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**Policy networks and belief systems: the drivers of cooperation in international  
climate change politics 2001-2014**

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# Policy Networks and Belief Systems

The drivers of Cooperation in International Climate Change Politics 2001-2014

Marlene Kammerer & Christian Hirschi

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## Abstract

In this paper, we analyze the drivers of political cooperation in international climate change policy-making. Specifically, we are interested in the stability and alteration of network features, policy-relevant belief structures and actor constellations over time as key drivers for cooperation in international climate change politics. Although nation states undoubtedly continue to remain the main actors in international climate change policy-making, we argue that the international climate change policy field today resembles a policy subsystem, a concept usually assigned to domestic policy arenas, involving a wide range of different types of actors (state and non-state actors from various levels) who regularly seek to influence policy choices around the climate change issue. To analyze and understand policy processes in the international climate change policy subsystem, we apply the Advocacy Coalition Framework (ACF). In doing so, we break new theoretical grounds as former applications of the ACF usually focus on domestic policy processes in Western Europe and North America. In line with most recent applications of the ACF outside this regional focus and with a particular emphasis on foreign policy issues, we further extend the theoretical scope of the ACF and explore the framework's potential to better understand the policy process on a global policy issue such as climate change. In addition, to answer a common critique of the ACF we also include structural characteristics of the subsystem as driving forces for cooperation in our analysis. Empirically, we use political event data analysis to collect and systematize information on the international climate change policy process in a long-term perspective. Event data describes interaction patterns between various kinds of actors over time by encoding who did what to whom and when. In addition, we code for all the actors their key policy preferences and understand them according to the ACF as a function of underlying belief systems. Methodically, we apply a time dynamic network model (Temporal Exponential Random Graph Model, TERGM) that allows for a systematic testing of hypotheses on how and why network features, policy-relevant belief structures and actor constellations have evolved over time.

Keywords: Climate change, policy networks, belief systems, cooperation, Advocacy Coalition Framework

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## 1 Introduction

Global warming is a problem of global scale, and today there is a significant scientific and political consensus about its causes and threats. Often, these threats are not tangible, immediate or visible, and distributed asymmetrically across the globe (Giddens, 2011). In addition, the common-pool resource characteristic of the global climate and the high diversity of interests across nation states hamper an agreement on the right *modus operandi* to tackle the issue of a warming climate. Thus, to decide who should do what to mitigate climate change and to adapt to its consequences remains a challenging task even after 20 years of negotiations.

The late 1980s and early 1990s saw the emergence of successful international environmental regimes such as the Montreal Protocol to protect the ozone layer. This triggered an academic literature about the formation, design and effectiveness of such regimes (Breitmeier et al., 2006; Miles et al., 2002; Mintzer & Leonard, 1994; Schröder, 2001). In the case of global climate change, political cooperation continued to be extremely difficult. Correspondingly, political science research focused on explaining cooperation hindrances with classical rational choice arguments such as the collective goods problem (Grundig, 2009; Grundig et al., 2001; Ward, 1996) or the dilemma between long-term goals and short-time interests (Sprinz & Vaahoranta, 1994). Recently, a growing literature on narrative country positions in the UN climate negotiations analyzes the relationship between the evolution of country groups and their respective positions on key issues and how this affects the outcomes of climate negotiations (Betzold et al., 2012; Blaxekjær & Nielsen, 2014; Brenton, 2013).

However, a narrowly-focused perspective on global climate change politics that only looks at the United Nations (UN) negotiation process falls short of reality. Today, the global climate regime resembles a “regime complex” (Keohane & Victor, 2011) segmented into multiple levels of policy-making and fragmented into a large number of institutions and arrangements. Thus, in line with the appearance of the multi-level governance (MLG) concept (for example Bache & Flinders, 2004; Cairney, 2012; Jörgens & Jänicke, 2004), manifold studies investigated global climate change politics from the perspective of collaboration of multiple actors (horizontal governance) across multiple levels (vertical governance) (Bättig & Bernauer, 2009; Betsill, 2008; Betsill & Bulkeley, 2006; Bulkeley et al., 2014; Gough & Shackley, 2001; Granberg & Elander, 2007; Lidskog & Elander, 2010; Nevell, 2002; Schroeder & Lovell, 2012).

Despite this already broadened perspective on global climate change politics, little is yet understood about the political processes beyond the UN climate negotiation process. We argue that,

substantial cooperation in the global climate change domain mostly happens outside the scope of the United Nations Framework Convention on Climate Change (UNFCCC), while the UN climate negotiations are in large parts symbolic action only. Therefore, in this study we focus on material cooperation between political actors that happens outside the UNFCCC and ask the following research question: What cooperation patterns can be observed in the global climate change policy domain, on what basis do they emerge, and what makes cooperative relationships endure? To answer this question we take in the perspective of the political process. This allows us to consider both actor-specific and structural drivers of political cooperation in the global climate change policy domain.

To analyze this relationship, we use the Advocacy Coalition Framework (ACF) (Sabatier & Weible, 2007) as theoretical background, which provides us with two concepts helping us to describe, analyze, and understand the drivers of political cooperation: policy subsystems and policy-specific beliefs. On the one hand, the policy subsystem concept serves us to define the unit of analysis. Although nation states undoubtedly continue to remain the main actors in global climate change policy-making, we argue that the global climate change policy domain resembles a policy subsystem that involves a wide range of different types of actors (state and non-state actors from various levels), who regularly seek to influence policy choices around the climate change issue. On the other hand, the ACF provides the concept of policy-related beliefs, which are presumed to be the “principal motivator” for or “causal driver” of political behavior (Weible et al., 2009, p. 122).

However, the ACF does not offer theoretical considerations about structural factors that explain cooperation. In this regard, policy networks (Adam & Kriesi, 2007; Knoke, 2011) are a useful theoretical and analytical tool. Firstly, they allow us to disentangle political processes in a combined perspective of networking structures among involved actors and actor-specific characteristics such as policy beliefs. Secondly, they enable us to “describe the patterns of interaction among actors working [in] a particular (...) decision-making process” (Henry, 2011, p. 361).

Data-wise, we use political event data that systematizes information on the international climate change policy process between 2001 and 2014 to create a network of interactions between state and non-state actors. This enables us to analyze actor constellations in the form of networking structures. To test hypotheses on how policy-specific beliefs influence the formation, duration or dissolution of cooperative relationships, we collected data on policy-relevant beliefs and systematized them in the accordance with the ACF belief system. Methodically, we apply a temporal exponential random graph model (TERGM) (Hanneke et al., 2010). In a nutshell, these kinds of models enable us to

investigate the formation of cooperative relationships over time by including parameters reflecting how previous realizations of collaboration structures determine current cooperation patterns.

In the next section, we briefly outline the key milestones of international climate change politics since 2001. Section three is devoted to the development of our theoretical argument, the formulation of hypothesis and the adaptation of the ACF beliefs system to the purposes of global policy domain. After describing data and methods in section four, the remainder of the paper covers the analysis, interpretation and discussion of our results in the light of the previously formulated research hypothesis.

## 2 International Climate Change Politics

Since the adoption of the UNFCCC in 1992, international climate change politics has been characterized by intense negotiations to find a global, legally-binding climate protection agreement. The Kyoto Protocol, adopted in 1997, was the first legally-binding climate protection agreement aiming to limit the emission of greenhouse gases (GHG) in a first commitment period from 2008 to 2012. However, it was targeted to industrialized countries only, so-called Annex I countries, and was thus very limited in scope. Also, not all countries listed in Annex I effectively ratified the protocol and sanction mechanisms to control for compliance were rather weak.

The international climate negotiation process reached its peak in 2007 (Blühdorn, 2012). At that time enthusiasm and public awareness were high, due to the release of the fourth IPCC assessment report (International Panel for Climate Change, IPCC, 2007), the Stern Review on the economics of climate change (Stern, 2006), and the IPCC and Al Gore winning the peace nobel price. Spurred by this enthusiasm the international community agreed on the Bali roadmap for post-Kyoto negotiations paving the way for an international climate treaty superseding the Kyoto Protocol. In this context, great hope in “the battle against global warming” (Blühdorn, 2012, p. 11) was linked to the UN climate conference in Copenhagen (COP 15) in 2009. The conference was the final stage of two years of negotiations, but instead of producing a convincing strategy and binding targets, the conference revealed “insurmountable discrepancies of interests between negotiation partners” (Blühdorn, 2012, p. 11). The Copenhagen summit ended with the Copenhagen Accord, a one-paged non-binding declaration on the intention to continue international climate policy efforts. Although the international community continued to negotiate in the following years, the discrepancies among the involved parties remained more or less unresolved. These issues included important topics such as setting targets for the maximum global temperature increase, finding the level of carbon

concentrations in the atmosphere, determining country targets, and agreeing on the responsibilities and capabilities of developed, emerging and developing countries. Finally, in 2012, the Kyoto parties agreed last-minute on launching a voluntary second commitment period from 2013 to 2020 (Doha Amendment). However, until today only 18 countries have ratified the amendment. Hence, it does not fill the gap left by the end of the first commitment period.

The “Copenhagen disaster” (Blühdorn, 2012) seriously damaged the UN climate process, but vibrant political endeavors can be observed that go beyond the UNFCCC (Dimitrov, 2010). In example, in recent years an increasing number of countries have started to introduce national climate protection policies or are engaged in some kind of cooperation outside the UN negotiation process. In this context, we argue that global climate change policy is not only about the international negotiations that take place within the UN framework, but also driven by fragmented political processes manifested in political cooperation or dissent happening in the scope of multiple, bi- and multilateral arrangements, on regional or national level, as well as between different kinds of actors such as nation states, intergovernmental organizations (IGOs), non-governmental organizations (NGOs), scientific networks, transnational networks, private actors or supranational jurisdictions. In this regard, the global climate change domain can no longer be seen as the sheer result of UN focused international agreements that are implemented top-down on national level, but as a segmented policy domain (Biermann, 2006; Biermann et al., 2009) characterized by interlinkages between different parallel policies and regimes that are embedded in a multilayer and multi-actor governance system.

### **3 Cooperation in the Global Climate Change Policy Domain**

The Advocacy Coalition Framework (ACF) is a theoretical approach designed to describe, analyse, and understand political processes, the behaviour of actors therein, as well as the conditions for policy change. Here, the political process is characterized by the competition between different coalitions of political actors that advocate their beliefs about a specific policy problem (Sabatier & Weible, 2007; Sabatier & Smith-Jenkins, 1999). These political processes take place within the topical and geographical boundaries of a policy subsystem, which comprise of both competing and allied political actors from a wide range of different types such as state actors, interest groups, NGOs, academics, or media (Henry et al., 2014).

Important drivers of the political process are shared policy-specific beliefs on the basis of which they “develop enduring relationships” (Orr, 2006, p. 152) and the underlying structure of the respective policy subsystem. However, the ACF has been widely criticized for neglecting structural

considerations such as the logic of collective action mechanisms (Weible et al., 2011). An increasing number of ACF applications responded to this critique by including both shared beliefs and shared patterns of coordination into the analysis (e.g. Weible & Sabatier, 2005).

In the international relations literature, structural drivers of cooperation are the focus of manifold studies. Cooperation is here defined as the adjustment of a political actor's behavior to the "actual or anticipated preferences of others, through a processes of policy coordination (...)(Milner, 1992, p. 467). This implies that cooperation is not only driven by actor specific characteristics, but also by the anticipated cooperative (or non-cooperative) behavior of actor. In this regard, cooperation is a matter of rational choice and game theoretic considerations such as absolute or balanced gains, or structural considerations about the number of players, interdependencies between states, or the role of international regimes. In this context, Institutionalism, Transnationalism, or Regime Theory have developed hypotheses about cooperative behavior (Keohane & Nye, 1977). The core hypothesis of all these approaches states that a higher degree of institutionalization, interdependence, or transnational intertwining increases the likelihood of international peace and cooperation due to amplified trust and an improved mutual understanding of the motivation for specific behavior and preferences. This mitigates the perils of international anarchy (Schimmelfennig, 2013, pp. 89 - 137).

For our analysis this implies two things: Firstly, we use policy networks as an analytical framework as they allow us to include both actor-specific and structural drivers of cooperation. Policy networks offer a useful "analytical toolbox" (Adam & Kriesi, 2007, p. 146) to analyze political processes. They allow describing and analyzing governance processes in the absence of a central steering authority. Thus, the analytical value of policy networks lies in the fact that they conceptualize "policy making as a process involving a diversity of actors who are mutually *interdependent*" (Adam & Kriesi, 2007, p. 146). Secondly, we take in a longitudinal perspective, as this enables us to study the formation of cooperative relationships over time as a function of anticipated behavior of other political actors involved in the policy network.

### *The ACF and the Global Climate Change Domain*

Traditionally, the ACF is applied in the scope of domestic politics. Nonetheless, we argue that it is possible to stretch the framework beyond its traditional scope and use it to describe, analyze and understand political processes at global or international level. In doing so, we contribute to a growing body of literature that employs the framework outside of the geographical boundaries of North America and Western Europe. Only few of those applications emphasize global (Farquharson, 2003), or foreign policy issues (Hirschi & Widmer, 2010; Pierce, 2011). With respect to climate change

politics, there are two studies outside the domestic realm. However, they are not truly global or international, as they either investigate the policy process along “the domestic-foreign frontier” by including international aspects into the analysis of the domestic process (Litfin, 2000, p. 236) or investigate overlapping political processes at international, national and subnational levels. We continue and extend this previous work by analyzing cooperative patterns in the context of global climate change politics.

One of the key arguments of this paper is that the global climate change policy domain resembles a policy subsystem, as it is defined by territorial boundaries (global) and comprises of a relatively stable set of participants. Earlier research underpins this argumentation. For example, Orr (2006) finds a stable participation of representatives from nation states and non-nation state actors that are both actively concerned with the climate change issue and bring expertise into the political process. Sewell (2005) comes to a similar conclusion, but argues from the perspective of international regimes: International diplomacy or decision-making often aims at negotiating some kind of explicit principles, norms and rules as basis for international agreements, treaties, or regimes. These international bodies and arrangements have functional and territorial components forming more or less autonomous communities with a particular domain of expertise and include a wide range of actors – including national delegations, IGOs, NGOs, and the media. Hence, decision-making at international level can be considered as similar to public policy formulation processes at national and subnational levels.

#### *Actor-specific Drivers of Cooperation*

Policy-relevant beliefs are the “principal motivator” for or “causal driver” (Weible et al., 2009, p. 122) of political behavior, as they build the foundation on which policy choices are made. To be able to influence policy outcomes around a specific domain, participants of political process cooperate and identify allies on the basis of shared beliefs and form stable coalitions – so-called advocacy coalitions. Each participant holds an actor-specific belief system that consists of deep-core beliefs (fundamental and normative axioms), policy-core beliefs (fundamental policy positions concerning the basic strategies for achieving core values within the subsystem), and secondary aspects (instrumental decisions and information necessary to implement the policy core) (Sabatier & Smith-Jenkins, 1999). In particular, deep-core and policy-core beliefs are pre-existing beliefs that are difficult to alter, whereas secondary aspects are more instrumental and may change frequently. In the realm of public policy, it has been already convincingly shown that shared beliefs are a major driver for collaboration between actors (e.g. Ingold & Fischer, 2013 for a study on collaboration patterns in Swiss climate

mitigation policy). Correspondingly, we hypothesize that in the global climate policy domain shared beliefs are major driving forces for the formation of cooperative ties between political actors. Thus:

*H1: Participants in the global climate change policy domain more likely cooperate with those sharing the same policy-related beliefs than with others that advocate dissimilar beliefs.*

Moreover, since policy core beliefs are “very resistant to change, the line-up of allies and opponents within a subsystem will remain stable over time” (Sabatier & Smith-Jenkins, 1999, p. 123) and only change in presence of some kind of change promoting factors such as internal (e.g. policy failure) or external subsystem events (e.g. changes in socio-economic conditions, outputs from other subsystems or disaster), policy oriented learning or negotiated agreements. This implies that cooperative relationships once being established have a tendency to be stable over time in the absence of significant disturbances to the policy subsystem. Change promoting factors may result in an alteration of belief structures and thus affect coalitions and cooperation structures. Therefore, we put forward the following hypothesis:

*H2: Participants of the global climate change subsystem have a tendency to engage in enduring cooperation in particular when they share similar policy-specific beliefs.*

### ***Structural Drives of Cooperation***

Reciprocity, transitivity, and structural balance are network effects describing patterns of interdependent social behavior between actors in any kind of network. Therefore, they are suitable to describe and analyze the formation and endurance of cooperative relationships. Reciprocity describes the degree to which an actor has mutual connections to other actors. According to network analysts any social relation shows a tendency for reciprocation (Wasserman & Faust, 1994; Chapter 13). International relations literature, on the other hand, still disagrees about whether reciprocation increases cooperative behavior over time (Goldstein & Jon, 1997; Goldstein et al., 2001; Keohane, 1986). Transitivity (Wasserman & Faust, 1994; Chapter 6) reflects whether actors tend to cooperate with partners of partners. A positive tendency for transitivity in the global climate policy subsystem would imply that political actors tend to build cooperation clusters according the cooperative behavior of their cooperation partners. Structural equivalence is closely related to transitivity (Wasserman & Faust, 1994; Chapter 9). It describes the tendency to form cooperative relationships with others making similar choices. This tendency has always been an important element of international relations theory explaining the non-desirable behavior of states to build equivalent blocs in particular in the cases of international crisis (Hirschi, 2011; Maoz et al., 2006). For global climate

change politics this would mean that rather homophile blocs of negotiation parties are confronting each other. This would run contrary to reaching a universal climate regime.

## 4 Data & Methods

It is the concept of subsystems where we can link the ACF to the idea of policy networks. While subsystems are defined by the policy domain (here *climate change* policy) and the geographic scope (here *global* climate change policy), policy networks are usually located within policy subsystems and comprise of the very same set of political actors that actively attempt to gain influence over policy outcomes (Henry, 2011). In network terms, these actors can be understood as nodes with the ties between them expressing the specific type of relationship such as collaboration, trust, resource exchange, etc. In *consequence*, each policy subsystem hosts as many policy networks as kinds of relations among its actor's exist.

For the purpose of our analysis, we used political event data analysis to gain information about the configuration of the global climate change policy subsystem. In general, event data can be used to collect and systematize data on political processes in a long-term perspective. It describes interactions patterns between political actors over time by encoding their participation in an event. In a nutshell, event data breaks down complex processes into a series of single events and so captures “who did what to whom when”. Thus, the event data set consists of the date of an event, the initiating political actors (the source), the targeted actor (the target), and the type of political action (event type) (Hirschi, 2009). The basis for event data sets are text sources such as news reports or archival records. These text resources are coded in a systematic way “by converting natural language into nominal and ordinal data” (Hirschi, 2009, p. 91). Coding rules for identifying actors and events are formulated in encompassing codebooks (for events and actors) and dictionaries (Schrodt, 2011, 2012). Today, event data coding is done via machine coding. After an initial manual training phase of the coding software, massive amounts of text can be coded via within seconds. Machine coding does not only bring advantages over manual coding in terms of time efficiency, but assures inter- and intra-coder reliability, since coding rules are applied with complete consistency and are not subject to differences between individual coders, fatigue, deviant interpretations or biases concerning the text sources (Schrodt, 2011; Schrodt & Gerner, 1994, 2004).

Strength and weaknesses of event data for empirical analysis have been comprehensively discussed in the literature {Gerner, 2002 #823}{Huxtable, 1986 #833}{King, 2003 #834}{Schrodt, 1994 #815}. A most common limitation of event data is their dependence of the media coverage of an issue

creating a bias in favor of high-level interactions. While interactions between more prominent actors and less technical topics usually receive high media attention, interactions between less prominent actors and more technical topics, for instance during multilateral meeting or negotiations at expert level are less well covered.

### *The POLCLIMATE Event Data Set*

We used the POLCLIMATE (Politics on Climate Change) event data set (for more info on and applications of the data set compare Hirschi, 2008, 2011) that identifies political events between international political actors based on news reports from Agence France Presse (AFP). As AFP has rather frequently reported on international political events on the climate change issue throughout the last decade, it provides a rich data source for monitoring and analyzing the international politics of climate change (Hirschi, 2011). For this study we updated the data set until 2014. The current version of the POLCLIMATE data set was coded and updated with the Penn State Event Data Project using the software TABARI (Text Analysis by Augmented Replacement Instructions, Schrodtt, 2011) and covers mainly international events on the issue of global climate change for the period from 1 January 2000 to 31 December 2014.

Event types were coded according to the “Conflict and Mediation Event Observations (CAMEO)” (Schrodtt, 2012) system. To identify the type of an international political nominal codes are assigned to each coded political event (see table 8 in the Appendix). Following (Schrodtt & Gerner, 2004) we aggregated political events into five event categories: verbal cooperation, material cooperation, verbal conflict, material conflict, and mediation and negotiation (compare table 1).

**Table 1: Event Category Aggregations for Climate Politics**

Category	CAMEO Events
Verbal Cooperaton (vercp)	Cue Categories 010 & 020, 022, 040 -044
Material Cooperation (matcp)	Cue categories 03, 05, 06, 07, 08 & 21,23,211-214,231-234
Verbal Conflict (vercf)	Cue categories 09, 10, 11
Material Conflict (matcf)	Cue categories 12, 13, 14, 15, 16, 17, 18, 19, 20
Mediation and Negotiation (meneg)	025 - 028, 035 - 039, 045 – 046, 105-108

Based on Schrodtt and Gerner (2004: 315) and Hirschi (2008) with categories adjusted by the authors.

As event data describes interaction patterns between political actors over time, the dyadic event data can be aggregated into network panel data generated by transforming it into a one-mode actor-actor matrix. Every coded event can be understood as a tie - a cooperative or conflictive relation –

between a pair of political actors (nodes). As the event data set distinguishes between sources and targets the resulting political network is directed.

Before transforming the relatively continuous stream of political events (Hirschi, 2011) into panel network data, we distinguished meaningful phases describing particular stages in the development of global climate politics between 2001 and 2014 (compare table 2 for an overview on the phases). This allows us to observe gradual changes of the political network. We aggregated the POLCLIMATE data set into three subsequent phases (network stages), each of which capturing a time period of about 4 to 5 years. We delimited each period according to important institutional and political developments of global climate change politics.

**Table 2: Overview table Network Stages 2001 - 2014**

Stage	Milestone 1	Milestone 2	Start	End
t <sub>1</sub>	Marrakesh Accords, 3 <sup>rd</sup> IPCC report;	Kyoto protocol enters into force 16 February 2005	01.01.2001	28.02.2005
t <sub>2</sub>	UNFCCC COP 11/ CMP 1 Montreal, first meeting of the KP parties	UNFCCC COP 15 Copenhagen Accord (Copenhagen Disaster)	01.03.2005	31.12.2009
t <sub>3</sub>	UNFCCC COP 16 Cancun Agreements	UNFCCC COP 20 Lima	01.01.2010	31.01.2014

The first network stage (t<sub>1</sub>) spans from 2001 to early 2005. It is characterized by negotiations concerning the ratification of the Kyoto Protocol and starts with the release of the IPCC's Third Assessment Report, the adoption of the Marrakesh Accords in 2001 and the US pullout from the Kyoto Protocol. The Marrakesh accords set the rules for implementing the Kyoto Protocol and details the flexibility mechanisms (Betzold et al., 2012). The phase ends with the entering into force of the Kyoto Protocol on 16 February 2005. This first period is "strongly shaped by disagreements between highly advanced economies on the one side (in particular the EU) and emerging economies such as India and China on the other side, but also between the US and the EU, on the definition of the climate crisis and appropriate measures to address it" (Hirschi, 2011, p. 12). The predominant key principle are the North-South divide and the principle of "Common – but Differentiated Responsibilities and Respective Capabilities (CBDR/RC)" that distinguishes between Annex I countries (with greater historical responsibility and capability to combat climate change) and non-Annex I countries with relatively less (or no) such responsibility or capability to combat climate change (Blaxekjær & Nielsen, 2014).

The second stage (t<sub>2</sub>) spans from March 2005 until the end of 2009. The most important issues during this time were to implement the Kyoto Protocol and to negotiate its successor. With respect to

the institutional framework conditions three important milestones must be named: the adoption of the Bali Road Map in 2007, which paved the way for a post- 2012 agreement; the release of the IPCC's Fourth Assessment Report in 2007, which brought the climate change issue on top of the international agenda; and great enthusiasm among the Parties ahead of COP 15 in Copenhagen with respect to agreeing on a new international legally-binding agreement and a second commitment period of the Kyoto Protocol. However, the high expectations were not met. The Copenhagen Accord drafted at COP 15 was not taken note by the COP, but countries only submitted non-binding emission reduction pledges or mitigation action pledges at a later point of time. In general, the phase starts off with high political and public attention towards the climate change issue as a result of the release of the fourth IPCC report and former US Vice-President and environmentalist Al Gore winning the Nobel Peace Prize in 2007 (Hirschi, 2011). It ends with disappointment and resignation about the "Copenhagen disaster" (Blühndorn, 2012, p. 8). Similar to the previous phase there is a static North-South divide between countries positions, with developing countries and emerging economies seeing themselves as having little (or no) responsibility as well as capability to combat climate change.

Stage 3 (t<sub>3</sub>) spans from 2010 to the most recent developments in 2014. It starts with the adoption of the Cancun Agreements, which advanced important mechanisms such as the Green Climate Fund, the Technology Mechanism and the Cancun Adaptation Framework. Despite the failure of the Copenhagen conference in 2009, countries continued negotiating with the goal to achieve a legally-binding international treaty that is applicable to all Parties and comes into effect from 2020. Negotiations on the design of the agreement mainly take place under the Ad hoc working Group on the Durban Platform for Enhanced Action (ADP). Its main goal is to reach progress towards implementing clear mitigation contributions by all Parties and assisting Parties to adapt to a changing climate (Blaxekjær & Nielsen, 2014). The time after COP 15 brought a proliferation of institutions and arrangements under the umbrella of the UNFCCC. Moreover, it also brought a call for reinterpretation and questioning of the UNFCCC key principles, as well as a rearrangement of country groups (Blaxekjær & Nielsen, 2014; Brenton, 2013). The divide is now between three main antagonistic camps. The emerging powers stick to the key principle of CBDR/RC and the North-South divide. They demand that industrialized countries must carry the heavier burden, as they are historically responsible and relatively more capable in combatting climate change. Alongside with a broad range of vulnerable (least) developing countries the EU presses for sharp emission reduction and calls for joint action of all involved countries. In this perspective, all Parties, but in particular industrialized and emerging economies must take action. Finally, the USA and other developed nations such as Russia and Canada are more reluctant in terms of legally-binding emission reductions.

In sum, the period after COP 15 led to the emergence of a new political landscape with a rearrangement of political actors and their positions as well as a “trend of increasing complexity and fragmentation” (Blaxekjær & Nielsen, 2014, p. 11) of institutions and actors groups.

### *The Adjusted Belief System*

To operationalize ACF belief system concept for a global policy domain, some theoretical adaptations have to be done. So far there is only little research in this area. Only Sewell (2005) followed a promising approach and adapted the beliefs system for the purposes of international climate change politics. However, his version of an international belief system as well includes aspects of domestic policy processes, as he focuses on when, how and why national and international policy subsystems overlap. We took Swell’s study as well as other studies employing the ACF outside its traditional scope as starting point for the adjustment of the belief system. On this basis, we reformulated the belief system in accordance with the specific requirement of a global policy domain. Next, we formulated climate change policy-specific beliefs by consulting the relevant literature in the field (Bernauer, 2013; Betzold et al., 2012; Blaxekjær & Nielsen, 2014; Brenton, 2013; Dröge, 2010; Giddens, 2011; Hallding et al., 2013; Sewell, 2005). In a next step, we further condensed the belief system to three key questions that continue to be virulent for the global climate change issue and cover the most important beliefs. Compare table 7 in the Appendix for the adjusted ACF belief system for the global climate change policy domain.

1. Who is responsible and capable to tackle global climate change?
2. Is climate change a real threat and if so, is it induced by human activity?
3. How are the risks and impacts of climate change assessed?
4. What are the most important policy objectives and with what kinds of instruments should they be assessed?

In line with these questions, we identified four variables that, taken together, cover the most important policy core beliefs and secondary aspects: fundamental position towards the distribution of responsibilities and capabilities of countries (**responsibility**), fundamental position towards causes of climate change (**causes**), fundamental position on how climate change related risks are assessed (**impacts**), and position on the most important policy objectives and instruments (**instruments**). With respect to the operationalization of the variables, we developed an encompassing coding framework defining variable categories. To increase inter- and intra-coder reliability, we formulated explicit coding rules and provided text examples for each category (compare table 6 in the Appendix for the complete coding guideline). The guideline was developed in line with previous work on the issue (in

particular Sewell, 2005) and in the scope of a pilot coding phase. In the pilot coding phase, we coded a number of countries representing all important country groups - that is developed countries, emerging economies, developing countries, least developed countries and small island developing states (SIDS) – for all three network stages. As a result, the belief system data set contains three subsets – one for each network stage.

As data source we used statements made by high-level country representatives and observer organizations (High-level segment statements by Heads and Governments and Observer Organizations) at selected UNFCCC Climate Change Conferences of the Parties (COPs). We selected those COPs that best reflected the overall characteristics of the respective period. Specifically, we coded COP 16 (Cancun Climate Change Conference) and COP 20 (Lima Climate Change Conference) for phase 3, COP 13 (Bali Climate Change Conference) for phase 2, and COP 9 (Milan Climate Change Conference) for phase 1<sup>1</sup>. Whereas earlier statements are partially available in written form, in the majority of cases we relied on webcasts of the Joint High-Level Segments at the respective COPs.<sup>2</sup>

#### *Temporal Exponential Random Graph Model Using Bootstrap (BTERGM)*

The pivotal difference of network analysis to regression analysis lays in the consideration of network dependence structures. Thus, to test our hypotheses we set up an inferential network model that is designed to model network dependencies over time. For this purpose, we apply a temporal exponential random graph model (TERGM) (Hanneke et al., 2010). As the name indicates, this model type belongs to the family of exponential random graph models (ERGMS) (Lusher et al., 2013). The main purpose of the ERGM family is to model the process of network tie formation. The presence of a tie between two nodes can be explained by nodal attributes, dyadic attributes or structural network characteristics. Thus, the explicit aim is to incorporate possible dependencies between nodes. TERGMs are extensions of ERGMS for modelling inter-temporal dependencies between the same network, observed at different discrete points of time. This is realized by including parameters into the model reflecting the ways in which previous realizations of the network determine current features of the network (Leifeld et al., 2015a). Alike cross-sectional ERGMS, TERGMS allow for

<sup>1</sup> Data for COP 9 must still be collected. For the purpose of this analysis we assumed that beliefs do not change between phase 1 and 2. This assumption is acceptable, as phase 1 is dropped in the time dependent model.

<sup>2</sup> All written and audiovisual statements are available on the individual COP meeting websites hosted by the UNFCCC .

For COP 20: [http://unfccc.int/meetings/lima\\_dec\\_2014/meeting/8141.php](http://unfccc.int/meetings/lima_dec_2014/meeting/8141.php).

For COP 16: [http://unfccc.int/meetings/cancun\\_nov\\_2010/meeting/6266.php](http://unfccc.int/meetings/cancun_nov_2010/meeting/6266.php).

For COP 13: [http://unfccc.int/meetings/bali\\_dec\\_2007/meeting/6319.php](http://unfccc.int/meetings/bali_dec_2007/meeting/6319.php).

For COP 9: <http://unfccc.int/cop9/>.

incorporating both exogenous covariates (nodal attributes) and endogenous dependencies (network structures).

In this study, we estimate our model by using bootstrap methods with estimation via maximum pseudolikelihood. In doing so, we follow the recommendations of Leifeld et al. (2015a). They regard this approach as preferable to maximum likelihood estimation based on Markov dependence assumptions (MCMC MLE) as applied in separable temporal exponential random graph models (STERGM, Krivitsky & Handcock, 2014). The drawback of STERGMs is the strong assumption of conditional independence of tie formation or dissolution across time. In other words, whether ego cooperates with alter does not depend on their status of cooperation at previous times. In our case this is highly unrealistic. Using the bootstrapping approach allows us to model time dependencies by conditioning on previous realizations of the same network.

## 5 Analysis and Discussion

### *Exploratory Analysis*

*Visualization* of the global climate change policy network over time suggests that the subsystem got larger and denser in  $t_2$  as compared to  $t_1$  (compare figure 3 in the Appendix for the respective graphs). In 2007, the high awareness of the climate issue triggered cooperative relations and motivated more and more actors to actively take part in the political process. However, the high expectations towards the Copenhagen climate conference in 2009 were not met, considerably abating cooperative behavior. This development seems to be also reflected in the data, since in  $t_3$  density and size of the policy network declined again. These first findings are supported by measures of network cohesion and centralization (compare table 3).

**Table 3: Measures of Network Cohesion**

Stage	Centralization (Degree)	Degree (Betweenness)	Average Degree	Transitivity	Reciprocity
$t_1$	0.31	0.23	6.04	0.29	0.55
$t_2$	0.37	0.20	8.89	0.32	0.63
$t_3$	0.22	0.18	5.53	0.24	0.47

*Density* is the simplest measure of network cohesion. It can be interpreted as the probability of a tie existing between any pair of randomly chosen nodes. Densities were very low in all three stages. In  $t_1$  less than 8% of the possible cooperative ties were realized; in  $t_2$  and  $t_3$  the values even declined to 6%. This suggests that most political actors have not developed or sustained cooperative relationships.

Density cannot be compared between networks without problems, as it is dependent on the number of the nodes present in each stage of the network (Borgatti et al., 2013, pp. 150-155). A better concept to compare network cohesion across the stages it is *average degree*. In fact, the average degree rose from approximately six ties in  $t_1$  to about nine ties per node in  $t_2$ . In  $t_3$  the average number of ties per node decreased to less than six nodes per tie again. The number of cooperative relationships augmented after 2005 not only due to the larger number of parties involved, but also due to an enlarged cooperation of already active actors.

The results for *transitivity* and *reciprocity* both point to a rather non-hierarchically structured network. Transitivity measures the probability that adjacent nodes are connected. This is also referred to as network clustering. Reciprocity reflects the rate to which the receivers of cooperative ties also send them back. Increased values of transitivity and reciprocity in  $t_2$  indicate slightly intensified cooperation between 2005 and 2008. On an overall level, however, transitivity was rather low, as only about 30% of adjacent nodes were connected. This suggests low levels of network clustering. Ties were reciprocated by about 55 percent in  $t_1$ , by about 63 percent in  $t_2$ , and by about 47 percent in  $t_3$ . Thus, there seems to be a considerable degree of horizontal connection within the global climate change policy subsystem. Similarly, relatively low levels of degree and betweenness *centralization* in all three network stages suggest that the global climate change policy network was non-hierarchically structured.

The analysis on the level of political actor reveals that few actors were intensively engaged in cooperative action. All three time phases showed a strongly right-skewed degree distribution (compare figure 4 in the Appendix). Thus, only few actors had many cooperative ties, but many actors had few cooperative ties. This is also supported by the values of nodal centrality statistics such as degree, betweenness or eigenvector centrality (Borgatti et al., 2013). Degree centrality is a measure for the activity of an actor. Betweenness centrality expresses how intermediate an actor is in the network. It is based on the frequency with which a node falls between pairs of other nodes on their shortest geodesic paths. High betweenness centrality suggests that a node exhibits a high potential to control relationships between others. Eigenvector centrality measures the centrality of a node in relation to the centrality of his neighbors. Thus, ego gets stronger when he is connected to strong alters. Overall, in all network stages political actors have rather low values of degree and betweenness centrality. This is in line with above results: Although there were several actors with considerably higher centrality statistics than the rest of the network, there were no single high activity or influence hubs that have the power to control the network. In  $t_1$  climate change politics was mainly

an issue among a small number of industrialized countries, the EU and the UNO. However, in  $t_2$  the picture got more diversified. Now China ranged among the most active participants together with other major economies. In addition, actors from science and environmental movements played an increasingly important role. Finally, other emerging economies such as India and Brazil started to engage in material cooperation. In  $t_3$ , the number of cooperative relationships decreased visibly, but the configuration of higher-degree actors remained more or less unchanged. Now a number of industrialized countries like the USA, Germany, Japan or Australia, the EU, major emerging economies, and science belong to the most actively cooperating actors. Similar to the other centrality statistics, eigenvector centrality values are high for the USA, EU, and the UNO in all phases. Thus, they are linked to almost all the other active actors. Again the composition of central actors changed in  $t_2$ . For example, whereas Russia was actively engaged in cooperative relationships with high-level actors during  $t_1$ , it lost centrality after 2005. Emerging economies like India, China and Brazil gained in importance between 2005 and 2008. In  $t_3$ , the number of actors showing a high eigenvector centrality decreased again.

#### *TERGM With and Without Cross-Temporal Dependencies*

In the theoretical section, we assumed that at global level cooperation on the climate change issue is driven by characteristics of the involved actors and features of the policy subsystem. To test this relationship we set up two TERGMs, one without and one with temporal effects. Whereas the parameters of the TERGM can be interpreted as an average across the three network cross-section, the TERGM with temporal effects reflects cross-sectional dependencies over time. We included in our models different network effects such as reciprocity, transitivity, or structural balance, temporal effects, and actor characteristics. We estimated the models with the **xergm** package for R (Leifeld et al., 2015b)

We set up a number of exogenous and endogenous model parameters (with the corresponding model terms of the **ergm** package given in brackets) as starting point for both models:

- Edges: This baseline parameter expresses the balance between creating and deleting ties (edges).
- Reciprocity: Models whether there is a tendency to reciprocate ties (mutual).
- Popularity spread: This parameter models the patterns of popularity across the network. A positive parameter indicates that actors have dissimilar levels of popularity. A negative parameter indicates that most actors have a similar level of popularity and the network is not centralized on in-degree (gwidegree).

- Activity spread: This parameter models the patterns of activity across the network. A positive parameter indicates that actors have dissimilar levels of activity. A negative parameter indicates that most actors have a similar level of activity and the network is not centralized on out-degree (gwodegree).
- Triangulation: This parameter captures the degree of closure or multiple clusters of triangles in the data. A positive parameter suggests a high degree of network closure. A negative parameter points to a low degree of network closure (gwdsp).
- Activity closure: This parameter models the tendency of actors to send ties to similar people. Implicitly, the parameter models structural equivalence, as sending ties to the same alters means that two egos share same background conditions or the same neighborhood (Koskinen & Daraganova, 2013). This is also a parameter capturing network closure, when combined with the triangulation parameter. A negative estimate in conjunction with positive triangulations points to a tendency in closing 2-paths (gwesp).
- Shared beliefs: The main independent variables (“Responsibility”, “Impact”, and “Instruments”) are stored in matrices that indicate whether two actors share a policy-specific belief. We dropped the “causes” variable from the models, as coding them revealed that there are no significant differences in the position of political actors in  $t_2$  and  $t_3$  (edgecov).
- Belief similarity: Captures the main dependent variables in one similarity matrix
- Finally, we included several covariates in our models that display characteristics of political actors: a dummy variable indicating whether a country has high absolute GHG emissions<sup>3</sup>, a categorical variable indicating the level of per capita emissions<sup>4</sup> (nodefactor), and a variable that captures the similarity in the developing status of countries according to World Bank categories (nodematch).

We started with the TERGM without cross-temporal dependencies. Iteratively, we included the covariates (model 1), the main independent variables (model 2), and structural parameters (model 3) in the model. Eventually, to improve the model fit, we excluded the reciprocity parameter in the final model (model 4). Table 4 presents an overview of all estimation results. We can see that countries

<sup>3</sup> Countries with high absolute GHG emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, F-gases) – threshold: 0.5 CO<sub>2</sub>eq Gt/year; Source: Joint Research Centre (2015): EDGAR – Emission Database for Global Atmospheric Research. Available online. URL: <http://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012>. Accessed: 10.06.2015

<sup>4</sup> 1= Countries with low per capita emissions (below CO<sub>2</sub>eq 5t/year); 2=Countries with medium per capita emissions (between CO<sub>2</sub>eq 5-10t/year); 3=Countries with high per capita emissions (above CO<sub>2</sub>eq 10t/year); Source: World Bank Data. Available online. URL: <http://data.worldbank.org/indicator/EN.ATM.CO2E.PC>. Accessed: 10.06.2015

with high levels of GHG emission are less likely to engage in material cooperation with others. The effect remains stable in all four models, but decreases when including structural effects. Countries with medium per capita emissions are also less likely to engage in cooperative events than countries with low per capita emissions. Finally, countries with the same developing status do not significantly cooperate more often with each other.

**Table 4: Estimation Results TERGM without Cross-Temporal Dependencies**

	Model 1	Model 2	Model 3	Model 4
Edges	<b>-2.73 *</b> [-3.19; -1.57]	<b>-2.69 *</b> [-3.19; -1.63]	<b>-1.33 *</b> [-1.56; -0.58]	<b>-1.34 *</b> [-1.56; -0.56]
Nodematch income	0.08 [-0.72; 0.33]	0.09 [-0.66; 0.36]	0.05 [-0.18; 0.31]	0.05 [-0.19; 0.31]
Absolute GHG emissions	<b>-0.28 *</b> [-0.83; -0.14]	<b>-0.27 *</b> [-0.92; -0.12]	<b>-0.14 *</b> [-0.43; -0.04]	<b>-0.14 *</b> [-0.44; -0.04]
Pc GHG emissions high	-0.11 [-0.33; 0.04]	-0.13 [-0.42; 0.06]	-0.06 [-0.31; 0.00]	-0.06 [-0.31; 0.00]
Pc GHG emissions medium	<b>-0.27 *</b> [-0.68; -0.13]	<b>-0.26 *</b> [-0.68; -0.13]	<b>-0.27 *</b> [-0.32; -0.17]	<b>-0.27 *</b> [-0.32; -0.18]
Responsibility		0.07 [-0.26; 0.62]	-0.40 [-0.65; 0.35]	-0.40 [-0.65; 0.35]
Instruments		0.13 [-0.46; 0.27]	<b>-0.20 *</b> [-0.40; -0.01]	<b>-0.20 *</b> [-0.40; -0.02]
Impact		<b>-0.35 *</b> [-0.49; -0.18]	<b>-0.64 *</b> [-0.74; -0.43]	<b>-0.64 *</b> [-0.74; -0.40]
Reciprocity			0.22 [-13.26; 0.78]	
Activity closure			<b>0.54 *</b> [ 0.41; 0.57]	<b>0.54 *</b> [ 0.40; 0.57]
Triangulation			<b>-0.17 *</b> [-0.33; -0.15]	<b>-0.17 *</b> [-0.34; -0.15]
Popularity spread			<b>-2.60 *</b> [-2.97; -2.36]	<b>-2.60 *</b> [-2.98; -2.36]
Activity spread			<b>-1.96 *</b> [-2.28; -1.62]	<b>-1.96 *</b> [-2.28; -1.62]
Belief similarity			0.32 [-0.00; 0.43]	0.32 [-0.00; 0.42]

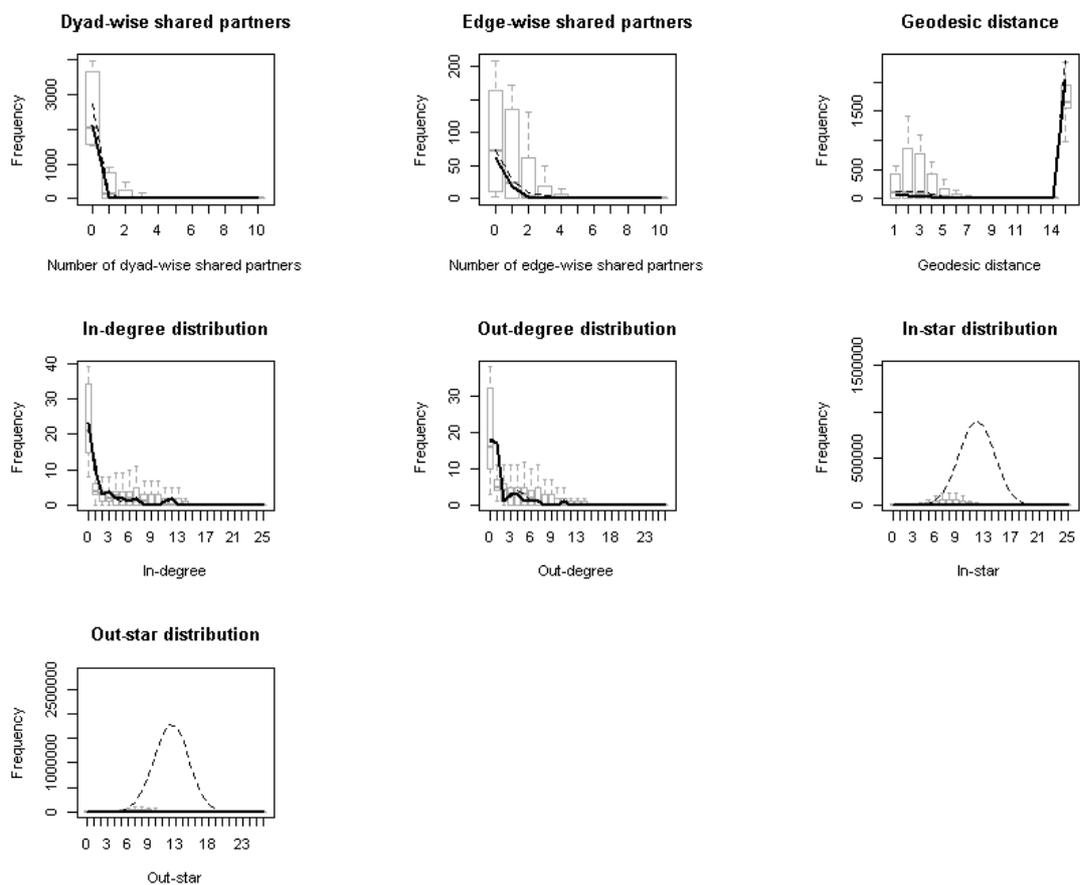
\* significant on the 0.95 level when 0 is outside the confidence interval

With respect to our independent variables, no significant effect for the “responsibility” variable can be observed. A significant, negative relationship is present for the “impact” variable. Surprisingly, actors tend to cooperate less often with each other if they assess the impacts of climate change in a similar way. The same accounts for the “instruments” variable. Actors tend to cooperate less often when supporting similar policy objectives and instruments. We also controlled for belief similarity by combining all independent variables in a similarity matrix. In line with the above results, the model shows no significant relationship between the likelihood of cooperation and belief similarity. Finally, the model includes several significant network effects. A positive activity closure parameter indicates the tendency of actors to cooperate with structural equivalent others, thus those who share similar background conditions and neighborhoods. In contrast, there is a negative triangulation parameter suggesting a rather low degree of network closure. Both the popularity spread and activity spread

parameters are high and significant. This implies low centralization and non-hierarchic structures in the network, which is in line with the results from the descriptive analysis.

Figure 1 shows the goodness of fit of the final TERGM (model 4) without cross-sectional dependencies. Here, the distribution of edge-wise shared partners, dyad-wise shared partners, geodesic distance, in-degree, out-degree, and in-star and out-star of the simulated models are compared to the values of the empirical climate change policy network data. The boxplots are the result of 300 simulations of model 4. The black solid line represents the observed policy network. As the solid line goes through the median for all distributions, model 4 shows a very good fit.

**Figure 1: Goodness of Fit TERGM without Cross-temporal Dependencies**



The TERGM with temporal effects now allows us to control for cooperation choices at each previous time steps. This is accomplished by including parameters in the model that reflect the ways in which previous realizations of the network determine its current features (Leifeld et al., 2015a). In other words, we now treat the previous network stages as a covariate for the current network, thus  $t_1$  for  $t_2$  and  $t_2$  for  $t_3$ . This also means that  $t_1$  is dropped from the analysis and only used as covariate for  $t_2$ , as there is no previous network stage to  $t_1$ . We set up the model in a very similar way to the TERGM

without cross-sectional dependencies, but dropped belief similarity variable. We included two “memory terms”, which can be understood as a “class of intertemporal dependencies designed to capture temporal processes without capturing additional network structure” (Leifeld et al., 2015a, p. 4). Firstly, we created a memory term that models dyadic stability. The parameter can be intuitively interpreted as a count for stable dyads: a positive parameter reflects a tendency to maintain dyads over time. Secondly, as we dropped the reciprocity parameter from the model, we included “single-period delayed reciprocity” (Leifeld et al., 2015a, p. 16) that captures whether cooperation decisions are reciprocated over time.

**Table 5: Estimation Results TERGM with Temporal Effects**

	Model 1	Model 2	Model 3	Model 4
Edges	<b>-2.12 *</b> [-2.38; -1.89]	<b>-2.31 *</b> [-2.66; -2.02]	<b>-1.18 *</b> [-1.18; -0.92]	<b>-0.84 *</b> [-0.96; -0.54]
Nodematch income	-0.02 [-0.71; 0.26]	-0.03 [-0.84; 0.27]	0.04 [-0.59; 0.46]	0.08 [-0.46; 0.42]
Absolute GHG emissions	<b>-0.72 *</b> [-1.13; -0.13]	<b>-0.76 *</b> [-1.17; -0.16]	<b>-0.50 *</b> [-0.90; -0.02]	-0.40 [-0.79; 0.04]
Pc GHG emissions high	<b>-0.16 *</b> [-0.36; -0.05]	<b>-0.12 *</b> [-0.33; -0.03]	0.09 [-0.26; 0.12]	0.13 [-0.18; 0.13]
Pc GHG emissions medium	<b>-0.18 *</b> [-0.30; -0.13]	<b>-0.14 *</b> [-0.28; -0.11]	0.08 [-0.20; 0.08]	0.16 [-0.04; 0.16]
Responsibility		<b>0.49 *</b> [ 0.23; 1.12]	<b>0.54 *</b> [ 0.43; 1.06]	<b>0.50 *</b> [ 0.39; 1.01]
Impact		<b>-0.09</b> [-0.25; 0.03]	<b>-0.26 *</b> [-0.32; -0.05]	<b>-0.23 *</b> [-0.23; -0.08]
Instruments		<b>0.18 *</b> [ 0.02; 0.18]	<b>0.16 *</b> [ 0.16; 0.22]	<b>0.15 *</b> [ 0.15; 0.17]
Reciprocity			<b>-0.22 *</b> [-11.63; -0.22]	
Activity closure			<b>0.42 *</b> [ 0.23; 0.97]	<b>0.33 *</b> [ 0.11; 0.98]
Triangulation			<b>-0.20 *</b> [-0.82; -0.14]	<b>-0.15 *</b> [-0.75; -0.10]
Popularity spread			<b>-2.43 *</b> [-2.79; -1.76]	<b>-2.62 *</b> [-3.08; -1.75]
Activity spread			<b>-2.13 *</b> [-2.13; -1.68]	<b>-2.11 *</b> [-2.14; -1.48]
Dyad stability				<b>0.45 *</b> [ 0.40; 0.48]
Delayed reciprocity				<b>-1.12 *</b> [-1.54; -0.33]

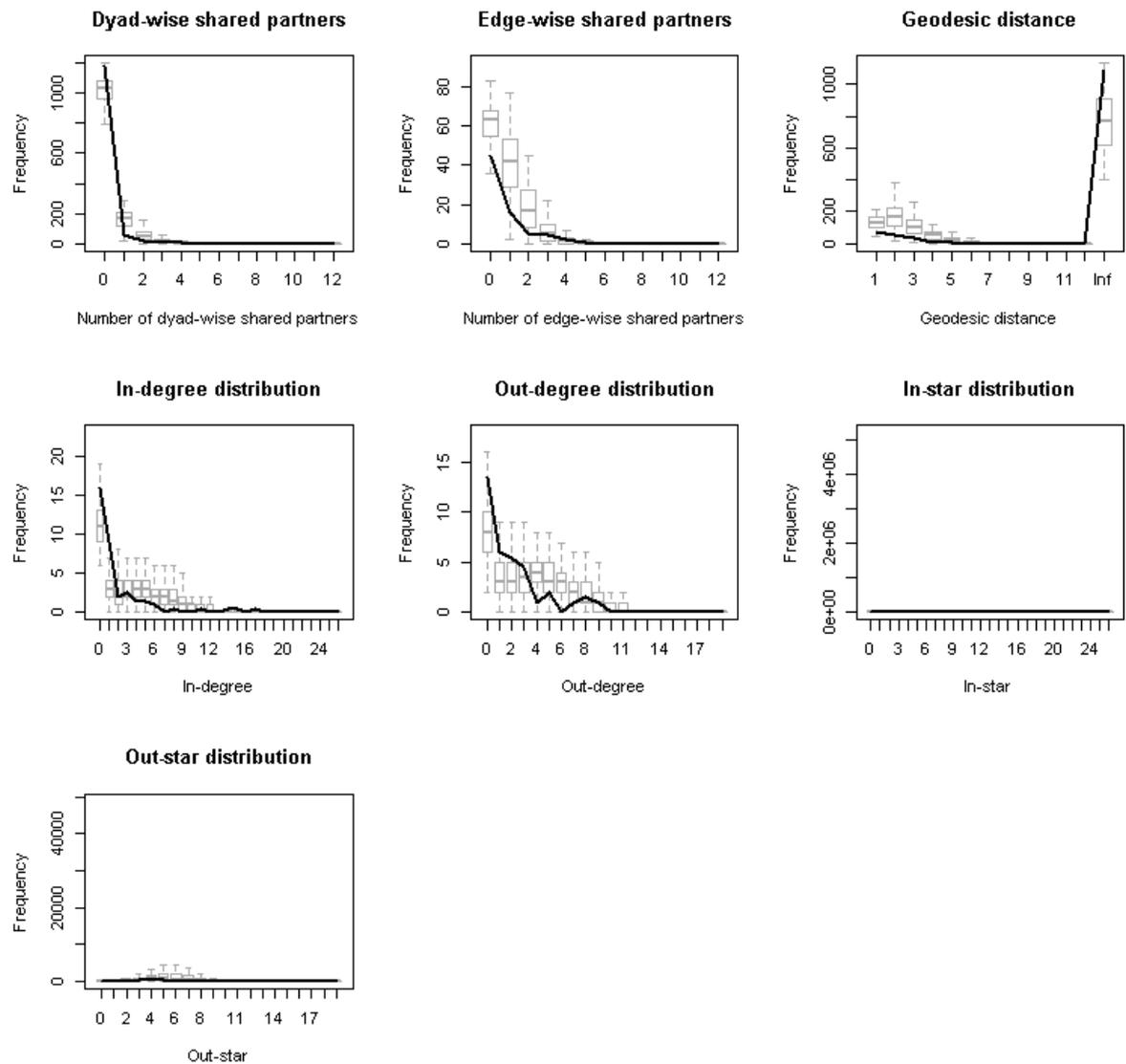
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\* 0 outside the confidence interval

With respect to the estimation results (compare table 5), we can see that in a time dependent perspective none of the covariates has significant effects. With respect to the independent variables there are interesting differences to the model without cross-sectional dependencies. We can now observe a stable and significant effect for all belief variables. We see a positive relationship between sharing the same conviction about the distribution of responsibilities and capabilities among developed and developing states and the likelihood of forming cooperative ties. The same can be observed for the “instrument” variable. In contrast to the former models, actors now tend to

cooperate more often with each other if they have similar preferences about policy instruments and related policy objectives. The effect of the “impact” variable the relationship stays negative. Assessing the impacts of climate change in a similar way is related to a negative probability of building cooperative ties.

**Figure 2: Goodness of Fit for TERGM with temporal effects**



Like the TERGM without temporal effects the model shows a positive and significant activity closure parameter, which indicates that egos have a tendency to cooperate with structural equivalent, alters. There is also a negative triangulation parameter suggesting a rather low degree of network closure. Both the popularity spread and activity spread parameters are high and significant. This implies low centralization and non-hierarchic structures in the network. The temporal effects are both significant. The positive dyad stability parameter indicates that ties are stable over time.

Moreover, the negative delayed reciprocity parameter suggests that actors do not reciprocate ties over time.

Finally, the goodness of fit for the model with temporal fit is particularly good for the out-star and in-star distribution, and dyad-wise shared partners. A less good, but still acceptable fit can be seen for edge-wise shared partners, geodesic distance, and out-degree and in-degree distributions. In all, the model shows a good fit (compare figure 2).

### *Discussion*

The first question we asked was about the cooperation patterns observed in the global climate change policy domain. In this regard, we conducted a descriptive analysis of all three network stages investigating overall and actor-specific network patterns. The analysis of the whole network led to three main conclusions: Firstly, the cooperation network is rather sparse showing low values of network cohesion. This suggests that material cooperation on the climate change issue continues to be rather unattractive. However, once material cooperation is provided, political actors tend to reciprocate these relationships. Secondly, cooperation intensifies between 2005 and 2007, when the international awareness for the climate problem reached its peak. This is indicated by rising values of average degree, transitivity, and reciprocity in  $t_2$  declining after the “Copenhagen disaster” (Blühdorn, 2012) at the beginning of  $t_3$  to values even below those in  $t_1$ . This can be interpreted as a decreased willingness to cooperate. Finally, comparably low levels of transitivity and centralization and a considerable degree of reciprocation suggest a rather non-hierarchical actor constellation. With respect to the actors involved, it can be stated that between 2001 and 2014 global climate change politics was dominated by a small circle of actors among them a number of vital industrial countries such as the USA, Germany, Japan, or Australia, emerging economies such as China, India, or Brazil, international organization such as the EU, or the UNO, as well as representatives from science and environmental movements. However, overall low levels of degree and betweenness centrality statistics allow us to conclude that cooperation on the climate change issue falls far short of its potential.

Moreover, we asked about the drivers for the formation of cooperative relationships. Our analysis has shown that the effects differ pending on the whether or not we included cross-sectional effects into the model. For the model without cross-sectional dependencies over time hypothesis 1 has to be rejected. This implies that on average belief similarity does not increase the likelihood for forming cooperative relationships. On the contrary, the impact and instrument variable even showed a

negative relationship between the likelihood of cooperation. In other words, political actors with a similar conviction with respect to the assessment of climate change impacts and a similar position towards policy objectives and related policy instruments are less likely to involve in cooperative relationships with each other. However, including temporal effects changes the picture. Now, we are able to partially accept hypothesis 1. Thus, in a dynamic perspective actors are more likely to cooperate with others that share beliefs about burden sharing, policy objectives and the use of instruments. Only the impact variable keeps its negative relationship with the likelihood of forming cooperative ties in the dynamic perspective as well. One possible explanation for this is that material cooperation rather occurs between actors from different kinds or income levels. Put it differently, it makes sense that material cooperation will more often be offered by industrialized countries to those countries most affected by climate than vice versa. Additionally, it can be assumed (and seen in the data), that those countries most vulnerable to climate change assess the impacts of climate change in relation to other issues in a very similar way. Moreover, most of the developed countries are located in the global North and are therefore less prone to climate related risks. In this regard, the impact variable may be correlated with the vulnerability and income level of a country to climate change. Not so with the responsibility and instrument variable. Here, the preference of the political actors also depends on the level of their development, but the relationship is far less clear. Many more factors play a role here, for example the overall position towards environmental or climate policy.

With respect to structural patterns, both models show very similar effects except for reciprocity. Disregarding temporal dependencies, in both models there is a tendency for structural equivalence, but no tendency for network clustering. On the one hand, this implies that actors tend to cooperate with those actors that make similar choices according to their cooperation partners. On the other hand, the climate change policy network is rather anarchically structured and not clustered. Moreover, the two models show deviant results for reciprocity. In the model with cross-sectional dependencies the reciprocity parameter is positive, but not significant. Thus, on average a slight tendency to reciprocate ties can be assumed. In a dynamic perspective, the parameter turns negative and significant. This is also supported by the significant and negative delayed reciprocity parameter. In this regards, material cooperation is not reciprocated over time, but is arranged according to the respective circumstances. Finally, the negative activity and popularity spread parameter indicate a horizontally and anarchically structured subsystem.

Finally, we raised the question what makes cooperative relationships endure. Answering this question is not an easy task. Our time dependent model shows a positive and significant parameter

for dyad stability. In this regard, we can confirm hypothesis 2: Participants have tendency to keep up cooperative relationships over time. From our models we have learnt, that structural characteristics are important factors for cooperation over time. However, patterns do not significantly change whether we consider temporal dependencies between the network stages or not. On the other hand, shared policy-specific beliefs only can be considered as drivers for cooperative relationships in a temporal perspective. This indicates that enduring cooperation is driven rather by shared attitudes towards policy-specific questions, than structural factors.

## 6 Conclusion

In sum, the descriptive analysis of the global climate change policy network allows us to draw three major conclusions: Firstly, the motivation for cooperation among political actors reached its peak between 2005 and 2009 when the overall awareness for the climate problem was high. After the “Copenhagen disaster” in 2009 the willingness to cooperate decreased significantly. Secondly, climate change politics at the global level is an issue among a small circle of actors from various kinds among them a number of industrialized countries and emerging economies, international organization, environmental movements, and science. Finally, overall cooperation falls short of its potential. On the other hand, the inferential analysis has revealed that cooperation is driven by both structural factors and actor-specific characteristics. We were able to partly confirm hypothesis 1: In the long run, political actors are more likely to cooperate with those actors sharing the same set of beliefs. Moreover, hypothesis 2 is as well supported, as political actors seem to have a tendency to keep up cooperative relationships in particular with those sharing similar beliefs.

However, cooperation on the climate change issue is facing serious structural problems: Firstly, the tendency to not reciprocate cooperation over time indicates that cooperation falls short of its potential and is rather driven by opportunity structures than by stable interdependencies between political actors and relations based on trust and mutuality. In a similar direction points the anarchically and horizontally structured policy subsystem. Increased network clustering would contribute to decreased uncertainties and political risks of political cooperation originating from the perils of anarchy such as free-riding. This would increase the levels of collective action due to enhanced communication, the creation of common norms and the possibility to restrain opportunistic behavior. In addition, increased network closure would facilitate sanctions in the case of non-compliance to norms, rules, and standards, increasing mutual trust relations. Finally, the positive tendency towards structural equivalence suggests that cooperative behavior is rather a matter of

structural positions in the subsystem. For climate policy this means that there is a tendency for homophile blocs opposing each other, which is in stark contrast to eventually agreeing on a universal climate protection agreement.

The next steps of our analysis may include the following: Firstly, we will complete and expand the belief system data set, which allows us to include a great number of beliefs, as well as the belief set of phase 1. Secondly, we intend to do inferential analysis on different aspects of the climate change policy network including both conflictive and cooperative ties. This enables us, for example, to determine advocacy coalitions. Finally, we intend to refine the event data set and collect the data on the basis of full text instead of lead sentences. This may refine the analysis in the sense that now more actors and events are included which have been neglected beforehand.

## 7 Appendix

**Table 6: Coding Guideline Belief System**

<i>Responsibility: This category addresses the question of who is responsible and capable to tackle global climate change.</i>			
Category	Definition	Example	Coding Rules
EQUAL	Despite historic divergent responsibilities all countries are equally responsible to tackle climate change. Nevertheless, different country groups may have different capabilities. Each country has to commit to legally-binding and multilaterally coordinated contributions.	<p>"Looking to the future, Australia will work to secure an agreement in Paris that is strong, effective and ensures countries live up to their commitments. To deliver on its promise, the agreement must establish a common playing field, <b>moving past the developed-developing country divide</b> that puts a brake on real action" (Australia, High-level segment statement, COP 20, Lima).</p> <p>"Let us stop a blame game. Let us stop standing. Let each of us – <b>the developed countries, the large emerging economies, and the most vulnerable countries alike</b> – come out of our respective cocoons. We must compromise to save our future. All of us live in one village." (Kenya, High-level segment statement, COP 16).</p> <p>"<b>We need commitments from all countries</b> - common but differentiated commitments, reflecting individual capabilities as they evolve over time. We need a response to the climate challenge which is ambitious and equitable at the same time" (Austria, High-level segment statement, COP 20).</p> <p>"I am sure that nobody will back-down from a solution that foresees balanced and shared commitments for all, and <b>I say ALL, the countries</b>. Our future agreement must also incorporate the low carbon development option for developing countries: a solution strongly supported and promoted by the industrialized world" (Italy, High-level segment statement, COP 16).</p>	<p>Reference to ...</p> <ul style="list-style-type: none"> <li>• the necessity to overcome the CBDR/RC principle or the developed – developing divide, OR</li> <li>• the need to stop blaming each other, but to collaborate, OR</li> <li>• the urgency that all countries alike have to fulfill their commitments, AND</li> <li>• changing or evolving responsibilities and capabilities of countries.</li> </ul>
EQUAL_FLEX	Despite historic divergent responsibilities all countries are equally responsible to tackle climate change. However, only voluntary commitments should be made with differentiated targets and full flexibility for all countries according to national circumstances.	<p>"Of course we understand that nation circumstances must be taken into account (...). That is why Canada supports CBDR. <b>Any long-term agreement should be flexible [and] allow for all countries to choose the policies that suit their political realities</b>" (Canada, High-level segment statement, COP 13, Bali)</p>	<p>Reference to ...</p> <ul style="list-style-type: none"> <li>• national differences and circumstances AND</li> <li>• flexibility for ALL countries.</li> </ul>
MAJOR_EMITTERS	Shared responsibility among all countries. However, major emitters – those that emitted most in the past and those that are responsible for future emissions – have to take the	<p>"While we recognize the need to respect the principles of the Convention concerning differentiation, we need to apply these <b>principles according to today's economic and geopolitical realities</b>" (EU, High-level segment statement, COP 20, Lima).</p> <p>"And this reduction in emissions can only be achieved <b>if all countries, namely all main</b></p>	<p>Reference to...</p> <ul style="list-style-type: none"> <li>• the CBDR/RC principle but changed socio-economic realities, OR</li> </ul>

	<p>lead and are responsible to tackle climate change. Therefore, industrialized countries and large emerging economies have to commit to legally-binding and multilaterally coordinated contributions. Full-flexibility and differentiated targets shall be granted to least developed countries.</p>	<p><b>emitters, act.</b> Climate change does not stop at national borders. Cross-border problems therefore require global solutions. National efforts are good, but internationally coordinated and binding measures are better" (Switzerland, High-level segment statement, COP 19, Warsaw).</p> <p>"(...) the countries with obligations under the Kyoto protocol cause 30% of global emissions. Even drastic reductions in these countries will not be enough. Therefore, <b>the new agreement must include all major-emitters.</b> (...) " (Norway, High-level segment statement, COP 13, Bali)</p>	<ul style="list-style-type: none"> <li>• emerging economies as new major source of emissions, OR</li> <li>• the need to take action by developed countries AND emerging economies AND</li> <li>• the need for socio-economic development, poverty reduction in least developed countries, OR</li> <li>• the flexibility for least developed countries.</li> </ul>
<p>DEVELOPED</p>	<p>Shared responsibility among all countries to mitigate climate change. However, industrialized countries, who have predominately caused global warming in the past, are the ones to take the lead in mitigating climate change and support developed countries in taking action. Therefore, industrialized countries have to commit to legally-binding and multilaterally coordinated contributions. Full-flexibility and differentiated targets shall be granted to all developing countries, as they still have to catch up in terms of socio-economic development.</p>	<p>The new agreement " (...) should be able to address the <b>genuine requirements of the developing countries</b> by providing them equitable carbon space to achieve sustainable development and eradicate poverty. (...) The beautiful balance of collective action – the <b>principles of equity and common but differentiated responsibilities</b> - should form the basis of continued action. Our ambition in the post-2020 period is directly linked with <b>ambitious actions in the pre-2020 period by the developed countries</b>; otherwise the poor people in developing countries will not get the <b>carbon space</b> to achieve sustainable development". (...) We firmly believe that the INDCs are to be 'nationally determined'. We do not see any role for any ex-ante review in this process" (India, High-level segment statement, COP 20, Lima).</p> <p>"<b>Differentiation between developed and developing countries is absolutely</b> essential to ensure the global level of ambition required to keep temperature increase below an agreed threshold. (...) While enhanced ambition is expected from all Parties, we must ensure that previous commitments are safeguarded and that developed countries are taking the lead in the global effort against climate change, while allowing developing countries to gradually assume further obligations, in accordance with their development circumstances" (Brazil, High-level segment statement, COP 20, Lima).</p> <p>„For us, that Agreement must be legally binding, with <b>flexibility for LDC's and SIDS.</b> (...) in the global fight against climate change, historical polluters must take the lead with economy wide emission reduction commitments, and that historical responsibility should provide the basis of their contributions" (Guyana, High-level segment statement, COP 20, Lima)</p> <p>"(...) reflecting the principle of CBD (...)” requires “measures to <b>protect the world's poorest and most vulnerable</b> to the consequences of climate destruction. (...) The <b>rich part of the world must now take the lead</b>". (Sweden, High-level segment statement, COP 13, Bali)</p>	<p>Reference to...</p> <ul style="list-style-type: none"> <li>• the principle of equity and common but differentiated responsibility,</li> <li>• importance of the divide between the developed and developing world AND</li> <li>• the need for socio-economic development of developing countries, OR</li> <li>• poverty reduction of developed countries, OR</li> <li>• "carbon space", the polluter pays principle, or the (historic responsibility of developed countries OR</li> <li>• the flexibility for developing countries.</li> </ul>

<i>Causes: Is climate change a real threat and if so, is it induced by human activity?</i>			
Category	Definition	Example	Coding Rules
NOT_WARMING	The global climate is not warming.	No example found	Any form of denial of global warming
UNCLEAR	Current trends are unclear	No example found	Any form of doubt with respect to global warming
NATURAL	Global climate is warming due to natural events	No example found	Reference to ... <ul style="list-style-type: none"> <li>• upward warming trend</li> <li>• natural trend/ unclear</li> </ul> Both issues have to be mentioned.
HUMAN	Global climate warming is anthropogenic above all due to historic and current emissions by industrialized countries	<p>"The World Meteorological Organization's in its recent report states that the concentration of carbon dioxide in the atmosphere reached a record high in 2014 and continues on an upward trend. The WMO also reported that 2014 so far has been the hottest year on record. The IPCC's latest finding reaffirms that the human-generated climate change is real" (Afghanistan, High-level segment statement, COP 20, Lima).</p> <p>"Japan takes the findings of the IPCC's Fifth Assessment Report very seriously" (Japan, High-level segment statement, COP 20, Lima).</p> <p>"As the report of the IPCC has clearly shown the substantial increase of global temperature as a result of emissions of GHG is man-made" (Argentina, High-level segment statements, COP 20, Lima)</p> <p>"As stressed by many speakers before me, the threats of global climate change are real. The time to act is now. The world does not need any more catastrophic events to validate climate change impacts" (Thailand, High-level segment statement, COP 13, Bali)</p>	Statements such as ... <ul style="list-style-type: none"> <li>• upward warming trend due to human influence is real,</li> <li>OR</li> <li>• climate change is scientifically acknowledged,</li> <li>OR</li> <li>• results of IPCC report has to be taken seriously.</li> </ul>

<i>Impacts: How are the risks and impacts of climate change assessed and valued when compared to other critical areas such as economic development and poverty reduction?</i>			
Category	Definition	Example Statement	Coding Rules
UNCLEAR	Risks of climate change are unclear – positive impacts are possible	No example found	NA
LOW	Climate change bears risks and negative impacts, but other issues (economic development, competitiveness, etc. ...) are more important	No example found	NA
MEDIUM	Climate change bears substantial risks and negative impacts. However, the costs of responding are also high and other issues (economic development, competitiveness, etc. ...) are at least equally important and should not be compromised by climate change mitigation or adaption action.	<p>“Climate change is a challenge for us all, with serious environmental, social and economic consequences. Individually and collectively we must deliberate carefully and determine the best course of action to reduce emissions. <b>This action must deliver real cuts in emissions and not put countries at a competitive disadvantage. And it must work alongside countries’ plans for strong economic growth, jobs and development</b>” (Australia, High-level segment statement, COP 20 Lima).</p> <p>“Bangladesh, though an LDC, has expressed its willingness to participate in mitigation if supported with finance and technology. Bangladesh needs huge amounts of energy to fuel its development process and at present we have large shortfalls in commercial energy. (...) <b>We shall not compromise our efforts towards development</b>, but we are committed to put our efforts for mitigation activities” (Bangladesh, High-level segment statement, COP 16, Cancun)</p> <p>“The royal Thai government has carefully planned measures to reduce” GHG emissions <b>that to not affect the Thai economic development path</b> (Thailand, High-level segment statement, COP 13)</p>	<p>Reference to both</p> <ul style="list-style-type: none"> <li>the seriousness of climate change impacts</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>the necessity to consider other factors such as socio-economic development, competitiveness, as well.</li> </ul>
HIGH	Climate change bears high risks and negative impacts, and the costs of impacts clearly outweigh the costs of responds. However there are other issues (economic development, competitiveness, etc. ...) that are also important.	<p>“<b>In addition to all these challenges Afghanistan is one of the ten countries in the world identified as most vulnerable to climate change.</b> We are experiencing that the impacts of climate change in this land-locked, mountainous, and least developed country. The new government and the President himself have recently identified the impacts of climate change as a major additional hurdle in achieving our socio-economic objectives” (Afgahnistan, High-level segment statement, COP 20, Lima).</p> <p>“Climate change is a global challenge with serious consequences for nations across the globe. <b>The cost of inaction far outweighs those of taking concrete measures</b>” (Iran, High-level segment statement, COP 20, Lima).</p> <p>“Vietnam belongs <b>to the group of countries that are most affected by climate change</b>, also affecting its socio-economic development”. (Vietnam, High-level segment statement, COP 13, Bali)</p>	<p>Reference to ...</p> <ul style="list-style-type: none"> <li>climate change as an additional and major burden for socio-economic development,</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>the serious consequences of climate change,</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>the high vulnerability of a country to climate change,</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>cost of inaction are higher than of taking concrete measures.</li> </ul>

VERY_HIGH	Climate change has most significant risks and the costs of its impacts are well exceeding the costs responds. Climate change impacts are among the most important threat to socio-economic development and safety.	<p>“For Africa, Climate change is indeed a challenge. (...) most African economies rely on climate-sensitive sectors <b>highly exposed to climate variability</b>, drought, flooding, which are disrupting agricultural production, endangering livelihoods and health, (...)” (African Union, High-level segment statement, COP 20, Lima)</p> <p>„The projected future impacts present <b>catastrophic scenarios</b> for Kenya, Africa and other vulnerable developing countries (Kenya, High-level segment statement, COP 20, Lima)</p> <p>“<b>Climate change is the single greatest challenge facing my country</b>” (Tuvalu, High-level segment statement, COP 20, Lima)</p>	Climate change impacts clearly range among the most important threats indicated for example by superlative formulations, adjectives such as catastrophic, or an enumeration of negative impacts.
<i>Instruments: What are the most important policy objectives and with what kind of instruments should they be addressed? Respective category has to clearly dominate over other categories in order to be coded.</i>			
Category	Definition	Example Statements	Coding Rules
COMMITMENT	Preference is given to the matter of reducing political uncertainty as caused by non-compliance to national commitments and free-riding. The possible policy instruments to address this matter are monitoring and reporting arrangements that control, legally-binding commitments, and enforcement mechanisms (such as sanctions) and flexibility mechanisms to lower the costs of implementation.	<p>“(..) we need clarity on the information required to ensure that Parties proposed contributions <b>are transparent and understandable</b>; we should also agree on a process on a process to consider and analyze those proposed commitments before Paris” (EU, High-level segment statement, COP 16, Cancun).</p> <p>A global legally-binding agreement “(...) <b>will provide reasonable assurance that there will be reciprocity of actions among Parties and instill confidence</b> in countries to implement their own” (Singapore, High-level segment statement, COP 16, Cancun).</p> <p>An agreement must “deliver action over time. One effective way to do that is <b>to allow countries to cooperate in full-filling their obligations</b>” (Norway, High-level segment statement, COP 20, Lima)</p> <p>The Paris protocol “has to satisfy the following criteria. It has to be legally-binding. Countries will only be willing to make commitments, if they can be sure that all other countries will stand by (...). <b>We need a credible review mechanism for commitments and a robust transparency system</b>” (Germany, High-level segment statement, COP 20 Lima)</p>	<p>Priority must be given to at least one of the following issues:</p> <ul style="list-style-type: none"> <li>transparency mechanisms or monitoring and reporting arrangements,</li> <li>the legally-binding character of commitments that ensures the reciprocity of action among Parties, or</li> <li>flexibility mechanisms in the sense that the implementation of commitments is ensured.</li> </ul>
ASYMMETRIES	Preference is given to the matter of reducing asymmetries of interests and capabilities between developing and developed countries. Possible policy instruments to address this issue are technology or financial transfer mechanisms, capacity building and Loss & Damage arrangements.	<p>“It is equally evident that developing countries could do more <b>if finance, technology support and capacity building is ensured</b>” (India High-level segment statement, COP 20, Lima).</p> <p>“We need a neutral mechanism <b>to determine the reasonable fair share</b> of the huge global effort of each party, both to minimize the risk of dangerous climate change and enable adaptation to the global warming which has already been caused primarily by the Annex 1 countries.” (Afghanistan, High-level segment statement, COP 20, Lima).</p> <p>“<b>Climate financing is one of the key elements</b>. Climate financing is not only about funding. It is also about balancing economic interests and responsibilities. And of creating trust</p>	<p>Priority must be given to at least one of the following issues:</p> <ul style="list-style-type: none"> <li>developed countries that support developing countries through financial or technology transfer, or capacity building,</li> <li>compensation payments for climate change mitigation action and impacts through</li> </ul>

		between countries at all levels of development” (Norway, High-level segment statement, COP 16, Cancun).	<p>Loss and Damage or REDD, AND</p> <ul style="list-style-type: none"> <li>equity in terms of a fair share of efforts and benefits of mitigation or adaptation action.</li> </ul>
UNCERTAINTY	Preference is given to reduce technical uncertainty such as the height of economic costs imposed by specific commitments. Possible policy instruments to address this issue are all kinds of flexibility mechanisms that ensure that climate change mitigation action is in accordance with economic development goals.	<p>“As for addressing another sensitive and essential issue, namely the surplus and carry-over of Kyoto units, the solution should take into consideration all aspects: acknowledge the compliance efforts of the parties in respecting the KP provisions, assure <b>fairness for all Parties, and correctly assess the economic, financial and social consequences of reducing emissions and the respective Parties</b>. For achieving mitigation objective in a cost-efficient manner, we believe that carbon market is an essential tool” (Romania, High-level segment statement, COP 16 Cancun).</p> <p>„Latvia was very concerned about its possible commitments and their impact upon economic growth” (Latvia, High-level segment statement, COP 20, Lima).</p>	<p>Priority must be given to</p> <ul style="list-style-type: none"> <li>the concern about economic costs of climate change mitigation commitments and fairness in terms of the social-economic costs of reducing GHG emission AND/OR</li> <li>to the use of flexibility mechanisms-</li> </ul>
TECHNOLOGY	Priority is given to technological or economic solutions to mitigate climate change. This may include mechanisms of technology transfer, carbon capture and storage, the increased use of renewables and increased energy efficiency of technologies, among others.	<p>“This process is a technology intensive one. We, therefore, <b>need extensive global cooperation including practical measures and mechanisms for developing, transfer and dissemination of technology on concessional and preferential terms</b>. (...) Therefore international cooperation for developing and transferring relevant technologies and associated know-how, to help achieving cleaner energy from fossil fuels is of paramount importance. Furthermore, transfer of technology and associated know-how is critical for sustainable agriculture to promote food security and to combat hunger and poverty across the globe” (Iran, High-level segment statement, COP 20 Lima).</p> <p>“Reduction targets have to be set in all countries so that new, <b>climate –friendly technologies</b> are put to use. We in Switzerland have the technological know-how in water protection, in buildings, energy use and air quality management. Wealthy countries have to support poorer countries” (Switzerland, High-level segment statement, COP 16, Cancun).</p>	<p>Priority must be given to one of the following issues:</p> <ul style="list-style-type: none"> <li>technology transfer as a tool to ensure that developing countries are able to reduce their GHG emissions,</li> <li>renewables, green technology and increased environmental efficiency as the preferred tool to reduce GHG emissions,</li> <li>economic instruments such as taxes,</li> <li>the balance between climate change mitigation and economic development is an opportunity,</li> <li>the important role that the transfer to a green economy play for mitigating climate change.</li> </ul>

**Table 7: Adjusted ACF Belief System**

Level	Beliefs adjusted to international politics	Climate change specific beliefs	Variable
<b>Policy Core</b>			
	1. Orientation on basic value priorities	Key beliefs concerning climate change politics such as the nature and scope of national policy responses and contributions	Instruments
	2. Identification of respective needs, responsibilities & capabilities of involved parties	Key beliefs concerning the responsibilities and capabilities of developing and developed countries	Responsibility
	3. Overall seriousness of the problem	Key belief concerning the seriousness of the impacts of climate change and its socio-economic costs	Impacts
	4. Basic causes of the problem	Fundamental position on the perceived causes and trend of global climate change	Causes
	5. Fundamental position on the appropriate level of governance in tackling a certain problem (nation state-centered action vs. international arrangements)	Fundamental position towards the coordination of national responses	Responsibility
	6. The role of the global market (multi- and transnational corporations, international business) in tackling international problem	The role of the global market (multi- and transnational corporations, international business) in tackling global climate change	NA
	7. Priority accorded different policy instruments of international politics such as financial aid/ transfer, monitoring, voluntary or legally-binding commitments, market-bases instruments, etc.	Fundamental position on the most important objectives and respective instruments	Instruments
	8. Ability of international community to solve the problem	Fundamental position on whether the international community is able to combat climate change	NA
	9. Method of financing	Fundamental position on how and by whom climate change related measures must be funded	NA
	10. Participation of non-state actors	Fundamental position on the role of non-state actors in tackling global climate change	NA
<b>Secondary Aspects</b>			
	1. Seriousness of specific aspects in specific locales	Estimation of the need for action on specific issues	NA
	2. Importance of various causal linkages in different locales over time	Importance of specific domestic factors and restrictions, or international affairs and connections to third parties	NA
	3. Decisions concerning specific instruments, technicalities, institutions and arrangements, and procedural rules	Decisions concerning the pillars of global climate change policy that is mitigation, adaptation, finance and technology transfer, and loss and damage	Instruments
	4. Information regarding the performance of specific programs and institutions	Information on the effect of different existing institutions and arrangements within and outside the UNFCCC	NA

**Table 8: CAMEO Codelist****01: MAKE PUBLIC STATEMENT**

010: Make statement, not specified below

011: Decline comment

012: Make pessimistic comment

013: Make optimistic comment

014: Consider policy option

015: Acknowledge or claim responsibility

016: Deny responsibility

017: Engage in symbolic act

018: Make empathetic comment

019: Express accord

**02: APPEAL**

020: Make an appeal or request, not specified below

021: Appeal for material cooperation, not specified below

0211: Appeal for economic cooperation

0212: Appeal for military cooperation

0213: Appeal for judicial cooperation

0214: Appeal for intelligence

022: Appeal for diplomatic cooperation (such as policy support)

023: Appeal for aid, not specified below

0231: Appeal for economic aid

0232: Appeal for military aid

0233: Appeal for humanitarian aid

0234: Appeal for military protection or peacekeeping

024: Appeal for political reform, not specified below

0241: Appeal for change in leadership

0242: Appeal for policy change

0243: Appeal for rights

0244: Appeal for change in institutions, regime

025: Appeal to yield, not specified below

0251: Appeal for easing of administrative sanctions

0252: Appeal for easing of political dissent

0253: Appeal for release of persons or property

0254: Appeal for easing of economic sanctions, boycott, or embargo

0255: Appeal for target to allow international involvement (non-mediation)

0256: Appeal for de-escalation of military engagement

026: Appeal to others to meet or negotiate

027: Appeal to others to settle dispute

028: Appeal to engage in or accept mediation

**03: EXPRESS INTENT TO COOPERATE**

030: Express intent to cooperate, not specified below

031: Express intent to engage in material cooperation, not specified below

0311: Express intent to cooperate economically

0312: Express intent to cooperate militarily

0313: Express intent to cooperate on judicial matters

0314: Express intent to cooperate on intelligence

032: Express intent to engage in diplomatic cooperation (such as policy support)

033: Express intent to provide material aid, not specified below

0331: Express intent to provide economic aid

0332: Express intent to provide military aid

0333: Express intent to provide humanitarian aid

0334: Express intent to provide military protection or peacekeeping

034: Express intent to institute political reform, not specified below

0341: Express intent to change leadership

0342: Express intent to change policy

0343: Express intent to provide rights

0344: Express intent to change institutions, regime

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- 035: Express intent to yield, not specified below
  - 0351: Express intent to ease administrative sanctions
  - 0352: Express intent to ease popular dissent
  - 0353: Express intent to release persons or property
  - 0354: Express intent to ease economic sanctions, boycott, or embargo
  - 0355: Express intent to allow international involvement (non-mediation)
  - 0356: Express intent to de-escalate military engagement
- 036: Express intent to meet or negotiate
- 037: Express intent to settle dispute
- 038: Express intent to accept mediation
- 039: Express intent to mediate

**04: CONSULT**

- 040: Consult, not specified below
- 041: Discuss by telephone
- 042: Make a visit
- 043: Host a visit
- 044: Meet at a "third" location
- 045: Mediate
- 046: Engage in negotiation

**05: ENGAGE IN DIPLOMATIC COOPERATION**

- 050: Engage in diplomatic cooperation, not specified below
- 051: Praise or endorse
- 052: Defend verbally
- 053: Rally support on behalf of
- 054: Grant diplomatic recognition
- 055: Apologize
- 056: Forgive
- 057: Sign formal agreement

**06: ENGAGE IN MATERIAL COOPERATION**

- 060: Engage in material cooperation, not specified below
- 061: Cooperate economically
- 062: Cooperate militarily
- 063: Engage in judicial cooperation
- 064: Share intelligence or information

**07: PROVIDE AID**

- 070: Provide aid, not specified below
- 071: Provide economic aid
- 072: Provide military aid
- 073: Provide humanitarian aid
- 074: Provide military protection or peacekeeping
- 075: Grant asylum

**08: YIELD**

- 080: Yield, not specified below
- 081: Ease administrative sanctions, not specified below
  - 0811: Ease restrictions on political freedoms
  - 0812: Ease ban on political parties or politicians
  - 0813: Ease curfew
  - 0814: Ease state of emergency or martial law
- 082: Ease political dissent
- 083: Accede to requests or demands for political reform, not specified below
  - 0831: Accede to demands for change in leadership
  - 0832: Accede to demands for change in policy
  - 0833: Accede to demands for rights
  - 0834: Accede to demands for change in institutions, regime
- 084: Return, release, not specified below
  - 0841: Return, release person(s)
  - 0842: Return, release property

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- 085: Ease economic sanctions, boycott, embargo
- 086: Allow international involvement, not specified below
  - 0861: Receive deployment of peacekeepers
  - 0862: Receive inspectors
  - 0863: Allow humanitarian access
- 087: De-escalate military engagement
  - 0871: Declare truce, ceasefire
  - 0872: Ease military blockade
  - 0873: Demobilize armed forces
  - 0874: Retreat or surrender militarily

**09: INVESTIGATE**

- 090: Investigate, not specified below
- 091: Investigate crime, corruption
- 092: Investigate human rights abuses
- 093: Investigate military action
- 094: Investigate war crimes

**10: DEMAND**

- 100: Demand, not specified below
- 101: Demand material cooperation, not specified below
  - 1011: Demand economic cooperation
  - 1012: Demand military cooperation
  - 1013: Demand judicial cooperation
  - 1014: Demand intelligence cooperation
- 102: Demand diplomatic cooperation (such as policy support)
- 103: Demand material aid, not specified below
  - 1031: Demand economic aid
  - 1032: Demand military aid
  - 1033: Demand humanitarian aid
  - 1034: Demand military protection or peacekeeping
- 104: Demand political reform, not specified below
  - 1041: Demand change in leadership
  - 1042: Demand policy change
  - 1043: Demand rights
  - 1044: Demand change in institutions, regime
- 105: Demand that target yields, not specified below
  - 1051: Demand easing of administrative sanctions
  - 1052: Demand easing of political dissent
  - 1053: Demand release of persons or property
  - 1054: Demand easing of economic sanctions, boycott, or embargo
  - 1055: Demand that target allows international involvement (non-mediation)
  - 1056: Demand de-escalation of military engagement
- 106: Demand meeting, negotiation
- 107: Demand settling of dispute
- 108: Demand mediation

**11: DISAPPROVE**

- 110: Disapprove, not specified below
- 111: Criticize or denounce
- 112: Accuse, not specified below
  - 1121: Accuse of crime, corruption
  - 1122: Accuse of human rights abuses
  - 1123: Accuse of aggression
  - 1124: Accuse of war crimes
- 1125: Accuse of espionage, treason
- 113: Rally opposition against
- 114: Complain officially
- 115: Bring lawsuit against
- 116: Find guilty or liable (legally)

**12: REJECT**

- 120: Reject, not specified below
- 121: Reject material cooperation
  - 1211: Reject economic cooperation
  - 1212: Reject military cooperation
- 122: Reject request or demand for material aid, not specified below
  - 1221: Reject request for economic aid
  - 1222: Reject request for military aid
  - 1223: Reject request for humanitarian aid
  - 1224: Reject request for military protection or peacekeeping
- 123: Reject request or demand for political reform, not specified below
  - 1231: Reject request for change in leadership
  - 1232: Reject request for policy change
  - 1233: Reject request for rights
  - 1234: Reject request for change in institutions, regime
- 124: Refuse to yield, not specified below
  - 1241: Refuse to ease administrative sanctions
  - 1242: Refuse to ease popular dissent
  - 1243: Refuse to release persons or property
  - 1244: Refuse to ease economic sanctions, boycott, or embargo
  - 1245: Refuse to allow international involvement (non mediation)
  - 1246: Refuse to de-escalate military engagement
- 125: Reject proposal to meet, discuss, or negotiate
- 126: Reject mediation
- 127: Reject plan, agreement to settle dispute
- 128: Defy norms, law
- 129: Veto

**13: THREATEN**

- 130: Threaten, not specified below
- 131: Threaten non-force, not specified below
  - 1311: Threaten to reduce or stop aid
  - 1312: Threaten with sanctions, boycott, embargo
  - 1313: Threaten to reduce or break relations
- 132: Threaten with administrative sanctions, not specified below
  - 1321: Threaten with restrictions on political freedoms
  - 1322: Threaten to ban political parties or politicians
  - 1323: Threaten to impose curfew
  - 1324: Threaten to impose state of emergency or martial law
- 133: Threaten with political dissent, protest
- 134: Threaten to halt negotiations
- 135: Threaten to halt mediation
- 136: Threaten to halt international involvement (non-mediation)
- 137: Threaten with repression
- 138: Threaten with military force, not specified below
  - 1381: Threaten blockade
  - 1382: Threaten occupation
  - 1383: Threaten unconventional violence
  - 1384: Threaten conventional attack
  - 1385: Threaten attack with WMD
- 139: Give ultimatum

**14: PROTEST**

- 140: Engage in political dissent, not specified below
- 141: Demonstrate or rally, not specified below
  - 1411: Demonstrate for leadership change
  - 1412: Demonstrate for policy change
  - 1413: Demonstrate for rights
  - 1414: Demonstrate for change in institutions, regime
- 142: Conduct hunger strike, not specified below
  - 1421: Conduct hunger strike for leadership change
  - 1422: Conduct hunger strike for policy change

- 1423: Conduct hunger strike for rights
- 1424: Conduct hunger strike for change in institutions, regime
- 143: Conduct strike or boycott, not specified below
  - 1431: Conduct strike or boycott for leadership change
  - 1432: Conduct strike or boycott for policy change
  - 1433: Conduct strike or boycott for rights
  - 1434: Conduct strike or boycott for change in institutions, regime
- 144: Obstruct passage, block, not specified below
  - 1441: Obstruct passage to demand leadership change
  - 1442: Obstruct passage to demand policy change
  - 1443: Obstruct passage to demand rights
  - 1444: Obstruct passage to demand change in institutions, regime
- 145: Protest violently, riot, not specified below
  - 1451: Engage in violent protest for leadership change
  - 1452: Engage in violent protest for policy change
  - 1453: Engage in violent protest for rights
  - 1454: Engage in violent protest for change in institutions, regime

**15: EXHIBIT FORCE POSTURE**

- 150: Demonstrate military or police power, not specified below
- 151: Increase police alert status
- 152: Increase military alert status
- 153: Mobilize or increase police power
- 154: Mobilize or increase armed forces
- 155: Mobilize or increase cyber-forces

**16: REDUCE RELATIONS**

- 160: Reduce relations, not specified below
- 161: Reduce or break diplomatic relations
- 162: Reduce or stop material aid, not specified below
  - 1621: Reduce or stop economic assistance
  - 1622: Reduce or stop military assistance
  - 1623: Reduce or stop humanitarian assistance
- 163: Impose embargo, boycott, or sanctions
- 164: Halt negotiations
- 165: Halt mediation
- 166: Expel or withdraw, not specified below
  - 1661: Expel or withdraw peacekeepers
  - 1662: Expel or withdraw inspectors, observers
  - 1663: Expel or withdraw aid agencies

**17: COERCE**

- 170: Coerce, not specified below
- 171: Seize or damage property, not specified below
  - 1711: Confiscate property
  - 1712: Destroy property
- 172: Impose administrative sanctions, not specified below
  - 1721: Impose restrictions on political freedoms
  - 1722: Ban political parties or politicians
  - 1723: Impose curfew
  - 1724: Impose state of emergency or martial law
- 173: Arrest, detain, or charge with legal action
- 174: Expel or deport individuals
- 175: Use tactics of violent repression
- 176: Attack cybernetically

**18: ASSAULT**

- 180: Use unconventional violence, not specified below
- 181: Abduct, hijack, or take hostage
- 182: Physically assault, not specified below
  - 1821: Sexually assault
  - 1822: Torture

- 1823: Kill by physical assault
- 183: Conduct suicide, car, or other non-military bombing, not specified below
  - 1831: Carry out suicide bombing
  - 1832: Carry out vehicular bombing
  - 1833: Carry out roadside bombing
  - 1834: Carry out location bombing
- 184: Use as human shield
- 185: Attempt to assassinate
- 186: Assassinate

**19: FIGHT**

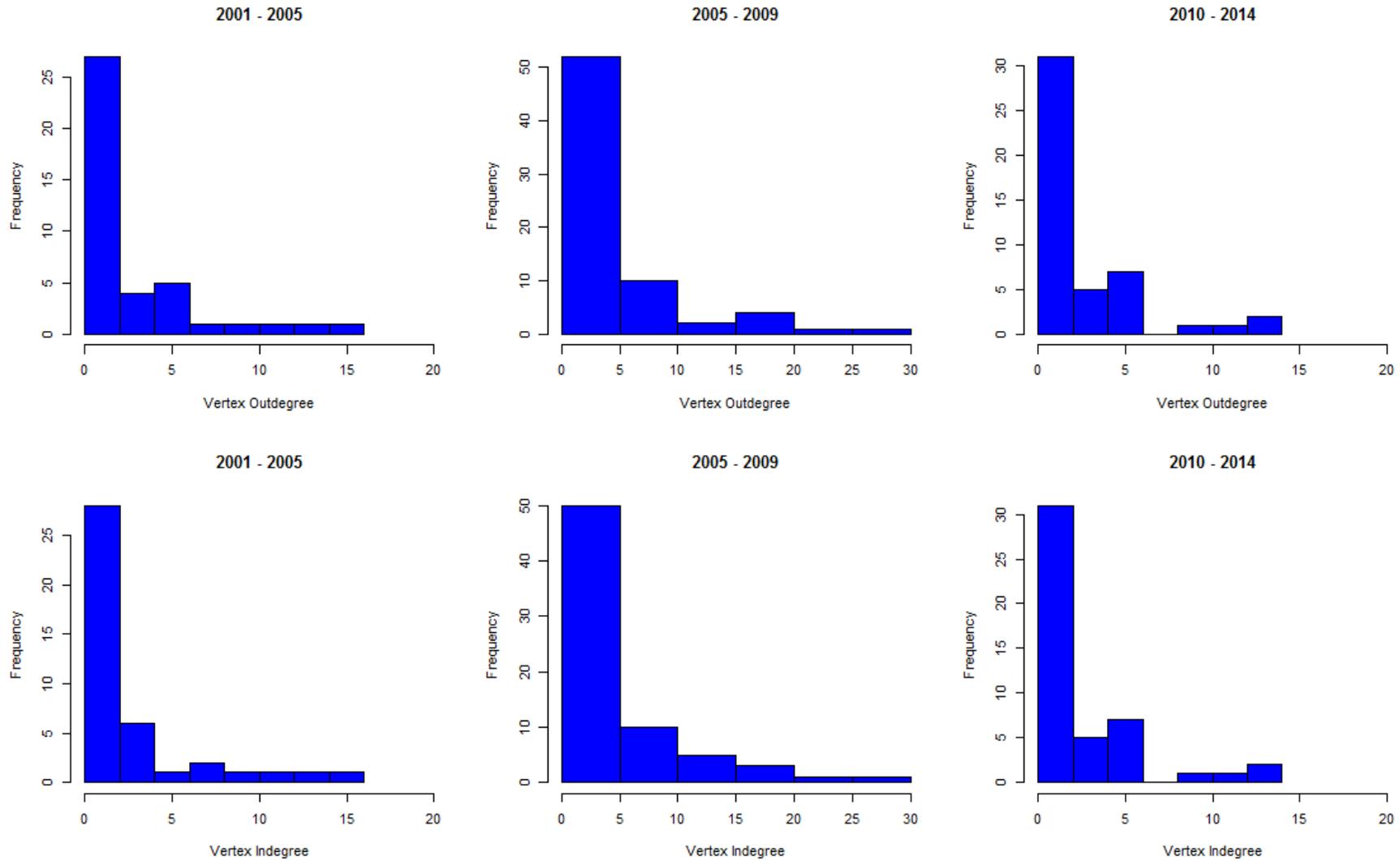
- 190: Use conventional military force, not specified below
- 191: Impose blockade, restrict movement
- 192: Occupy territory
- 193: Fight with small arms and light weapons
- 194: Fight with artillery and tanks
- 195: Employ aerial weapons, not specified below
  - 1951: Employ precision-guided aerial munitions
  - 1952: Employ remotely piloted aerial munitions
- 196: Violate ceasefire

**20: USE UNCONVENTIONAL MASS VIOLENCE**

- 200: Use unconventional mass violence, not specified below
- 201: Engage in mass expulsion
- 202: Engage in mass killings
- 203: Engage in ethnic cleansing
- 204: Use weapons of mass destruction, not specified below
  - 2041: Use chemical, biological, or radiological weapons
  - 2042: Detonate nuclear weapons



Figure 4: Degree Distribution



## 8 Literature

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