least a basic understanding of the science and – less so – ideas for technological solutions.

96 Interview with NGO 4, 19/10/2010, Delhi.

97 E.g. Interview with Embassy 1, 05/11/2010, Delhi.

Although an increase in knowledge could be identified in Maharashtra as well, presupposing at least some sort of learning on a small scale, this knowledge does not qualify as widely shared background knowledge yet.

Most actors with a sound base of scientific (and sometimes technological) knowledge who are working on climate change issues had the normative position that India should do something about climate change. However, there were different opinions on what should be done domestically and internationally and different judgements on the dominant normative knowledge in India. When I asked questions targeting normative knowledge (see Appendix II), the Indian position in the international negotiations and the role of India and other developing countries in global climate governance often came up in the answers. The insights gained through the interview confirms previous research that roughly identifies three groups in Indian climate governance (see Chapter 2): growth first stonewallers, progressive realists and progressive internationalists (Dubash September 2009; Rajamani 2009). While they are certainly ideal types, these positions were roughly reflected in the descriptions of India's climate governance landscape. Most interview partners belonged to the second or third group, in favour of India doing its share in climate protection. This supports the notion of an ongoing shift or change towards a normative commitment to climate protection, at least domestically.

No specific climate protection norm or standard exists yet, but several co-beneficial norms for business, among them the Perform, Achieve and Trade system (see Chapter 5.4.1). Whether the voluntary measures such as energy efficiency star rating or emission disclosure will reach a more widespread acceptance among business and individuals remains to be seen. Since India already has a strong record on energy efficiency and the reduction of energy intensity, especially in industrial productions (see Chapter 5.4.1), it is very likely.

The normative arguments brought forward in the interviews and the normative knowledge connected to them refer a lot to equity and the integration of development, growth and environmental concerns. Traditionally, these have been understood as opposing in India (see Stevenson 2011). Despite the ongoing shift in India's domestic climate governance, this position still has a firm ground at both the national level and in Maharashtra among parts of business and government, but also in some civil society organisations. Ramesh himself criticized this opposition and the non-communication between the "two cultures" and – by quoting Indira Gandhi – argued that "the inherent conflict is not between conservation and development but between environment and the reckless exploitation of man and earth in the name of efficiency"

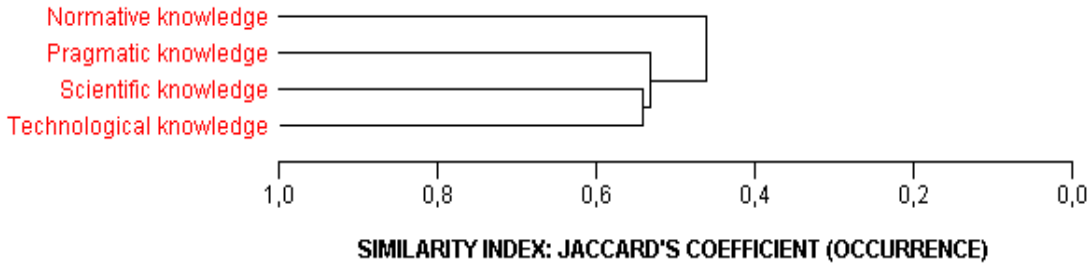
(Ramesh 2010:16). He advocates for more co-beneficial or “yes, but”-solutions and said that the scientific community and the growth-advocates have a special role in communicating their positions and engaging the larger public (Ramesh 2010:16).

This pragmatic-sounding argument brings us to pragmatic knowledge. Its content became clear through interview partners' reasoning and/or their identification of it as a general necessity for India's climate governance. The most prominent point mentioned by government and administration, experts and civil society alike was how to balance different goals and responsibilities: primarily poverty reduction, development and sustainability/climate change concerns. Many said that a trade-off between environment and development is inevitable at some point. Several NGO representatives called for a more people-centred approach which presents environmentally sustainable alternatives for the poor and integrates the masses into environmental protection plans. Also, some experts explained the lack of interest and action on the state level with the primacy of poverty reduction in policy-makers' vision in poorer states such as Bihar. While this is understandable, it also shows that these policy-makers fail to make the connection between poverty reduction and adaptation to climate change. At the national level, the governmental interview partners did make this connection. Pragmatic knowledge also included the awareness that natural resources such as oil are limited and imports of energy sources are already high in India, which makes more efficient production and the turn towards alternative energy sources necessary.

Both the interviews and review of the literature make clear that pragmatic knowledge is required in India's climate governance, but it was unclear who is supposed to provide it and combine scientific knowledge with technically viable, equitable and pragmatic solutions.

After this content-analytical interpretation of the knowledge types, I now use the tool of code co-occurences as a different approximation for the identification of background knowledge. The code co-occurrence of all interviews supports the idea that the different types of knowledge are connected, but the Jaccard's co-efficient is smaller than for the interviews in South Africa (see Chapter 8.3.3), ranging from 0,45 to 0,54 (see Figure 12). When the number of clusters is increased to two, normative knowledge gets separated, which could imply that they are either a somewhat separate issue or they may even oppose the other knowledge dimensions in terms of its content. But no hard evidence supporting either conclusion can be drawn from the clustering.

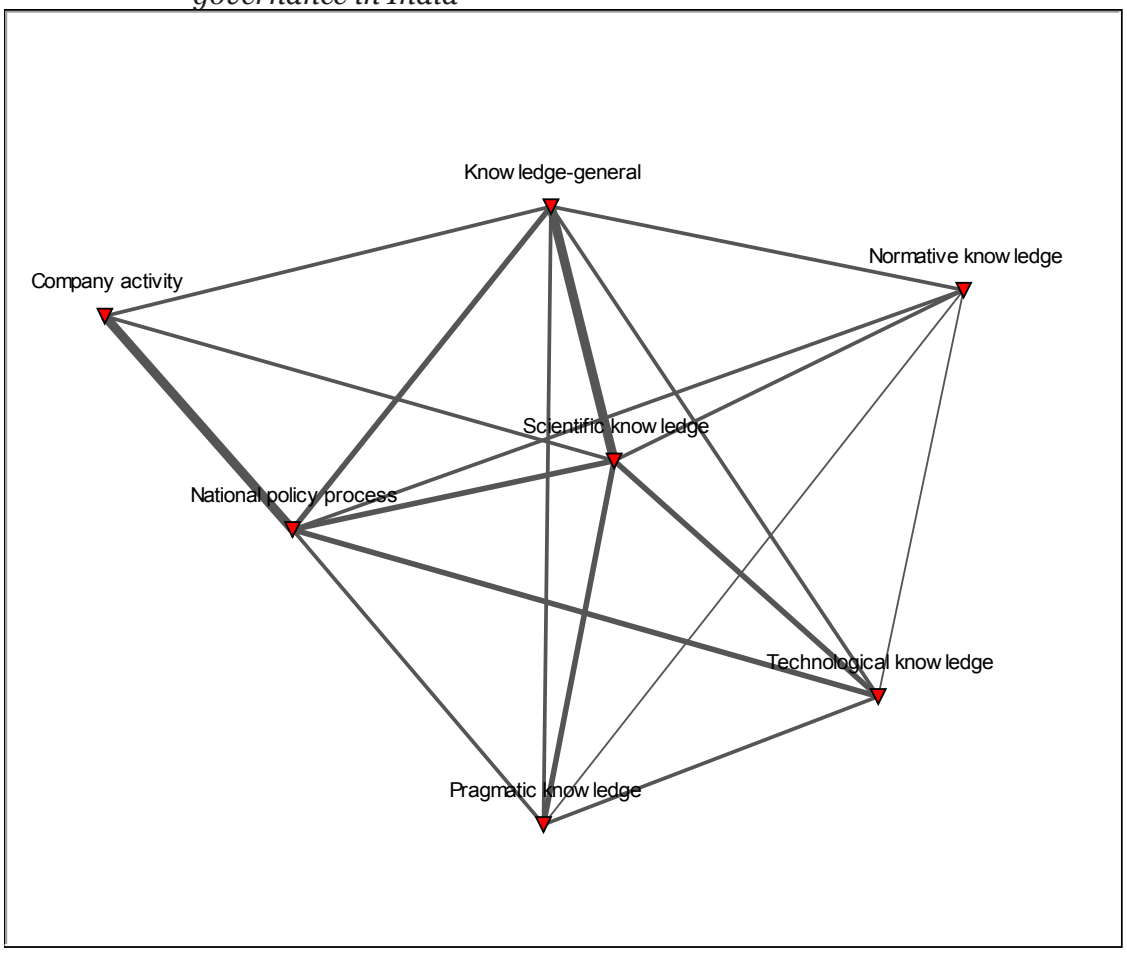
Figure 12: Code co-occurence of knowledge types in India (all interviews)



Source: Author's own compilation.

To find out what general relevance these code co-occurences may have for climate governance, I calculated the co-occurence of codes in all interviews again. This time, I added the codes "National policy process" and "Company activity" for climate governance and "knowledge-general" to include all general statements about knowledge (see Fig. 13). I expected to get some indications for the way interviewees associate these themes, approximating the underlying background knowledge.

Figure 13: Cluster structure of codes representing knowledge and climate governance in India



Stress: 0,21698 R^2= 0,7959 Source: Author's own compilation.

Figure 13 shows that all four knowledge types as well as general knowledge are connected (co-occur) to the national policy process, meaning that interviewees associate them in their flow of talking, but only scientific and general knowledge connect to company activity. Given that the number of companies and business associations interviewed was rather small, the explanatory power of this normally surprising finding is not as strong as the R^2 suggests.

Still, these co-ocurrences give further support to the hypothesis that different types of knowledge exist in India and that they are related, as the content analysis of the interviews also suggests. But their mere existence does not create a knowledge system or collective learning process in the sense of cognitive evolution. It is now necessary to check to what extent these developments are related to the existing communities of practice and networks identified in the previous section and what kind of loop-learning is taking place in the Indian cases, if any.

From the interviews, it becomes clear that knowledge about climate change is unevenly distributed among the different actor groups and generally higher at the central level than in Maharashtra. In those fields in which co-benefits exist between climate governance and energy security, primarily concerning energy efficiency and solar and wind energy, the interests of business converge with the knowledge and motivation of the (tentative) communities of practice surrounding the key individuals Ramesh and Mathur and possibly a community or network between CSE, MNRE and key companies in the wind and solar sector. Here, strong signs for double-loop learning exist because new policy instruments are under development in these fields. New financial commitments are already made (see Chapters 5 and 6) and the underlying norms or values for action has shifted from energy security to co-benefits. This fits the characteristics of double-loop learning (see Pahl-Wostl 2009; Appendix VII). However, the difficulties in the identification of communities of practice (with all their members) complicates a straightforward tie-back of the new shared knowledge and attitudes. Results remain preliminary here.

The learning process is less advanced with respect to the adaptation to the impacts of climate change in India, at both the national level and in Maharashtra. The different missions concerned with it under the NAPCC as well as the general inaction of companies in this field point towards single-loop learning. Different actors including some NGOs call for an improvement of information, for example of regional climate models. Government refers to existing policies and expenditure[98] and their possible

98 For example, the document that India is already spending 2% of its GDP on India is often quoted by policy-makers and buraucrats, including the governmental interviewees in this study. (India: Addressing Energy Security and Climate Change. Ministry of Environment and Forests, Ministry of Power and Bureau of Energy Efficiency, October 2007)

amendment, instead of changing regulatory frameworks in a substantial way. While bottom-up initiatives exist in several states and at local levels, these are often driven by donor organizations or transnational NGOs such as the WWF. Drawing on Pahl-Wostl's (2009) characterization of changes and loop-learning in resource-governance (see Appendix VII), single-loop learning prevails here.

The ongoing controversies and the power struggles between key individuals and their communities, opposing networks and interest groups indicate the beginning of double-loop learning: Established norms are called into question, such as the rejection of mitigation targets and official engagement in mitigation, new measures are discussed such as the introduction of comprehensive REDD+ mechanisms and informal knowledge exchanges that cross-cut levels matter increasingly. This last point is nicely illustrated through the ad-hoc, informal influence of scientists (see previous section). These characteristics all reflect double-loop learning, but they also underline the difficulties in the process and the uncertainties of its outcomes, as none of the networks and communities has more institutional power than the others. Even the key figure Ramesh faced a lot of criticism within government and was shifted to a different post in July 2011.

Since discursive shifts are important for loop-learning and change and since both a knowledge-related debate and discursive power are part of the knowledge system-concept, it is useful to analyse development in the debate and media attention to the topic in more detail now.

Michaelowa and Michaelowa found that the number of articles treating climate change in the Times of India, one of the major national newspapers, increased sharply from 3 articles in 2006 over 35 and 50 pieces in 2007 and 2008, to 224 pieces in total in 2009 (Michaelowa/Michaelowa 2011: 16). Coverage in the Times of India remained roughly at this level after 2009. In terms of content, they find that the CDM and impacts of climate change have attracted the majority of media attention before Ramesh took office and before the Copenhagen conference approached in 2009. Then, the international negotiations shifted to the centre.

My interview partners confirmed that the climate change debate is more pervasive now than compared to three or four years ago (2006/7). Instead of treating climate change as a problem of industrialized countries or an issue of technology transfer only, as in the time period before 2007, it is increasingly framed as a development issue. Moreover, the potential impacts on India are recognized and discussed and the (political) discourse focuses on co-benefits and different paths towards low-carbon development of the Indian economy. A couple of interview

partners indicated that the debate about how to integrate climate change and development has been introduced by the North and that some stakeholders may tell you what they think you want to hear without any deeper knowledge or belief in what they say, especially if the person addressed comes from a donor country.[99] Even if this is the case, answers given would still be part of the discourse, albeit a different one.

While it is generally accepted that India has to do something about climate change now, the disagreement about what to do and how exactly is so high that climate governance is largely taking place in debates and workshops and has not translated enough into action, some interviewees argued.[100] The general agreement among governance actors that India has to somehow do something domestically presupposes that a basic form of knowledge and understanding of climate change exists. Here, an in-depth discourse analysis would be necessary to find out who (which actor, community of practice or network) actually introduced which kind of argument and how powerful and convincing it truly is. The data gathered did not produce enough information for this and a complete discourse analysis goes beyond the exploratory scope of this study.

The findings of Michaelowa and Michaelowa (2011) stress the links between Ramesh and the media and the role his connections play not only for the climate change debate, but also for awareness raising. According to them, Ramesh managed to place his positions in the press and thus triggered public reactions:

> "It seems that this led to a ping-pong action-reaction process of mutual influence between the public, the media and the minister, strongly stimulating the domestic debate on national and international climate policy." (Michaelowa & Michaeolowa 2011:16).

Despite the power struggles between Ramesh and defendants of a more conservative approach to climate policy such as Shyam Saran, which also took place in the media, the perceived relevance of climate change as a topic and awareness about it increased (id: 17). My findings correspond to their analysis, providing more ground to the conclusion that Ramesh and those sharing his position have gained in and exerted discursive power over time. This discursive power cannot be quantified.

Given Ramesh's central role, some observers fear that the different changes are only "Ramesh-deep" (Miacheoloa/Michaelowa 2011: 17). It remains to be seen whether the new minister Natrajan will continue along Ramesh's lines. If she does, this could be a sign that the new background knowledge Ramesh stood for will reach the tipping point after which it will become institutionalized, meaning that it is accepted and internalized by all important actors. The tipping point is reached once a critical mass of

99 Interview with Academic/Expert 9, 19/11/2010, Mumbai; Embassy 1, 05/11/2010, Delhi.

100 For instance, interview with NGO 7, 16/11/2010, Mumbai.

actors has learnt and uses the new background knowledge.

Until December 2010, the knowledge in India was unevenly spread and the learning process was at different stages as well, depending on the actors, their (business) interests and – somewhat less – their location (national or state/local). There was a lack of knowledge on some issues, particularly adaptation and a certain knowledge-practice gap as well. No structural power that relates to a knowledge system could be identified. An exception to the low knowledge levels are those issue areas where co-benefits exist and pragmatic knowledge coincides with economic incentives. The results support hypothesis 3b that pragmatic knowledge, practical rationality and economic incentives together support the spread of climate governance mechanisms. This is the case for both the national level and Maharashtra. But for the latter, the spread of governance concerns more the business sector than government, at least till the end of 2010.

Hypothesis 3a on pragmatic knowledge is unclear for the national level. A lack of pragmatic knowledge exists and a few communities of practice as well, however the current dynamics and unclear actor relations make a more definitive "yes" or "no" for this hypothesis impossible for the time period analysed. For Maharashtra, the data obtained do not support the hypothesis on pragmatic knowledge and practical rationality of communities of practice.

The ongoing contestation if, what and how to do something about climate change slows down collective learning processes. The confusion and insecurity were quite high. Maybe the formation of new communities of practice or this spread of existing ones may help here. Those actors closely working on climate change have started to develop new background knowledge, but this is not shared across actor groups. No widely shared, intersubjective background knowledge of the different dimensions has come about yet. The differing strategies and positions suggest that the three rough groups of growth first stonewallers, progressive realists and progressive internationalists identified in the literature (Dubash 2009, Rajamani 2009). Trust, informal relations and a certain amount/type of normative knowledge together with the other three knowledge types seems necessary for a progressive attitude.

Business associations and large and transnational companies show signs of collective learning, at least partly and the same applies to parts of the central government. The process of collective learning in Maharashtra was not as far-reaching at the time of observation. In general, the re-formulation of strategies and policy papers as well as the ongoing shift in positions give sufficient reason to believe in at least a single-loop learning process. In some areas such as energy efficiency, solar and

CDM a double-loop learning process has occurred. For cognitive evolution, this means that the cognitive threshold or tipping point has not been passed yet. The results thus do not clearly support the hypothesis that the existence of a climate knowledge system and with it, collective learning in the from of cognitive evolution heighten the chance for a change in climate governance. But the results do not clearly contradict it either – business interests are simply a stronger driver and where they coincide with knowledge and collective learning, climate governance spreads.

8.3 South Africa

8.3.1 Drivers and problems of climate governance

The identification and discussion of the general drivers and problems of climate governance in South Africa form the centre of this chapter. The research questions addressed are: Which factors influence climate governance? What role for economic incentives? As in the corresponding chapter on India, the inductive proceeding serves the identification of inhibiting and driving factors for the collective learning and change processes as well as the generation of hypotheses that target differences between the cases. The same semi-structured questions as in the corresponding chapter on India generated the results presented here.

Similar to India, there are three groups of driving forces for climate governance in South Africa: a number of *events,* several *key individuals and groups* and a number of *strategic and knowledge-related drivers*.

In terms of driving *events,* a further differentiation is necessary. On the one hand, interviewees referred to the triggering effects of developments at the international level such as the publication of the 4th Assessment report of the IPCC and especially the increase in international attention attached to it. Also, the run-up to the UNFCCC conference in Copenhagen in December 2009 and the conference itself had a push effect. On the other hand, interviewees stressed developments and events on the national level. Here, the declaration of the ANC in Polokwane in December 2007 and the publication of the LTMS in July 2008 have been pointed out as major events. The rise of electricity prices and the energy crisis of 2008 helped in increasing individuals' awareness and climate change-related behaviour, for instance, saving electricity. In the private sector, companies started looking at energy efficiency and investing into measures which bring co-benefits, such as reduced energy use and addressing climate change, thus taking climate change onto their agenda. This frequent citation of both the price hike and the power supply crisis shows that triggering events do not

necessarily have to be directly related to climate change. The driving force of co-benefits matters in South Africa. Moreover, economic incentives are relevant for the initiation of both individuals' consumer behaviour and companies strategies. As one journalist put it:

> "The price of power has gone to the roof, so people have started saving more energy because of that, increased energy efficiency, it has nothing to with awareness about climate change, it's about when it gets to people's pockets"[101]

The second set of drivers concerns *key individuals and groups* that actively engage in and push for climate governance measures. These are the environmental NGOs: primarily WWF, Earthlife Africa and to some extent groundwork and Climate Action Partnership. Greenpeace has only recently established an office in South Africa and therefore does not count as a particularly influential NGO in South Africa yet. Most of the interview partners emphasized the role of Marthinus van Schalkwyk, Minister of Environment under Thabo Mbeki, in both putting South Africa on the political map in the international climate negotiations and in domestically pushing for the development of a climate strategy. For the development of the Action Plan on Climate Change of the Western Cape, Tasneem Essop, former member of the Western Cape government and now member of WWF, was frequently named as a key individual. In line with the inductive methodology used for the identification of key individuals in this study, both van Schalkwyk and Essop therefore tentatively count as a critical key individual in the sense of the concept of climate knowledge systems. In addition, a small number of scientists drive climate governance. The section about communities of practice (8.3.2) further deals with these relations and interactions between actors and experts.

The exchange with peers in international associations influences the behaviour of some companies. This concerns both the exchange of ideas and practices, as well as an emerging general momentum or even peer pressure. Again, I come back to this in the section on communities of practice.

The third set of drivers, *strategic and knowledge-related factors,* refers to more awareness and increased knowledge – here, primarily a minimal scientific understanding - about climate change. For most actors, this correlates with a positive attitude towards climate protection measures, indicating a certain normative knowledge. In terms of raising awareness, the media has an important function. While the media helps to raise awareness and to stimulate debate in society, its influence is restricted because only a part of South Africa's population has exposure to it, especially newspapers. Content analysis of all 35 interviews showed: those actors who are aware

101 Interview with Journalist 2, February 2010, Johannesburg.

of climate change and have understood what it means, while also being generally positive about combating climate change, try to do something about it. Several of my interview partners pointed out that there is a difference between an individual's awareness and the knowledge or deeper understanding of climate change and the challenges attached to it. Their observation is convincing and it gives rise to the question how much knowledge is necessary to make it actionable, or whether awareness is enough already. I come back to this in Chapter 8.3.3.

For companies, strategic market assessments and competitiveness considerations fuel activity. The mining companies interviewed, for instance, fear that climate change is going to affect their competitiveness when international and European clients abstain from buying their "dirty" coal. The same reasoning – or fear – drives the fruit and wine industry towards more sustainable production.[102] Also, insurance companies have a vital strategic interest in increasing resilience to climate change impacts, in order to avoid having to pay for excessive damages in the future. Several of the companies interviewed indicated the relevance of transnational ties to peers through associations and other, direct contacts. Those international peers stimulate particular companies' response to climate change, increase awareness or enable best practice exchanges and learning.

Some companies want to develop a green image for public relations reasons, potentially increasing their attractiveness for customers, while some environmental NGOs accuse companies of merely green-washing or re-labelling Corporate Social Responsibility activities as climate change measures. Those companies interviewed here primarily start acting out of perceived economic risks or benefits, but a normative belief that it is necessary and right for them to do something about climate change matters for them as well. This indicates a form of normative knowledge.

The following summary of the main problems completes the overview of climate governance drivers and challenges in South Africa. Again similar to the corresponding section on India, I group the challenges in South African climate governance in the categories cross-cutting problems, government- and business-related challenges.

Concerning the *cross-cutting problems,* interview partners stressed different points. There was high agreement, however, that the implementation of measures presents a widespread difficulty in South Africa. It affects not only climate governance, but other governance fields as well. In terms of policy, the implementation at lower levels of administration appears difficult, even if the political will is there at the top level. The actual enforcement of legislation is a challenge:

102 Interview with Business 1, 19/01/2010.

> "One of the big problems in South Africa is that we can have the best, most progressive laws, but there is no enforcement and people know that."[103]

The implementation of climate governance measures often touches on individuals' or consumer's behaviour which is very difficult to change. In addition, some interviewees pointed out that South Africans feel they have a certain right to catch up on lifestyles detrimental to the environment which were denied to them under the Apartheid regime.[104]

Various experts, companies and some NGOs underlined that there still is a lack of understanding and knowledge concerning climate change both in government and business. While some actors are very well informed and knowledgeable, others lag behind. Several scientists and members of the National Business Initiative argued that the communication of science and the education of actors – in other words, the learning – is crucial and still needs improvement.

The (remaining) scientific uncertainty, in particular the lack of down-scaled data about specific local impacts, presents a difficulty for actors in South Africa. Despite the fact that many countries across the globe have to deal with this problem and even though most key actors in South Africa do not question climate science fundamentally, overall uncertainty is exacerbated by the vocal presence of groups of climate change sceptics and denialists. In the run-up to the Copenhagen conference, there was a wave of scepticism in the South African media, further fuelled by the email-hack in the Climatic Research Unit at the University of East Anglia[105] in December 2009. Interview partners disagreed about the actual influence of these sceptics and denialists, but they do have a voice and get attention in the media.

With respect to *government*, several challenges exist: First, a lack of collaboration and coordination between departments parallels a lack of coherent policy. Insufficient collaboration primarily concerns the DEA and DoE, whose relationship is characterized by a certain tension. The third advocate of climate governance measures, National Treasury, has an ambiguous role. The Treasury introduced the carbon tax in 2009 without consulting other departments, according to my interviewees. Also, Treasury decides whether DEA or DoE have access to funding, creating a certain competition. A term that kept coming up in the interview was "silo thinking"[106], implying that each government department follows its own approach.

103 Interview with Government/Administration 2, 28/01/2010.

104 E.g. interview with Government/Administration 2, 28/01/2010.

105 The access and publication of emails of climate scientists that allegedly showed their manipulating of climate science data feeding into the IPCC assessment led to a controversy that captured a lot of international attention. An investigation later sustained none of the allegations, but criticized the scientists for their lack of transparency.

106 Interviews with Academic/Expert 5, 18/02/2010; Academic/Expert 6, 25/02/2010; Political

Moreover, DEA and DoE both count as rather weak departments in terms of power. The same appears to be true for the two ministers of these departments, Buyelwa Sonjica and Dipuo Peters. Sonjica was replaced by Edna Molewa in November 2010. The "silo thinking" and lack of cooperation is less of a problem in the Western Cape government.

In addition to a lack of knowledge and understanding in some government departments (on all levels of administration), insufficient skills and institutional capacity are a problem. To some extent, these are due to the electoral turnover of staff every five years and to a lower payment rate compared to similar positions in the private sector. A lack of financial resources was identified as a further obstacle because only a small amount of the national and province budgets is allocated to climate change measures. It was not possible to obtain figures of how much of public expenditure goes into climate change-related activities (either concrete measures or research).

The overarching problem for government is how to balance different needs and integrate different policy and political goals. Even some of the environmental NGOs and experts, who are in favour of more encompassing climate governance, acknowledge that government has to deal with problems that may be more pressing in the short-term, e.g. housing and job creation or crime prevention and HIV/AIDS.[107] Compared to the other South African provinces, the Western Cape may be somewhat less exposed to these challenges, including budgetary problems, as several experts indicated.

The final set of problems relates to *businesses*. In general, companies wait for a policy frame and for government to take the lead. On the one hand, this is a problem concerning government (since it blocks progress), on the other hand it does not justify companies' inertia. A first mover advantage appears possible. This leads to the second issue, the discrepancy between groups within the private sector: a handful of big companies take the lead and have started acting, a second group have only recently become aware of the climate change challenge and potentially started working on risk assessments. A third, large group of all other companies which are either not aware yet, do not have enough knowledge and understanding, or see the sole responsibility for acting to be a matter of the big GHG emitting companies only (especially Eskom and Sasol):

> " [..] after the big five there is a big gap to other big and small and medium enterprises, they don't feel responsible for emissions. They have other things on their mind, a lot of competing things to worry about."[108]

Opposition Member 1, 08/03/2010.

107 Interview with Government/Administration 2, 28/01/2010.

108 Interview with Business 1, 19/01/2010.

The level of awareness is lower among small and middle enterprises than among big and transnational companies. Whether the increase in awareness and activity by large and transnational companies diffuses through their value chains to small and medium enterprises remains to be seen. Thus far, only single big companies such as Woolworths try to raise awareness in their supply chain by designing a code of conduct and/or providing information.

The drivers and barriers identified in this section lead to the following interim conclusions: Both the international and the national level matter and at least for business, transnational influences and initiatives advance climate governance. Since some big businesses are waiting for government to give them a frame within which to develop their climate protection measures, it becomes clear that comprehensive climate governance in South Africa does not work without the state.

While science and different kinds of knowledge matter as a driving force, their lack is also a problem. It enhances the general problem of implementation of policies and other governance measures. In terms of actors, the number of important players seems limited, with scientists potentially having a special function. But knowledge is not the only driver of the developments in South Africa's climate governance. Co-benefits, economic incentives and some events unrelated to climate change are important as well. This does neither contradict the approach of this study nor the hypotheses testing different aspects of knowledge systems. On the one hand, the claim of the concept climate knowledge systems is not an exclusive explanation of change in climate governance – the “how” of the general research question underlines this. On the other hand, economic incentives and co-benefits are at least to some extent integrated in the concept and hypotheses through pragmatic knowledge and practical rationality.

In sum, the drivers and challenges identified in South Africa's climate governance are largely similar compared to India. Notable differences concern the fragmentation of science and civil society and their weaker influence as well as a stronger business- and market-oriented co-benefits logic of both government and big business in India. Also, the emphasis of economic growth as a goal under all circumstances by some actors and the emphasis on international equity arguments appears stronger in India. But scepticism and denial of climate change are not as much of a hindering factor in India as they are in South Africa. In South Africa, a lack of transparency in and more or less total exclusion of civil society in governmental decision-making as identified for Maharashtra were not identified in the same way. Whether the key events relevant for climate governance developments in both

countries together qualify as a cognitive punch in the sense of Adler is hard to tell. The results in the following sections may shed some more light on this. From the evidence presented this far, it is a combination of several smaller events and other factors that is required to induce change in climate governance.

8.3.2 Communities of practice and their power

Communities of practice are the central feature of the climate knowledge system. This section identifies them and assesses their power in South Africa, both on the national level and in the Western Cape. It addresses the hypotheses on climate knowledge systems and their function (H1) and the hypotheses on communities of practice and their power (H2a and H2b). The same interview questions as in the section on India (8.2.2) generated the results here.

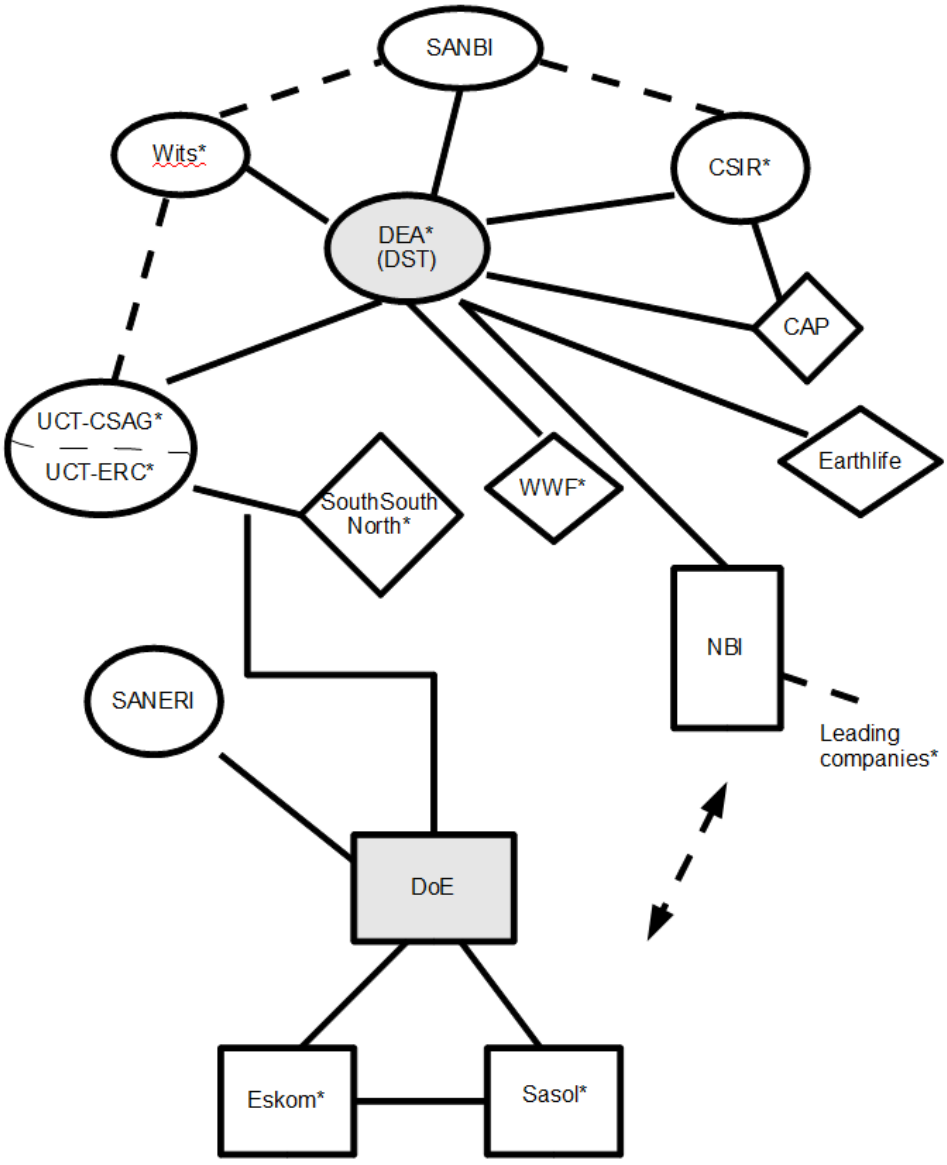
Communities of practice at the national level

The circle of influential and really active people in climate governance in South Africa is fairly small. On the national level, there are about 15-20 key actors who strongly push for climate governance, if not even less. This holds an advantage for the researcher: identification of key individuals and network structures becomes easier.

The circle of actors splits into (at least) three different communities of practice, primarily active on the national level. Different links to transnational and international levels exist for many members, supporting the argument that the separation of international and domestic levels is cumbersome (see Fig. 14). In the figure, circles and squares are not nodes in the sense of formal SNA, but represent individuals in the abbreviated organisations and institutions.

Communities of practice revolve around the Department of Environmental Affairs (DEA) and—to a lesser extent—the Department of Science and Technology (DST). Another community of practice involves individuals in the Department of Energy (DoE) and the two major greenhouse gas-emitting companies, Eskom and Sasol. The academics (both natural and social scientists) form an epistemic community as a specific type of community of practice. They split into different communities of practice when it comes to their interactions outside the purely scientific realm. Some are members of South Africa's delegation at the international negotiations and some form a part of the transnational epistemic community IPCC, thus connecting domestic and global governance.

Figure 14: Communities of practice in South Africa's climate governance



Note: Stars indicate transnational links. *Source: Author's own compilation.*

The Council for Scientific and Industrial Research (CSIR) has a lot of input in the DEA climate change team and works closely with the DST as well. Two of the CSIR researchers have been repeatedly cited as key individuals in the interviews and one of them belongs to the transnational community IPCC. The climatological knowledge exchange—and development of measures based on it—is complemented by the input of researchers from the University of Cape Town (UCT), most notably a scientist of the Climate Systems Analysis Group, who takes part in the IPCC as well. Another research group of the UCT, the Energy Research Centre, works on energy and climate questions and tries to present different mechanisms to the Department of Energy. Along with a member of the non-governmental organization SouthSouthNorth, an ERC researcher mainly drove the LTMS process. Thus, they build another community of practice along with the DoE and researchers of the South African Energy Research Institute (SANERI).

Here, the institutional power of communities of practice shows: The LTMS, which contains the communities' knowledge and ideas for practices, has been widely adopted and is often used as a reference by governance actors, for example in the Green Paper on climate change and also at the international level. The LTMS suggestion to commit to a peak, plateau and decline-plan in terms of GHG emissions is the South African pledge in the Copenhagen accord. The implementation of the pledge and papers remains to be done, but substantial changes in the regulatory framework are underway. Following Pahl-Wostl's (2009) characterization, this indicates either double- or triple-loop learning (see Appendix VII).

The community of practice around the DEA also contains scientists who are more concerned with adaptation to the impacts of climate change—these are primarily one researcher of the South African National Biodiversity Institute (SANBI) and in terms of risk-management strategies, a researcher of the University of Witwatersrand (Wits). In the DST, the staff charged with climate change is also more prone to adaptation questions due to the closer collaboration with SANBI and CSIR researchers working on adaptation questions, but maybe also because of a working relationship with the South African Weather Service.

Within the DEA, the number of staff working on climate change numbers is fairly small. Relations among team members and between team members and advising scientists, were repeatedly described as “very personal,” “friendly” or “close”,[109] thus pointing towards relationships of trust and even towards a “we feeling”. One interviewee from the DEA described the climate-governance landscape in South Africa

109 Interviews with Government 3, 15/02/2010, Pretoria; Expert 3, 02/03/2010, Cape Town; Expert 5, 20/01/2010, Johannesburg.

to be driven by a small circle that functions "almost like a closed club."[110] There are two key individuals within the DEA who take part in the international climate negotiations and drive the domestic policy processes as well, connecting levels of action.

Additionally, Marthinus van Schalkwyk, former minister of the environment, was repeatedly cited as a key figure for lifting climate change onto the government's agenda. Already in 2004, van Schalkwyk stressed that "we are dealing with not only an environmental issue; it [climate change, B.N.] is centrally an economic, social and sustainable development issue as well."[111] This understanding of the economic and social impacts of climate change that require South African government and business to act took several more years to sink into other actors' minds. The evidence gathered suggests that this happened due to continuous knowledge-building, knowledge diffusion and trust building activities of the communities of practice discussed above.

Two conclusions can be drawn here. First, critical individuals are important for the influence of communities of practice. Second, the team surrounding van Schalkwyk – the community of practice in and around the DEA pictured above – has exerted enough productive power over time to establish this understanding in the public discourse. Differences in views have largely shifted to more detailed aspects on how to deal with these challenges now, instead of ignoring or dismissing climate protection as unimportant (see Chapter 8.3.3).

In terms of environmental NGOs, the community of practice around the DEA has its most influential members within the transnational organisation WWF and to a lesser extent, among the individuals of Earthlife Africa and the Climate Action Partnership (CAP). Whether the latter belong to the core of the community of practice is hard to tell since the exact knowledge and learning processes are impossible to trace (without extensive participant observation). The final members of this community of practice are two key individuals of the National Business Initiative (NBI), an association of businesses that promotes climate protection and initiates knowledge- and practice-exchange activities both with government and within the business sector. Several of the companies interviewed indicated a community of practice-type link with international peers in business associations: They exchange knowledge and best practices, learn and stimulate each other to take action.[112] These transnational communities of practice overlap somewhat with domestic ones in the private sector, indicating that drawing a line between the international and the domestic/local is

110 Interview with Government 3, id.

111 Statement by the office of Marthinus van Schalkwyk. Minister of Environmental Affairs and Tourism: Van Schalkwyk urges global partnerships and local action on climate change, 15 December 2004, Pretoria.

112 Interviews with Business 4, 03/02/2010, Pretoria; Business 6, 03/03/2010, Cape Town; Business 7, 04/03/2010, Cape Town.

somewhat counterproductive.

The third community of practice concerns the closely collaborating climate change teams of Eskom and Sasol. A formal community of practice may come about in the future.[113] Since both companies, especially Eskom, are not very homogeneous entities, it is not clear to what extent and which part entertains ties to the DoE. Moreover, some individuals and units of the companies and DoE advocate *against* climate protection, or for nuclear energy, while the climate change teams and other parts of DoE favour renewable energy and more climate protection. Various interview partners emphasized that Eskom and Sasol are very close to the DoE, indicating a community of practice-type link in any case. Eskom and Sasol are also members of the NBI. The breaking-up of concerted company interests and the entertainment of different types of informal ties to other actors that result in conflicting knowledge, ideas and identities of employees of the same company can be interpreted as another sign of double-loop learning.

Interview partners belonging to these communities emphasized the good relations within these groups. Experts underlined the club-like structure of the actors, experts and stakeholders driving South Africa's climate governance.[114] The results therefore support the existence of communities of practice, as the identified networks show signs for identity building. With respect to the influence and power of communities of practice, the data leads to the following further conclusions:

The interviews made very clear that the drivers of climate governance are, in terms of people, individuals and small teams within the DEA and DoE, a number of key scientists who establish relations of trust to policy-makers, a handful of vocal NGOs and some leading companies – the communities of practice identified above. However, in the overall power-play system within the South African government, DEA and DoE are seen as rather weak departments, as are their ministers. Therefore, communities of practice involving these departments suffer from a power disadvantage from the outset. For communities of practice, institutional power means that they spread their knowledge and impact decision-making and actions beyond their direct area of influence, i.e. into other ministries, companies and, finally, society's background knowledge as a whole. The establishment of a climate change team or at least one appointee within each ministerial department could be a result of the institutional power of the communities of practice, but data here are unclear.

The policy processes leading to the Green and White Papers and probably a carbon tax in the near future, are indications both for and against the power of the

113 Interview with Business 3, 05/02/2010, Johannesburg.

114 E.g. Interview with Academic/Expert 5, 15/02/2010, Johannesburg.

identified communities of practice. On the one hand, the communities of practice were successful in initiating the processes as well as establishing a basic understanding of climate change in policy-makers' and private actors' minds – insofar, as none of the actors at key levels seriously doubt any more that South Africa has to do something about climate change, even independent of the international negotiation outcomes. On the other hand, the repeated postponement of the Green and White Papers' publication reflect the insufficient power of communities of practice in pushing their knowledge and ideas through more quickly. The controversy around the Medupi power plant illustrates this nicely. It also underlines the great need for more pragmatic knowledge and corresponding solutions (see next section).

Moreover, the collaboration between government departments is insufficient, leading to a lack of coherent policy. In particular, the DEA and the DoE could improve their collaborative efforts. A stronger collaboration would show in the structure and membership in (the same) communities of practice. Up to the time of writing, the National Treasury and the National Planning Commission acted as rather isolated bodies. Competition for financial resources between the DEA and the DoE aggravates the situation, because the Treasury grants their budgets.[115]

The productive power of communities of practice in terms of shaping the debate within government circles is higher than in overall society, as particularly scientists and members of DEA contribute to a certain framing of the debate. This framing revolves a lot around energy and mitigation issues and coins climate change as an economic and political problem South Africa needs to deal with actively (see Chapter 9.3.3). The debate in society is additionally shaped by the media and the groups of civil society that they give room to – notably, some NGOs and some vocal climate sceptics.[116] Results of the interviews and documents here are preliminary and would require a full discourse analysis.

Generally, the communities of practice identified succeeded in anchoring climate change as a factor to be dealt with in major governance actors' strategies and decision-making, even if it is only in a discursive way as a first step. Even the Energy Intensive User's Group is in favour of a carbon tax now, which their members would have to pay mostly. Member companies want to engage in climate governance within the realm of their business possibilities and proactively help government achieve its Copenhagen accord commitments.[117] New investments into wind energy by mining

115 Interview with Government 1, 27/01/2010, Pretoria.

116 E.g. Interviews with Business 4, 03/02/, Pretoria; Government 5, 02/03/2010; observation of print media such as Mail&Guardian and Engineering News over various years. No methodological content analysis of the media was undertaken.

117 A Response by the Industry Task Team on Climate Change to National Treasury's Carbon Tax

companies such as Exxaro reflect at least a partial shift in mind-set. Differences in the exact shape of measures and potential gaps between discourse and knowledge on the one hand and acting accordingly in all fields on the other hand indicates that collective learning processes have not passed a certain stage and that communities of practice have not managed to exert enough power to fully institutionalize their background knowledge yet. The next section further clarifies this.

In sum, the insufficient power of communities of practice may slow the spread of new background knowledge that advances climate governance. The strength of the knowledge system is therefore not fully developed. In turn, the systemic-ordering function of the climate knowledge system is restricted. The hypothesis (H1) that a stronger climate knowledge system advances change is thus supported because, first, several small communities of practice exist that produce knowledge and ideas for practice, exert considerable influence in their direct area of influence and frame the debate. Second, change happens, but does not seem to be complete towards fully institutionalized new background knowledge, as the expansion of communities of practice and the production of a coherent set of new background knowledge seems limited. This, in turn, seems to be due to a certain lack of power, which – in reverse - supports the hypothesis that more institutional and productive power support the expansion of climate governance. The relevance of key or critical individuals for communities of practice has become clear for the national level (H2b).

Communities of practice in the Western Cape

In the case of some individuals, membership of the three major communities of practices on the national level overlaps with communities of practice active in the Western Cape. This concerns the researchers of the UCT and SANBI. Compared to the local or city level, the Western Cape provincial government's activities are financially more constrained and the implementation of the developed measures is slower.

A key figure in the development of Western Cape's climate action plan was Tasneem Essop, then Provincial Minister of Environment, Planning and Economic Development, now member of WWF. The central community of practice on the provincial level in the Western Cape is much smaller than on the national level. Key members include the climate change team of the Department of Environmental Affairs and Planning in the Western Cape government, which at the time of my research trip consisted of only four members and only one full-time appointee to climate change issues. Even though a member of the climate change team in the department

Discussion Paper, February 2011, http://www.eiug.org.za/publications/comment-papers/ (accessed 05/12/2011).

emphasizes that their actions are all in line with the national government plan[118], there are no ties to the national government as in a community of practice. Since the Western Cape government is ruled by the opposition party Democratic Alliance, this does not surprise.

The Western Cape climate change team collaborates with the city of Cape Town, whose head of the climate change, Sarah Ward, was frequently cited as a key individual for driving climate governance in Cape Town. With respect to the environmental NGOs and consultancies, the WWF entertains close ties to the WC provincial government. Their headquarters in Cape Town facilitate the contact, while most other NGOs have their offices in Johannesburg, aiming their activities at the national government. Despite their office in Cape Town, the CAP does not to belong to the small community of practice at the provincial level. The organisation concentrates on the national level.

The consultancy OneWorld Sustainable Investment did a lot of the technical work on which the Western Cape climate change action plan is based. For instance, they produced a status quo report that described the current state of water resources and agriculture and discussed different adaptation and mitigation. The influence of OneWorld on the provincial policy was high, but as a consultancy that was paid for the task, it is doubtful whether any informal relations existed and continue to exist.

The community of practice in the Western Cape is overall rather small. The lack of interest by the NGOs, which prefer campaigning in Pretoria and the financial and staff constraints of the climate change team in the Department of Environmental Affairs and Development Planning make an expansion of the community seem unlikely. Both the institutional and productive power of the community of practice are limited because the Department of Environmental Affairs acknowledges that one of its central tasks, apart from implementing several projects, is awareness raising in other departments of the Western Cape government. If they had a lot of institutional and productive power, this point would have been passed already. Generally, power lies more with the municipality and the – probable - community of practice surrounding Sarah Ward. Their actions also receive more attention in the press and the city was usually mentioned first before provincial government members, when I asked for important actors in the Western Cape to recommend.

However, a second community of practice acting in the province appears to be under development. It involves the insurance company Santam, CSIR and the UCT criminology unit. They have started to exchange knowledge and develop adaptation practices by decreasing vulnerability through the development of a comprehensive

118 Government/Administration 5, 02/03/2010, Cape Town.

sustainable livelihood approach.

For the Western Cape, the strength of the knowledge system and its impact on change remains somewhat unclear. Communities of practice, science and knowledge do matter, but the degree of expression or the size of the knowledge system is smaller in the Western Cape. The interplay between local and provincial communities of practice is a relevant factor. The support for H1 is clearly there for the national case and comes to a "yes, maybe/probably" for the Western Cape. The local or municipal level is more important in the Western Cape and seems to have more power as well, which makes a clear support or falsification of H2a on power somewhat difficult. However, key individuals in a power position play a central role in communities of practice in the Western Cape and their participation in a community of practice seems crucial, again supporting hypothesis H 2b.

Whether these first results on the hypotheses for both the national and the provincial case really apply will become clear by turning to knowledge and learning in more detail.

8.3.3 Knowledge and collective learning – cognitive evolution?

The climate knowledge system presupposes that specific types of knowledge are present, both as individual and intersubjective knowledge. This section discusses these different types of knowledge, shows the evidence for collective learning processes in South Africa's climate governance and draws conclusions for cognitive evolution based on it. I proceed in the same way as in the corresponding section on India (8.2.3), pointing out differences and similarities between the national and Western Cape cases where possible.

To begin with, I compare and reconstruct knowledge levels about climate change at the beginning of 2007 and at the end of 2010. Then, I analyse the content, amount and distribution of knowledge types separately, before turning to their connections and potential collective learning process. To find out if and what kind of learning has occurred and how this is connected to communities of practice, it is necessary to identify the background knowledge governance actors draw on. In addition, it is required to contrast the state of knowledge of all governance actors to that of communities of practice. Not all members of communities of practice are governance actors in the strict sense, for instance, if they only provide knowledge input. The analysis of the loop-learning process and potential origins in communities of practice completes the qualitative evidence on the productive, institutional and

structural power of the knowledge system. This section therefore primarily addresses the general hypotheses on climate knowledge systems (H1) and the two specific hypotheses on pragmatic knowledge and practical rationality (H3a and H3b).

Drawing on the retrospective statements of interview partners, knowledge levels about climate change among government and business were generally superficial before 2007. While the Midrand convention on climate change in 2005 certainly attracted a lot of momentary public attention, actual awareness and a deeper knowledge of the topic was limited to a small number of specialists at the time. The number of experts and academics working on the issue as well as the number of staff in government and business charged with climate change-related questions has increased greatly since about 2007.

> "Since 2007 the issue gained in importance for other groups of people outside environmental civil society organisations. Also, there's expanding knowledge and understanding since then. It has become a foreign policy issue, every delegation coming to South Africa wants to talk about energy and climate change now, a lot of the donors as well. "[119]

Generally, awareness and perception of the issue have changed from about 2007 onwards (as 60% of interviewees explicitly stated). More people know about climate change in 2010 and most importantly, more people at decision-making level in government and business do. The domestic debate has also increased significantly during this time period and changed in terms of its content, as 48% of interviewees conceded. I come back to a more detailed analysis of discursive developments later.

Regardless of the general scope of these statements, they already make sufficiently clear that climate change did not figure in the dominant background knowledge that helps to define actors' interests in South Africa before 2007. This kind of knowledge was limited to a number of specialists and environmental NGOs already working and campaigning on the issue.

Let us now turn to the state and content of knowledge in 2010. In a nutshell, most actors who work directly on climate change issues have at least a basic understanding of the science and contend that South Africa needs to do something about climate change (as one possible expression of normative knowledge). In the interviews, evidence for all four types of knowledge could be found, supporting the existence of this part of the climate knowledge system. To identify learning processes, it is necessary to find out to what extent the individual knowledge corresponds to intersubjective knowledge.

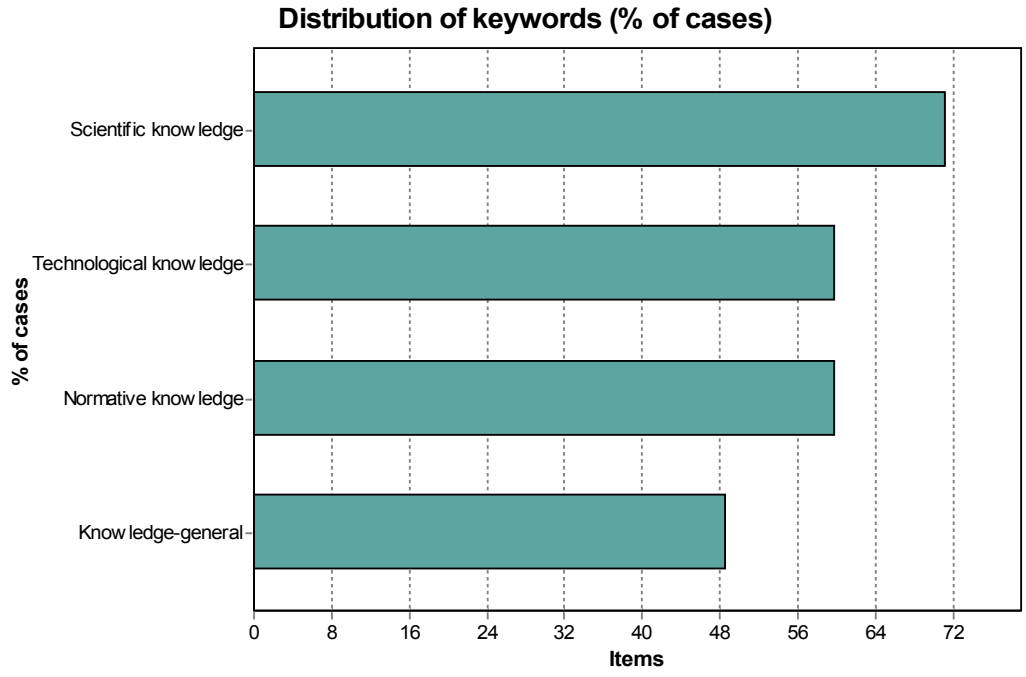
Two tools for data analysis are applied here: The quantitative measure of coding frequencies and distribution of codes in percentage of cases gives an overview whether

119 Interview with Academic/Expert 6, 18/02/2010, Johannesburg.

and to what extent normative, scientific and technological knowledge exist, based on the interviews. In addition, the calculation of Jaccard's co-efficient, a statistical measure of similarity between texts, supports the identification of the new dimension pragmatic knowledge. Thus, an indirect test of pragmatic knowledge becomes possible while avoiding a theory-led interpretation bias during coding. I further elaborate on this below. The content-analytical comparison between individual interviews, members of communities of practice and information all interviewees give on South African governance actors' background knowledge complements analysis of knowledge distribution and learning.

The distribution of codes across the different interview partners (cases) in Figure 15 shows that sufficient evidence for normative, scientific and technological knowledge exist, thus justifying this categorization. The total frequencies of the codes scientific knowledge (67 counts), technological knowledge (46), normative knowledge (38) and general knowledge aspects that did not fit into the three categories (27) also illustrate this. Additionally, they indicate the frequency (manifest) effect size of each category (see Chapter 4). Scientific knowledge has a high effect size, the other three categories have a medium effect size. The quantifications further indicate that scientific aspects received more attention than normative concerns or technical questions.

Figure 15: Frequencies of different knowledge codes (South Africa)



Source: Author's own compilation.

Now, I clarify one by one what these knowledge dimensions mean specifically in the South African context, beyond the general definitions given earlier.

In terms of scientific knowledge, interviewees emphasized South Africa's reliance on coal as its energy source and its role as a major emitter on the African continent because of this dependency. A lot of the interview partners directly referred to the IPCC report, UCT or CSIR research or "what the science tells us."[120] Some interviewees – apart from the scientists who naturally have a high scientific knowledge – showed awareness of modelling problems in climatology and the lack of down-scaled data concerning the proposed impacts of climate change. Water scarcity was usually mentioned as a priority area together with energy and GHG emission concerns. In the Western Cape, interview partners also have basic knowledge about the impacts climate change has on biodiversity, especially the unique floral kingdom in the area. Given the value of the province's biodiversity for the tourism industry, this does not surprise.

These results underline that those people who have an interest in the subject and/or are working on climate change-related issues do undertake the effort to acquire at least some knowledge and learn about the science. The scientists interviewed report an increasing demand for scientific information and advice, particularly from government, administration and the media, but also from society as such:

> "Society outside government is clamming at the door of scientists for actionable information, bridging the science-society divide is central, we have very little resources to do that both in terms of money and personnel. [...] We have to change people's perception through relationships. [...] It's the relation with the stakeholder, building up trust, they then see that the science is not perfect but we're trying. There's no perfect model, we are trying as much as they are but that's a labour intensive process, building such a relation with a stakeholder, you can't do it with everybody. " [121]

Here again, the relevance of personal relations and trust becomes clear for communicating and educating and therefore, learning processes. Companies, however, draw more directly on the IPCC reports, information from transnational peer associations, or have their own R&D units. In those companies interviewed, awareness and knowledge spreads from small groups, units or individuals within the company or results from transnational relations or peers (mining or insurance associations, or because the company's CEO is a foreigner).[122]

Technological knowledge primarily concerns the difficulties of how to measure adaptation, which technical options are the best to reduce emissions as well as deciding which is the best or most appropriate technology to save water and energy

120 E.g. interview with Government 5, 02/03/2010.

121 Interview with Academic/Expert 9, 02/03/2010.

122 Interviews with Business 3, 01/03/2010; Business 6, 03/03/2010.

simultaneously, especially in power generation. But deep technical expertise is not widespread in South Africa, neither within communities of practice, nor outside of them. Companies search for technical knowledge around climate change and competition to employ those relatively few people who do have the required expertise. [123] The complexity of climate science may be one reason here. The following citation also supports the idea of communities of practice that develop knowledge and practices in specialized areas. Possibly, the core of a community of practice may even shift somewhat according to the concrete technical issue at stake:

> „Technical knowledge in government I would say yes, it's there, in business it varies. But you have to see, hardly any of these people are really tech people with in-depth knowledge, it's more about policy and values, the debate on climate science is very specialized. Knowledge in the whole climate change debate is very compartmentalized. People have very special knowledge in their little area and maybe some general grasp of other areas but still everybody is talking about the same issue, that's quite amazing I think."[124]

Thus, technological knowledge – which is coupled to at least a basic understanding of the science – seems to be developed by members of communities of practice, but it has not reached the status of new background knowledge yet. There are two reasons here: for one, technical adaptation and mitigation options are still under development. Also, learning in this area beyond "simple measures" such as water and electricity saving in everyday-life may require the technical expertise of an engineer.

In terms of the more concrete content of normative knowledge, there is no climate protection norm or standard of behaviour in South Africa yet, even though business reporting initiatives such as the CDP project may help to develop these. Those interview partners who showed some sort of normative knowledge stressed that South Africa has to do its part in global emission reduction. Both within and outside the private sector, there was agreement that big business in South Africa has to act as well, while those businesses that are already active are waiting for both government to develop a comprehensive national policy and for the rest of the business sector to catch on. But climate protection has to be balanced with different challenges and normative requirements, such as poverty reduction, sustainable growth of the economy, or health and safety issues. None of the companies interviewed interpreted climate protection as antagonistic to the growth of the economy. They pointed out that both have to be integrated.

Whether this kind of normative knowledge just described can count as intersubjective, shared background knowledge across *all parts* of society at this stage remains doubtful. As discussed before, the awareness of climate change is still limited,

123 Interview with Business 4, 03/02/2010.

124 Interview with NGO 5, 08/03/2010.

even though it has risen. Moreover, the sceptics and denialists in South Africa pursue the spread of a different kind of normative knowledge, opposing the further development and spread of climate protection norms. Still, communities of practice exert some productive power through spreading their normative knowledge in their direct areas of influence such as in stakeholder workshops (e.g. convened within the private sector by NBI) and in shaping public opinion through the media. Some of the normative arguments used can be identified in the climate change-related discourse and its development between 2007 and 2010. Media coverage and public discourse increased significantly during this time.

Previously, the dominant framing used in the press was an environmental one, at least in the three major Western Cape newspapers in 2005, as Cramer (2008) shows. By environmental framing, she means the discussion of the impacts of climate change on South African ecosystems, when framing is the specific, selected way of presenting a topic in the media (see Cramer 2008).[125] Since no comparable study exists for the national level, it can only be assumed that national media coverage was similar. This seems likely, as the South African government, administration and business as a whole still identified their own domestic climate governance role as a rather reactionary, passive one at the time (see Koch et al. 2007). This shifted. By 2010, the frames used are more diverse, with a new dominance of political and economic issues: South Africa's role in mitigation and global climate governance, the concrete measures towards low-carbon development such as a carbon tax, the costs of different policies and the costs of inaction as well as the integration of economic growth, climate protection and energy security now figure prominently in public discourse. These different framings have become particularly evident in the fierce discussions around Eskom's new coal-fired power plant Medupi, finally financed by the World Bank (see Rafey & Sovacool 2011). Climate sceptics such as Andrew Kenny and Kelvin Kemm are also still heard and vocal in the media. Interview partners affirmed that the debate within government and among key actors in the private sector has also shifted to a more concrete discussion about the implementation of measures, especially of a carbon tax (see also (Vorster, Winkler & Jooste 2011). The debate here still revolves mostly around mitigation questions, reflecting the dominant knowledge and expertise in at least two of the three communities of practice identified in the previous section.

While I did not conduct a complete discourse analysis tracing the origins and detailed contents of the changing arguments, some conclusions regarding the impact of

125 According to Entman, fully developed frames perform the functions problem definition, causal analysis, moral judgement and remedy promotion. It alters the audiences' preferences and interpretations through priming Entman 2007:164.

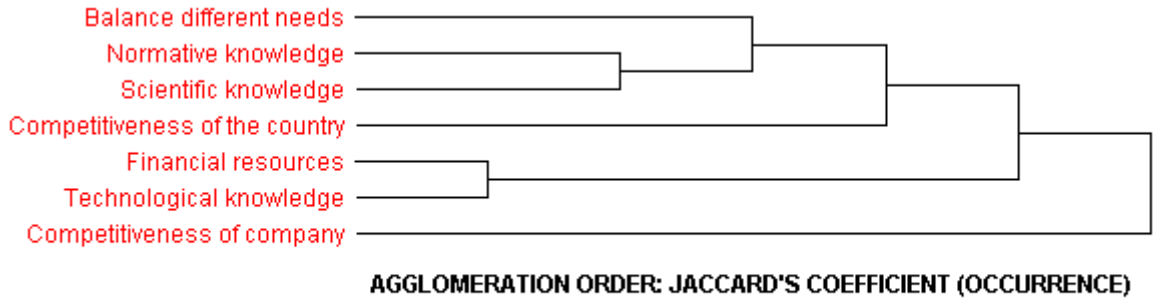
communities of practice and a knowledge system are nevertheless possible. The results on communities of practice, key individuals and the general driving forces in South Africa's climate governance (see previous sections) identified the relevant people responsible for the change quite clearly. They are very likely to be responsible for the change in debate as well, together with an increase in general knowledge about climate change and international developments that put climate change higher on the political agenda in many countries. Since opponents and diverging ideas are also heard in the debate (such as climate sceptics or Eskom's pro-nuclear faction) and the open way of asking questions about relevant actors in Section 8.3.1 allowed for different explanations, no alternative conclusion can be drawn from the empirical material. The identified communities of practice are largely responsible for a change in the climate change-related debate.

The calling into question of previously dominant frames and the emergence of new and diverse normative groundings of arguments are clear signs of double-loop learning, when taking Pahl-Wostl's (2009) characteristics as means for classification (see Appendix VII). If concrete measures such as a carbon tax get implemented, this would be a substantial change of the regulatory framework towards climate protection and therefore count as triple-loop learning.

Let us now turn to pragmatic knowledge and practical rationality. To begin with, I provide evidence for the existence of these theoretical elements before connecting the data to the hypotheses on pragmatic knowledge and practical rationality.

To find out whether pragmatic knowledge exists at all and in order to increase the sample size, I analyse all interviews, regardless of whether the interviewee is a member of a community of practice or not. First, by calculating Jaccard's coefficient with the software QDA Miner, co-occurrences of codes of the interview transcripts can be identified. The Jaccard's coefficient statistically measures the similarity between texts. It ranges from one to zero and can be interpreted similar to a correlation coefficient. Put simply, two codes that co-occur frequently indicate how closely interviewees associate these two aspects and how their line of thinking goes – roughly, what kind of background knowledge they draw on. QDA Miner can depict the Jaccard's coefficient as dendogram and 2-D Maps as well. The codes I used are scientific, technological and normative knowledge and as indicators for pragmatic knowledge the codes "Balance different needs", "Financial resources", "Competitiveness of the country" and "Competitiveness of the company". Results are presented in Figure 16.

Figure 16: Pragmatic knowledge: code co-ccurences of all interviews in South Africa



Source: Author's own compilation.

The agglomeration order in Figure 16 shows that considerations about science and normative aspects, for instance, if South Africa should reduce emissions and what the science says on that, tend to be discussed together. Then, interviewees associate this with the issue of having to balance difference needs, or to attend to different (policy) goals.

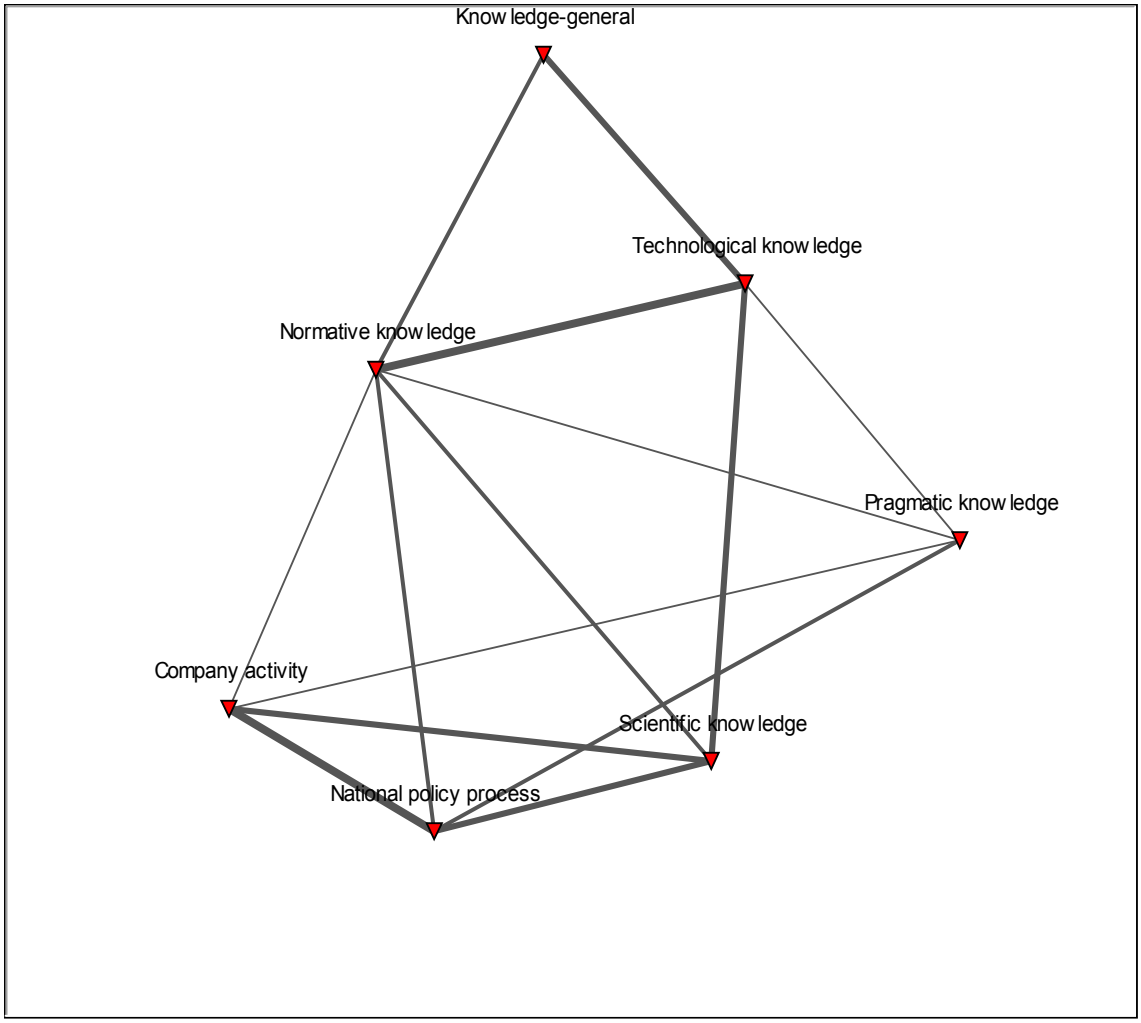
The co-occurence of technological knowledge and financial resources indicates a practical rationality of what is technically and financially feasible for governance actors. The association gives reason to believe that what I termed practical rationality exists. The overall agglomeration order supports the idea that pragmatic knowledge results from a combination of the other knowledge dimensions and practical-rational aspects such as competitiveness considerations or knowing that other needs require attention as well.

The cluster structure of the four different knowledge types and the codes "Knowledge-general", "National policy process" and "Company activity" further illustrates how interviewees associate knowledge and governance and what kind of background knowledge they draw on (see Figure 17).

Scientific knowledge is associated with both the national policy process and company activity in the line of thinking of the interview partners. Pragmatic knowledge is more strongly associated with the national policy process than with company activities – similar to normative knowledge. This indicates that scientific knowledge may have a higher relevance for both the perceptions of climate governance and governance and decision-making itself. Interview partners rely on their scientific knowledge when talking about government and company activity and associate these with each other. Pragmatic knowledge and practical rationality seem to be directly relevant to the governance process, particularly together with normative arguments.

These results support the hypothesis that different types of knowledge matter for collective learning and that pragmatic knowledge may have a specific function.

Figure 17: Cluster structure of interview codes representing knowledge and climate governance in South Africa



Stress: 0,21410 R 2= 0,8108 Source: Author's own compilation.

After these analyses, I coded the interview material again using the code “pragmatic knowledge”. To have a comparable analysis to India, I calculated the co-occurence of the four knowledge types pragmatic, scientific, technological and normative knowledge. Since the Jaccard's coefficient ranged from 0,54 to 0,68, they are somewhat more closely associated than by Indian interviewees (see Section 8.2.3). For further analysis of these different results, content analysis of the interviews was applied.

The content analysis of the interviews showed that the integration of climate protection and development goals is central to a far-reaching change. This confirms

previous research (Winkler/Marquard 2009). Members of government as well as scientists stressed that there is an increased need for scientific information and feasible options for solutions – both to help overcome uncertainty and to guide governance processes. Since most scientists and central consultants are members of the communities of practice described above, these play a key role in providing deeper cognitive and practical order/orientation. This indicates that the climate knowledge system begins to provide the dynamic order proposed.

Some environmental civil society organisations have begun to recognize the need for pragmatic, or practical-rational, lobbying and propositions. Greenpeace, for example, is shifting its strategy towards the promotion of green job creation. This is a strategy that is more acceptable to government, as it offers more ways to meet several political goals (reducing unemployment and environmental protection). This also supports the conceptual idea of pragmatic knowledge and practical rationality as one key factor promoting collective learning in climate governance. Moreover, the communication of knowledge, including the shift from awareness to knowledge (as one indicator for learning) and establishing relations of trust to policy makers are important.

When comparing the knowledge of those members of communities of practice to the other interviews as well as to what all interview partners said about knowledge and learning among all governance actors in South Africa, some preliminary conclusions can be drawn here. The collective learning process in South Africa is under way, but there is still a difference between the knowledge and ideas for practices developed within communities of practice and their diffusion and actual practice: there is a split. One of the scientific experts puts it this way:

> "Is there a rift between knowledge and practice? I would put it differently, people are at different stages of the learning curve, everyone has awareness, some are a bit further."[126]

The spread of new background knowledge seems to depend on personal relations and communication/education activities by members of CoP. Their success and therefore the collective learning process, depends on key individuals, relations of trust, power positions and, in terms of the knowledge itself, providing both more information and those kind of knowledge and practice propositions that are feasible and compatible with other goals and interests. For the South African government, these are employment, housing and economic growth as well as HIV/aids programmes under budget constraints. For companies, the integration of economic interests, corporate social responsibility actions such as mining safety and competitiveness/market risk assessment and development are important. The exertion of pragmatic knowledge and

126 Interview with Academic/Expert 1, 20/01/2010.

practical rationality, for instance by showing how investments in wind and solar energy can provide jobs as well as reduce GHG emissions, helps both in convincing other actors and in the overall collective learning process. Communities of practice are increasingly active in this knowledge dimension and in developing knowledge and practices accordingly, but still have a way to go. The demand is there and general pragmatic knowledge is there, but the process is ongoing.

Where climate policy and energy policy overlap in a concrete manner, the institutionalization of the new background knowledge that takes climate change (mitigation and adaptation) as an equal factor to be considered has not quite happened yet. Discursive tensions around Medupi show this. The government used both economic and environmental frames to justify Medupi. It thus tried to manage the balancing act between meeting business interests in securing electricity provision, and keeping up to its commitment towards low-carbon development and climate protection in a pragmatic way (see Rafey & Sovacool 2011).

Here, it is obvious that the influence of different interests groups and the communities of practice identified reflects differently among government departments and individual administration members. More open conflict lines ran only between environmentalists and some donors opposing Medupi and government and the World Bank on the other hand. Even though the government officially fully supports Medupi for both economic and pragmatic reasons, some members of government and administration privately oppose this in favour of more extensive climate governance.[127] Another example is the evident political reluctance to open the South African power market to IPPs, confirmed by my interviewees. The ANC's 25% ownership of Hitachi power, which won part of the contract to build Medupi, gave further fuel to the argument that the ANC is protecting Eskom's monopoly on the electricity market. It is only in 2011 that first more concrete steps towards liberalization seem to be taken and therefore towards private investment into renewable energy projects (see Baker 2011).

The results presented in this section make clear that knowledge of the different dimensions is unevenly spread in South Africa. A collective learning process has occurred for some governance actors only, but a desire for learning and orientation – so, potentially new background knowledge – exists. Communities of practice provide this orientation for some governance actors already and thus indirectly govern. But their insufficient institutional power and the lack of coherence between actors slows down the spread of their knowledge and practices. It is not clear whether the structural power of the climate knowledge system has succeeded in spreading new background

127 Interview with Government/Administration 2, 28/01/2010.

knowledge. From these first results, it looks as if the collective learning process has initiated at least a double-loop learning process, giving rise to new governance measures and thought processes across society. But no final judgement is possible yet whether a triple-loop learning process is taking place.

In sum, the qualitative results on knowledge and learning in South Africa support the general hypothesis of the climate knowledge system and its driving effect on governance (H1). The idea of pragmatic knowledge and practical rationality has empirical support and the developments and difficulties South African climate governance face give sufficient support to the hypothesis H3b.

8.4 Conclusion

The qualitative empirical data served a range of purposes. We started out by inductively identifying the driving and inhibiting factors that shape India's and South Africa's climate governance. These are largely similar in the countries and the four cases. In both countries, climate governance is driven by a number of events that raised awareness, by certain key individuals and groups and also by strategic and knowledge-related considerations. Market and competitiveness considerations that have co-benefits for climate protection are stronger in India. The challenges or inhibiting factors to the expansion of domestic climate governance are also largely similar in both countries. They include a lack of knowledge, difficulties in the implementation of measures and insufficient collaboration between governmental departments as well as the challenge of having to integrate different, potentially conflicting political goals. Insufficient financial resources and the vocal presence of climate sceptics are a somewhat greater problem in South Africa, while India' s scientific landscape is more fragmented and civil society is less heard. The insufficient transparency of political decision-making in Maharashtra is not mirrored by a similar problem in the Western Cape.

These factors show that a focus on knowledge and the identification of the groups or networks that are influential is useful. The identification of a knowledge system, communities of practice and their power was the next step. Communities of practice and a knowledge system could be clearly identified at the national level in South Africa and, to a lesser extent, in the Western Cape. The hypothesis that a stronger knowledge system and more knowledge induce change in climate governance can be supported for the case of South Africa's national climate governance. The support is less strong for the case Western Cape. For the national level in India, the

evidence is unclear. For the case of Maharashtra, some communities of practice may be developed in the future. There is no evidence for hypothesis H1 in this case, as neither a knowledge system nor a substantial change in the climate governance of the state could be identified.

The qualitative data supports the hypothesis 2a on the relevance of institutional and productive power in two cases (both national level cases) and is unclear for the Western Cape. Key individuals exert an important function for the spread of new knowledge and practices (H2b) in three cases (all except Maharashtra), while support for the Indian national case is less strong as the membership of the communities of practice around Jairam Ramesh and Ajay Mathur, for example, could not be clearly identified. Supporting evidence on the hypotheses on pragmatic knowledge and practical rationality (H3a) exists quite strongly in the two South African cases and somewhat less for the Indian national level. The combination of pragmatic knowledge and economic incentives as a driving force for climate governance is generally relevant in all cases. This is less the case in Maharashtra because no communities of practice exist there, but pragmatic and economic co-benefits drive those governance actions under development.

Finally, the following conclusions can be drawn from this qualitative evidence for collective learning processes and the expression of the dependent variable "change in climate governance": Interview partners, documents and literature shows that a change in the domestic climate governance has taken place in both countries, more clearly at the national level than at sub-national level and differing in specific fields. India is more advanced in renewable energy and energy efficiency, while the general depth of awareness, knowledge and learning are higher in South Africa. However, knowledge and collective learning are unevenly spread in both countries. In South Africa at the national level, at least, a double-loop learning process is happening with potential for triple-loop learning. The Indian central government and private actors are generally in a single-loop learning process, with double-loop learning occurring in some areas and for individual measures or plans, such as in solar energy promotion. The issue is generally being taken more seriously in both countries and receives more public attention, also in the media. The content of the discourse has changed and increased in pervasiveness in both countries within the time period analysed. But a discrepancy between knowledge and debate on the one hand and implementation and practice on the other remains in both countries as well. This is a challenge for the advancement of learning and change. The next chapter discussed these results in more detail by triangulating them with the evidence generated from the other data types.

9. Meta-inference and discussion

9.1 The big picture: climate knowledge systems and change (H1)

The mixed methods approach taken in this study requires the triangulation of the different empirical results. The triangulation provides the concluding test of the concept and the hypotheses and assesses the expression of the dependent and independent variables in the four cases. The systemic ordering function and the impact of the climate knowledge system on climate governance processes build the central hypothesis of this study. In the following, I triangulate and discuss the evidence for the hypothesis from the different chapters and explain the consistency and differences between the cases. Table 12 gives an overview of the triangulation outcomes of the different data for the four cases.

Table 12: Triangulation Hypothesis 1

	India national	India Maharashtra	SA national	SA Western Cape
H1				
Aggregate data	o	o	o	o
CDP	(+)	(+)	(+)	(+)
Expert survey	+	(+)	+	(+)
Interviews/qual	o	-	+	0/+
Triangulation	**0/+**	**-**	**+**	**0/+**

Note: + = confirmation of hypothesis, O = in between/unclear data, - = falsification, ( ) = indirect evidence Source: Author's own compilation.

The *dependent variable 'change in climate governance'* varies between the four cases. Its measurement has been comprehensive: The density and intensity of regulations, the development of R&D expenditure and clean energy investment, CDP responses and trends, as well as questions in the expert survey and semi-structured interviews all gave insights into the degree of change. Generally, the change process is more advanced at the national level than in the exemplary province/state in both countries. The Western Cape's climate governance has undergone a deeper process of change between 2007 and 2010 than Maharashtra's climate governance. Results from the qualitative and quantitative data do not contradict each other, allowing for a simple triangulation.

While the regulatory intensity and density increased in both countries between 2007 and 2010, the number of co-beneficial policies especially concerning renewable energy and energy efficiency is higher in India. This corresponds to the higher investments in clean technology there, which mostly come from government. Parts of the big business sector in both countries show signs of growing awareness and

knowledge about climate change, independent of the geographical location of the companies' headquarters. Some companies, particularly in South Africa, develop measures and plans for how to reduce their GHG emissions, increase energy efficiency or save water. The trends in disclosure, results of the expert judgements and the interviews all indicate that a shift in the corporate world in India and South Africa has taken place, but the depth of knowledge and learning varies.

The expert judgements that see a change in attitude, interests and self-understanding of South Africa with respect to climate change and its governance, as well as a change in the South African negotiating position are largely confirmed by the qualitative data. Only with respect to actors' interests do the qualitative data draw a more differentiated picture. Some actors in business and government have incorporated climate change considerations into their strategies in a way that substantially alters previous plans and actions. But there are also others who have not closed the gap between knowledge and practice in a transformative fashion. This relatively large group of companies only altered their actions in a way that is co-beneficial to their business interests, or they did not change them at all. Long-standing routines and established practices between government and business concerning the protection of corporate interests remain hard to break. The prime example here is South Africa's energy policy. Moreover, major players such as Eskom or Sasol are not homogeneous in their interest-building, as different teams or individual staff advocate for different strategies. For all actors in South Africa, it is necessary to analyse whether the change of interests is broadly reflected in changed actions and implementation of measures over time. It is still too early for a definite answer in this respect.

The results for India are consistent in that they reflect the tension and unanimity currently shaping the changing climate governance processes. Expert judgements and interview partners both emphasized a change in general attitude towards climate change. But the split of opinion whether and to what extent actors' interests and the Indian international negotiating position has changed also persists across datasets. The conclusion to be drawn from this is that the underlying mind-set has only partly changed. Established interests and differing opinions on what to do results in some actors' refusal of the progressive standing taken by Ramesh, Mathur and their entourage. The depth of change and learning varies, but a shift and a process have begun that are unlikely to be completely reversed – as long as co-benefits and/or a relation to development are maintained.

A small contradiction between the results of different data types exists in terms of the accountability in India's climate governance processes, compared to that of

South Africa. The aggregate data of the Climate Competitiveness Index see India ahead of South Africa here, especially after the Copenhagen conference in 2009, indicating a change towards a more participatory approach. The interview results contradict this finding because civil society in India has comparably less access to climate change decision-making processes, or is less heard, compared to civil society in South Africa. The interview results are more credible here, as the method and grounds for this particular judgement in the accountability index are not traceable.

At the national level in South Africa, at least a double-loop learning process has occurred, but its progress and thus the wide-spread passing of the cognitive threshold depends upon the actual implementation of measures under development. This is similar in the Western Cape. In India, a single-loop learning process has occurred at the central level. In some fields, double-loop learning is taking place, accompanied by actual investments and measures that are being implemented in the fields of renewable energy and energy efficiency. The order of change or the loop-learning in Maharashtra is at best single-loop, given that a state action plan is only being developed now, so that change there is largely limited to companies' engagement. Thus, the depth and nature of change is following different paths in India and South Africa.

Let us now turn to the *independent variable "climate knowledge system"* and the hypothesis H1. With respect to a dichotomous measurement, the presence of a knowledge system can be confirmed for the two South African cases and to a limited extent for India at the national level, but it is absent in Maharashtra. A more gradual assessment that takes the evidence of the different data types into account shows that different parts of the knowledge system are variably expressed in the cases. Moreover, the system's impact on the governance of climate change varies in the respective country and state:

For the case "*India national*", the evidence for the hypothesis on the strength and impact of a knowledge system is mixed. The aggregate data and the disclosure results support the idea of a change in India's domestic climate governance. They also indicate an increase in knowledge and awareness as well as a growing business interest in co-beneficial measures in the fields of renewable energy and energy efficiency. But they do not give insights into the details of the learning process or the types of knowledge produced and used. The CDP survey data additionally showed that physical risks associated with climate change and regulatory/business opportunities may increasingly drive Indian companies' engagement in climate governance. These assessments derive from a basic scientific and potentially, pragmatic knowledge. The

survey results therefore give some indirect support to the hypothesis H1. Results of the experts survey support the existence and impact of several elements of the knowledge system: communities of practice with limited power, the role of scientific and technical knowledge as a driving force of ongoing change and an uneven distribution of knowledge and learning that sees central government and the big business sector a step ahead of sub-national governments and smaller companies. Contradictory kinds of normative knowledge may be a challenge – as confirmed by the interview results.

In contrast to this tentative confirmation of the hypothesis, the qualitative results have shown that the climate knowledge system is only partly developed at the national level in India. Some communities of practice exist and the knowledge and ideas produced by them have resulted in a shift in debate and first co-beneficial actions taken. Moreover, the impact of key individuals on the debate and a shifting mind-set is clearly visible in the fierce contestation around the shifts and the potentially new background knowledge. These key individuals are members in the communities of practice, such as Jairam Ramesh. This contestation, an uneven spread of knowledge and collective learning – especially among parts of business that stick to the previous, established mind-set in India – hamper the strength of the knowledge system and the change processes. More simple networks exist at the central level in India for the moment which do not fit into the category "community of practice" or "knowledge system". Business interests are simply a stronger driver, reflected in the advanced stage of change in co-beneficial renewable energy and energy efficiency governance and the slow developments in other areas of domestic climate governance.

The weighting of these results has to correspond to the qualitative-dominant design of this study. The triangulation of the evidence therefore only gives unclear results, or a "maybe" tending towards the support of the hypothesis. A confirmation depends upon the further developments and clarification of the power distribution among the networks and communities of practice around the Indian central government. For the time being, no clear structural power can be ascribed to a knowledge system in India at the national level.

For the case "*South Africa national",* the same limited informative value or explanatory power of the aggregate data exists as for the Indian cases. All other data types give evidence and support the hypothesis, so that a triangulation confirms the hypothesis as well. The CDP results and associations indicate the relevance of scientific and a certain normative knowledge for South African companies' development of GHG reduction plans, targets and incorporation of climate change considerations into international strategies. Further, the survey identified positive trends between 2007

and 2010 concerning the general awareness, perceptions and actions taken by businesses – indicating a learning process. The expert survey also confirmed knowledge as a relevant driver and its lack as a central challenge, especially at sub-national level and concerning adaptation issues. The existence and relevance of communities of practice was confirmed, as was the change process. These were then more closely identified by the qualitative data. Several small communities of practice with a group identity produce and diffuse new knowledge of the four kinds as well as ideas for practices, but the diffusion is limited by their insufficient institutional power in the overall political system. Key individuals as well as relations of trust and power matter with respect to the impact of the knowledge system.

Concerning the state of the dependent variable in this case, the climate knowledge system is present and exerts influence, but is not fully developed. The identified knowledge system has begun to provide the systemic order through new background knowledge, even though the collective learning process has not passed the cognitive threshold towards wide-spread triple-loop learning yet. The structural power of the climate knowledge system that lets actors embrace climate change into their decision-making has only begun to enfold. Till the end of 2010, it was somewhat limited overall. The insufficient power of communities of practice, some contradicting ideas between the different communities as well as several cross-cutting problems in South Africa's governance system, for instance concerning the implementation of measures, explain the current state of change. Alternative explanations for the "how" of the influence of knowledge on climate governance, such as interest networks or advocacy coalitions, are not convincing in the light of these different empirical findings. Hence, when triangulating the evidence, the hypothesis H1 applies for this case.

For *Maharashtra,* the trends in knowledge, awareness and investments in clean energy identified by the aggregate and CDP data apply for the large and transnational companies located there as well. Since the expert survey results are mostly unclear regarding the sub-national level in India and the support for communities of practice and knowledge as a driver of change processes are general predications, an inference for Maharashtran processes in particular is only indirectly possible. In spite of the expert judgement's tentative support for the hypothesis, the triangulation with the dominant qualitative results has to lead to a falsification of the hypothesis in this case. The shifts in Maharasthran climate governance between 2007 and 2010 are rather small. They mostly derive from a co-benefits logic of companies and an increase of their knowledge through the national level developments, rather than from the actions

of local communities of practice. Collaborations between researchers and the state government cannot count as a community of practice for the time being, so that there is no sufficient evidence for a climate knowledge system that exerts a systemic ordering function or influences climate governance systematically through the development of new knowledge and practices.

For the *Western Cape*, finally, the evidence from the different data types does not give a completely coherent picture. Similar to Maharashtra, the quantitative data and the expert survey indirectly support different elements of a climate knowledge system. Examples are the driving force of different types of knowledge, or the general existence and growing power of communities of practice and their impact on climate governance in the Western Cape. The interview results identified one existing community of practice and another one under development. Their knowledge of different kinds advances climate governance. Moreover, it can be safely presumed that the climate knowledge system at the national level also plays a role for shifting the dominant mind-set, but overall the knowledge system is less strongly expressed in the Western Cape. Change processes appear to be driven by collaborations with the local level. Thy may sometimes even originate at the local or city level and then expand to the province. This was not the focus here, however and has to be left open for further research. What follows from a triangulation of the evidence for the Western Cape is a "yes, maybe" for the hypothesis on the systemic-ordering function and the increase in knowledge and learning through a knowledge system.

Hence, the hypothesis that more knowledge and a stronger knowledge system increase the chance for a change in climate governance receives clear support in one case, less support in two cases and cannot be supported in one case. In the case of Maharashtra, it is possible that the absence of a climate knowledge system is responsible for the very limited degree of change in climate governance there, but the evidence obtained does not give sufficient insights for such a definite conclusion.

In comparison of the cases, the presence or absence and the strength of the climate knowledge system explains the differing depth of change to a substantial part, but not completely. I did not assume that the knowledge system is forcibly the only causal factor from the start, so this is unproblematic. For the South African cases, no credible alternative explanation for the influence of knowledge on change processes could be found. All key actors identified belong to the knowledge system in some way or the other. In the Western Cape, the city level would have to be included, but its driving force does not negate the effect of a knowledge system per se, because the local level is likely to be part of it.

The evidence found gives enough reason to believe that the absence of an effective knowledge system (which would resolve power, knowledge and interest struggles if the majority of actors draws on the same new background knowledge) presents an important factor explaining the lower level of change in the Indian cases. The inductive parts of this study made clear that market forces are a relevant driver of change, especially in India, and that climate change related-events such as extreme weather events also have a driving effect. These can be understood as conducive additions to knowledge, learning and a knowledge system.

The climate change-related events such as extreme weather events do not fully qualify as a cognitive punch in the sense of Adler. Climate change as a whole still remains too abstract for actors and stakeholders. Compared to such events as the atomic accidents in Fukushima in 2011 which led to a quick paradigm shift in German energy policy, the catalytic effect of the climate change-related events identified in India and South Africa is smaller. Developments in the international climate negotiations can be either conducive or hindering for climate governance developments in India and South Africa, as for instance the relevance of the CDM in India's climate governance shows. It has had a positive effect thus far, but if the Kyoto Protocol ends and with it the CDM, this would be detrimental to climate governance in both countries, but more so in India. International equity considerations continue to be a hindering factor to the development of India's domestic climate governance. Together with a weak knowledge system, these factors explain the lower level of change in the two Indian cases. No alternative explanations for the change process in South Africa could be found, apart from the identified knowledge system.

In sum, the explanatory power of the concept climate knowledge system is sufficient for the exploratory test in this study. More research is required to strengthen these results and to allow for a more fine-grained weighting of the different driving factors along with the knowledge system.

9.2 The power of communities of practice and the role of key individuals (H2a and H2b)

The institutional and productive power of communities of practice and the participation of key individuals in them build central features of the climate knowledge system. Their assessment helps to identify the strength or the degree of expression of the knowledge system in more detail. The exploratory test of the hypothesis that more productive and institutional power of communities of practice increase the selection

and diffusion of climate governance mechanisms (H2a) draws on evidence from the expert judgements and the qualitative data, which require triangulation here. The hypothesis that the chance for cognitive evolution to pass the tipping point increases if a key individuals in a power position is a member of a community of practice (H2b) only draws on the interviews. Thus, no triangulation with different types of results is possible or necessary. Instead of just repeating the results for the hypothesis here, I put them in perspective with the other findings and shortly discuss the inferences drawn. Table 13 summarizes the results of the triangulation, differentiated along the four cases.

Table 13: Triangulation Hypotheses 2a and 2b

	India national	India Maharashtra	SA national	SA Western Cape
H2 a				
Aggregate data CDP				
Expert survey	+	o	+	o
Interviews/qual	0/+	-	+	o
Triangulation	**+**	**-**	**+**	o
H2b				
Aggregate data CDP Expert survey				
Interviews/qual	0/+	-	+	+
Triangulation	**0/+**	**-**	**+**	**+**

Note: + = confirmation of hypothesis, O = in between/unclear data, - = falsification, ( ) = indirect evidence Source: Author's own compilation.

Regarding Hypothesis 2a, the expert survey clearly supports the existence of communities of practice in both India and South Africa, but judgements were split regarding the power and expansion of the communities. The slightly stronger support for the hypothesis that could be derived from the South African survey correlates with the results from the interviews, albeit in two different ways: On the one hand, the communities of practice's institutional and productive power strongly shaped the change processes under way. On the other hand, their limited institutional power and their different foci slowed down the spread of new background knowledge and collective learning. This can be safely inferred from the content analysis of the interviews. Despite reservations regarding the validity of the expert survey and the incomplete analysis of the productive power of communities of practice, the hypothesis 2a receives enough support to confirm it for the case “South Africa national”. The same generally applies to the case “India national”, but here, the evidence from the

interviews is unclear and less supportive. Some powerful communities of practice exist that exert a certain discursive power (in the case of the community around Jairam Ramesh, e.g. through dominance in the media) or influence the shape and spread of co-beneficial measures. Triangulating these results, the rather diffuse picture at the national level only gives partial support to the hypothesis H2a.

For the two sub-national cases, the expert survey gives unclear results, since the question on communities of practice and their power did not differentiate between governance levels or areas. While it is possible that communities of practice exist among companies in Maharashtra, evidence of a knowledge system does not exist clearly enough. The weak, incomplete national climate knowledge system does not really impact Maharashtra apart from budget or planning decisions by the MoEF – no testing of the power of communities of practice is possible, therefore. For the Western Cape, the evidence from the expert judgement and the interviews is both mixed. A small community of practice exists that certainly has some productive and institutional power – but more power that influences the province as well comes from the local city level and the communities of practice or actor networks there. Triangulated, the uncertainties do not cancel each other out, so that a partial support for the hypothesis seems plausible, since it is clear that communities' power is a relevant factor in the Western Cape as well.

The exact measurement of the power of communities of practice has been difficult in this exploratory test and no quantification was possible for a number of reasons. First, the identification of actor networks and communities of practice and an assessment of their power in the same methodological step (here: through the same interviews) only give less detailed results. Second, the informality of relations and their dependence on trust make access to material or propositions directly produced by communities of practice and their tracing through political processes difficult. Third, a complete, detailed measurement of the discursive power of communities of practice would require a discourse analysis, which was not possible in this study. Still, the data gathered was sufficient to come to conclusions regarding the hypothesis through a *relational* assessment of power – by drawing on interviewees' descriptions of power relations, powerful people and paths of influences and by cross-checking these results with the standardized expert judgements.

In the chapter presenting the qualitative results, it has become clear that the hypothesis on key individuals (H2b) receives clear support for the two South African cases, that results are mixed but tentatively supportive for the case “India national” and that the hypothesis has to be falsified for Maharashtra. No cross-checking or

increasing of the validity through another data type was possible here. While this weakens the explanatory power of the study in this part, the evidence for the role of key individuals was so strong in the South African cases and regarding the role of Jairam Ramesh and other key figures in India, that the inference quality can still be deemed high for these results. Moreover, the findings from the interviews indicate that it is helpful if these key individuals are members of government and have a certain kind of knowledge. Generally, interview partners described a key individual as a person who has a central role in pushing the policy process, who deeply engages with the topic and is committed to his or her task and who has concrete ideas on what to do and how in climate governance. Being able to communicate these in a credible way was also described as an additional quality some key individuals have. From this, it can also be inferred that the power of a key individual is highly relevant for the overall institutional and productive power of communities of practice. I take these issues up again in the hypothesis-generating chapter 9.4.

9.3 Pragmatic knowledge, practical rationality and economic incentives (H3a and H3b)

Pragmatic knowledge and practical rationality have a specific function within the knowledge system. Feedback-loops that lead to an evaluation and re-configuration of the knowledge and practices developed find their way especially through pragmatic thinking. Pragmatic knowledge is the type of knowledge that connects to and reflects most closely the situation of a large developing country that is caught between sometimes conflicting complex political, social and economic goals. It is probable that the amount and success of pragmatic knowledge and practical rationality help cognitive evolution processes to reach the tipping point, after which a critical mass of actors have accepted and institutionalized the new background knowledge (H3a). The combination of pragmatic knowledge and rationality with economic incentives that are likely to dominate mind-sets or developments in large developing countries may support climate governance actions (H3b). Table 14 provides an overview of the outcomes of the triangulation.

Similar to the hypothesis above on the institutional and productive power of communities of practice, only one type of data could be used for the testing of hypothesis 3a. The content analysis of interviews and the calculation of code co-occurences have given mixed results for the case “India national” and support to the hypothesis in the two South African cases.

Table 14: Triangulation Hypotheses 3a and 3b

	India national	India Maharashtra	SA national	SA Western Cape
H3a				
Aggregate data				
CDP				
Expert survey				
Interviews/qual	o	-	+	+
Triangulation	**o**	**-**	**+**	**+**
H3b				
Aggregate data	+	o	o	o
CDP	o	o	o	o
Expert survey	+	+	+	+
Interviews/qual	o/+	o/+	+	+
Triangulation	**o/+**	**o**	**+**	**+**

Note: + = confirmation of hypothesis, O = in between/unclear data, - = falsification, ( ) = indirect evidence Source: Author's own compilation.

In line with the results for the other hypotheses thus far, hypothesis 3a could not be confirmed for the case of Maharashtra. An ex-post coding of interviews with the code pragmatic knowledge also back up these conclusions: 53% of interview partners in India showed some sort of pragmatic knowledge, while 66% of interview partners in South Africa had pragmatic knowledge. This higher percentage helps to explain the differences in the depth of change between the countries and cases, even though code frequencies should not be overrated.

Still, if we look at the results for the existence and strength of communities of practice within the knowledge systems in both countries and combine these with the insights on knowledge and collective learning processes, the following inference is plausible: South African communities of practice have developed more background knowledge and practices that draw on pragmatic knowledge and practical rationality than their Indian counterparts, presenting one reason for South Africa's comparably advanced stage of change. The recent – at least discursive – shift towards the promotion of more green jobs underlines this as well.

However, the statement by a South African scientist that "society outside government is clamming at the door of scientists for *actionable* information"[128] illustrates that communities of practice have not developed enough pragmatic knowledge yet. They are, like the rest of the political arena, still caught up in the development of knowledge and practices that integrate the different political goals adequately. Given the state of knowledge, data availability and the trickiness of the issues at stake, this is not surprising. The relatively early point in time of the recent

128 Interview with Academic/Expert 9, 02/03/2010; Emphasis by B.N.

political momentum explains why cognitive evolution has not passed the tipping point yet, in spite of the existence and relevance of pragmatic knowledge and practical rationality. Moreover, the results of the other part of the study on the power distribution and challenges connected to climate governance in South Africa provide additional explanations why the new background knowledge has not been institutionalized by a critical mass of actors and therefore has not passed the tipping point. It would be an interpretative fallacy to assume a mono-causal explanation derived from pragmatic knowledge and practical rationality only here. To avoid this in the first place, the hypothesis H3a centres on a probability. In this way, the hypothesis receives confirmation from the two South African cases.

With respect to the two Indian cases, the mixed results complicate inferences concerning the explanatory power of the hypothesis. On the one hand, the interviews showed that pragmatic knowledge exists and that it is connected to the other types of knowledge and the national policy process in interviewees' line of thinking (code co-occurrences). On the other hand, the current dynamic actor relations and the limited identification of communities of practice have made it nearly impossible to identify or trace if and to what extent the communities exert a practical rationality.

Some tentative conclusions can be drawn in the light of the other results of the study. In India, the pragmatic knowledge developed does not only have to bridge the (perceived) gap between environmental protection, economic growth and the way of balancing different needs, but may have to more prominently establish a type of bridge to existing, previously dominant mind-sets or positions. In India, for example, the previously dominant position that the country has a right to catch up on development for equity considerations and should therefore not have to engage in mitigation measures still exists. Pragmatic knowledge provides a bridge, so that the shift towards a new paradigm becomes more gradual. New positions, knowledge or practices that are currently perceived as radical, such as some decisions or propositions by Jairam Ramesh, trigger fierce controversies. Additionally, they may be opposed by the bureaucratic system that is afraid of bold shifts entailing some risk. When these propositions correlate with economic incentives or economically co-benefits, they are more likely to be accepted, both in cabinet and by business.

For the hypothesis on pragmatic rationality and economic incentives (H3b), the evidence from all four data types needs to be triangulated. The co-occurences of the interview codes “opportunities and co-benefits” and “pragmatic knowledge” point towards a stronger association of the two aspects in South Africa (Jaccard co-efficient: 0,64) than in India (Jaccard co-effcient: 0,45). The triangulation or meta-inference will

now show whether these results can be confirmed and related to the extent of climate governance measures.

The aggregate data indicated a strong business interest in clean energy in India, which can be confirmed by the other three data types as well. Generally, therefore, economic incentives and a logic of co-benefits drive climate governance in both Indian cases. In the sense of the hypothesis, the question then is, if and to what extent this reasoning correlates with pragmatic knowledge and practical rationality and to what effect. Here, the triangulation leads to different conclusions for the national- and the state-level case. Till the end of 2010, it was unclear who is supposed to develop and who is really developing pragmatic knowledge that draws on scientific and technical expertise and combines it with economic incentives. For the national level, the evidence allows the conclusion that both those communities of practice and the pro-active business-bureaucracy networks, the latter for example around solar energy, draw heavily on a co-benefits logic that combines market and competitiveness considerations with practical-rational considerations of low-carbon development. The explanatory power of this argument is particularly high if we look at the extent of climate governance mechanisms in specific areas: energy efficiency, wind and solar energy governance are advanced compared to other areas, regardless of whether only economic incentives triggered the mechanisms in the first place. “Good energy policy from a climate perspective wouldn't differ from good energy policy from an energy viewpoint”[129], as a member of government and administration put it. In this regard, it does not matter which kind of knowledge or incentive provided the first push. Summing up, the hypothesis on pragmatic knowledge and economic incentives receives tentative support for the Indian national case, but it also remains somewhat unclear given the limited access to and the fuzziness of the actor landscape and potential communities of practice and their thinking in detail.

In Maharashtra, the combination of pragmatic knowledge and economic incentives seems to start working as well, at least in the renewable energy business and partly in government, as a pragmatic knowledge about “low hanging fruit” and potentially simple shifts or re-labelling of existing measures in energy policy could attract additional funding under a climate mitigation cap. For adaptation to climate change, this is more difficult. However, the data for this case is insufficient and does not allow for any definite inferences. The result concerning hypothesis H3b therefore has to be left open for the case of Maharashtra.

The triangulation of the evidence for the two South African cases leads to the

129 Interview with Government/Administration 3, 11/11/2010.

same outcome – a confirmation of the hypothesis H3b. Economic incentives generally play a role, even though the aggregate and CDP data give no further insights concerning a combination with pragmatic knowledge. The expert survey further confirms that economic opportunities are an important driver, but only the interview results give insights into a possible integration of economic incentives and pragmatic knowledge. One form of practical rationality that became evident through the interviews is the consideration of what is technically and financially feasible, particularly in mitigation issues. These considerations can be found as products of communities of practice in both governmental debates and propositions as well as in scientific feasibility studies (for example in the LTMS in South Africa or the Interim Report of the Low-Carbon Expert Group in India). As we have seen above, the search for and the development of pragmatic knowledge is ongoing in South Africa, particularly for the path towards a low-carbon development. The extent of climate governance mechanisms in place has increased between 2007 and 2010, but policy planning is behind schedule and the implementation of governance mechanisms presents a perpetual challenge. While pragmatic knowledge, practical rationality and economic incentives have the important function assumed, they have not been developed and clearly implemented enough – which explains why the extent of climate governance is limited. The change process is ongoing here and the development of these kinds of measures is not a simple task and may take some more time.

The comparatively higher relevance of economic issues and co-benefits in India through the CDM, energy efficiency and clean energy investments (particularly in solar and wind energy) and its pragmatic linking to climate protection explains the extent of climate governance and the degree of change well. The head-start of India in these fields compared to South Africa results from the higher initial regulatory intensity and density and the experience Indian policy-makers and companies can draw on from decades of renewable energy development in the country. The next section discusses the conclusions to be drawn from comparing the countries and cases in more detail.

9.4 Comparative Hypothesis-generation

The exploratory, deductive test of hypotheses that targeted different aspects of the climate knowledge system was the prime goal of this study. A second goal is the inductive generation of hypotheses based on the comparison of the four cases. They may further refine the concept or show areas for future research, uncovered by the rich empirical data. The strength of the climate knowledge system helps to explain the

differing stages and focal points of domestic climate governance in India and South Africa. It is, however, not the only driving factor of change processes, as both the present empirical data underlines and previous research suggested. From the outset, I did not assume this anyway – hence, the "how"- formulation of the central research question.

In this section, I derive three hypotheses and point out additional interesting findings that do not give enough grounds for the formulation of hypotheses just yet. Instead of repeating the empirical findings and observations that constitute the background in detail, I only highlight the key points of the respective chapters from which I derive the new hypotheses.

The first striking difference between India and South Africa at the national level is the number of stakeholders and actors participating in climate governance processes. In South Africa, the number of actors, experts and stakeholders engaging in the development of climate governance is smaller and cognitive evolution processes have at least reached a double-loop learning phase. In India, the fragmentation and contestation among actors are reflected in the domestic climate governance processes. Actors only agree with respect to the development and implementation of strongly co-beneficial measures that make straightforward business and development sense as well as addressing climate governance. For the climate knowledge systems, these different circumstances may present a decisive factor. The following hypothesis can be derived from these observations:

- The number of actors participating in domestic climate governance at the national level matters for the formation and influence of communities of practice. A limited number of actors increases the chance for communities of practice to form and cognitive evolution processes to be triggered.

The amount of scientists and the fragmentation of the scientific landscape present another difference between the South African and the Indian cases. A small number of scientists exerts a considerable influence in the South Africa knowledge system and their participation and driving force in communities of practice has been crucial for the advancement of collective learning and change in climate governance. The number of scientists and institutions working on climate change is rather small and the degree of competition therefore low. In India, by contrast, many institutions, universities and scientist compete and present different findings and ideas for the future of India's low-carbon development and climate governance mechanisms. Some Indian scientists reasoned themselves that one central institution might not only end some of the confusion, but also lead to better, more usable results for policy-makers. The higher influence of business and bureaucracy compared to scientists (and civil society) may be

due to the character of the science landscape in India. Here, more tests on other cases are required. The data obtained did not give indications that a differing image of scientists in society or their place in society matters. It is possible that some sort of effect comes from a difference in employment: in India some scientists are directly employed in the ministerial departments and in South Africa they are usually not. However, the data here was unclear. Therefore, the resulting hypothesis from these differences is:

- The size of the scientific landscape and the degree of competition among scientists impacts the nature of change occurring in climate governance. A smaller number of scientists and a low degree of competition among them increases their influence on government.

Throughout the study, the relevance of key individuals for the advancement of climate governance has become clear in both countries. Adler argues that it helps the expansion of communities of practice and cognitive evolution if government networks or powerful policy-makers join a community of practice (see Chapter 3.2). The present study confirms this argument and goes a step further by making the attributes and attitude of these central figures more explicit. To promote climate governance, the key individual does not only have to be a member of government, but, additionally, it is important that he or she a) has at least a basic understanding of the science of climate change (scientific knowledge); b) wants do something about climate change (normative knowledge); and, ideally, c) has some pragmatic sense of combining climate governance with other political, social or economic goals (pragmatic knowledge). Together, these attributes may increase the credibility of the key individual in the perception of other actors and stakeholders, so that they might be more attracted to join the community of practice of the key individual. These issues need to be tested in more depth and could be complemented by a formal social network analysis approach. The hypothesis that captures this is the following:

- If at least one key figure within a community of practice or a network comes from part of government, the chances for a higher order change increase. In SNA terms: the more central an actor with certain attributes (government member, knowledge of climate change, wanting to do something), the more likely that the number of actors in the network and the density of the network increases.

Some additional observations would need further inductive research, before the formulation of a new hypothesis makes sense. They concern three possibly linked

issues: (1) the legitimacy of the knowledge produced and the legacy of old, long-standing policy paradigms; (2) a potential, specific transnational dimension of a climate knowledge system; and (3) a local content of knowledge types that reflects the tensions between a developing country position and emerging economies with a higher responsibility for global collective goods.

A minority of interviewees in India hinted that the local production of science and knowledge may be an issue for its acceptance by policy-makers. Inter- or transnational knowledge may have to be validated in India, at least for some governance actors, to deem it legitimate. Reasons for this apparently lie in the past. The shift from "Nehruvian developmentalism" (Deshpande 2003:69) to neoliberal globalism in the 1990s in India did not only affect India's economic and foreign policy, but also supported normative congruence building towards transnational climate governance that uses economic opportunities, as Stevenson (2011) argues. She also concludes that the normative congruence between international climate governance norms and goals and domestic conditions stands on shaky ground. While there are several reasons for this, one of them that could relate to a broader legacy of the Nehruvian developmentalism that stood for self-reliance and rejection of foreign influences. The initial distrust of Indian policy-makers in the IPCC and the tendency of government to listen more to Indian scientists and reports produced in India has diminished somewhat with the higher participation of Indian scientists in the IPCC (see Biermann 2002). However, it does not seem to have disappeared completely. This could be due to an underlying kind of background knowledge or political culture that still draws on self-reliance, independent of economic policy. The question of legitimacy of knowledge and potential distrust of IPCC knowledge did not come up in South Africa, so that it is unclear what, if any, effect on the shape of a knowledge system and on climate governance itself exists. However, the evidence and data on these kinds of questions is sparse here, as I did not systematically ask more pointed questions in this direction.

The evidence for companies in both countries shows that transnational companies or large national companies that participate in transnational peer associations may be more prone to learning and knowledge exchanges. In the sense of the above argument, the neoliberal-global turn of Indian corporates may help their learning and acceptance of knowledge of different origins in a transnational setting. Several members of the climate knowledge system in South Africa also act in transnational or international settings. To what extent a transnational dimension is a condition for the successful expansion and influence of a knowledge system

domestically cannot be derived from the data of this study and the comparison of the cases does not give enough grounds for the formulation of a hypothesis yet. This would be a next step with another round of data collection.

Finally, a more in-depth comparison of the local content and definition of knowledge within the four categories may prove fruitful, as large similarities, but some differences exist as well. The contents of scientific and technological knowledge are similar in India and South Africa. The contents of normative and pragmatic knowledge are also largely similar. For instance, in both countries the balancing and integration of poverty reduction, economic growth and development based on affordable energy and the responsibility to do something about climate change in both mitigation and adaptation at the same time matter. In India, international equity arguments were used and connected to a normative positioning, while some South African partners raised internal, domestic equity and equality issues that stem from the legacy of Apartheid. The growing middle classes in both countries may not see why they should not be allowed to use luxury goods and lead a lifestyle detrimental to the environment, as others have done before. In addition to that, there may be an additional white/black justice issue in South Africa.

Generally, the content of pragmatic knowledge determines the success of communities of practice and limits the application of the concept to industrialized countries. The integration of development and the governance of climate change is a major concern that affects the shape of climate governance. The kind of concerns and the knowledge and ideas required are similar in the countries and cases here.

A smaller nuances between the cases that could be worth further pursuit from a different perspective concerns the electorate. Some interview partners indicated that the educated middle classes in South Africa are beginning to exert pressure on government to attend to environmental and climate change matters, especially in the Western Cape, so that policy-makers may increasingly be caught between different pressure groups. No election in either India or South Africa can be won without a comprehensive, credible programme on poverty reduction, job creation, education and health, but environmental concerns including climate change may be on the way to become an electoral issue as well. While green parties have reached no real significance in either India's or South Africa's party system yet, they may do so in the future.

Whether and what kind of effects these observations have on collective learning, the knowledge system and the influence of actor networks cannot be determined. There is not enough clear data or literature to justify the formulation of hypotheses – yet.

10. Summary and outlook

10.1 Implications for theory

Ideally, the governance of climate change in large developing countries includes a comprehensive transformation towards a low-carbon development path that addresses both mitigation and adaptation effectively. This is hardly possible without a collective learning process of political actors, economy and society. The change process that has begun in India and South Africa between 2007 and 2010 can count as a first step in this direction.

We have seen in this contribution that scientific, technological, normative and pragmatic knowledge all matter for the advancement of climate governance in both India and South Africa. Such knowledge is in two to three of the four cases produced by communities of practice composed of scientists, civil society, business and members of government and administration. The results obtained for the test of climate knowledge systems as concept and the different hypotheses formed of its elements were mixed. The systemic ordering function of a climate knowledge system is stronger in the two South African than in the two Indian cases. Therefore, the answer to the central research question of this study, how different types of knowledge and learning influence the change in climate governance, is: through a climate knowledge system – in some cases. In South Africa, the new background provided by the knowledge system has led to a double-loop learning process or second-order change (Pahl-Wostl 2009; Hall 1993). In India, change at the central level has reached double-loop learning in some fields, but single-loop learning or first order change prevail. In Maharashtra, only little change occurred and no knowledge system could be identified. These differences can be largely explained by the presence/absence and the strength of a knowledge system. For the Indian cases, economic incentives and co-benefits account for a substantial part of double-loop learning in the fields of energy efficiency, renewable energy and engagement in the CDM.

What can we learn from this for the theorizing of climate governance? How do the findings of the study advance the field? First of all, the building of a mid-range theory for the group of large developing countries that are under increasing pressure to act in mitigation and adaptation requires more research. Despite the mixed results, the exploratory test undertaken in this study was successful. It lays a base for refinement of the concept in the way proposed by the formulation of the new hypotheses in the previous chapter and its testing on more cases. A methodological combination with formal social network analysis may prove particularly useful in those cases where the

required data for it can be obtained, so, when all members of the communities of practice can be clearly identified. This should help building a mid-range theory for the group of large developing countries that are under increasing pressure to act in mitigation and adaptation. This requires more research.

There are several implications for governance research that derive from this study. The provision of new background knowledge as well as concrete inputs into governance processes by communities of practice in the South African cases implies that governance functions are actually exerted by small groups of people who are for the most part not democratically elected. In India, the situation is not that different, even though the fuzziness in the actor landscape at the central level prevents a final statement on who governs. The evidence suggests that it is a combination of informal networks between business, government, administration and some communities of practice composed of a mix of members. In any case, those who shape climate governance by the provision of knowledge, ideas and practices are mostly not accountable to the people. What this means from a participatory perspective warrants further research that goes beyond the scope of this study. Nevertheless, it is important to note that despite prevalence of informal networks, key individuals in government or a central ministries remain relevant. Governance thus still takes place *with* the state – in a flexible, dynamic way.

Moreover, even in areas of limited statehood such as in India and South Africa, the governance of climate change depends upon the participation of the state, at least to some extent. This comprises the adoption of climate change policies and creation of public-private partnerships. It is reflected in the relevance attached to these established forms of governance by actors and experts. Given these results, the governance of climate change in general seems unlikely to be achieved by private governance and initiatives alone.

The results obtained here also have theoretical implications for the analysis and conceptualization of the fragmentation in global climate governance. Both the fragmentation and multi-level quality of climate governance are often emphasized in the literature, making encompassing conceptualizations difficult, regardless of whether an author deems such fragmentation useful or not. The flexible and systemic character of knowledge, its production and connection to actors, power and debates in the climate knowledge system allow for multi-level influences. But it also joins some of the allegedly fragmented pieces of the puzzle. Knowledge and especially background knowledge is indeed a cross-cutting theme, as for instance the earth system governance project (see Chapter 2) suggests. Background knowledge and the knowledge system's

dynamic ordering function present the underlying ties between actors and levels. They provide the invisible linkages between them. Despite the multi-level character of global climate governance, its fragmentation may not be as strong as often claimed (see e.g Biermann & Pattberg 2008). This is a significant finding, because it contradicts the prevalent opinion in the literature. Here, more research is required to identify the different kinds of background knowledge and their scope of diffusion at domestic levels and beyond. The concept of climate knowledge system therefore has a direct added value for global climate governance research.

For constructivist theorizing in political science, the results of this study imply that it can be useful to carefully combine constructivist research interests on ideas, norms and knowledge with elements of other research traditions and even other disciplines. Leaving the often self-set boundaries behind does not only support the often-sought interdisciplinary approach, but improves results as well. The integration of a constructivist conceptualization of knowledge, the rational choice element economic incentives and the concept of loop-learning by natural resource management produced a valuable answer to the research question, how knowledge influences change. It has become clear that pragmatic knowledge, which incorporates economic incentives is very relevant in large developing countries. Indeed, it seems to be crucial for reaching the tipping point of cognitive evolution. Designing and testing quantitative and qualitative indicators, that measure exactly when a critical mass of governance actors accepting the new background knowledge is reached, presents another future path for research.

The notions of the social construction of climate change and co-production of science and policy emphasize the social settings in which climate governance takes place. The climate knowledge system has drawn on these bodies of research and advanced them. Both norm-centred and discourse-centred constructivists concerned with climate change find their ideas in the knowledge system. To some extent, it builds the background for both, because normative knowledge and the framing, development and implementation of norms are strongly connected. For discourse-oriented scholars, the knowledge system helps to identify the sets of actors (communities of practice) who have discursive or productive power. It enables an analysis of a knowledge-related debate that can be linked more easily to other types of studies, even those with strictly positivist understandings of reality (and social science). The climate knowledge system, however, does not provide a conceptual lens that radical discourse analysts would accept. This is because the debate and productive power are just two elements among others that together form the system and not the only viable analytical entity. This

study did not undertake an in-depth discourse analysis, but it would be useful for further tests and a potential refinement of the concept.

A final point with respect to the theoretical implications for constructivist research concerns previous studies' findings that credibility and trust matter greatly at the science-policy and knowledge-power interfaces. The findings confirm this, as 'credibility of science' relates to the background knowledge that prevails, while 'trust' relates to the relations within communities of practice as well as their expansion. This study's results add to this, firstly, the relevance of informal, trust-building relations between actors for advancing political change. It thus connects constructivist political science and propositions of resource management with respect to networks and learning in one approach. Secondly, the findings highlight the importance of key individuals who have different kinds of knowledge that they express through their attitude and actions. These are a basic understanding of the science of climate change and the normative knowledge that it is good and necessary to engage in climate governance. This combines with the pragmatic knowledge of how to achieve climate governance best, while balancing different needs and finding co-beneficial solutions apt to the respective local political, economic and social context. Identifying the networks between actors and their qualification as communities of practice are of analytical interest for constructivists as well as of practical relevance for the process of collective learning and the transformation towards low-carbon development.

The flexibility and a certain contingency inherent to the climate knowledge system show that an overtly strict conceptualization of climate governance, which follows clear causal paths may not be suitable. Such contingency could come about through key individuals in government, who are part of an important community of practice and whose role changes for any reason. An example is the former Indian minister for environment and forests, Jairam Ramesh, who was promoted to become minister of rural development in July 2011. This flexibility makes conceptualizations difficult for some political scientists, especially positivists. A dynamic system seems to reflect most closely the political reality in large developing countries' domestic climate governance for the time being.

The top-down approach to both knowledge and governance I have taken excluded local levels of governance and bottom-up engagement with knowledge production and diffusion. A comparison of local communities of practice, networks, their knowledge and collective learning with the top-down climate knowledge system is necessary. If the collective learning triggered through cognitive evolution is successful so that triple-loop learning has taken place, the climate knowledge system also

provides the background knowledge at local levels, or it converges with local knowledge and local communities of practice. The latter would mean expansion and integration. It seems also possible that systems overlap or contradict each other here. Does the climate knowledge system and its background knowledge present the underlying connecting factor across *all* levels of society engaged in climate governance in a given large developing country? Under what conditions? And if not, how do potentially differing knowledge systems converge or contradict each other – and to what end? Can we identify knowledge system in other governance fields as well? These are just some of the questions that arise from the results of this study. Methodologically, further research drawing on this exploratory study may consider using techniques of formal social network analysis, discourse analysis or ethnographic methods. This could include participant observation to understand deeper the details of the functioning of the knowledge systems.

While the concept of climate knowledge systems bridges several conceptual gaps and provides a political science based, interdisciplinary usable approach, it also opens up a number of new theoretical and empirical questions. This provides a number of starting points for further research.

10.2 Implications for practice

The results of this study and in particular the empirical data, provide useful insights for practitioners in the field of climate change and its governance. First, the identification of the relevant actors, their knowledge, interests and relations in India and South Africa makes targeted projects and programmes, financial support, or campaigns and lobbying easier and probably more effective.

Second, both the relevance of different kinds of knowledge and the lack thereof indicate where explanations of the science at basic levels and awareness campaigns may be useful. This concerns primarily the sub-national levels in government and administration in both countries and parts of the business sector, especially small and medium enterprises. The knowledge gaps with respect to projected impacts of climate change and adaptation are greater than regarding mitigation and energy consumption. Knowledge about mitigation options is somewhat weaker in South Africa. Given the general state of knowledge and the limited availability of local data and down-scaled models, pragmatic knowledge and the development of co-beneficial measures on different scales seems useful in both countries.

Civil society or donor organizations could contribute to capacity building here and use the results of this study as staring points. They may not be able to transmit all

the relevant technological knowledge – if even available. Yet it appears possible and useful to promote actions or initiatives that raise the understanding of climate change (scientific knowledge). It is crucial to the advancement of climate governance on all levels in India and South Africa to develop and exert pragmatic knowledge that translates into feasible, easy to understand practices, which combine different goals and draw on existing programmes, such as energy efficiency. Capacity building programmes could play an important role in assessing specific local needs and understandings, and in engaging with stakeholders over time to facilitate trust-building and learning.

Embedding ("mainstreaming") climate change into development plans, as often proposed especially by donor countries, would have to take the local background knowledge and knowledge system into account. Under conditions of financial constraints, such plans may only makes sense in areas that climate governance overlap with. Climate change itself is not the cause of wide-spread problems in the implementation of policies and current insufficient access to electricity and water, for example. Shifting funds from mechanisms that target these challenges to climate change programmes could be detrimental. It may prove better to balance different goals and tackle individual challenges from a different angle, which has positive side-effects on climate governance.

The overview of the drivers and problems in domestic climate governance has given further insights into what kind of targets campaigns could designate, or what may slow down success. I refrain from repeating them here in detail and just draw some simple conclusions. Changing the dominant political mind-set in the Indian bureaucracy, both in central government and in the different states may prove to be a tougher challenge than in South Africa. The previous mind-set of promoting economic growth at any cost continues to prevail in many minds there and the Indian bureaucracy is generally notoriously slow to change. Pragmatic solutions that include economic incentives appear most likely to be successful in the short-term. Economic incentives can then continue to work in the long-term as well. In South Africa, by contrast, continuing the debate with climate sceptics and overcoming barriers to the development and acceptance of renewable energy are necessary – but not easy tasks.

This study found that governance practices depend on key individuals. This makes practical climate governance somewhat contingent upon the kind of person in office. It matters whether he or she is part of a communities of practice or can be incorporated into an existing one. A change of staff after an election, for example, or the promotion of a progressive minister to another portfolio, such as Jairam Ramesh

in July 2011, may have sudden, far-reaching consequences for the expansion of new knowledge, learning and the development of climate governance. The results of this study show that one way to counter this problem at least to some extent is the creation of trust on an individual basis and building of informal communities of practice. In some cases, as in India, simple networks that rely on trust and knowledge exchange without identity-building may work well too. In India, the provision of locally developed practices or ideas for practices may have higher chances of success. This requires further research. Yet in any case, it could be helpful to build a more central scientific institution that gathers the different scientific knowledge produced in India – as interview partners suggested.

Overall, this study has demonstrated the significance of the knowledge system composed of a limited number of communities of practice for change processes in South Africa. In India,both communities of practice and networks at the national level exert influence and created tension between 2007 and 2010. This highlights the importance of targeting specific actors, e.g. in trying to convince or lobby, and developing knowledge of different kinds until a tipping point has been passed. However, much of this study has been top-down and excluded bottom-up initiatives and potential local interpretations of knowledge. This is not to say that these are unnecessary or should not receive attention of practitioners – a combination of both is certainly suitable.

Collective learning and the change of climate governance comes in small steps in India and South Africa – and will remain a slow process for some time. Overcoming the gap between knowledge and practice may be the hardest bit. Supporting collective learning processes can help overcome this. In large developing countries such as India and South Africa, where companies are developing increasing interests in clean technology markets, economic incentives present one possibility for the short-term. Enhancing and using context-specific pragmatic knowledge that draws on co-beneficial ideas certainly belongs to the "low hanging fruit" among the options for climate governance. Knowing about a domestic climate knowledge system, the local kind of background knowledge and how to change it, as well as awareness of the informal relations between actors and their power increases the chance for deeper change. Making use of this knowledge in the long-run is therefore strongly beneficial for academics as well as practitioners.

Appendix I: Expert survey

(survey for South Africa as example)

Expert Survey on Climate governance in India and South Africa

1. In your opinion, what have been the most significant developments in climate governance in South Africa in the past two years?

_____

_____

_____

2. Compared to other emerging economies, how do you rate overall climate governance in South Africa in terms of….?

	VERY ADVANCED	RATHER ADVANCED	AVERAGE	RATHER POOR	UNSATISFACTORY/ POOR
The state of planning					
The state of implementation					
Adaptation efforts					
Mitigation efforts					

3. Below, you find a list of factors that could positively influence the state of climate governance. In general, to what extent do these factors drive governance actors' decision to engage and/or promote climate governance in South Africa?

	VERY MUCH	MUCH	SOMEWHAT	NOT SO MUCH	NOT AT ALL
Technological knowledge about mitigation/adaptation options					
Economic opportunities					
Governmental sanctions/incentives					
Actor's belief that climate change is happening and it is good to control it					
Actor's green ideology					
Other (please specify):					

4. In the following you find a list of statements that represent general problems for the spread and implementation of climate governance. Please choose to what extent these hinder climate governance in South Africa, if applicable.

	VERY MUCH	SOMEWHAT	NOT AT ALL
Lack of financial resources			
Understanding that climate protection measures hinder economic growth			
Lack of awareness and understanding of the problem			
Lack of technological knowledge about mitigation/adaptation options			
Understanding that climate change is a problem industrialized countries need to solve			

The following questions target the existence and influence of communities of practice in the climate field in South Africa.

Communities of practice are a specific type of informal, dynamic social network. Members share a sense of joint entreprise, so that the community develops an identity: it is more that just a set of relationships. Members produce and share knowledge, they learn and apply certain practices through the interaction with each other. The community thus helps to spread new ideas and practices. People can belong to different communities of practice at the same time. Members can come from different levels of society: they do not have to belong to the same company, organization, region etc.

5. Which of the following statements comes closes to the situation in South Africa?

There are no significant communities of practice. ☐

There are some communities of practice in the climate field that try to establish new ideas and practices across society, but they do not have enough power to diffuse them effectively. ☐

The number and power of communities of practice are growing, so that a change In general ideas and practices of how to deal with climate change is taking place. ☐

6.Please identify the five most influential actor groups that currently shape climate governance in your country. Pick and rank by filling in the numbers 1-5 (1= most influential)

Communities of practice……..
Large and transnational companies……..
Small and medium entreprises…….
Government and state officials (national level)…….
Government and state officials (province and local level)……..
Environmental civil society organisations……..
Epistemic communities (transnational scientific networks)……
National scientific advisory institutions……..
Donor organizations……
Foundations (e.g. Clinton Climate Initiative)……..
Other (please specify)……..

7. Do you think *state* actors directly or indirectly working on climate questions have sufficient scientific understanding of climate change to deal with it…?

	YES	NO	I DON'T KNOW
…in general at the national level			
… in general at the sub-national level			
…in the energy efficiency field (mitigation) at the national level			
… in the energy efficiency field (mitigation) at the sub-national level			
In water resource management (adaptation) at te the national level			
In water resource management (adaptation) at the sub-national level			

8. Do you think *state* actors directly or indirectly working on climate questions have enough technological knowledge about mitigation and adaptation options to deal with climate change…?

	YES	NO	I DON'T KNOW
…in general at the national level			
… in general at the sub-national level			
…in the energy efficiency field (mitigation) at the national level			
… in the energy efficiency field (mitigation) at the sub-national level			
In water resource management (adaptation) at the the national level			
In water resource management (adaptation) at the sub-national level			

9. Do you think the following groups of non-state actors currently have sufficient understanding of climate change to deal with it?

If you belong to one of the groups stated below, please only check the boxes for the other groups, not your own.

	YES	NO	I DON'T KNOW
Transnational companies			
Large national companies			
Small and medium entreprises			
Non-state actors in general concerning energy efficiency (mitigation)			
Non-state actors in general in water resource management (adaptation)			

10. Do you think the following groups of *non-state* actors currently have enough technological knowledge about *mitigation* options to deal with climate change?

If you belong to one of the groups stated below, please only check the boxes for the other groups, not your own.

	YES	NO	I DON'T KNOW
Transnational companies			
Large national companies			
Small and medium entreprises			
Non-state actors in general concerning energy efficiency (mitigation)			

11. Do you think the following groups of *non-state* actors currently have enough technological knowledge about *adaptation* options to deal with climate change?

If you belong to one of the groups stated below, please only check the boxes for the other groups, not your own.

	YES	NO	I DON'T KNOW
Transnational companies			
Large national companies			
Small and medium entreprises			
Non-state actors in general in water resource management (adaptation)			

12. In your opinion, is a change in South Africa taking place or has it alread taken place concerning…?

	YES	NO
…the general attitude towards climate change?		
… the definition of actors' interests relating to climate questions?		
…the self-understanding (own role) of South Africa in climate governance?		
…the position of South Africa in the international climate negotiations?		

If yes, since when? Please give a year, event or number of months:

……
……
……

13.The term discourse refers to the frame in which a topic is being debated. How would you describe the general state of the discourse around climate change in South Africa? Please choose.

There is a dominant discourse. ☐

The discourse varies between levels (national, province, local). ☐

The discourse varies between actor groups. ☐

There is no climate change-related discourse. ☐

If you chose “there is a dominant discourse”, please answer the following two questions. Otherwise, please comtinue with Question 14.

13.a) In your opinion, to what extent does this dominant discourse influence climate governance actors? Please give a number between 1 and 10, where 10=influences completely (single detrmining factor)

13.b) In a few words, please describe the main issues debated within the frame of this discourse:

……
……
……
……
……
……

14. Please assess the degree to which you think the fields and issues below are or will be affected by the impacts of climate change in South Africa.

	STRONGLY AFFECTED	SOMEWHAT AFFECTED	MODERATELY AFFECTED	NOT AFFECTED
Coastal zones/sea-level rise				
Water supply				
Infrastructure				
Health				
Food supply				
Energy supply				
Poverty reduction				

Finally, we would like to ask you to enter some details on your background. These will be kept confidential within the boundaries of the research project and will be used for academic purposes only.

If you would like to receive information on the results of this survey, please enter your email address:

Name:
……

Institute/Organization:……..

Years of experience in the climate or environmental field:……

Email address (optional):…….

Thank you very much for completing this survey!

Space for additional comments:

Appendix II: Semi-structure of interviews

Icebreaker question: There are different views on how big a challenge climate change is for society. What do you think?

State and content of climate governance	• Could you describe what climate governance means for you? • What climate governance measures are taking place in your country/company? How/why did you decide for those specific measures? • What relevance has climate change compared to other fields in your country/for you/your company? • Has something changed in the past 2-3 years? • For experts: relation intersubjective-individual knowledge and practice? • In your view, what needs to happen in your country to have an effective, successful climate governance?
Actors/ international	• Who are the most important actors in climate governance in your country? For experts: Who should be part of an effective climate policy/governance? • How would you describe the respective positions of these main actors? Who drives, who blocks? Change in the past 2-3 years? • Describe the influence/relation between international or and domestic level/actors • For government: how do the international and domestic position and activities go together? For NGOs, scientifics, companies: How many possibilities do you have for influencing the government?
Climate discourse	Public awareness? Change in awareness/knowledge over last years? For experts: Are actors influenced by the debate?
Information flow and communities of practice/networks	• From where and how do you get information/knowledge on how to combat climate change? Which level? • Who do you collaborate or exchange with on climate change questions and practices (Ministries, administration, NGOs, other companies, experts, international experts/foreign partners?) Personal, regular contacts on what level? Contact to scientists - national/international? • How would you describe these exchanges? Do you feel that you're engaging/fighting for the same thing, those people you exchange with (regularly) *if applicable*? • How would you describe the information exchange process between national and province governments? Formal/informal? Regular/Irregular? • For government/experts: How does the collaboration between the Ministries/Departments work? For experts: Are there networks that push for cc gov? Do they cross-cut organization boundaries (ngos, businesses etc)? For scientists: Are you approached for advice? By whom? How often?

Technological knowledge	• Can you identify concrete technical possibilities for combating climate change? How would you describe the level of technological knowledge on mitigation/adaptation options in your area/peers/country?
Scientific knowledge	• Is your country subject to the impacts of climate change? In what way? • What are the central ecological challenges of the future in your country? • How do you assess energy/water supply in your country/for your company in the light of climate change? For experts: Do the main actors have enough scientific/technological knowledge?
Normative knowledge/Pragmatic knowledge	• What priority has climate change compared to other fields/tasks? Why? • Should one combat the impacts of climate change? Who? • Do you think that sth like a climate protection norm/standard of behaviour is evolving? Should there be one? • What standing does environmental protection have vis à vis development for you/in your country? • Do you think that climate protection concerns everyone, every individual? • Does climate protection depend on wealth/financial resources? Does your country have financial resources to combat cc?
Incentives	• Under what conditions would you take climate protection measures (if non taken)? • Will climate change affect your competitiveness/the competitiveness of your country? In what way? • What are the biggest obstacles for the development/implementation of climate protection measures (for your company, the state etc)? • Is there a rift between knowledge and practice/action? • What role do international agreements and mechanisms play? - How do you asses the future of green technologies in your country?
Questions for companies	• Do you think that the government's climate governance presents an opportunity or an obstacle for the development of your company? • What role do financial incentives such as emission trading or the green technology market play for your company? • Does your company conduct R&D on climate protection issues? How does it work? • Are there best practices? • What role does climate protection play for your public relations? • What role does energy availability play in your area of operations? Do you take energy saving and efficiency measure? Benefits for your company, in what way?

Appendix III: List of interview partners

India (in alphabetical order):

Apne, Deepak	Bombay Natural History Society
Basin, Shikha	The Climate Group
Biswas, CD	IRADe
Christ, Guido	Indo-German Chamber of Commerce Delhi
Das, Debajit	Winrock International
Dubash, Navroz	Centre for Policy Research, Delhi
Gadag, Gayatri	Prayas, Pune
Ghosh, Aditya	Centre for Science and Environment, Delhi
Goenka, Debi	Concervation Action Trust, Mumbai
Gupta, Akilesh	Climate Change Coordinator, Department of Science and Technology
Jayaraman, T	TISS Mumbai
Joshi, Sachin Kant, Promode	Confederation of Indian Industries, CII-ITC Sustainability Institute of Green Economy
Kumar, Rakesh	National Environmental Engineering Institute, Mumbai
Lanjekar, Prutha	TERI Mumbai
Mandal, Thirtankar	WWF
Mathur, Ajay	Bureau of Energy Efficiency
Mathur, Ritu	TERI
Parasnis, Anjali	TERI Mumbai
Pathak, Siddarth	Greenpeace
Patwardhan, Anand	IIT Bombay
Raghunandan, D	Delhi Science Forum
Raja, VP	Marahashtra Electricity Regulatory Commission
Rajamani, Lavanya	Centre for Policy Research
Reidar Bergum, Ole	Norwegian Embassy
Rodewald, Achim	Indo-German Chamber of Commerce, Mumbai
Sethi, RK	Director Climate Change Division, Ministry of Environment and Forests
Shah, Chintan	Head of Strategic Business Unit, Suzlon
Shrivastava, Sonia	Intel
Sinha, Shirish	Swiss Development Agency
Srinivas, SN	UNDP

South Africa (in alphabetical order):

Adams, Ferriel	Earthlife Africa
Archer, Emma	CSIR
Chapman, Arthur	Oneworld sustainable investment

Chevallier, Romy	South African Institute of International Affairs
Day, Brian	Technology Manager, Exxaro
Fakir, Saliem	WWF
Geen, Valerie	National Business Initiative
Gerding, Harald	KfW Sektorkoordinator Klima und Energie
Gilder andrew	IMBEWU Legal Specialists on Sustainability
Greyling, Lance	Indpendent Democrats
Groenewald, Yolandi	Mail&Guardian
Harrington, Shamini	Sasol
Hewitson, Bruce	Climate Systems Analysis Group, University of Cape Town
Isaacs, Goosain	Climate Change Manager, Department of Environmental Affairs and Planning, Government of the Western Cape
Kgope, Barney	National Business Initiative
Koketso, Sakhile	Heinrich-Böll-Stiftung
Kruger, Ferdi	NERSA
Lee, Edmond	Santam
Lind, Johanna	Embassy of Sweden
Maphiri, Nkopane	Greenpeace
Marais, Sarshen	Climate Action Partnership
Matooane, Leluma	Climate Change Manager, Department of Science and Technology
Mdalose, Zakhele	Director Environment, Department of Trade and Industry
Midgley, Guy	SANBI
Nteo, Dorah	Climate Change Division, Department of Environmental Affairs
Parsons andrew	AngloGold
Raubenheimer, Stefan	SouthSouthNorth
Reddy, Trusha	Institute for Security Studies, Cape Town
Rhambharos, Mandy	Eskom
Smith, Brad	Greenpeace
Smith, Justin	Woolworths
Surridge, Tony	SANERI
Taylor, Tristen	Earthlife Africa
van der Merwe, Christy	Engineering News
Vincent, Katherine	UNEP Consultant
Vogel, Coleen	University of the Witwatersrand
Whande, Webster	Institute for Security Studies
Winkler, Harald	Energy Research Centre, University of Cape Town
Ziervogel, Gina	University of Cape Town

Appendix IV: Interview Codebooks

Codebook India

Note: Code categories in bold, codes marked blue, code descriptions in italics.

Change

- Activities by business
  Change in intensity and content of business actions on climate change
- Activities by civil society
  Change of actions in civil society; increase/decrease of campaigns by NGOs, change in content of campaigns and other activities
- Change in awareness and perception
  General statements about a change of awareness of climate change, and the way climate change is perceived (eg as a problem, opportunity, risk)
- Change in government actions/behaviour
  Shifts of the position of government both domestically and in the international negotiations; statements about shifts in the way government acts
- Increase in debate
  Increase in debate about climate change in the public, by actors or only by certain acor groups

Discourse

- Discourse development/content
  Existence, development and content of discussions of the topic in general in society, and in specific actor groups
- Influence of media
  Position and influence of the media on climate governance. Content and intensity of media attention.

Drivers

- Critical individuals
  Role and power of individual actors in the advancement of climate governance.
- Driving events
  Political events and publication of scientific data or a policy/strategy that have a distinctive triggering effect.

Economic incentives

- Competitiveness of company
  Strategic market reasons and future projections of competitiveness as incentive for a particular businness, fear of risks posed by climate change to the competitiveness/profits
- Competitiveness of the country
  Sustain of the country's economic growth, general economic interests of the country and competitiveness of the economy as incentive (or not)
- Opportunities and co-benefits
  Business and market opportunities that arise through climate change and climate change-related fields. Investments that will be economically beneficial irrespective of the actual impact of climate change.

- Impacts/experience
  Impacts of climate change such as extreme weather events that are directly felt or observed, experiences that are ascribed to climate change irrespective of the actual cause
- International peer pressure
  Statements about the driving force of international organizations, countries and international/foreign relation dynamics for domestic action. Pressure by transnational peer associations/networks especially for business action.

Information flow/networks

- Collaboration ministries
  Description and analyses about the way different parts of government and ministries work together, including statements about power struggles.
- Collaboration scientists govt
  Interactions between scientists and government/ministries, formal and informal. Influence of science on government and policy.

- Companies-govt
  Interactions between companies and government/ministries, formal and informal, through associations/chambers of commerce and directly. Influence of business on government and policy.
- Exchange national-province
  Descriptions about the relation between central government and state/province governments. Nature of exchanges, collaboration, power and finance issues.
- Exchange ngo govt
  Interactions between civil society organisations and government/ministries, formal and informal. Information exchanges and influence of on government and policy.
- Potential communities of practice
  Statements indicating the (non-) existence of networks, their members and interactions and possible qualification as a community of practice.

International
- Multi-level linkages
  Connections between of different levels and influence on each other a) in terms of actions and processes and b) in terms of actors interacting across levels, or the same actor taking part in activities on different levels
- Negotiations
  Proceedings of the international negotiations, behaviour of the country/government or actor groups in the negotiations

Knowledge
- Knowledge-general
  Statements about knowledge of actors, and reference to knowledge and awareness aspects that cannot be attributed to any of the other knowledge types.
- Normative knowledge
  Statements and attitude about what is good and/or bad with respect to climate change and what should be done by whom. Knowledge about norms, their development and their intrepretation.
- Pragmatic knowledge
  Political feasibility and practical rationality about what can be done about climate change in the specific country and actor context.
- Scientific knowledge
  Statements showing that the interviewee knows about the basics of climate science: what climate change is, what mitigation and adaptation is, and what the projected impacts of cimate change say for the country. Experts: also comments about the scientific knowledge of others
- Technological knowledge
  Statements indicating that either the interviewee has the technical know-how about climate change and mitigation/adaptation, or descriptions about technological needs and the state of tech. knoweldge of others.

Problems
- Balance different needs
  Challenge of having to meet different policy goals and attend to different, equally important problems. Problem of integration of these different goals.
- Financial resources
  Lack of financial resources for specific measures and/or overall indication that the country does or does not need external financial help for climate governance.
- Government-related
  Problems within government, ministries and administration, and problems caused by government behaviour

Implementation
- Implementation of policies
  Problems with the implementation of policies, laws and projects.

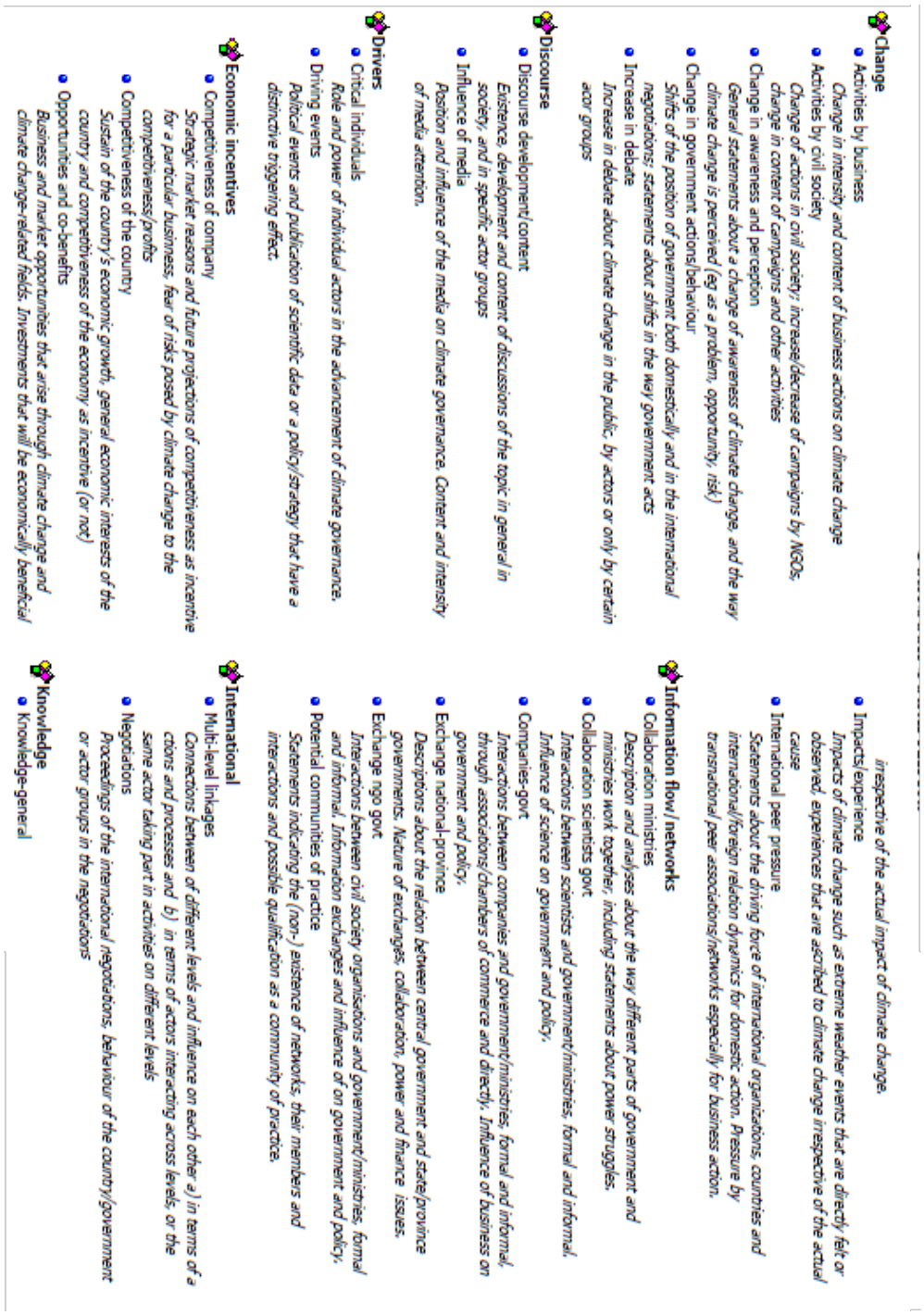
  - Rift knowledge-action
    Actors and/or public are aware of climate change in general, and possibly perceive it as a problem, but no action taken.
- Lack of understanding
  Lack of awareness and knowledge about what climate change is and what it means for the country, city etc. Primarily lack of the types scientific and technologial knowledge.
- Other problems
- Scientific uncertainty/time issue
  Uncertainty inherent to the data of climate science, insufficient/uncertain data concenring local impacts and adaptation. Uncertainty about timing of impacts and measures to be taken.
- Skepticism
  Skepticism about the science and existence of climate change.

State of governance

- CDM and PPPs
  Process, content and motivations/problems of CDM and other public-private partnerships
- Company activity
  Actions taken by the business sector in general and particular companies directly related to climate change and co-beneficial activities
- Local policy process
  Development and state of local climate change policy and related policies, local initiatives
- National policy process
  Descriptions about the development and state of the national climate change policy and related policies
- Provincial policy process
  Development and state of the provinicial/state climate change policy and related policies

Codebook South Africa

Note: Code category in bold, codes marked blue, code description in italics.



Statements about knowledge of actors, and reference to knowledge and awareness aspects that cannot be attributed to any of the other knowledge types.

- Normative knowledge
  Statements and attitude about what is good and/or bad with respect to climate change and what should be done by whom. Knowledge about norms, their development and their intrepretation.
- Pragmatic knowledge
  Political feasibility and practical rationality about what can be done about climate change in the specific country and actor context.
- Scientific knowledge
  Statements showing that the interviewee knows about the basics of climate science: what climate change is, what mitigation and adaptation is, and what the projected impacts of cimate change say for the country. Experts: also comments about the scientific knowledge of others
- Technological knowledge
  Statements indicating that either the interviewee has the technical know-how about climate change and mitigation/adaptation, or descriptions about technological needs and the state of tech. knowledge of others.

Problems

- Balance different needs
  Challenge of having to meet different policy goals and attend to different, equally important problems. Problem of integration of these different goals.
- Financial resources
  Lack of financial resources for specific measures and/or overall indication that the country does or does not need external financial help for climate governance.
- Government-related
  Problems within government, ministries and administration, and problems caused by government behaviour

Implementation

- Implementation of policies
  Problems with the implementation of policies, laws and projects.
- Rift knowledge-action
  Actors and/or public are aware of climate change in general, and possibly perceive it as a problem, but no action taken.
- Lack of understanding
  Lack of awareness and knowledge about what climate change is and what it means for the country, city etc. Primarily lack of the types scientific and technologial knowledge.
- Other problems
- Scientific uncertainty/time issue
  Uncertainty inherent to the data of climate science, insufficient/uncertain data concenring local impacts and adaptation. Uncertainty about timing of impacts and measures to be taken.
- Skepticism
  Skepticism about the science and existence of climate change.

State of governance

- CDM and PPPs
  Process, content and motivations/problems of CDM and other public-private partnerships
- Company activity
  Actions taken by the business sector in general and particular companies directly related to climate change and co-beneficial activities
- Local policy process
  Development and state of local climate change policy and related policies, local initiatives
- National policy process
  Descriptions about the development and state of the national climate change policy and related policies
- Provincial policy process
  Development and state of the provinicial/state climate change policy and related policies

Appendix V: Code Frequencies

India

Category	Code	Count	% Codes	Interviewees	% of Interview.
Change	Activities by business	5	0,7%	5	16,7%
Change	Activities by civil society	5	0,7%	4	13,3%
Change	Change in awareness and perception	24	3,3%	17	56,7%
Change	Change in government actions/behaviour	17	2,3%	14	46,7%
Change	Increase in debate	9	1,2%	7	23,3%
Discourse	Discourse development/content	17	2,3%	11	36,7%
Discourse	Influence of media	3	0,4%	3	10,0%
Drivers	Critical individuals	19	2,6%	16	53,3%
Drivers	Driving events	5	0,7%	4	13,3%
Drivers\Economic incentives	Competitiveness of company	9	1,2%	7	23,3%
Drivers\Economic incentives	Competitiveness of the country	8	1,1%	7	23,3%
Drivers\Economic incentives	Opportunities and co-benefits	29	4,0%	16	53,3%
Drivers	Impacts/experience	8	1,1%	8	26,7%
Drivers	International peer pressure	2	0,3%	2	6,7%
Information flow/networks	Collaboration ministries	14	1,9%	10	33,3%
Information flow/networks	Collaboration scientists govt	26	3,6%	18	60,0%
Information flow/networks	Companies-govt	22	3,0%	16	53,3%
Information flow/networks	Exchange national-province	9	1,2%	8	26,7%
Information flow/networks	Exchange ngo govt	23	3,1%	15	50,0%
Information flow/networks	Potential communities of practice	30	4,1%	17	56,7%
International	Multi-level linkages	29	4,0%	17	56,7%
International	Negotiations	17	2,3%	13	43,3%
Knowledge	Knowledge-general	24	3,3%	18	60,0%
Knowledge	Normative knowledge	27	3,7%	16	53,3%
Knowledge	Pragmatic knowledge	21	2,9%	16	53,3%
Knowledge	Scientific knowledge	35	4,8%	18	60,0%
Knowledge	Technological knowledge	33	4,5%	16	53,3%
Problems	Balance different needs	25	3,4%	16	53,3%
Problems	Financial resources	6	0,8%	6	20,0%
Problems	Government-related	17	2,3%	13	43,3%
Problems\Implementation	Implementation of policies	10	1,4%	7	23,3%

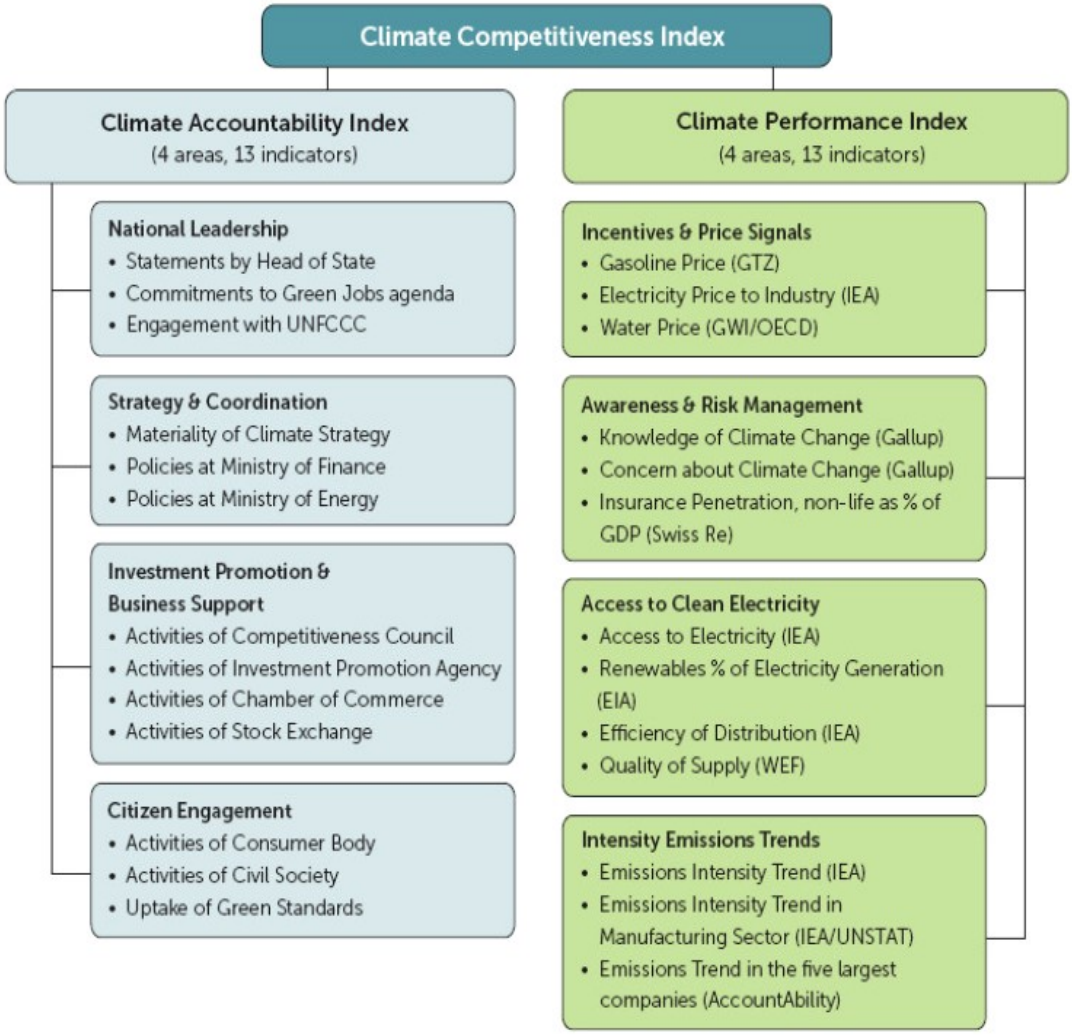
Problems\Implementation	Rift knowledge-action	15	2,0%	11	36,7%
Problems	Lack of understanding	19	2,6%	14	46,7%
Problems	Other problems	17	2,3%	13	43,3%
Problems	Scientific uncertainty/time issue	12	1,6%	7	23,3%
Problems	Skepticism	1	0,1%	1	3,3%
State of governance	CDM and PPPs	12	1,6%	11	36,7%
State of governance	Company activity	28	3,8%	19	63,3%
State of governance	Local policy process	1	0,1%	1	3,3%
State of governance	National policy process	74	10,1%	27	90,0%
State of governance	Provincial policy process	25	3,4%	19	63,3%

South Africa

Category	**Code**	**Count**	**Interviewees**	**% of Interview.**
Change	Activities by business	12	9	25,7%
Change	Activities by civil society	7	7	20,0%
Change	Change in awareness and perception	39	21	60,0%
Change	Change in government actions/behaviour	12	9	25,7%
Change	Increase in debate	11	10	28,6%
Discourse	Discourse development/content	20	17	48,6%
Discourse	Influence of media	15	12	34,3%
Drivers	Critical individuals	16	11	31,4%
Drivers	Driving events	7	7	20,0%
Drivers\Economic incentives	Competitiveness of company	14	9	25,7%
Drivers\Economic incentives	Competitiveness of the country	10	8	22,9%
Drivers\Economic incentives	Opportunities and co-benefits	40	23	65,7%
Drivers	Impacts/experience	12	8	22,9%
Drivers	International peer pressure	9	9	25,7%
Information flow/networks	Collaboration ministries	28	21	60,0%
Information flow/networks	Collaboration scientists govt	24	16	45,7%
Information flow/networks	Companies-govt	31	21	60,0%
Information flow/networks	Exchange national-province	8	6	17,1%
Information	Exchange ngo govt	24	11	31,4%

flow/networks				
Information flow/networks	Potential communities of practice	40	21	60,0%
International	Multi-level linkages	57	24	68,6%
International	Negotiations	27	19	54,3%
Knowledge	Knowledge-general	27	17	48,6%
Knowledge	Normative knowledge	38	21	60,0%
Knowledge	Pragmatic knowledge	43	23	65,7%
Knowledge	Scientific knowledge	67	25	71,4%
Knowledge	Technological knowledge	46	21	60,0%
Problems	Balance different needs	31	20	57,1%
Problems	Financial resources	36	20	57,1%
Problems	Government-related	58	24	68,6%
Problems\Implementation	Implementation of policies	29	17	48,6%
Problems\Implementation	Rift knowledge-action	23	19	54,3%
Problems	Lack of understanding	33	19	54,3%
Problems	Other problems	39	24	68,6%
Problems	Scientific uncertainty/time issue	3	3	8,6%
Problems	Skepticism	13	8	22,9%
State of governance	CDM and PPPs	9	7	20,0%
State of governance	Company activity	59	24	68,6%
State of governance	Local policy process	12	10	28,6%
State of governance	National policy process	81	29	82,9%
State of governance	Provincial policy process	26	17	48,6%

Appendix VI: Indicators of the Climate Competitiveness Index



Source: AccountAbility (2010): The Climate Competitiveness Index 2010: National progress in the low carbon economy. Technical Report, page 10.

Appendix VII: Characterization of changes in governance regimes for loop-learning

Source: Pahl-Wostl 2009, page 360(slightly shortened).

	Singe-loop	*Double-loop*	*Triple-loop*
Institutions-general	No calling into question of established institutions	Reinterpretation of established institutions by many parties	Established institutions changed and/or new institutions implemented
Regulative institutions	Existing regulations are strictly followed and used to justify established routines	Regulatory frameworks identified as major constraints for innovation	Formal substantial changes in regulatory frameworks, new policies implemented, institutional changes towards flexible regulations; process regulations
	New by laws and interpretations of existing law to accomodate exceptions	More conflicts about rule intrepretation	
Normative institutions	Established norms are used o justify prevailing system; relying on good practices	Established norms and routines called into question	Change which can be identified in public discourse and new practices
Cultural-cognitive institutions	Discourse remains in established paradigms that are refined; radical alternatives clearly dismissed	New ideas emerge beyond isolated groups; strong arguments about alternative views	Discourse dominated by new paradigm (media, public hearing, politica debate, scientific conferences); powerful representation of „mainstream“ argue in new paradigm
Uncertainty	Used to justify non-action; activities to reduce uncertainties, reliance on science to find the truth/solution	Uncertainty accpeted, preceives as opportunity; existence of different perspectives and world views explicitly acknowledged	New approaches to manage uncertainty and risk are implemented with correpsonding efforts to change structural constraints
Actor networks	Actors reamain mainly within their networks/communities of practice; established roles and identities not called into question	Explicit search for advise from actors outside the established network; new roles emerge, arguments about identity frames; boundary spanners increasingly important that start to connect different networks – communities of practice	Changes in network boundaries and connections; new actors and groups have become established; changes in power structure; identitity franes and roles blurred, rather joint approaches than isolated performances
Multi-level interactions	Vertical coordination in established patterns; pattern of flow of authority does not change	Increased informal knowledge-eschange between levels; informal coordination groups to improve exchange in planning processes established	Formalized participation of actors at different levels; steablished practices of knowledge exchange across levels; more polycentric structures and balance between bottom-up and top-down approaches
Governance mode	No change in the relative dominance of governance types	Other governance types start to become more visible and dominant type is called into question	New governance types implemented, established governance types substantially changed
	Improvement of performance within established governance modes	Informal networks shaping discoutse and supporting experimental innvoations becomre more prominent	More diverse governance structures, less dominance of one typel; learning networks challenging dominant structural assumptions become connected to established policy arenas

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