



ATLANTIC FUTURE

SCIENTIFIC PAPER

16

Climate change impacts in the Atlantic Basin and coordinated adaptation responses

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ABSTRACT

The need for ambitious implementation of strategies and measures for climate adaptation has become clear, however, at a global level, it is uncertain if or whether the issue is best confronted by centralised or fragmented structures of adaptation governance. This paper, an output of the EU ATLANTIC FUTURE project, investigates the dynamic network of transnational climate adaptation institutions currently working in the Atlantic Basin region. From a broad pool of adaptation institutions present in the Atlantic, eight case studies were selected and investigated, together representing an array of regions, forms of cooperation, actors, and thematic issues. Through case study analysis, this paper considers whether the work undertaken by these institutions is uniquely 'Atlantic' in nature – that is, if and how they are driven, facilitated, or bounded by the specific actors, climate impacts, or characteristics of the region – or whether they are more global in nature. Secondly, we examine how these institutions fit within the larger picture of fragmented global climate adaptation governance. In doing so, we find indications that the Atlantic hosts and fosters a diverse and active array of institutions, but that these are largely focused on the production and exchange of scientific knowledge and capacity building, rather than on the implementation of concrete measures. Although the fragmented governance structure currently in place has produced much valuable work, increased centralisation could be beneficial for ensuring better coordination and implementation of adaptation activities at the ground level.

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1. Introduction

Climate change presents a critical challenge to global governance, and the governance of the Atlantic Basin is no exception. While much focus has been given to the issue of mitigation (i.e., reducing the quantities of greenhouse gases emitted into the atmosphere), it has become increasingly apparent that current attempts in this regard, both nationally and internationally, are not bold enough and, at the current pace of efforts, it appears likely that more ambitious instruments may arrive too late to halt the rise of temperatures. As such, an equally pressing area of study is adaptation, activities that seek to limit the detrimental impacts of climate change on societies by altering natural and human systems to reduce vulnerabilities and enhance resilience.¹

This paper presents a first attempt to paint the larger picture of international and transnational collaborative climate change adaptation activities occurring within the Atlantic Basin. This framework provides opportunities to explore trends in terms of types of activities and adaptive responses, actors involved, funding mechanisms, and overall best practices. It also allows us to better understand the current state of the Atlantic Basin itself as a unique space that may drive, facilitate, and shape the adaptation activities occurring within. The paper provides initial insights into the governance structures involved in these activities, their centralised or fragmented nature, the impact this has, and the long-term efficacy that these structures may have in addressing the large and complex challenges of adaptation.

This study has three major objectives. First, we discuss the ways in which climate change affects the Atlantic Basin. We identify common impacts and vulnerabilities, as well as thematic areas where the impacts of climate change will be most intensely felt. The assumption in doing so is that common challenges encourage actors to develop coordinated responses. More generally, we analyse the drivers and obstacles for climate change adaptation cooperation in the Atlantic Basin and observe how actors have actually responded to the challenge of climate change in the Atlantic Basin. Secondly, we assess to what degree governance structures of climate change adaptation have actually been implemented, looking at bilateral and multilateral institutions. We also assess the effectiveness of these governance structures, acknowledging that current governance structures of climate change are inevitably fragmented. Finally, we conclude by determining the potential for further cooperation in the Atlantic Basin and question whether the pan-Atlantic is a useful dimension for addressing climate change impacts.

In the second section, we present background information and a review of relevant adaptation and governance literature, starting with a discussion of the various challenges and measures that climate change entails. We continue by outlining the current global governance structures of climate change, highlighting its fragmented nature especially in the area of climate change adaptation. The fragmentation of global governance structures is a subject of intensive debate among scholars of international relations and we draw from this debate to facilitate the assessment of the identified case studies.

In the third section, we present our methodology and pose key questions that the paper sets out to answer through an evaluation of selected Atlantic basin case studies.

¹ For a more robust definition of climate adaptation, see Section 2.

Section 4 provides an overview of the key climate change impacts and vulnerabilities identified for the Atlantic Basin, divided by sub-regions and thematic areas (e.g., agriculture, forests, freshwater).

In Section 5, we present seven case studies of climate change adaptation initiatives in the Atlantic Basin, providing an overview of each case study (history, actors, etc.), summarising the stated goals of each initiative and what has been achieved so far, and an analysis of governance structures. In Section 5, we bring together the main findings from the case studies, assessing specific strengths and weaknesses of each initiative as well as common benefits and shortcomings. We conclude by making recommendations based on the case study findings regarding future potential areas of cooperation and the strengthening of existing frameworks.

2. Background

Climate change adaptation has been defined as a “process, action or outcome in a system (household, community, group, sector, region, country) through which the system better copes with, manages or adjusts to changing condition, stress, hazard, risk or opportunity associated with climate change” (Smit and Wandel 2006). The IPCC has defined climate change adaptation as “adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC 2007a).

The term adaptation is not specific to climate change, however, but is a problem-solving process in response to situations where routine responses cease to be sufficient (Stepien et al. 2014). Closely related, the term adaptive capacity refers to “the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences” (IPCC 2001).

Adaptation to climate change can involve building general adaptive capacity or can instead entail adaptation-specific measures (Adger et al. 2005). Adaptive capacity is reflective of the resources and institutions available and of conditions such as access to finance, technology, infrastructure, and institutional environments (Smit and Wandel 2006). Even in areas where the physical impacts of climate change are similar, research shows that the level of experienced impacts on people, the economy, and natural resources varies depending on the capacity to adapt to changing circumstance (Gerstetter et al. 2012). In addition, having effective institutions and governance in place in a given country, region, or community influences whether effective adaptation policies are adopted and implemented. Thus, improving overall adaptive capacity and putting effective governance institutions in place can enhance the ability of people or institutions to respond to climatic changes.

Adaptation-specific measures can be aimed at reducing the sensitivity of the system to climate change (e.g., increasing freshwater storage and conservation, planting crops with greater resistance to climatic variability, building flood protection), altering the exposure of the system to climate change (e.g., developing early warning systems, disaster preparedness, vaccination programs), and increasing the resilience of the system to cope with changes (e.g., increasing access to resources, helping populations recover from loss, insurance schemes, compensation and social security systems) (Adger et al. 2005). There are many forms and levels of adaptation actions and strategies, ranging from short-term responses to long-term transformations (Smit and

Wandel 2006). Actions can be either anticipatory or reactive, as well as autonomous (i.e., independent or ad-hoc) or planned (i.e., governmental measures) (Adger et al. 2005). Further, adaptation actions can be taken through either private (individual) or public (collective) action, though generally, efforts to improve the ability of whole populations are more often achieved through public policy (Ibid; Wreford et al. 2010). For the purposes of this paper, our primary focus is on planned adaptation measures where climate change is a contributing motivator.

While a wide range of measures support adaptation efforts, not all come under the title of adaptation (Gerstetter et al. 2012). Adaptation oftentimes occurs within the context of other socioeconomic changes and decision-making processes, making it at times challenging to clearly identify actions as being triggered in reaction to climate change (Adger et al. 2005). In fact, climate change is not commonly the sole motivating factor behind adaptation actions (Ford, Berrang-Ford, and Paterson 2011). Climate adaptation actions are often taken for other reasons, or within the context of other sectoral policy measures (Smit and Wandel 2006). Adaptation initiatives are rarely stand alone measures and instead tend to be modifications to existing policies, programs, or processes. Incorporating climate change into other sectors and processes is commonly known as “mainstreaming.” Like many other environmental problems, climate change is a cross-cutting issue that does not fit into one sector, suggesting the need for broader, cross-sector integration (Peters 1998; Gerstetter et al. 2012). Successful climate change adaptation and vulnerability reduction is rarely undertaken with respect to climate change alone and a combination of strategies in different areas and at different levels may be most effective at reducing vulnerability (Smit and Wandel 2006).

For several reasons, effective and efficient governance of climate change adaptation can benefit from cooperation between various communities, within and across state boundaries. First, it is clear that many communities lack the adaptive capacity to confront the manifold challenges that climate change poses. For these communities, the exchange of financial, human, or technical resources is often central to improving adaptive capacity. Second, the effects of climate change have already hit some communities, whereas other communities have not yet experienced the detrimental impacts of climate change. The latter can therefore learn from the former, shortcutting lengthy and expensive trial-and-error processes. Third, the effects of climate change do not stop at borders and multiple communities sharing or bordering a common region may experience common impacts. It therefore may make sense to pool resources rather than addressing challenges in isolation.

The question remains, however, as to how interconnected and inclusive cooperative efforts in the realm of climate change adaptation can or should be. Does climate change adaptation require a truly global and comprehensive response or are regional approaches more useful? How much central coordination is necessary? At this point, despite some centralised coordination at the global level, climate change adaptation has primarily ensued at the regional or local level in a largely decentralised fashion. Whether this furthers or hinders effective and efficient climate change adaptation remains to be seen.

Concepts such as “regime complex” (Keohane and Victor 2010), “transnational climate governance” (Andonova, Betsill, and Bulkeley 2009), and “polycentric governance” (Abbott 2012) attempt to capture - fully or in part - the myriads of multilateral, “minilateral”, and unilateral efforts of public and private actors to adapt to the consequences of climate change. These efforts are often embedded in international and transnational organisations, networks, “clubs”, and other forms of institutionalised

cooperation that bring together national and sub-national governments and administrations, firms, and various civil non-governmental organisations (NGOs).² Many of these transnational and international institutions fulfill governance functions insofar as they possess the authority to steer the conduct of target actors toward collective goals (Abbott 2012; Andonova, Betsill, and Bulkeley 2009). From the 1980s until the early 2000s, the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP) stood at the core of the nascent global architecture of climate change governance. However, for the past ten to fifteen years, a myriad of international and transnational institutions and initiatives have emerged with only weak or no official or explicit links to the UNFCCC/KP. As a result, the global governance structure of climate change mitigation and adaptation has become increasingly fragmented.

Global governance architectures are fragmented, in general (Biermann et al. 2009). This fragmentation characterizes global climate change governance, as stated above, and is especially pronounced in the area of climate change adaptation.³ Since it is more challenging for climate models to predict impacts at the local level, it is not precisely clear how different regions and communities will be affected by the specific effects of climate change, leaving ample room for diverging scenarios and different policy responses. As Bulkeley and his colleagues observe: “Initiatives which include adaptation are somewhat different from the others, with a stronger role being played by community-based organisations and foundations, as well as regional and local government, suggesting that this is predominantly an issue being pursued by organisations with some form of place-based focus” (Bulkeley et al. 2012). This place-

² By “transnational” relations we mean “regular interactions across national boundaries when at least one actor is a non-state actor or does not operate on behalf of a national government or an international organisation” (Risse-Kappen 1995: 3). The definition thus considers sub-national public actors (e.g., city governments, local councils, etc) as non-state actors. Transnational relations can take place exclusively among private actors or among public actors or connect both groups in hybrid public-private partnerships (Andonova, Betsill, and Bulkeley 2009: 59-62). “International” relations, on the other hand, exclusively take place between national governments either bilaterally or multilaterally, sometimes institutionalised through the various multilateral (international) organisations and regimes that states build to facilitate their interactions.

³ For several reasons, fragmentation is pronounced in the governance architecture of climate change (mitigation and adaptation). First, as we witness contrasting developments between the rise of global concerns about climate change and the declining problem solving capacity of the UNFCCC, actors attempt to find “minilateral” responses that go beyond the lowest common denominators usually reached at the Conferences of the Parties (COPs). In fact, the UNFCCC/KP explicitly invites public and private actors to form complementary institutions to help implementing its goals and to achieve more ambitious targets (Moncel and van Asselt 2012). Second, climate change poses complex problems that intersect with numerous other policy areas such as economy, security, and environment. It is therefore not surprising that innumerable actors with diverse values, interests, and resources are affected and become involved in the governance of climate change. Due to the complexity of the challenges posed by climate change and the diversity of participating actors, cooperation evolves around governance niches (e.g., air traffic emission, flood protection, etc.) and requires the cross-border coordination of responses, involving different levels and scales (sub-national, national, regional, and/or global) (Abbott 2012: 583f.; Andonova, Betsill, and Bulkeley 2009: 57f.). Third, timing and organisational path-dependence have caused to the emergence of a plethora of uncoordinated institutions that either complement or contradict each other (Keohane and Victor 2010: 15).

based focus is not surprising, taking into account that the effects of climate change will manifest themselves in divergent ways across different localities.

This cause of fragmentation is further amplified by the fact that the architecture of global climate change adaptation overlaps with many other global governance architectures - namely, food, water, health, energy, migration, economy, and security (Biermann and Boas 2010). This overlap requires mainstreaming, incorporating climate change adaptation into these policy sectors, as mentioned above. It also necessitates understanding of how specific measures taken in these policy areas affect the overall adaptive capacity of communities. There might be tradeoffs, but it is also possible that various measures are mutually reinforcing.

Acknowledging fragmentation within the global governance architecture for climate change adaptation, brings forth the question as to whether this is a negative development or one to be embraced as leading to needed diversity in terms of problems addressed, actors and resources involved, and solutions provided. Several scholars support the latter view, arguing that the emergence of a wide variety of numerous international and transnational institutions is not only inevitable, but should be applauded. Keohane and Victor (2010), for instance argue that regime complexes are ideally suited to generate flexible and highly adaptive responses to newly emerging challenges under conditions of high uncertainty and policy flux. As Kenneth Abbott puts it: "Small and medium-scale organisations can take advantage of local knowledge developed for local contexts" (Abbott 2012). Moreover, smaller organisations suffer less from collective action problems. And since the interests of members in smaller organisations are more in line, they might be willing to intensify and deepen cooperation, setting targets that go well beyond the lowest common denominator achieved in institutional configurations of many actors.

Studies on "adaptive governance" and "adaptive co-management" especially stress the importance of local and regional state and non-state actors in bolstering the resilience of communities in the face of far-reaching environmental changes such as those that emerge from climate change (Folke et al. 2005; Nelson et al. 2007). The importance of local and regional communities is not surprising. As Folke and his colleagues point out: "Social sources of resilience, such as social capital (including trust and social networks) and social memory (including experience for dealing with change), are essential for the capacity of social-ecological systems to adapt to and shape change" (Folke et al. 2005).

Local and regional communities can feed practical knowledge into a governance system. However, they might lack the scientific knowledge as well as the technical and financial resources to translate this knowledge into action. Combining local and scientific knowledge is therefore both a challenge and an opportunity for more effective implementation of adaptation measures. Moreover, successful climate change adaptation structures depend on the "collaboration of a diverse set of stakeholders, operating at different levels, often through networks from local users to municipalities, to regional and national organisations, and also to international bodies" (Folke et al. 2005). As Folke and his colleagues further argue, "the vertical links of such arrangements may boost adaptive governance, for instance when local and national institutions gain strength from being nested in regional and global institutions" (Folke et al. 2005).

However, other scholars caution that governance measures at various levels might contradict and counteract each other. Bierman et al. (2009), for instance, fear that further fragmentation might lead to the emergence of conflicting norms and policies. Fragmentation can lead to coordination gaps which in turn could cause unnecessary

redundancies and duplication of efforts. Moreover, even though minilateral institutions might be more ambitious for the moment, they could discourage the realisation of equally or even more ambitious goals at a higher scale. Transnational institutions are also more flexible to include new and different types of actors (e.g., firms). Yet this flexibility will offset the advantage of smaller organisations - namely, lessening the collective action problem. Finally, in smaller minilateral organisations, weaker members may not be able to gain strength by “ganging up” against larger and more powerful members, as they can in larger organisations. In smaller organisations, more powerful members can dominate without having to listen to a group of smaller members (Biermann et al. 2009). Fragmentation can also have the unintended impact of disadvantaging public and private actors from developing countries. Membership in several organisations increases administrative costs, including additional human capacity, causing poorer member states to be underrepresented in a fragmented global governance system.

Therefore this paper concludes that even though a recentralisation of this structure is neither likely nor desirable, centralisation could have some benefits, including coordination of various initiatives to ensure that actions and strategies are mutually reinforcing and work towards the same goal(s) where appropriate (von Asselt and Selli 2013). With that said, it should be clear that several of the noted shortcomings of a fragmented governance structure tend to be hypothetical rather than real. While it is true that in other policy areas, such as global migration, the lack of a coordinated approach might cause the emergence of conflicting norms, beggar-thy-neighbour effects, and a domineering role of larger economies (Betts 2011), it is unlikely that transnational climate change adaptation initiatives would lead to the emergence of conflicting norms or would unduly disadvantage and put an additional burden on neighbouring states that are not part of a particular transnational or international institution. Nevertheless, central coordination would help to identify and avoid potential duplications of efforts, spread knowledge about worst and best practices about climate change adaptation measures, and would help international donors to funnel resources towards successful initiatives.

3. Methodology

In this exploratory study, we attempt to provide a preliminary assessment by analysing cases of primarily transnational governance institutions that focus on climate change adaptation in the larger Atlantic Basin. By institutions we refer to structures that guide interactions between various actors (individuals, groups, states, etc.) in specific areas of social, economic, and political life. We do not intentionally focus on transnational initiatives and deliberately ignore international forms of cooperation. It just so happens that cooperative efforts in the area of climate change adaptation almost always include at least one non-state actor, which makes them transnational forms of cooperation by definition (see footnote 1).

Sixteen potential Atlantic Basin adaptation case studies were identified in an initial desk study.⁴ These sixteen case studies consisted of projects, partnerships,

⁴ The main method of locating potential case studies were Google searches using various permutations of the terms ‘climate change’, ‘climate’, ‘adaptation’, ‘initiative’, ‘Atlantic Basin’, ‘Atlantic region’, ‘Atlantic Ocean’, ‘North America’, ‘Central America’, ‘Caribbean’, ‘South America’, ‘Europe’, ‘Africa’, ‘project’ and ‘program/programme’, as well as screening of known

institutions, and programmes where climate change adaptation was a major focus, and whose activities took place within the Atlantic Basin. From the initial screening, seven case studies were chosen according to a set of criteria designed to curate a diverse and robust a set of examples. The criteria used in the selection process included: the geographic origin of the actors involved; the geographic region where case study activities were undertaken; the type of biomes present in the case study regions; the sectors addressed by adaptation measures; the type of adaptation activities undertaken (capacity building, information sharing, research and development, etc.); the level of governance involved (regional, national, subnational); and the actors (government, public research institute, NGO, private actor, etc.); and the profile of the relationship between the actors (north and south, south and south) relationship. According to these criteria, the seven case studies presented herein were selected.

Keeping the discussion in section 2 in mind, we analyse these cases to assess whether the specific types of cooperative behaviour further the goal of climate change adaptation in effective ways. In assessing this, we need to analyse the structures and activities of the specific institutions, but also the overall governance structures of climate change adaptation. In other words, it is necessary to establish whether these institutions reinforce, duplicate, or even contradict other measures that aim at climate change adaptation. If we find instances of best practices, we further challenge whether this type of cooperative behaviour is transferable to other situations. At a larger level, by examining these case studies, we attempt to discern if the fragmentation of climate adaptation governance in the Atlantic Basin, to the extent that it exists, is a unique reflection of the region's characteristics. More specifically, we attempt to determine whether the cultural, economic, historical, geographic, and political realities of the region are driving or facilitating factors within these adaptation institutions.

We start our analyses, however, with a more descriptive exercise and identify which actors are involved in cooperation; what drives the cooperation; what are the declared goals; and which resources are accessible to the actors? We sought answers to the questions through the consultation of secondary sources (e.g., official documents, scholarly and journalistic articles, etc.). Further research activities such as interviews or field research were beyond the scope of this paper.

These are then the research questions that guide the analyses of our cases studies:

1. Who are the participating actors in the institutions? Are they governmental, non-governmental, public, private, for-profit, non-profit, and/or research institutions? Where are these actors physically located (inside or outside of the Atlantic Basin, in the North or South)?
2. Who are the primary founders of these institutions? How are resources shared between members of these institutions? And do resources translate into decision-making power in these institutions?
3. What are the origins and driving forces of the institutions? Are there common perceptions, interests, and values that facilitate cooperation among the various actors in those institutions? Does the Atlantic Basin constitute an area of shared interests and values that shape the collaborative efforts of those institutions?
4. What are the goals of the transnational/international institutions? Do these goals exclusively comprise climate change adaptation measures? Or is climate

databases of adaptation measures such as the EU's Climate-ADAPT and UNDP's Adaptation Learning Mechanism.

change adaptation one of several other goals (e.g., climate change mitigation, food security)? Do these institutions attempt to build adaptation capacity in the long run? Or are they focused on short-term responses?

5. Are structures put in place that facilitate the exchange of information between the members of the institution? Are the experiences and needs of all members clearly articulated and heard throughout the institution? Does the membership lend itself to the achievement of the stated goals?
6. Do the institutions cooperate with each other, either directly or through some umbrella organisation such as the UNFCCC? Are experiences shared on a regular basis? Do the institutions ensure that activities do not contradict or unnecessarily duplicate the activities of other institutions within the architecture of climate change adaptation?
7. Assuming a specific case of cooperation has been successful - i.e., it has achieved its stated goals, has used its resources in the most efficient ways, and has not duplicated or even contradicted other cooperative attempts to adapt to climate change - can this case serve as a blueprint for other regions? In other words, can different actors in other regions learn from this case?

In addition to the seven case studies in Section 5, we briefly surveyed a number of examples of adaptation that did not fit the above criteria: bilateral or multilateral cooperation within one region or sub-region of the Atlantic (e.g., intra-regional, not transatlantic) and cooperation taking place with actors outside of the Atlantic Basin (e.g., extra-Basin). These examples, located in the Annex, were intended to widen the frame of reference so as to better evaluate aspects of cooperation which are or are not unique to the Atlantic Basin.

4. Impacts of climate change in the Atlantic Basin

4.1. Definition of Atlantic Basin and geophysical description of regions

The 83 countries of the Atlantic Basin occupy a vast territory spanning a significant portion of the globe.⁵ Combined, their land area covers nearly 10% of the Earth's

⁵ For our purposes, Atlantic Basin is defined as those countries bordering the Atlantic Ocean, with the EU 27 and Switzerland. The exact countries in the Atlantic Basin are as follows: *Africa*: South Africa, Angola, Benin, Cameroon, Cape Verde, Cote d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Liberia, Morocco, Mauritania, Namibia, Nigeria, Republic of Congo, Democratic Republic of Congo, São Tomé and Príncipe, Senegal, Sierra Leone, Togo. *South and Central America and the Caribbean*: Argentina, Bahamas, Brazil, Cuba, Dominican Republic, Guyana, Haiti, Suriname, Trinidad and Tobago, Uruguay, Venezuela, Antigua and Barbuda, Barbados, Belize, Colombia, Costa Rica, Dominica, Grenada, Guatemala, Honduras, Jamaica, Nicaragua, Panama, St Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines, and Bermuda. *North America*: Canada, United States of America, Mexico. *Europe*: EU-27 (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark – including Greenland –, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom), Iceland, Norway (as coastline countries) and Switzerland.

surface, with the Atlantic Ocean itself covering a further 22%⁶. The Atlantic Basin countries nearly stretch from North to South Pole, and span roughly 195° of longitude. They encompass a vast array of biomes, including tundra, desert, savannah/grassland, coniferous forest, temperate, and tropical broadleaf forest, and mangroves. Even within sub-regions, a marked diversity of climates is often found. As such, there is a wide variety in experienced climatic conditions and potential future climate change impacts both across and within countries.

The broad spectrum of climatic and biophysical conditions present in the Atlantic Basin means there are few simple narratives in describing and understanding the impacts of climate change. From an adaptation perspective, this reality is compounded by the diversity of socioeconomic conditions found across the 83 countries in question – a group of states that includes some of the world's largest and most developed economies, major emerging economies, as well as many developing and least-developed economies. The differing levels of financial, technical and informational resources available to different Atlantic Basin countries, as well as the unique social and cultural lenses with which actors within these countries view the issue of climate change, both shape and constrain their capacity to adapt in unique and fundamental ways.

Given the space constraints of this paper, it is not feasible to outline the specific climate impacts for every single sub-region with a distinct climate or biome. For our purposes, we have divided our focus into four main regions, divided along continental lines:

- North America
- South America, Central America, and the Caribbean
- Europe
- Africa

Clearly, these broad regional groupings contain significant variability, but provide a set of basic geophysical and socioeconomic clusters that facilitate identifying, locating, and understanding climate change impacts across the Atlantic Basin.

4.2. Dominant climate change vulnerabilities and sectoral trends across the Atlantic Basin region

Even with the wide array of geophysical, socioeconomic, and political differences present in the Atlantic Basin, a study of the experienced and anticipated impacts of climate change across the various regions reveals that there are indeed broad trends felt across all or several of the sub-regions.⁷ In this section, climate change

⁶ This figure is based on country land area data obtained from: World Development Indicators, Word Bank. Available online at: <http://data.worldbank.org/data-catalog/world-development-indicators>. Accessed 12 November 2013.

⁷ Due to the timing of its publication, this report was not able to fully incorporate the 2014 IPCC report "Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II Contribution to the IPCC 5th Assessment Report - Changes to the Underlying Scientific/Technical Assessment", which presents a current assessment of the scientific, technical and socioeconomic literature on impacts, risks and vulnerabilities stemming from a

vulnerabilities and sectoral trends are outlined for the Atlantic Basin across the following commonly identified thematic areas:

- Coastal vulnerability, including sea level rise and extreme weather events
- Agriculture and food security, including decreased crop and livestock yields from climatic vulnerability, spread of arid regions and extreme weather events
- Freshwater quantity, quality, and availability
- Biodiversity shifts and losses for marine and terrestrial ecosystems
- Human health impacts related to extreme weather events and spread of vector-borne illnesses
- Forests and forestry, including increase of fire events

These thematic areas were used as part of the case study selection criteria discussed in Section 3, and each one represents an issue area addressed by at least one of the institutions analysed below. To provide context for the case studies, we provide an introduction to the specific vulnerabilities and trends present in each thematic area. To provide added specificity, we identify the sub-regions within the Atlantic Basin where these vulnerabilities and impacts are most acutely felt, according to the geographic regions identified in Section 3. Brief descriptions of the degree of vulnerability, sectoral impacts, and long-term implications are also provided.

4.2.1. Coastal vulnerability from sea level rise and extreme weather events

A significant percentage of the population of the Atlantic Basin lives in coastal zones, including a number of major cities and population clusters around river deltas. Climate change impacts in these zones include flooding, risks to infrastructure, coastal erosion, damage to local economies, loss of territory, and saltwater intrusion into groundwater supplies.

North America: The IPCC report states with (very high confidence) that coastal communities and habitats in North America will be increasingly stressed by climate change impacts in particular when combined with development and pollution management.⁸ Sea level rise occurring along coastlines erodes natural barriers and increases vulnerability to flooding and storm surges and other extreme weather events. The OECD has identified the U.S. as being one of the countries most at risk for losses due to sea level rise, owing to the significant economic assets and low defense levels in major cities. Three American cities (Miami, New York, and New Orleans) are responsible for 31% of economic losses accrued by climate change worldwide according to a 2013 paper for the OECD project exploring the policy implications of flood risks due to climate change and economic development (Hallegatte et al. 2013). In addition to human vulnerabilities, there are geophysical ones. Salt marshes, coastal

changing climate. Yet, an initial review finds that the report generally reaffirms (and in some cases raises further concerns) about the impacts overviewed in this section.

⁸ Note: The research for this report was done prior to the release of the IPCC's Fifth Assessment Report (AR5) and instead relies on the 2007 Fourth Assessment Report (AR4).

habitats, and low lying estuaries are vulnerable to impacts of biodiversity loss and accelerated change.

South and Central America and the Caribbean: With some sixty major Latin American cities situated along coasts and a high levels of urbanisation (over 70% of the population in Central and Latin America live in urban areas), sea level rise poses a serious human and economic threat. In particular, Central America and small island countries are considered the most vulnerable to extreme weather events and sea level rise given their high level of exposure. Low elevation coastal zones in Belize, Guyana, and the small island states of the Caribbean are and continue to be exposed to storm flooding and damage, coastal erosion, and increased salinity of aquifers (Lankao 2008). South and Central America are also home to several fragile coastal mangrove ecosystems that are important places for fish hatcheries and biodiversity. Further south, Argentina and Uruguay's coasts and estuaries are low lying and sea level rise and salt water intrusion affect freshwater supplies (Parry et al. 2007).

Europe: Future sea level rise and storm events are expected to increase coastal erosion with wide ranging impacts across the EU (Parry et al. 2007). The largest threats from sea level rise and flooding are projected to occur in Western and Northern Europe and the Mediterranean where large populations and significant built infrastructure characterise the coastline (Parry et al. 2007). Low-lying countries like the Netherlands face significant potential loss of territory. Flooding and loss of wetlands have been identified as potential problems under future scenarios of sea level rise (Parry et al. 2007; European Environment Agency 2012).

Africa: The expected levels of sea level rise in Africa are higher than the global average in the tropics and sub-tropics. Under some scenarios (e.g., 4°C rise in global temperatures by 2100), certain countries will have 10-15% of their population acutely vulnerable to flooding events. Sea level rise is also expected to pose risks to coastal infrastructure (with effects on human and economic development), including impacts on human health, port infrastructure, and tourism. The Senegalese and Congo River deltas are particularly vulnerable (Schellnhuber et al. 2013).

4.2.2. Agriculture and food security vulnerability

Climate change across the Atlantic Basin is expected to influence agricultural productivity in a variety of ways. Key vulnerabilities include: decreased crop yields linked to increased seasonal precipitation and temperature variability; increased spread of arid regions; and increased extreme weather and drought events. These impacts are predicted to affect both industrial agricultural systems (predominant in the U.S. and Europe and some emerging economies in South America) as well as small scale and pastoral systems of farming that are prevalent in parts of Africa and South and Central America.

North America: Canada and the U.S. are significant players in the world market of grain commodities, and the industrialised system of agriculture that characterises this continent is highly susceptible to shocks in temperature and precipitation. Dependency on energy inputs including fuel, water, fertiliser, and pesticides are not only major contributors to greenhouse gas emissions, but are also particularly vulnerable to soil and land degradation. In 2012, several states in the Midwest U.S. lost their corn and soybean crop, which contributed to a global shortage of grain on the world market and a food price spike (USDA 2013).

South and Central America and the Caribbean: Despite Latin and Central America having high levels of urbanisation, agriculture is a major sector, particularly in growing economies. Agriculture contributed 5% to the region's gross domestic product (GDP) in 2012 (Vergera et al. 2014) and accounted for 9% of female employment and 19% of male employment between 2008 and 2011 (World Bank 2013). Of particular relevance is the increase of agricultural exports from Latin America which represent 23% of the regions exports and contribute 13% to agricultural commodities globally (Vergera et al. 2014). Thus, Central and Latin America are expected to be increasingly significant players in the eradication of hunger, for which Latin America has an estimated 49 million people suffering from undernourishment (OECD-FAO 2012). Changes in weather patterns and the length of the crop cycle will affect productivity of agriculture and while these may improve growing potential in some regions they will also depreciate it in others. The impacts on communities are likely to be diverse, but since approximately one third of Latin Americans depend on subsistence farming for their livelihoods and food security, the human security impact is high.

Europe: Shifts in climate across Europe may lead to a shortening of some crop growth phases, including grain-filling phases, which may in turn reduce yields for certain crops (e.g., wheat). Extreme weather events, including drought, are expected to increase yield variability. In Southern Europe, projected decreases in precipitation, paired with higher anticipated average temperatures, will increase irrigation requirements, while suitability for rainfed agriculture is expected to decrease. Though temperature increases in Northern Europe may allow for the expansion of certain types of cultivation, such as maize, it may also increase the habitat range of relevant weeds, pests, and diseases (European Environment Agency, 2012).

Africa: Africa is particularly vulnerable to climate change because of the combined factors of already low levels of productivity, high predicted population growth, and fragile farming systems. Africa has the highest incidence of rural poverty and is the continent worst affected by poverty and hunger after Asia (IFAD 2010). With a significant percentage of the population dependent on subsistence agriculture for their livelihood, changes in weather patterns and varied crop productivity have important implications for poverty and rural development. Several key crops have been observed to have temperature sensitivity, with temperature increases producing significant yield reductions. Significant losses of one third or more are predicted for maize, sorghum, millet, and groundnuts and cassava (Schlenker and Lobell 2010). Adjacent impacts of increased temperatures include the predicted spread of arid land, soil erosion, and desertification. Some indigenous pastoral systems of agriculture are particularly vulnerable when climate change impacts combine with issues of land fragmentation and access to water (Schellnhuber et al. 2013).

4.2.3. Freshwater quantity and quality

Climate change in the Atlantic Basin has implications for freshwater resources in both urban and rural areas. Freshwater quantity and quality is affected by issues related to decreased precipitation and river flows, glacial retreat, higher average temperatures, and competition for resources, pollution resulting from extreme weather events, and competition between users (e.g., reductions in water supply for domestic, industrial, and agricultural needs).

North America: Water resources are a major concern as climate change will likely bring about high competition between sectors for resources, with for instance, the combined demand coming from water use in agriculture, in households and for consumption and

for other energy intense industries. In the Great Lakes region and in major river basins across America, lower water levels are likely to exacerbate challenges regarding water quality, navigation, recreation, hydropower generation, water transfers, and intra-state relationships.

South and Central America and the Caribbean: The effects of climate change on water quantity and quality in Central and Latin America are complex. Glacier melt in the Andean mountain range is identified as a significant threat to watersheds. Some scientists predict the glaciers will disappear within 15-25 years, posing serious availability issues for cities and populations in Colombia, Peru, Chile, Venezuela, Ecuador, Argentina, and Bolivia (UNEP 2013). These countries on the western region of Latin America may be geographically excluded from the Atlantic focus, however, changes in these Western regions are affecting water flows on the Atlantic side of the continent. For instance, as Andean glaciers melt in the West, increased rainfall has resulted in more frequent flooding. Changes in rainfall patterns compounded by the disappearance of glaciers would notably reduce the availability of water for human, agricultural, and hydroelectric consumption. In particular, any reductions in rainfall would significantly affect Amazonia, as well as Brazil's central south region, where most of the country's agriculture and silviculture is located.

Europe: Summer flows of rivers are expected to decrease across much of Europe, including in regions where overall annual flows are expected to increase. Precipitation decreases are expected across southern Europe, while precipitation increases are expected in Northern Europe. Southern and South-Eastern Europe are expected to experience increased instances of drought from reduced river flows (European Environment Agency 2012).

Africa: Africa has distinct climatic zones and ecosystems ranging from the desert Sahara to the rainforests of Central Africa. Climate change impacts will vary, but generally increased prevalence of drought and ensuing scarce water resources in the Sahel are of primary concern. Water scarcity negatively impacts subsistence farmers, nomadic culture and food security and has contributed to the transformation of land to desert like environments in for instance Algeria, Chad, and Mali. Increased temperature and variations in rainfall are already negatively affecting the carrying capacity of the dry pastoral regions in Africa, threatening food security in the region as well as political stability as populations move to access dwindling resources. Lack of democratic governance, political instability, and conflict further undermine the management of natural resources, particularly water (Adano and Daudi 2012).

4.2.4. Biodiversity impacts

In the Atlantic Basin, climate change impacts are expected to have consequences for the biodiversity of marine, terrestrial plant and animal species, including reduced fitness, decreased genetic diversity, forced migrations, habitat and food loss, and phenological shifts. Results of these changes may include altered species compositions and interspecific relationships. For marine species in particular, key impacts include changes to ocean chemistry, such as pH balance, salinity, and oxygen.

North America: Climate change is expected to impact seasonal-life cycle events in North America, particularly for migratory species. This can result in timing mismatches, whereby a migratory species may arrive at a specific time in a place that is experiencing climatic changes, thereby, changing the territorial offerings in a particular time or place. Range shifts, both terrestrial and aquatic, are another key impact as land

changes as species are forced to move further north or south to meet their habitual needs. Ecosystems with colder temperatures, such as tundra and coldwater rivers and streams, face invasion from species adapted to warmer climates, leading to potential loss of species from the original ecosystems. Range shifts can also include new pathogens, parasites and disease, such as the mountain pine beetle or the oyster parasite, *Perkinsus marinus*, which can produce major die-offs. From an environmental perspective, salt marshes, coastal habitats, and low lying estuaries are vulnerable to impacts of biodiversity loss and accelerated change.

South and Central America and the Caribbean is the region with the greatest biological diversity in the planet and is home to half the world's tropical forests, 33% of its mammals, 35% of its reptilian species, 41% of its birds, and 50% of its amphibians (UNEP 2010). Rapid deforestation, however, continues to threaten the continent's unique biodiversity and between 1990 and 2005 some 69 million hectares of forest were cleared, corresponding to 7% of the regions entire forest cover (UNEP 2010). Moreover, the man-made clearing of forests compromises a species' ability to adapt to climate change. Drivers of deforestation vary from region to region, however, logging and clearing land for agricultural crops, particularly for animal fodder to meet the growing needs of the cattle market is a major driver of deforestation and contributor to climate change green house gas emissions (Barona et al. 2010). The eastern Atlantic coasts are also experiencing fast degradation from unsustainable use and pollution such as sewage. Mangroves, wetlands, and coral reefs are threatened by a combination of factors including urbanisation, sedimentation, contamination by toxic substances, water acidification, and overfishing (UNEP 2010).

Europe: Almost 20% of habitats and 12% of species of European interest are potentially threatened by climate change over their natural range. Bogs, mires, and fens are considered to be the most vulnerable habitat types. Climate change is believed to have produced changes in seasonal events across Europe, including shifting the time frames for phenological events. In particular, the breeding seasons of thermophilic insects such as butterflies, dragonflies, and bark beetles are lengthening, allowing for extra generations to be produced during a single year. In general, climate change is facilitating a northward migration for many European species. (European Environment Agency 2012).

Africa: Biodiversity loss in Africa, particularly sub-Saharan Africa is closely interlinked to changes in precipitation and drought. Savannah vegetation in particular is deemed to be highly vulnerable to climate change, including changes in atmospheric carbon dioxide (CO₂) levels. The Sahel region, for example, has already witnessed a 20% decline in tree density and reduction in species richness related to changes in temperature and precipitation, which is attributable to climate change. Biodiversity loss accrued to invasive species is increasingly problematic, particularly in already damaged or degraded ecosystems. In coastal areas with dense biodiversity, anticipated damage as a result of climate change is expected. Further challenges to biodiversity may also occur as spill over from efforts to adapt to other climate impacts, such as the undermining of riverine ecosystems through large scale water management activities (Schellnhuber et al 2013).

4.2.4. Health impacts

Climate change induced health impacts across the Atlantic are difficult to predict precisely, however, there are both indirect and direct implications for human

populations. Most obviously, there are the direct effects resulting from major climatic disasters, such as, heat waves, floods, mudslides, and other climate-induced disasters that result in human injuries and casualties. Indirect impacts of climate change that include losses in agriculture and food stuffs can lead to widespread nutritional deficiencies and stunted growth. There are also potential health risks related to changing temperatures and precipitation that bring about disease spread, in particular, vector-borne diseases such as malaria.

North America: The prevalence of obesity and heart disease in North America make the population particularly vulnerable to increasing temperatures and climate variability. Moreover, respiratory and allergy related illnesses are expected to worsen with increasing exposure to pollen and ozone. Vector-borne infectious diseases such as Lyme disease and West Nile Virus are health threats to both the human and animal populations.

South and Central America and the Caribbean: A rise in temperature may have an impact on human health in highly populated and dense cities (e.g., Mexico City, Santiago). Vector-borne illnesses (e.g., malaria, dengue) have been shown to change when temperature and precipitation increase as in Brazil, Columbia, Argentina, and Honduras. Additionally, extreme weather events will increase death and morbidity rates (injuries, infectious diseases, social problems, and damage to sanitary infrastructure).

Europe: Human health risks related to increases in flooding events (from sea level rise and extreme precipitation) are expected to increase, including: heart attacks, injuries, infections, psychosocial consequences, health effects of chemical hazards, and disruption of services. An increase of heat-related deaths due to projected increases of heat waves is expected, particularly in vulnerable groups (e.g., elderly and overweight). A decrease in cold-related deaths in some parts of Europe can also be expected. Climatic changes will alter and increase the habitat suitability for a range of disease vectors, such as the castor bean tick and mosquitoes. Temperature increases expected to increase risk of food- and water-borne illnesses, such as salmonellosis (from increased heat) and campylobacteriosis (from increased extreme precipitation and flooding) (European Environment Agency 2012).

Africa: Health impacts from climate change in Africa are projected to include vector- and water-borne diseases such as malaria, Rift Valley fever, and cholera. Vulnerability to these diseases is expected to rise as climatic changes expand the area within which these diseases operate. Malnutrition (tied to loss of income and food insecurity) can produce negative health effects like stunted growth and increased vulnerability to disease. Mortality and morbidity is also expected to increase as a result of extreme heat events

4.2.5. Forests and forestry

Warmer temperatures and changes in precipitation patterns are expected to increase fire events and fire prone regions. Climate change may also extend the range of certain forest pathogens. Inversely, the loss of forests due to fires or man-made encroachments accelerates climate change globally.

North America: Warmer summers have not only decimated crops, but increased the persistence of forest fires whose risk factor has risen by 10-30% and could result in increased burned total area of 74-118% in Canada by 2100 (IPCC, 2007a). The frequency of forest fires and drought has already started to shift North American

species north, thereby bringing about important ecological changes. Further fragmentation of habitats, invasive species, and specific contexts are likely to bring about fundamental changes in ecological systems, functions, and services.

South and Central America and the Caribbean: The size and density of the Amazon Basin make it a crucial player in the effort to back pedal against global warming with rain forests acting as major absorbers of carbon. Increasing deforestation magnifies global warming because trees release the carbon they are storing when they are felled into the atmosphere. In the eastern part of the Amazon region, increases in temperature and decreases in soil humidity have lead to the expansion of savannahs, marking significant ecological shifts.

Europe: Forest growth in Northern Europe is projected to increase, while Southern Europe is expected to decrease due to increased temperatures and decreased precipitation. Warmer climates expected to increase fire related weather events and increase the extent of fire prone regions (European Environment Agency 2012).

Africa: West African forest is being lost faster than any other region, owing to a range of factors including pressure from agriculture and human energy needs. Additionally, certain forest pathogens are sensitive to climate factors, and changes in climate may expand their range (Schellnhuber et al. 2013).

5. Case studies of bilateral and multilateral cooperation on adaptation in the Atlantic Basin

5.1. EUROCLIMA

Geographic focus

The EUROCLIMA programme aims to promote cooperation between Latin America and the European Union (EU) on climate change. EUROCLIMA is funded and coordinated by the European Commission and is implemented in 18 Latin American countries: Argentina, Bolivia, Brazil, Chile, Columbia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

Drivers of cooperation and objective

EUROCLIMA arose out of an existing strategic partnership between the EU, Latin America, and the Caribbean based on shared cultural, historical, and political ties. Cooperation on climate change developed at a later stage out of this prior collaboration.

The first bi-regional summit was held in Rio de Janeiro in 1999 out of which a strategic partnership was established, “based upon shared values inherited from a common history” and intended to “strengthen the links of political, economic, and cultural understanding between the two regions” (UNGA/UNEP 1992). At the partnership’s summit in Lima in 2008, participating heads of state and government agreed to encourage cooperation on environmental policies and sustainable development and to foster bi-regional cooperation on the environment, with a particular focus on climate change. The objective of the partnership was to deepen bi-regional coordination and dialogue on climate issues, particularly leading up to COP 15 in Copenhagen, and to facilitate joint initiatives on climate change mitigation and adaptation. The pre-existing

bi-regional partnership helped lay the groundwork for collaboration, despite some variability in country needs and priorities.

EUROCLIMA addresses both climate change mitigation and adaptation, with the overarching objective of providing Latin American decision-makers and the scientific community with better knowledge of climate change and its consequences (EC 2013; EUROCLIMA 2014a). The programme's goals include reducing vulnerability to climate change, reducing social inequalities caused by climate change, reducing the socioeconomic impacts of climate change, and reinforcing regional integration dialogue. The EUROCLIMA model has demonstrated a certain success in terms of its flexibility and breadth, though the programme's impacts in actually reducing climate vulnerability, as opposed to providing the tools to do so, are more difficult to measure.

Actors and resources

Funding comes from the EU (North Atlantic) while activity is primarily concentrated in Latin America (South Atlantic). EUROCLIMA, does, however, seek to promote exchange and dialogue between the regions and is also promoting the institutionalisation of increased South-South cooperation on climate change and works with existing Latin American organisations.

The regional cooperation programme was approved by the European Commission in December 2009 and funded with an initial budget of 5 million EUR. The first phase of the program was well received and resulted in its renewal for a second phase from 2014 to 2016 with a budget of 10 million EUR (EUROCLIMA 2014a).

EUROCLIMA is implemented by three partners – the Joint Research Centre of the European Commission (JRC), the Economic Commission for Latin America and the Caribbean (ECLAC) and by EuropeAid (DG Development and Cooperation, Regional Programmes Latin America and Caribbean Unit) – as well as national Focal Points. The JRC implements the programme's biophysical and sciences component. This includes the identification, collection and integration of biophysical data on the impacts of climate change in Latin America and is followed by the provision of tools and information to Latin American governments, as well as, scientific and technical institutions. The Economic Commission for Latin America and the Caribbean (ECLAC) has implemented EUROCLIMA's socioeconomic component, helping to improve and share knowledge on the socioeconomic aspects of climate change and providing input on sustainable development and climate change policies. EuropeAid, supported by Technical Assistance, is responsible for the programme's communication, coordination, and dialogue. National Focal Points, representatives assigned by the Parties, represent the positions of their governments and promote the application of programme products in national and regional policymaking.

Activities and results

During its first phase which lasted three years and began in the first half of 2010, EUROCLIMA developed activities in three main areas: research, capacity building, and network building (EUROCLIMA 2014a). Network building was an important prerequisite and foundation to the project. Prior to the initiation of EUROCLIMA in 2010, one of the implementing partners EuropeAid conducted a stocktaking exercise by interviewing Latin American government officials to gauge perceived vulnerabilities and priority areas for action. By the time the project started, the stocktaking report had already established the common challenges and recognized differences faced by the region, which provided a clear foundation for further work. The stocktaking report by EuropeAid highlighted, in particular, the shared challenges: limited knowledge on

climate change, insufficient human and financial resources, and a lack of political awareness.

Research conducted during the first phase concentrated on both biophysical and socioeconomic impacts and resulted in successful dissemination to decision-makers and scientists throughout Latin America. The initial programme focused primarily on the areas of water, agriculture, bioenergy, soils and desertification, and drought. Thematic studies, guides, manuals, and inventories helped facilitate adaptation measures in these areas. Scientific collaboration between scientists in Latin America and the EU under EUROCLIMA also contributed to developing specialised modelling tools and software and inventories of good practices. On the socioeconomic side, EUROCLIMA has helped develop studies quantifying the socioeconomic impacts of climate change on vulnerable groups.

EUROCLIMA has supported capacity-building through developing numerous courses, trainings, workshops, and sharing of resources on specific topics according to identified needs in Latin America. Information has been shared with a wide audience through electronic newsletters, videos, publications, a website, and events, including side events at three UNFCCC COPs. EUROCLIMA has facilitated training courses on techniques and methods to measure the socioeconomic impacts of climate change and formulate public policies for more than 70 government officials in Latin America and helped train more than 600 government officials and scientists in the use of new technologies.

For network building, the programme has brought together government officials and academics from Latin America and the EU to exchange experiences and scientific information; facilitate policy dialogue and debate; and assist in the design of strategic action on climate change. Regional events held in participating countries have helped to facilitate information exchange and dialogue on the issue of climate change. In the Third Regional Seminar in 2013, country representatives provided input on activities in the second round of the programme and discussed whether proposed objectives and priorities were in line with national public policies and needs (EUROCLIMA 2014b).

Atlantic dimension

EUROCLIMA is a transatlantic institution that arose out of a perceived sense of shared cultural and historical ties, geopolitical and economic interests, which developed over time to include cooperation on climate change specifically. It is interesting to note that the initial driver for cooperation was not a sense of shared climatic impacts, but instead a decision to collaborate based on cultural, political, and need-based factors.

Cooperation under EUROCLIMA involves European provisions of research, knowledge, and technical know-how to help Southern partners address climate change impacts. The history of the cooperation which dates back to 1998 may also indicate the existence of traditional roles that dictate engagement. With that being said, there is also a distinct effort to promote South-South and regional cooperation.

5.2. RIOCC

Geographic focus

The Red Iberoamericana de Oficinas de Cambio Climático (RIOCC), or Ibero-American Network of Climate Change Offices, was created in 2001 by an intergovernmental group of countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba,

Ecuador, El Salvador, Spain, Guatemala, Honduras, México, Nicaragua, Panamá, Paraguay, Peru, Portugal, Dominican Republic, Uruguay, and Venezuela.

Drivers of cooperation and goals

Spain and Portugal have illustrated a distinct interest in gaining influence in Central and Latin America, stemming from historical ties and common linguistic, cultural, and religious heritage established between the colonisers and the former colonies. In the last decades, large migrations between Spanish and Portuguese speaking European countries have taken place with Central and Latin America (IOM 2014). This heritage and history have led to closer political cooperation, out of which networks and framework programs like RIOCC and its main program PIACC (Iberoamerican Programme of Impacts Assessment, Vulnerability and Adaptation to Climate Change) have been developed.

On a political level, RIOCC aims to facilitate the creation and implementation of agreements on climate change and promote existing UNFCCC decisions on adaptation and mitigation. It also aims to develop camaraderie and partnerships between member countries' so as to consolidate their positions in international negotiations (RIOCC 2014). Within and through these activities, RIOCC acts as a knowledge exchange platform to enhance capacity building and technology transfer and to provide a channel for constant dialogue about the priorities, difficulties and experiences of the different countries. Finally, the RIOCC programme is intended to support development work by streamlining and emphasising climate change in existing development strategies and improve cooperation between private and public stakeholders while promoting competitiveness and market access to the region.

Actors and resources

RIOCC has a network of offices in the respective environmental ministries of the participating countries. The Spanish office is the network coordinator. Each country's ministry provides the funding for its respective office.

Activities and results

The RIOCC network holds annual meetings where all national offices are represented as well as 15 major organisations including the World Bank, the CAF (Development Bank of Latin America), CAN (Andean Community of Nations), and climate organisations like EUROCLIMA. The conclusions gathered are presented annually to the forum of Ibero-American environmental ministers. In addition there are two informal meetings each year that help develop strategies in different thematic work groups.

PIACC is the main program of the RIOCC and was developed in 2004 under the Nairobi Framework. It encompasses five major tasks: systematic observation and research, clean development mechanisms, adapting to climate change, training and awareness, climate change, and development aid. Among the activities that are carried out, the program includes the compilation of a portfolio of climate change adaptation projects provided by member countries and the development of a communication and information strategy. Within PIACC are a variety of climate related projects that are undertaken in collaboration with other actors. On top of this, several workshops have been hosted under the PIACC program to offer advice and possible adaptation and mitigation practices to different areas, among them energy, transport, construction, agriculture, forestry, and waste (IPCC 2007b).

In 2006, the coordinator of the climate change office in Spain drew the conclusion that the work of RIOCC has helped prioritise areas of work for adaptation in the region and has made some advancement in terms of knowledge exchange in this field (Lope 2006). According to the Spanish office, all RIOCC members view water resources as the top priority, followed by human health and agriculture. Thirty percent of RIOCC countries see a high development in impact evaluation and vulnerability assessment. Seventy percent of member countries acknowledge a middle to very low level of institutional strength and national coordination in the area of climate change adaptation. Only 10% of the countries see themselves as having the influence and capacity to identify actions and develop strategies to cope with climate change.

The RIOCC network and its programs are intended to mainly work on a political level. However, the information provided on the website and in literature is either vague on actual accomplishments or is outdated. The BID (Interamerican Bank for Development) states in its own report on vulnerability and adaptation to climate change, that the climate change offices in Latin and Central America suffer from low levels of financial support and small staff teams (Gutiérrez and Espinosa 2010). The RIOCC seems to have established important links to policymakers and ministers, however, its overall impact remains perhaps limited and its dissemination of results is weak. Understanding the RIOCC's accomplishments and mobilizing its political networks could prove fruitful for future negotiations and policy implementation in the region.

Atlantic dimension

The main driver for cooperation in RIOCC was based on shared cultural, historical, and linguistic ties between South and Central American countries and Spain and Portugal. A distinguishing factor of RIOCC cooperation is its focus on policymakers, political networking, and exchange between environmental ministries. It seems to put a specific emphasis on strengthening the bargaining power of developing countries in international fora, and improving collaboration between Spanish and Portuguese speaking countries. In so doing, it also introduces a geopolitical collaboration within a distinctly Atlantic dimension

5.3. Informal bilateral cooperation between Brazil and African countries

Geographic focus

Brazil and Africa.

Drivers of cooperation and goals

As an emerging strong economy, Brazil is increasingly active in Africa as both a provider of development aid and economic investment. Its involvement and interest in the African continent encompasses a variety of thematic areas with agriculture being one of the most significant. As a result, climate change as it relates to agricultural production is one of the issues dealt with in bilateral cooperation, specifically in relation to food and livelihood security and crop productivity.

A major driver of cooperation stems from the fact that Brazil and many African countries share similar environmental, and in some cases perceived socioeconomic, challenges. In particular, the successful transformation of Brazil's once sterile Cerrado (savannah) land to agricultural productivity has been a point of interest because of the geophysical similarities it shares to the savannahs in Sub-Saharan Africa. Brazil's

Cerrado was transformed using bioengineering techniques undertaken by the Brazilian agricultural research corporation Embrapa. In this process, Embrapa actually imported an African variety of grass called *brachiaria* that is three times as productive per hectare as the native Cerrado grass, and through cross breeding measures, introduced it to Brazil's Cerrado (The Economist 2010). This example highlights the interdependency of agricultural development in Brazil and Africa, as well as its compatibility. In addition to shared environmental climates, Brazil's geopolitical position as a developing country has fostered fraternal sentiments with many African leaders that are faced with similar socioeconomic challenges. In particular, the Brazilian government's effective implementation of nationwide agriculture and food security policies has been a major inspiration for cooperation to deal with low agricultural productivity and poor rural development and the resulting high levels of hunger, malnutrition, and livelihood insecurity.

It is difficult to identify the drivers for Brazilian interest in Africa as it encompasses both commercial and fraternal aspects. Some authors point out that Brazil's 'courtship' with African countries should be considered in relation to its geopolitical aspirations as a rising world power. For example, Brazil has a stated interest in obtaining a permanent seat on the UN Security Council where 54 African countries are members (Economist 2010). Brazil has also worked to increase the capacity of African countries to deal with WTO trade obligations, thereby strengthening the participation of developing countries in international fora and offsetting perceived traditional heavyweights (i.e., U.S. and EU). However, it also represents real opportunities for recipients of technical cooperation and capacity building who have the most to gain from improved participation in international fora. Finally, Brazil has relieved the debt obligations of several African countries and has taken steps to extend this to several other African countries, an act it has not carried out in any other region of the world.⁹ Compared to China's activity on the continent which is strongly focused on the extraction of resources and opening up of African markets through the construction of major infrastructure, Brazil's development cooperation has focused more on socioeconomic development (Shankland and Cabral 2013). Brazil's engagement, therefore, includes aspects of both a commercial and fraternal relationship.

Actors and resources

Brazil's cooperation with African countries was spearheaded by the former President Lula da Silva, who specifically reached out to African leaders through presidential visits, conferences, and exchanges. Thus, many of Lula's personal relationships with heads of government in Africa have been the turning point of cooperation agreements. This engagement is expected to be continued, perhaps less actively, by Lula's successor Dilma Rousseff (Shankland and Cabral 2013). While Brazil's engagement is increasingly widespread throughout the continent, it is the five Portuguese speaking countries (Angola, Cape Verde, Guinea-Bissau, Mozambique, and Sao Tome and Principe) that receive the most support and Mozambique in particular that engage in the most extensive interactions (Shankland and Cabral 2013).

Most technical cooperation projects in agriculture are run through the state-owned company Embrapa, which deals with climate change as it relates to improved

⁹ To increase lending opportunities between Brazilian banks, debt relief has been granted to several African countries including Cape Verde, Mozambique and Nigeria, with the expected continuation of relief to Guinea Bissau, The Democratic Republic of Congo, Senegal, Tanzania, and Zambia (Cabral 2011). Cabral and Shankland (2013).

agricultural production, the development of bioengineered seeds (e.g., drought resistant seeds) and bioenergy (Shankland and Cabral 2013). Other Brazilian governmental institutions involved in cooperation that indirectly or directly relate to climate change are the Technical Assistance and Rural Extension Enterprises (EMATER) that provides extension services at the national level and the National Rural Learning Service (NRLS) that specialise in rural technical training.

In some instances of technical cooperation, Brazil has engaged in triangular relations involving one or more multilateral institutions or other countries. In particular, the Food Acquisition Program is carried out in close coordination with the UN Food and Agriculture Organisation (FAO) and UN World Food Programme (WFP). Triangular approaches to development engagement have noted practical and geopolitical benefits. Working with third parties can facilitate the pooling of resources and scaling up of projects and can also strengthen strategic links with traditional donors.

Activities and results

The emerging partnerships between Brazil and a host of African countries focus primarily on agriculture, with climate change as a related topic. However, cooperative efforts are geared towards bioengineering and the development of drought resistant seeds, along with improved resilience of crops and rural populations in the face of resource deficiencies and climate variability.

Between 2003 and 2010, agriculture accounted for 22% of Brazil's technical cooperation with Africa. Brazilian technical cooperation in agriculture has focused heavily on improved agricultural production, the reclamation of eroded lands, natural resource management, production of clean energy with biofuels, and adaptation and mitigation strategies for climate change. Underlying Brazil's agricultural technical cooperation is a distinct focus on socioeconomic goals, of rural development that includes improved incomes and livelihoods as well as productivity. The underlying challenge for which this cooperation takes place, is food insecurity and hunger. The nature of Brazil's cooperation covers supporting production and value chain development, training extension agents, strengthening public sector institutions, supporting rural associations and cooperatives, and developing improved capacity for compliance with WTO trade laws in sanitary and phytosanitary regulations. Brazil itself has addressed these issues quite successfully within its own territory in recent years.

While the type, speed of deployment, and actors are unique to each of its deployed projects and bilateral governmental relationships, some trends can be identified in these cooperative efforts. Early technical cooperation primarily took the form of research and information exchanges, but has more recently involved the transfer of successful Brazilian social policies to African countries. Examples include the cash transfer programme Bolsa Familia, the More Food Africa Programme, and the Food Acquisition Programme are programmes initiated in Brazil under President Lula that have been implemented in several African countries (Cabral and Shankland 2013). Ghana, Zimbabwe, Mozambique, Senegal, and Kenya are all beneficiaries of the African version of the More Food Programme (Shankland and Cabral 2013). While these are not climate change policies outright, the prevalence of small farmers suffering from hunger the causes of which are often related to climatic variability and low productivity mean that policies directed at food security can and often deal with aspects of climate change adaptation.

One example is the Africa-Brazil Agricultural Innovation Marketplace, initiated in 2010 and formally endorsed by the World Bank. It is a project supporting entrepreneurship that awards up to 80,000 USD each year to ten projects developed via partnerships of

individuals, educational institutions, research institutes or private companies in Africa and Brazil. The cross-Atlantic dimension of collaborative research is a specific criterion for the Marketplace. African partners are matched up with Brazilian counterparts to develop projects and research. One of the four themes for which funding is available is the development of technologies for adaptation and mitigation of climate change – including forestry and agro-forestry options for fighting desertification, poverty, and hunger, livestock distribution, health and productivity, plant breeding, crop management, water harvesting and management techniques, soil reclamation, and reforestation. Since 2010, some thirty projects have won funding money and with a significant capacity building spill over effect with improved partnerships, networks, and capacity building that takes place in the process of developing a project.

Atlantic dimension

Brazil's engagement with African countries is a powerful example of Atlantic South-South collaboration and one of the few that disrupts more traditional North-South cooperation in development and technical capacity building. It is also specific to the Atlantic Basin where underlying impressions of shared climates and socioeconomic realities drive cooperation. Moreover, bilateral cooperation between Brazil and African countries highlights that countries within the Atlantic do, to a certain extent, have similar terrestrial ecosystems and experience similar climate change impacts which are a foundation for cooperation. In the field of agricultural development and improved crop productivity this is particularly true.

5.4. AMMA

Geographic focus

The African Monsoon Multidisciplinary Analysis (AMMA) is a transnational institution of scientists from more than thirty countries, representing more than 140 public and private institutes. The participating countries primarily include countries located in West Africa, Western Europe, and the U.S.

As an umbrella institution, it also indirectly supervises related and complementing activities through the coordination of several national and transnational projects - namely, AMMA-Africa, which brings together African scientists, AMMA-EU, which coordinates Europe-based activities and links European scientists to their colleagues in West Africa, AMMA-UK, which brings together the British AMMA community, and AMMA-US, a more loosely coupled group of American scientists (Redelsperger et al. 2006).

Drivers of cooperation and objective

AMMA's primary goal is “to improve our understanding of the West African Monsoon (WAM) system and will facilitate the multidisciplinary analysis needed to improve prediction of its variability and its associated societal impacts” (Redelsperger et al. 2006).

West Africa has experienced dramatic climatic changes in the past fifty years. In general, the region has become much drier with marked year-to-year variations in precipitation. Extremely dry years have had devastating environmental and socioeconomic impacts, putting significant stress on land, water, and food resources. Rapidly growing populations and additional effects of climate change further enhance the vulnerability of West African societies to these climatic developments. Yet the effect

of climate change in West Africa extends far beyond the region itself. The Intertropical Convergence Zone over Africa represents one of the planet's major heat sources and its associated meridional migration and regional circulations have wider reaching impacts on other regions (AMMA 2012). For example, Sahelian rainfall impacts hurricanes in the Atlantic. Africa is also the world's largest source of atmospheric dust and a major emitter of precursors to key greenhouse forcing agents (AMMA 2012).

The driver for cooperation for AMMA, therefore, was the recognition of the interdependency of the climate impacts occurring in West Africa on other parts of the world, particularly in the Atlantic Basin. To forecast weather and climatic changes in Africa and beyond, the WAM system needs advanced monitoring and understanding (Polcher et al. 2011). However, the scientific community historically lacked the resources to provide this monitoring service. Moreover, the societal and economic impacts of the changes in the WAM have not been researched adequately. AMMA has therefore pursued three key goals:

- Improving understanding of the WAM and its influence on the physical, chemical, and biological environment regionally and globally;
- Supporting science that relates variability of the WAM to issues of health, water resources, food security, and demography for West African nations and defining and implementing relevant monitoring and prediction strategies; and
- To ensure that multi-disciplinary research from AMMA is effectively integrated into prediction and decision-making activities (Redelsperger et al. 2006).

AMMA attempts to increase the capacity of West African nations to adapt to climate change by providing better forecasts about weather and climate in the West African region and effects on land productivity, water resources, and health impacts. The underlying goal is to arrive at "a better understanding of how weather and climate variability impact food security and human processes in the region" (Redelsperger et al. 2006).

Actors and resources

Lacking a central organisational structure, AMMA is more of an institution than an organisation. It is a transnational institution insofar as many of its members are non-state research institutes. At the helm of AMMA stands the International Governing Board, which is in charge of the institutional governance of AMMA, and the International Scientific Steering Committee and International Implementation and Coordination Group, which are responsible for the development and implementation of AMMA's scientific program. The Steering Committee also coordinates the various projects (e.g., AMMA-EU and AMMA-France) and facilitates contacts and maintains cooperation with institutions outside of the AMMA. AMMA represents more than 140 public and private institutes from over thirty countries.¹⁰

Based on a French initiative, AMMA commenced its activities in 2002. The initial phase lasted for seven years. The second phase started in 2010 and will last until 2020. It is

¹⁰ Algeria, Belgium, Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Congo, Denmark, Finland, France, Gabon, Gambia, Germany, Ghana, Guinea Bissau, Guinea Conakry, Italy, Ivory Coast, Mali, Morocco, Mauritania, The Netherlands, Niger, Nigeria, Senegal, Spain, Togo, United Kingdom, and U.S.

funded by a large number of agencies, particularly from France, the United Kingdom, the U.S., and various African countries. AMMA has also received major funding from the EU under the European Community's Sixth Framework Research Programme. Today's main donors are primarily located in Europe - mainly France, Germany, the United Kingdom, and the EU. The U.S. government agencies such as NASA and the Department of Energy fund AMMA through AMMA-US as well (Redelsperger et al. 2006).

Activities and results

Phase 1 of AMMA, from 2002-2010, resulted in an international research community of 600 people, produced 500 papers in peer-reviewed publications, organised international conferences bringing together hundreds of researchers, created a multi-scale multidisciplinary database, and deployed a long-term observation systems and field campaigns (Redelsperger et al. 2010). AMMA's efforts have helped make important advancements in understanding the multi-scale multidisciplinary aspects of the coupled ocean-atmosphere-land WAM system and regional climate predictions. Phase 2 intends to reorient activities to prioritise climate change and the needs of local populations (Redelsperger et al. 2010). Improved climate forecasting can inform climate adaptation strategies for agriculture and food security, water resources, and public health.

Although AMMA's prime donors and research institutes are located in the Northern hemisphere, there is a clear attempt to build up the scientific community in West Africa and improve the adaptive capacity of West African nations. Through AMMA-Africa, transnational networks of scientists are strengthened in order to consolidate research collaborations in the region. Responsibilities for coordinating research activities and maintaining research networks are successively transferred to local African agencies. AMMA also provides training and education activities for African schools and technical institutes. Finally, findings are diffused through numerous scientific reports and articles and African decision makers are directly informed about findings relevant to governments in the region such as anticipated rainfall changes (AMMA 2012).

In order to facilitate the exchange and integration of research results among the various scientific communities, AMMA maintains networks with numerous related scientific programs and projects.¹¹

Atlantic dimension

As already mentioned, the WAM system is a key variable to understand global weather and climate changes. WAM also holds comparative lessons insofar as WAM research results are relevant to other monsoon systems (Polcher et al. 2011; Redelsperger et al. 2006). West Africa's weather systems are also crucially important to understand weather developments over the Atlantic, since many hurricanes that form in the Atlantic develop as a result of the weather patterns in West Africa (Redelsperger et al. 2010).

¹¹ AMMA is endorsed by the World Climate Research Programme (WCRP) and continues to develop in association with the Climate Variability and Predictability (CLIVAR) and Global Energy and Water Cycle Experiment (GEWEX). AMMA has also been endorsed by two projects within the International Geosphere–Biosphere Programme (IGBP): International Global Atmospheric Chemistry (IGAC) and Integrated Land Ecosystem–Atmosphere Processes Study (ILEAPS). AMMA is working with other international projects and programs to achieve its aims, including the Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS), and The Observing System Research and Predictability Experiment (THORPEX).

AMMA showcases successful transnational scientific cooperation between Atlantic Basin actors. Moreover, the research being performed under AMMA has direct and important implications for the Atlantic Basin and for adaptation to climate change. Better understanding of the WAM and climatic variability can guide development of adaptation actions, and the programme is focusing on linking research and policy in its second phase. Many institutions sponsoring and supporting AMMA are located in the North, in Europe and the U.S., but the programme strongly emphasises building scientific research capacity in West Africa and developing regional scientific cooperation, creating a lasting interregional collaborative network.

5.5. Atlantic projects in the International Research Initiative on Adaptation to Climate Change (IRIACC)

Geographic focus

The International Research Initiative on Adaptation to Climate Change (IRIACC)¹² research program that aims to address the common climate adaptation challenges faced by populations in various regions of Canada, as well as in a number of countries in the developing world.

Though the projects of IRIACC do not entirely fall into the Atlantic Basin, four of the five projects do occur entirely within the countries being examined in this paper. These four projects, which form the basis of this case study, are:

- The Indigenous Health Adaptation to Climate Change (IHACC). IHACC involves case studies in the Canada, Peru, and the Arctic.
- Adapting to the Impacts of Climate Change on Water Resources (French title: *Faire-face Aux Changements Ensemble*, or FACE). FACE involves case studies in Canada, Morocco, and Niger.
- Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA). VACEA involves case studies in Canada, Argentina, Brazil, Chile, and Colombia.
- Partnership for Canada-Caribbean Climate Change Adaptation (ParCA). ParCA involves case studies in Canada, Trinidad and Tobago, and Jamaica.

Drivers of cooperation and goals

IRIACC's aims to fill knowledge gaps on the types of adaptation strategies that can best protect the people and economic sectors most vulnerable to climate impacts, by focusing not only on Canadian cases, but also cases of similarly vulnerable communities and sectors in developing countries. The initiative consists of five separate research projects, each focusing on a unique climate change adaptation challenge, such as agriculture, health in indigenous communities, or coastal resilience.

¹² For more, see:

http://www.idrc.ca/EN/Programs/Science_and_Innovation/IDRC_Challenge_Fund/Pages/IRIACC.aspx#bookmark1

The stated driver for IRIACC is the need for improved understanding of climate change vulnerabilities and stressors, as well as strategies for adaptation. During the selection process, projects were chosen that identify common adaptation challenges between Canada and different developing countries. Hence, the exact driver of cooperation differs from project to project, but can generally be seen as the perception that common vulnerability exists across Atlantic Basin countries, regardless of development levels. Specifically, the drivers for each project are:

- IHACC: Human health in remote indigenous communities, including issues related to climate variability and vector-borne illnesses.
- FACE: The relationships between water resource availability and human health, as relates to extreme weather events and long term climate variability.
- VACEA: The vulnerability of agricultural communities to extreme weather events and long term climate variability.
- ParCA: The vulnerability of low-lying coastal communities to sea level rise, coastal erosion and extreme weather events.

In the specific case of the FACE project, it is apparent that a common language (French) is an additional driving rationale for collaboration. This common driver occupies a space separate from the Atlantic Basin.

The expected outcomes of the IRIACC projects are threefold:

- Projects are expected to fill key knowledge gaps on the kinds of adaptation strategies needed to effectively protect the vulnerable communities and sectors. Key elements to this include: Research to enhance knowledge of stressors and vulnerabilities; development of new and innovative tools, technologies and collaborative approaches to facilitate adaptation; and integration of knowledge to better understand changing natural and social systems, in order to improve future research
- Projects are expected to shape policy by developing, implementing, and assessing adaptation policies, as well as facilitating knowledge sharing between relevant actors
- Projects are expected to build longer term research capacity through the following means: contributing to expertise and skill-building of young researchers; supporting government and community organisations dealing with climate adaptation through training and research findings; and creating and fostering international research networks

Essentially, IRIACC aims to improve climate change resiliency in both Canada and developing countries, while fostering transnational issue-based networks and channels of information exchanges.

Actors and resources

IRIACC is a five year long, 12.5 million CAD (~8.25 million EUR¹³) funding initiative. IRIACC was launched in 2009, with five projects being selected through a peer review process. These projects commenced in 2011, and each receive 500,000 CAD (~330 000 EUR) per year for the period 2011-2015. In addition to the IDRC, which coordinates IRIACC, the initiative is jointly funded by the three main public Canadian research funding bodies: the Canadian Institute of Health Research (CIHR), the Social Science and Humanities Research Council (SSHRC), and the National Science and Engineering Research Council of Canada (NSERC).

The research consortia consist of a mix of universities in Canada and developing countries. These research consortia also collaborate with NGOs, governments, and the private sector. For example, the ParCA project consortium consists of four Canadian universities and one Caribbean university (with campuses in three different Caribbean countries). These universities work in tandem with NGOs and community organisations in each of the four case study communities examined (two in Canada, two in the Caribbean), particularly with regard to stakeholder engagement, collaborative adaptation strategy design, and dissemination.

Though the funding bodies and key research institutions involved in IRIACC are all Canadian, the projects are designed with a significant effort to build an equal and collaborative relationship with the partner research institutions located in developing countries. The principal investigators of each project include an equal distribution of individuals from both North and South. Additionally, the specific aim of capacity building, especially amongst young researchers and community-level organisations, means that a large portion of the project activities, including dissemination activities, occurs with Southern partners.¹⁴

Activities and results

Because the IRIACC projects are currently only midway through their expected life spans (2011-2015), not all activities have been undertaken and an assessment of the full impact of these projects is not possible. That being said, the projects have each produced varying amounts of interim results. With regards to the first expected outcome of IRIACC (filling knowledge gaps), a key result so far is the production of array of new insights on climate change vulnerabilities through reports and peer-reviewed articles.¹⁵ Looking at these results from an Atlantic perspective, however, many of these results focus on a specific case study site, meaning that the transferability of their findings across different Atlantic Basin countries is limited. Given the context-specific nature of climate adaptation, this is perhaps unsurprising. At the same time, without the international collaboration of IRIACC, these results would not exist, and many of the results are produced jointly by investigators in different countries, meaning that at least at one level there is a broader Atlantic Basin impact of these projects.

¹³ Using conversion rate of 24 June 2014.

¹⁴ See, for example, the significant role of Caribbean community partners in guiding and disseminating research within the ParCA project: <http://parca.uwaterloo.ca/c/team/community-partners/>

¹⁵ For example publications see: Scott et al. 2012, (from ParCA); Abdoul-Asis and Seybou 2012, (From FACE); Hofmeier et al. 2012 (from IHACC).

With regards to the longer term goal of building capacity and fostering networks, the results are less immediately clear, given where the initiative is in its timeline. The existence of these projects, the funding of young researchers, and the collaborative production of reports and joint meetings demonstrate that these networks do indeed exist where none had existed before. It is unclear, however, if these networks will continue to exist after the expiration of the funding period (2011-2015). No indication has been given for any kind of follow up to IRIACC at this point.

Atlantic dimension

At an initial glance, the focus on specific issues and local level case studies in IRIACC does not seem to indicate that an Atlantic dimension should be of focus. However, it is worth noting that the outcome of IRIACC's peer review selection process was that four of five funded projects occurred entirely within the Atlantic Basin, with the majority of case studies across all five projects occurring in that space (see Figure 1). No data on the focus areas of projects *not* accepted for funding was found during this study, so it is not clear whether many unsuccessful applications focused on non-Atlantic Basin countries.

Figure 1: Location of IRIACC case study sites (IDRC, No date)



IRIACC highlights the potential for research and collaboration on climate change adaptation within the Atlantic Basin. The focus of each project on specific climate vulnerabilities indicates that common challenges exist across the Atlantic, even between countries with differing levels of development, and a focus on these challenges at the local level is a sound basis for fostering cooperation. Though the initiative is only halfway through its lifecycle, research outputs have already led to an enhanced knowledge of particular climate vulnerabilities in the Atlantic Basin. The feasibility of similar types of cooperation addressing broader issues or actors remains unclear.

5.6. WASCAL

Geographic focus

WASCAL is a large-scale research program that aims to increase climate resilience in human and environmental systems in Western Africa by strengthening climate change research infrastructure and capacity. The main geographical focus for strengthened capacity is in Western Africa (see Figure 2), namely in the following countries: Benin,

Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Mali, Niger, Nigeria, Senegal, and Togo. That being said, the project has an Atlantic Dimension in that the German Federal Ministry of Research and Education (BMBF) provided the majority of funding during its initial phases. Additionally, WASCAL involves the cooperation of numerous German universities and research institutions.

Figure 2: Map of West African partner countries in WASCAL (WASCAL 2014a)



The area focused on by WASCAL constitutes roughly 1/5 of the territory of Africa, and includes semi-arid terrain in the north, progressing southwards through savannah grasslands, woodlands, and then tropical rainforests. The initial research conducted and supported through WASCAL focuses on the southern Sudanian savannah belt, which is considered a “potential breadbasket for the region” (WASCAL 2014b).

Drivers of cooperation and objectives

The WASCAL initiative was started by the German BMBF, in line with the 1992 UNFCCC’s encouragement to enhance capacity building on climate change, a goal explicitly made in agreements like the Bali Action Plan. There was recognition by the German government that West Africa faced challenges in areas of land use policies and reliable climate data (KNUST 2014). Additionally, German press releases on WASCAL refer to a history of cooperation on education between Germany and Africa spanning 30 years, and WASCAL is positioned as an extension of this trend (BMBF 2014).

The objectives of WASCAL are to:

- Significantly improve the climate change research infrastructure and capacity in West Africa;
- Explore science-based scenarios and options for enhancing the resilience of human and environment systems in the face of climate change;
- Assist policy and decision-makers in design and implementation of land use patterns at watershed level that ensure the provision of the essential ecosystem services while supporting the livelihoods of local communities; and
- Help educate the next generation of scientists and policymakers that have intimate knowledge of the different climate related issues and can help the region in developing suitable coping strategies.

Actors and resources

WASCAL is legally defined as an international organisation under public international law, and is codified through a cooperation agreement and constitution signed by the countries involved (by the Ministers responsible for higher education and research). The partners undertaking the work in WASCAL are predominantly research institutions, working in cooperation with these ministries. In Germany, there are eleven partners, consisting of university departments and research institutions.¹⁶ In West Africa, there are over 35 partners, representing universities, national meteorological services, water authorities and agricultural research associations.¹⁷

Additionally, WASCAL is affiliated with the Economic Community of West African States (ECOWAS) Commission. Under the Constitution, WASCAL is also encouraged to cooperate with third countries and other organisations wherever possible and beneficial.

In terms of its internal structure, WASCAL's consists of:

- a Council of Ministers, which meets yearly (with the possibility of extra sessions if deemed necessary)
- a Governing Board with a subsidiary Executive Committee, which meets yearly to oversee the medium and long term strategy of WASCAL
- a Scientific Committee

The Constitution and Cooperation Agreement ensure that the Council of Ministers, Governing Board and Scientific Committee all contain representatives from each of the participating countries.

The resources supporting WASCAL come from within the initiative, predominantly from Germany, including initial funding (5.1 million EUR) during the preparatory period 2010-2012, and roughly 50 million EUR during the initial phase 2012-2016. It is stated that the participating West African countries will make their own financial contributions beginning in 2013 (a minimum contribution of 300,000 EUR each) but it is unclear whether that has been the case, and what amount has been contributed. In kind donations have come from several West African countries. For example, the headquarters of WASCAL itself, as well as the headquarters of the Competence Centre are located in these countries (Ghana and Burkina Faso respectively), with both countries providing tax exemptions for the facilities, though significant costs for the facilities were covered by Germany. In the case of the Competence Center, at Kwame Nkrumah University of Science and Technology, in Ghana, Germany provided 1.9 million Euros (WASCAL 2014b).

The contribution of financial resources is very asymmetrical, with most of the funding coming from Germany. Currently, in terms of technical and human resources, however, it is much less asymmetrical, with research institutions and national ministries in the

¹⁶ For a full list of German partners, see: <https://icg4wascal.icg.kfa-juelich.de/partner/german-partners>.

¹⁷ For a full list of West African partners, see: <https://icg4wascal.icg.kfa-juelich.de/partner/partners-in-west-africa>.

West African participating countries making large contributions to the operation of WASCAL.

Activities and results

Cooperation in WASCAL occurs between transnational actors at the subnational level. It involves non-governmental actors like private and public research institutes, rather than local authorities or national governments.

The preparatory phase began in 2010, with the final agreement signed between the participating countries in Lome, Togo in February 2012 (WASCAL 2012a). The success of this preparatory period is evident in the successful establishment of WASCAL (as formalised in the Constitution and Cooperation Agreement (WASCAL 2012b) and is a clear example of stated goals being achieved.

As the project is only halfway through its initial funding period, it is difficult to assess its overall impact in terms of strengthening adaptive capacity. No formal review of WASCAL is publicly available at the current time. Nevertheless, some clear indications of performance are apparent. In March 2014, the Competence Center was opened in Ghana, and currently enrolls 60 students in post-graduate education, with plans to expand to 1,000 students in the near future (WASCAL 2014b). Over 30 scientific publications addressing WASCAL objectives have been published through WASCAL, facilitating partnerships between West African and German academics that might not have existed before (WASCAL 2014c).

The Atlantic dimension

There is no clear indication available from desk research that the relationship between Germany and the 10 West African countries involved in WASCAL was motivated by a perception of common interests related to their shared geographic position within the Atlantic Basin. Furthermore, while the WASCAL cooperation agreement was signed by a wide variety of West African countries and Germany, the WASCAL Constitution is an agreement between the 10 West African countries, with no mention of Germany. This may reflect the long term vision that WASCAL will be eventually operated solely by West African countries.

That being said, the emergence of such a program does emerge from a clear acknowledgement by Germany of the benefits of cooperation on climate change, and builds on an existing history of exchange and cooperation in the field of education and research. Moreover, German representatives for the project have stated that WASCAL is part of a larger movement to better recognise Africa's growing regional importance (BMBF 2014).

5.7. Regional Adaptation Strategies for the German Baltic Sea Coast (RADOST)

Geographic focus

RADOST is a large-scale German research project focusing on the development of climate adaptation strategies. Broadly speaking, the area focused on by RADOST is the German coastline of the Baltic Sea, covering the Federal States of Schleswig-Holstein and Mecklenburg-Western Pomerania. However, the project has international outreach, which focuses on exchanges of information and experiences between the German Baltic coast and other regions facing similar coastal issues. The partner

regions of the project are: Latvia, the Polish Baltic Sea, the Slovenian Mediterranean Coast, the Moroccan Mediterranean Coast, and the Atlantic Coast of the U.S. (specifically the states of Maryland and North Carolina).

Of the international partnerships in RADOST, the most developed and extensive collaborations have been in the Atlantic Coast of the United States, with multiple joint workshops, dialogues, joint research, and other exchanges being held over the course of the RADOST project. With a focus on coastal areas, common vulnerabilities to climate change impacts are evident, such as sea level rise, erosion, and extreme weather events. Indeed, the U.S. regions focused on during the exchange, Chesapeake Bay and Albemarle County, North Carolina, exhibit many geomorphological similarities with sections of the German Baltic coast (extended coastlines, large estuaries), which have been identified as a basis for comparison.

Drivers of cooperation and objective

RADOST was one of seven projects funded by the German BMBF as part of the larger KLIMSUG project ('Regions Adapt to Climate Change')¹⁸ Each KLIMSUG project, like RADOST, focuses upon a different geographic region of Germany. The stated rationale for the KLIMSUG project is grounded in the acknowledgement that the impacts of climate change are unavoidable (and in some cases, already being experienced). Consequently, there is already a strong need for the development of innovative adaptation strategies. The involvement of international partner regions in these projects is intended to not only gather and exchange best practices in climate change adaptation in order to support the development of adaptation strategies, but also to establish Germany's position as a "pacesetter and driving force" for climate adaptation research (BMBF 2014b).

RADOST aims to develop innovative climate adaptation strategies by fostering a dialogue among academics, the private sector, policymakers, and the public. In doing so, it hopes to strengthen connections between research and practice, strengthening the manner in which adaptation plans are developed. Such strategies would ultimately minimise environmental, economic, and social harm from the impacts of climate change, as well as to capitalise upon any opportunities therein. Additionally, the project aims to foster and strengthen long-term, sustainable networks of dialogue and collaboration, both within the German Baltic coast and beyond. Thematically, RADOST focuses on six main topics: coastal protection, tourism and beach management, water management and agriculture, ports and the maritime economy, conservation and land use, and renewable energies.

Actors and resources

RADOST is a German project, funded by the BMBF. As such, the 17 official project partners funded under RADOST are all German, representing research institutes, universities, NGOs, private sector, and state ministries.¹⁹ Additionally, RADOST has roughly 100 additional German 'network partners' who participate in project activities cover the private sector, NGOs, research institutes and various forms of government, including city and *gemeinden* (equivalent to township or municipality).²⁰

¹⁸ For more on the Klimsug Project, see: <http://www.klimsug.de/en/index.php>.

¹⁹ For the core consortium, see: <http://klimsug-radost.de/en/info/partner#core>.

²⁰ For the full list of network partners, see: <http://klimsug-radost.de/en/info/partner#network>.

Beyond the German partners, international cooperation has been largely transnational in nature, occurring at the individual level through collaboration with universities, research institutions, NGOs, and representatives of state and local governments.

As the project was funded by the BMBF, the flow of resources has mostly originated from Germany, in terms of financing direct costs for individuals to travel, conduct research, and participate in research.

Activities and results

At the time of writing, RADOST is nearing the end of its project (July 2009 - June 2014). During this time, a range of activities have focused on coastal adaptation in the German Baltic coast, including implementation projects focused on aquaculture (RADOST n.d.(a)), eutrophication, and the protection of coastal plant species useful in the protection of water quality.²¹ A broader initiative, the Bay of Kiel Climate Alliance, was also developed under the RADOST project, creating a forum for tourism stakeholders in the Kiel region to collaboratively address climate issues through a unified corporate identity for regional tourism (RADOST n.d.(b)). Other outputs of the project include the development of climate change adaptation strategies for areas like the port city of Lübeck (Wensel and Treptow, 2013).

In terms of transnational cooperation, the main activities that have occurred involve exchange of ideas and best practices. On numerous occasions, RADOST project partners travelled to partner regions, including most frequently the U.S. Atlantic coast, with some exchanges also occurring with other Baltic Sea states such as Poland, Latvia, and Lithuania. Partners participated in workshops where they could learn more about local adaptation processes, or the social, economic, cultural, and political factors that inhibited adaptations. Over the project lifecycle, there were over 10 such formal events, along with numerous other informal bilateral meetings. The presentation and discussion of adaptation case studies from the respective regions served as the focus during these exchanges, such as the development of the Bay of Kiel Climate Alliance, or the collective design of a coastal defense system in the resort town of Timmendorfer Strand (see below).

Information during these exchanges was on several occasions collected formally via interviews and surveys. The lessons learned from these exchanges have subsequently been used as the basis for several forthcoming publications on enhanced methods of planning climate change. At the same time, individuals from the RADOST partner regions were able to learn more about initiatives undertaken in the RADOST project, such as the Bay of Kiel Alliance.

While many cases of face-to-face interaction between different regions occurred in RADOST, in some cases, participation and collaboration was also facilitated remotely. For example, in September 2012, the RADOST project hosted the 'Transatlantic Exchange of Adaptation Measures between the Baltic Sea Coast and the Chesapeake Bay', in the German coastal town of Timmendorfer Strand, which had recently implemented a large-scale coastal defense project which was agreed upon through extensive stakeholder consultations. During this event, speakers from the U.S. were involved via teleconference, and were able to present the work ongoing in their region and ask questions about the process in Timmendorfer Strand. The attendees from

²¹ For more on these implementation projects, see: <http://klimzug-radost.de/en/project/info/implementation-projects>.

Timmendorfer Strand consisted of local level decision-makers and other stakeholders in the coastal town, such as those involved in the economic sector.

A final conference in April 2014 will provide an opportunity for the RADOST project to present its research and experience to relevant stakeholders, with an eye towards determining which 'impulses' developed through RADOST can be further developed and sustained in the region.

Atlantic dimension

It is apparent that the RADOST project has fostered international exchange across the Atlantic space (particularly between Germany and the Atlantic coast of the U.S.). Cooperation in non-German regions has been most apparent in places with certain geo-morphological similarities to the Baltic Sea, such as the Chesapeake Bay, or Albemarle County, North Carolina. It is notable that these regions provided the basis for more collaborative activities than in other partner regions identified by the project.

The particular strength of the U.S. and German dialogue in RADOST may also have built off previously existing cooperation on environmental research, either at the individuals level, or through broader connections such as those established under the 2002 Memorandum for environmental research coordination between the German state of Schleswig-Holstein and the U.S. state of Maryland (MDE and MNF 2002).

6. Findings from case studies

The cases under review share several commonalities, allowing us to evaluate the framing of climate adaptation from a pan-Atlantic perspective, and to assess the pros and cons of a fragmented governance structure in the area of climate change adaptation. The case studies also allow us to point towards shortcomings in the current governance structure and ways to rectify problems related to duplication and other inefficiencies, especially as they relate to mainstreaming climate change challenges and responses to other policy areas (e.g., public health, economic development, etc.).

Most of the cases of institutionalised collaboration that were examined involved governments from both the North (West European governments, EU, Canada, and the U.S.) and the South (South and Central America and Africa). Northern governments served as the primary sources of financial and technical resources. The only case in which this role is assumed by a Southern government in an exclusive South-South institutional collaboration between Brazil and a number of African countries, where a variety of projects are financed and led by the Brazilian government. These institutional relationships are oftentimes predominantly of an international nature, insofar as the main collaborative actors are governments; sometimes governments only provide funds and leave the implementation of the various projects to private actors such as universities and research institutes. Yet even in the former case, non-governmental actors always appear to be involved in some stage of projects. As far as non-governmental actors are concerned, scientific organisations play a dominant role. On the other hand, the involvement of civil society organisation (e.g., environmental NGOs) and for-profit actors (e.g., companies) is somewhat limited compared to the overarching presence of government-oriented organisations. Where for-profit actors have been involved, such as in the case of RADOST, their involvement has been limited to activities within their own locality, such as pilot project initiatives, rather than active engagement in international exchanges where government and scientific actors tend to dominate.

The primary task of almost all the institutions studied is to increase the climate change adaptation capacity of communities in the Atlantic South by enabling these communities to better understand the consequences of climate change, spread knowledge about the impacts of climate change on socioeconomic developments, and develop instruments to better cope with the effects of climate change. The development of North-South research networks and of networks that connect scientists with policy-makers has in many ways taken centre stage, focusing on building capacity for efforts in Southern institutions. EUROCLIMA, AMMA, WASCAL, IRIACC, and RIOCC all attempt to empower stakeholders in regions that are expected to be hit by climate change. Empowerment thereby includes the strengthening of local research capacities. It is laudable that members from Southern countries have thereby assumed a strong, if not always equal, role in these transnational institutions. Moreover, empowering the research and coping capacities of Southern communities have always been central goals of collaborative efforts. In general, the exchange of best practices for climate change adaptation through sharing information and experiences was prevalent in all examples and in all configurations of North-South, North-North, and South-South cooperation, demonstrating a fruitful method of collaboration. The actual financing and implementation of measures to adapt to the effects of climate change are rarely primary goals though, and tend to be frequently left to other international (e.g., World Bank), national, or sub-national institutions.

We did not see much duplication of efforts within the selected case studies. Networks of communication within and between many institutions somewhat assuage the threat of duplication and redundancy, although there is still the possibility for duplication, especially if these kinds of initiatives spread further. For instance, it is unclear whether AMMA and WASCAL do not engage in duplicative activities and it is not clear how research results inform each other's activities.

The case studies also show that Southern communities have been able to play important roles in decision-making structures and they have been the prime beneficiaries of collaborative endeavours. WASCAL, for example, illustrates how to ensure that the interests and views of developing country partners can be best supported in mini-lateral agreements through the design of its internal governance structures, such as its constitution, which outlines methods of ensuring all party countries are equally represented in internal bodies, such as the Governing Board and related committees. The long-term sustainability of WASCAL, however, is unclear, for it has yet to be seen whether Western African partners will be able to meet their financial commitments beyond the initial funding period.

Functional needs, such as encountering collective threats, seemed to be less of a driver for transatlantic, cross-border collaboration. In many cases, too, initial collaboration was not founded on addressing climate change impacts, but rather climate change concerns were integrated into existing projects. For example, the cooperation between Brazil and African states has been driven by interests in improving agricultural production, yet has incorporated methods for improving resilience to increasing climate variability.

From a pan-Atlantic perspective, collaboration across borders almost always includes actors that share common histories, languages, values, and/or experiences. For example, RIOCC illustrates a relationship fostered around the Spanish and Portuguese languages and colonial ties. EUROCLIMA arose out of an existing bi-regional strategic partnership, "based upon shared values inherited from a common history" (UNGA/UNEP 1992). The IRIACC project 'FACE' appears to leverage the shared presence of the French language throughout the Atlantic region, in that it is a language common to the partner countries of Canada, Morocco, and Niger. Shared language serves both a functional purpose (facilitating cooperative research), but may also have

presented a less tangible driver in the formation of this project, as well as a key facilitator in field-level research. Language also played a role in Brazil-Africa agricultural cooperation, where Portuguese-speaking countries were identified as having the most extensive cooperation projects.

Transatlantic climate change cooperation in some instances rests on shared experience (or predicted) climate change impacts. For instance, Brazil's expertise in tropical agriculture, particularly the successful transformation of the Cerrado to productive agricultural land, offers potential insights to African savannahs. IRIACC is driven by the perception that common climate change vulnerabilities exist across countries and has primarily, though not exclusively, pan-Atlantic projects. In fact, cooperation founded on similar impacts and conditions was shown to widely occur outside of the Atlantic Basin as well, and is not a trend that is exclusive in any way to it (see, e.g., Annex). This is not surprising given the extensive range of climate change impacts experienced throughout the Atlantic Basin, as described in section 4. Furthermore, Atlantic sub-regions and biomes may share more characteristics with other regions outside of, rather than within, the Atlantic Basin and in return possess more similar climate vulnerabilities.

7. Conclusions and recommendations

As climate change prognoses grow increasingly severe, more resources and attention shift towards adapting to its impacts and a growing number of institutions are engaging in adaptation efforts. This paper has chosen to examine a select grouping of these institutions which collaborate across the Atlantic Basin, with two objectives in mind. Firstly, we have sought to evaluate if and how this cooperation is uniquely Atlantic in nature, where collaboration is driven, facilitated or bounded by the actors, impacts, and characteristics of the region. Secondly, we have examined how these institutions fit within a wider picture of fragmented governance on adaptation. Exploratory in nature, and necessarily limited in scope and outreach, the case study analysis offers some valuable initial insights into adaptation governance and Atlantic Basin relations.

The case studies reveal laudable collaborative efforts in the Atlantic Basin that bridge connections between North and South and between developed and developing countries. Within the framework of shared histories, cultures, and experiences, the focus of these transnational collaborations is frequently on research, particularly in the North, and capacity building in vulnerable Southern Atlantic communities that have to cope with climate change consequences. While research capacity and knowledge are strengthened, there appears to be little focus on implementation of policies and instruments to increase the adaptive capacity of Southern communities with other transnational and international institutions often called to the task. This limitation may reflect that the context-specific and frequently local nature of climate change adaptation is a barrier to achieving implementation through the types of institutions examined in this paper. It is in the transition, from research findings to the actual implementation of scientifically founded recommendations that a stronger role for central institutions in the global governance of climate change is needed. The case studies highlight both the need and potential for future Atlantic Basin cooperative frameworks to promote “bottom up” implementation of adaptation efforts that perhaps build on research efforts in existing institutions.

Meeting the costs of adaptation to climate change in developing countries is a major challenge and experts say that developing nations could require more than 100 billion USD for adaptation each year (World Bank 2010). The scale of adaptation finance to

highly vulnerable countries remains incommensurate to estimated needs. In the coming years, large-scale and long-term finance will prove to be one of the most critical factors in improving resilience and reducing vulnerability to climate change impacts. Institutions that improve knowledge of climate change impacts and practices and build capacity are performing important first steps, yet more follow up must be in place to finance and implement concrete adaptation measures at a larger scale. Many of the institutions reviewed were limited in time and funding. Given the relatively low focus on the implementation of actual adaptation measures, the benefits emerging from the collaboration examined in this paper, such as knowledge exchange and scientific research, may evaporate when funding periods end. As described above, administrative and resource costs stemming from participation in multiple governance structures can also pose challenges for poorer member states, which are multiplied, and can lead to under-representation in fragmented systems. Where possible, future frameworks and institutions should seek to promote self-sustaining efforts that move beyond traditional donor-recipient relationships.

Within the fragmented landscape of adaptation governance, transnational regional cooperation may be able to more efficiently connect actors and channel resources, particularly in the private sector from which funding is especially desired, that centralised efforts cannot. The examples examined herein exhibited diverse multi-stakeholder engagement and support. Regional or sub-nationally-focused institutions may also be able to better avoid some of the politicisation, inefficiencies, and collective action problems witnessed at the global level. A prevalence of regional institutions does pose a risk of diminishing funding and commitments to global frameworks, though we did not see evidence of duplication or that funds were not additional. Still, the implementation of large-scale adaptation measures, beyond capacity and knowledge building activities, is needed, and will require consistent and long-term funding from global financial institutions. For this to happen, a level of centralisation of governance structures may be needed.

Polycentric governance theories suggest that single policies or frameworks adopted at the global scale are insufficient to encourage collective action at the local level and that top-down governance frameworks should inform, as well as be informed by, bottom-up initiatives. Future efforts should encourage institutions at different levels (e.g., local, national, regional, international) and develop tailored adaptation strategies that address the particularities of a specific region, community, or ecosystem. Cooperative frameworks that balance top-down governance with experiences and knowledge from bottom-up initiatives, may be able to take advantage of both the flexibility and adaptive nature of small- and medium-scale organisations with the resources available from global institutions. Cole (2011) describes this dynamic balance of top-down and bottom-up and of interdependence and independence: “resilience in the face of rapid change is best met by systems of governance that exist at multiple levels with some degree of autonomy, complemented by modest overlaps in authority and capability.”

Many of the case studies examined focused on exchange of adaptation practices and improved understanding of impacts, between actors in the Atlantic North and South. Better coordination between these and other similar institutions and programs could greatly enhance efforts. One way to ensure that experiences and information can be shared is through the use of various (existing) adaptation portals and platforms.²² Such

²² See, e.g., Climate Adapt – European Climate Change Adaptation Platform: <http://climateadapt.eea.europa.eu/>; Climate Adaptation Knowledge Exchange (CAKE): <http://www.cakex.org/>; Climate Adaptation Learning Mechanism: <http://www.adaptationlearning.net/>; the Community-based Risk Screening tool – Adaptation and Livelihoods (CRiSTAL): <http://www.iisd.org/cristaltool/>.

exchanges and clearinghouses help to gather knowledge about the effects of climate change and strategies to cope with them, distribute this knowledge among transnational/international institutions, highlight potential redundancies and duplication of efforts, and, most of all, help to mainstream climate change mitigation and adaptation into broader international health, environmental, and developmental projects and institutions.

Cooperation from a variety of stimuli has led to dynamic and fragmented cooperation on climate change in the Atlantic. These efforts have shown success in building foundational steps to reduce climate vulnerability, and the institutions appear to be effective pieces within the global climate adaptation governance architecture. Climate change vulnerabilities within Atlantic Basin countries are diverse, and not necessarily exceptional from a global perspective, but create and show interlinkages vulnerabilities exist across the Atlantic, even at differing levels of development. In some cases, these shared experiences or vulnerabilities may form a foundation for working together on climate change, such as in exchanging best practices and knowledge, although this phenomenon is not limited to the Atlantic Basin and in fact can be seen globally in regions with shared environmental characteristics.

More unique to the Atlantic Basin, the case studies bring to light non-environmental factors that appear to play notable roles in driving adaptation cooperation. The case studies show that shared culture, history, and language may be interpreted as drivers of cooperation on climate change. These drivers are not insignificant and may be useful in understanding opportunities for future bilateral and multilateral collaboration and sharing, particularly in areas outside of the climate change umbrella (e.g., mainstreaming).

The wide variety of complex issues and impacts encompassed by climate change overlap with other governance architectures demand extremely high levels of expertise. For this reason, it is important, as represented in the case studies, that climate change adaptation institutions should be structured along thematic bases (e.g., coastal adaptation, human health, etc.) as this functional approach helps to maximise resources and knowledge, incorporate non-legal actors and experts, and facilitate cooperation based on shared impacts or theme, rather than other factors, such as monetary gain or investment opportunities.

Existing relationships and synergies should be built upon, where possible, and can help transfer wealth and technology from the more developed Atlantic North to the more vulnerable Atlantic South. Existing measures and agendas should be harnessed to incorporate climate change, both in terms of sectoral measures (e.g., mainstreaming) and in terms of political cooperation. This can help to create an even wider range of opportunities whereby cooperation and measures that are already in place provide openings for adaptation action and dialogue.

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Annex: Examples of intra-regional, extra-Basin, and UNFCCC climate change adaptation institutions

Intra-regional

Adaptation to Climate Change in Coastal Zones of West Africa (ACCC)	
Geographic focus	Cape Verde, the Gambia, Guinea-Bissau, Mauritania, and Senegal
Impacts and sectors	Coastal erosion and sedimentation in West Africa
Actors	Funded by the Global Environment Facility (GEF) and primarily implemented by UNESCO and UNDP, along partnering organisations the New Partnership for Africa's Development (NEPAD), International Union for Conservation of Nature (IUCN), and Japan International Cooperation Agency (JICA). The primary beneficiaries include 15 villages, three urban communities, and national environment agencies in the five countries.
Objectives	Implement country-driven strategies to adapt to climate-induced coastline erosion within the framework of integrated coastal area management planning and increase adaptive capacity through community-based demonstration projects and development of national policy measures.
Drivers	ACCC is driven by the shared marine ecosystem in the five West African countries and shared, anticipated impacts from climate change. These common environmental challenges were intended to provide a platform for regional cooperation through the project.
Activities and results	Country-specific coastal erosion assessments, consultations with stakeholders to identify existing strategies and capacities, demonstration projects, capacity-building initiatives, implementation of pilot strategies, climate and coastline erosion monitoring mechanisms, stakeholder consultations, and dissemination of lessons learned. Created a <i>Guide on Adaptation Options in Coastal Areas for Local Decision-makers</i> .
Sources	UNDP. 2014. "Adaptation to Climate Change in Coastal Zones in West Africa." Adaptation Learning Mechanism. http://www.undp-alm.org/projects/spa-acc-west-africa . UNESCO. 2014. "Providing options to respond to climate change in West African coastal areas." http://www.unesco.org/new/en/natural-sciences/ioc-oceans/single-view-oceans/news/providing_options_to_respond_to_climate_change_in_coastal_areas/#.U10EFxC2LoY .

Caribbean Risk Management Initiative (CRMI)	
Geographic focus	Cuba, Belise, Jamaica, Haiti, Dominican Republic, British Virgin Islands, Barbados, Trinidad & Tobago, Panama, Suriname, and Guyana
Impacts and sectors	Multiple: disaster risk reduction, water resources, agriculture, coastal livelihoods
Actors	Founded in 2004 by UNDP and the Regional Bureau for Latin America and the Caribbean (RBLAC). The above partner countries, as well as a number of intergovernmental and NGO partners, national and local governments, disaster management offices, civil defense, and meteorology offices work with CRMI. Support comes from governmental donors (Italy and Norway) and UNDP.
Objectives	CRMI is an umbrella programme designed to build capacity across the Caribbean region for the management of climate-related risks and impacts. The initiative provides a platform for coordinating and sharing knowledge and experiences on disaster risk management and climate change adaptation throughout the Caribbean, across language groups and cultures.
Drivers	Spearheaded by UNDP to promote best practices and develop capacity in the region, though emphasises strong regional ownership of work and South-South cooperation.
Activities and results	Implements a range of activities to support reduction of climate risks including policy development, publication of case studies and country assessments on regional best practices, and workshops and training courses.
Sources	UNDP. 2014. "Caribbean Risk Management Initiative." http://crmi-undp.org/en/index.php/about

Coffee Under Pressure (CUP)	
Geographic focus	Central America and Mexico
Impacts and sectors	Smallholder coffee farmers
Actors	Funded by Green Mountain Coffee Roasters and receives partner support from Catholic Relief Services and the International Center for Tropical Agriculture. Collaborates with national organisations from Mexico, Guatemala, El Salvador, and Nicaragua.
Objectives	CUP's objective is helping smallholder coffee farmers in Central America and Mexico adapt to the impacts of climate change.
Drivers	Initiated by the private sector to identify adaptation measures for coffee farmers.
Activities and results	Evaluation of the future impacts of climate change on coffee quality and quantity, analysis of the future suitability and distribution coffee sourcing areas, identification of alternative crops, case study analysis, and engagement between farmer organisations and supply chain actors to design adaptation measures.
Sources	UNFCCC. 2013. "Private Sector Initiative actions on adaptation." http://unfccc.int/files/adaptation/application/pdf/green_mountain_coffee_roasters.pdf CIAT. 2012. "Coffee Under Pressure." http://dapa.ciat.cgiar.org/coffee-under-pressure/

Great Green Wall Initiative (GGWI)	
Geographic focus	Covers more than 20 African countries, including Algeria, Benin, Burkina Faso, Chad, Djibouti, Egypt, Ethiopia, Ghana, Mali, Mauritania, Niger, Nigeria, the Gambia, Senegal, Sudan, and Togo
Impacts and sectors	Desertification and land degradation, increased climate variability
Actors	Founded by African governments and heads of state in 2007, including the African Union. Supported by, among other stakeholders and partners, the EU,

	FAO, the GEF, and the Global Mechanism of the UNCCD.
Objectives	Reforestation in the Sahara and Sahel so as to prevent desertification and combat land degradation.
Drivers	Driven by shared impacts and Pan-African proposal to cooperate to battle desertification.
Activities and results	Funded activities under the GGWI include investment in sustainable land and water management, improved land-use planning, implementation of climate and water monitoring network improvements, financial support to farmers, infrastructure development, economic diversification, and improved agricultural practices.
Sources	GEF. 2013. "The Great Green Wall Initiative. http://www.thegef.org/gef/great-green-wall . FAO 2013. "Great Green Wall for the Sahara and Sahel Initiative:" http://www.fao.org/partnerships/great-green-wall/en/

Extra-Basin

Tropical Forest and Climate Change Adaptation in Southeast Asia, West Africa, and Central America (TroFACCA)	
Geographic focus	Costa Rica, Honduras, Nicaragua, Indonesia, the Phillipines, Burkina Faso, Ghana, and Mali.
Impacts and sectors	Tropical forests
Actors	Funded by the European Commission and implemented by the Center for International Forestry Research (CIFOR) in partnership with the Tropical Agriculture Center for Research and Higher Education (CATIE) in Costa Rica and the World Agroforestry Centre (ICRAF) in the Philippines.
Objectives	Improve understanding of the impacts of climate change on forests and of the relationships between forests and human adaptation.
Drivers	Interest in improving understanding of climate change impacts to tropical forests and for people.

Activities and results	Identify regional development issues and vulnerability related to climate change impacts in forest; develop methodologies to assess vulnerability, contribute to national and regional adaptation processes, develop criteria and indicators for adaptive forest management, develop policy-oriented adaptation strategies, and facilitate stakeholder dialogue.
Sources	CIFOR. 2014. "TroFFCA." http://www.cifor.org/?id=428 ; http://www.cifor.org/trofcca/home.html

CARIBSAVE	
Geographic focus	Antigua and Barbuda, Bahamas, Barbados, Belise, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Venezuela
Impacts and sectors	Climate change impacts on livelihoods and vulnerable economies, small-island states and less developed countries
Actors	Not-for-profit, NGO created in 2008 between the Caribbean Community Climate Change Centre (CCCCC) and Oxford University. CARIBSAVE has offices in South Africa, Kenya, China, the UK, and the Caribbean and is funded through international donors and development partners including CCCC, Oxford University, DfID, AusAid, IDB, UNEP, and ACS.
Objectives	CARIBSAVE seeks to address the challenges surrounding climate change, tourism, the environment, economic development, and community livelihoods across the Caribbean Basin.
Drivers	CARIBSAVE was created in 2007 and arose from a partnership between Caribbean regional organisations and the University of Oxford.
Activities and results	The project aims provide information on climate change and to key sectors that are affected, work with policymakers, assess the vulnerability, resilience, and adaptive capacity of key socioeconomic sectors to climate change, conduct socioeconomic analyses of the costs and risks of climate change, provide and implement adaptation and mitigation strategies, and design, support and implement sector-based capacity building.
Sources	REGATTA. 2014. "CARIBSAVE Partnership." http://www.cambioclimatico-regatta.org/index.php/en/key-institutions/item/caribsave-partnership . INTASAVE-CARIBSAVE. 2014. http://intasave-caribsave.org/ .

South-South Cooperation between Pacific and Caribbean SIDS on Climate Change Adaptation and Disaster Risk Management	
Geographic focus	Caribbean and Pacific small island developing states (SIDS)
Impacts and sectors	Tropical cyclones, sea level rise, flooding, social and economic vulnerabilities
Actors	800,000 USD project from 2010-2012, funded by UNDP's Special Unit for South-South Cooperation and by the UNDP-Japan Partnership Fund. Partners included the Caribbean Disaster and Emergency Management Agency; CARICOM Climate Change Centre; University of the West Indies, Pacific Islands Applied Geo-Science Commission; South Pacific Regional Environmental Programme; Secretariat of the Pacific Community; University of the South Pacific, UNDP Pacific Centre, and CRMI.
Objectives	Help SIDS in the Caribbean and Pacific to exchange ideas, experiences, best practices, technologies, and planning tools to improve resilience and develop solutions to mitigate threats posed by climate change and natural disasters.
Drivers	Recognition of shared climate vulnerabilities and needs.
Activities and results	The project funded exchanges between practitioners involved in national planning, transfer of technologies and the knowledge of how to use them, and methodologies for building disaster risk reduction into development.
Sources	UNDP. 2013. Final Project Report: South-South Cooperation between Pacific and Caribbean SIDS on Climate Change Adaptation and Disaster Risk Management. UNDP. 2010. "South-South Cooperation between Pacific and Caribbean SIDS on Climate Change Adaptation and Disaster Risk Management."

UNFCCC

United Nations Framework Convention on Climate Change (UNFCCC)	
Geographic focus	Global

Impacts and sectors	Climate change mitigation and adaptation in all sectors
Actors	There are 196 Parties (195 states and European Union) to the UNFCCC.
Objectives	The UNFCCC is a global climate change treaty that has traditionally focused in mitigation, although efforts towards adaptation have grown. UNFCCC commits Parties to preparing for and facilitating climate change adaptation and helping meet countries' adaptation needs with technology transfer.
Drivers	International cooperation to mitigate and adapt to climate change

Activities and results	<p>A number of frameworks, programmes, and funds have developed under the auspices of the UNFCCC to address climate change adaptation:</p> <ul style="list-style-type: none"> • Adaptation Framework: Focuses on sharing technology and information, formulating and implementing national plans, finance, capacity building, stakeholder engagement and establishing global, regional and national institutions, including an Adaptation Committee • National Adaptation Programmes of Action (NAPAs): Policy documents through which Least Developed Countries (LDCs) assess and communicate vulnerabilities and adaptation needs and identify priorities. NAPAs are formulated with the support of the LDC Fund under the GEF. • Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP): Aims to assist Parties, particularly developing countries, LDCs, and small island states, in improving climate impact assessment and decision-making through a structured framework for knowledge-sharing and collaboration. The NWP framework is implemented by Parties, NGOs, the private sector, communities, and other stakeholders and covers methods and tools, data and observations, modelling, scenarios, socioeconomic information, adaptation planning and practices, research, technologies and economic diversification. • Special Climate Change Fund: Funds projects focusing on management, education, policy and capacity building initiatives • Least Developed Country Fund: Assists LDCs in developing and implementing NAPAs. • Adaptation Fund: Fund under the Kyoto Protocol to finance adaptation projects and programmes in developing countries, financed primarily with Certified Emission Reduction (CERs) issued for projects of the Clean Development Mechanism. • Green Climate Fund: Was created to transfer money from developed to developing countries in order to assist with both adaptation and mitigation, with a goal of raising 100 billion USD a year by 2020. • Adaptation Learning Mechanism (ALM): Launched by UNDP in partnership with UNFCCC, UNEP, the World Bank, FAO, and others, to share adaptation information and knowledge with stakeholders. The ALM focuses on best practices, capacity building and integration of climate risks and adaptation into development policies.
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Sources	<p>United Nations Framework Convention on Climate Change. 1771 UNTS 107; S. Treaty Doc No. 102-38; U.N. Doc. A/AC.237/18 (Part II)/Add.1; 31 ILM 849 (1992).</p> <p>Kyoto Protocol. UN Doc FCCC/CP/1997/7/Add.1, Dec. 10, 1997; 37 ILM 22 (1998).</p> <p>UNFCCC. 2014. "Adaptation." http://unfccc.int/adaptation/items/4159.php.</p> <p>TEDSEN, Elizabeth. <i>CLICO Working Paper: Climate Adaptation, Water and Security at the International Level: Overview of European Union and United Nations Initiatives</i>, 2012, http://clico.org/working-papers.</p>
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