



Is anticipatory governance opening up or closing down future possibilities? Findings from diverse contexts in the Global South

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ABSTRACT

There is an urgent need to understand how anticipation processes such as scenario planning impact governance choices in the present. However, little empirical research has been done to analyze how anticipation processes frame possibilities for action. This paper investigates how assumptions about the future open up or close down anticipatory governance actions in a large number of climate-focused anticipation processes. We focused on four Global South regions: West Africa, South Asia, Southeast Asia and Central America. We apply an analytical framework that identifies four diverse approaches to anticipatory governance and connect this to the notion of opening up or closing down of possibility spaces for action. Across the four regions, we find that many anticipation processes open up dialogue about deep uncertainties and pluralistic worldviews but end up informing mostly technocratic and linear planning actions in the present. We also observe that anticipation processes in the Central American context more often break this trend, particularly when transformative ambitions are formulated. The focus on more technocratic futures and linear planning strategies and reliance on a mostly North-based global futures industry may close down more culturally, socially and politically diverse and regionally relevant future worldviews in anticipation processes.

1. Introduction

Anticipation processes such as scenarios and visioning have become a key governance mechanism to imagine uncertain climate futures and at least potentially guide actions in the present. These processes have spread throughout different disciplines (Andersson, 2018; Edwards, 2010) and prominent norm setting institutions such as the Intergovernmental Panel on Climate Change and the United Nations Environment Program's Global Environmental Outlook (Pereira et al., 2021). However, there are very different ideas regarding how anticipation can inform governance across the social sciences and interdisciplinary sustainability sciences (Muiderman et al., 2020). Some consider anticipation processes as useful tools for designing policy trajectories that

prevent future risks and hazards (Fuerth, 2009; Fuerth and Faber, 2013) while others point to a lack of reflexive engagement with diverse visions of the future (Pulver & VanDeveer, 2009). These divergent visions have different implications for how futures work can help guide actions in the present (Muiderman et al., 2020). Anticipatory governance is emerging as an integrative, interdisciplinary research agenda that analyzes the steering effects of these emerging processes of anticipation by which is meant most broadly *governing uncertain futures in the present* (Vervoort & Gupta, 2018).

Critical social science scholars have pointed to an important research question. How can anticipation processes be understood as sites of political negotiation, where future dynamics are made sense of, and processes of prioritization and inclusion are shaped? They argue that

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imagining the future informs the shaping of policy choices in the present (Jasanoff & Kim, 2015; Taylor, 2004; Gupta et al., 2020). Of particular importance to this paper is Stirling (2008) who has pointed to the growing number of deliberative processes that try to engage with – or open up to – future complexities and contingencies in the anticipation of scientific and technological progress, but end up closing them down instead, because of the ways in which power limits what is considered possible and desirable to be explored; and how social actors frame and understand what are viable alternatives (Stirling, 2008; Turnhout et al., 2016). These dynamics are important, others have also argued, because futures can be framed in certain ways, e.g. as future emergencies, to either legitimize socially unwanted action (Bellamy, 2016) or to comply with pragmatic solutions available to current regimes (Sarkki et al., 2017; Sova et al., 2015).

The dynamics of opening up and closing down possibilities for action are important to scrutinize in the uncertain and normatively and scientifically contested terrain of futures work (Gupta et al., 2020). Anticipatory governance processes are often still quite prediction-oriented and technocratic (Low & Schafer, 2019; Muiderman et al., 2022; Muiderman, 2022). Such processes are dominant despite the fact that there are many processes and practices that have been designed specifically to provide openings for reflexive and critical dialogue about what and whose futures to engage with (Bennett et al., 2016; Bellamy et al., 2013). Technocratic and prediction-oriented anticipation processes close down dialogues, which may have material impacts in terms of action, insofar as they may act on some futures rather than on alternative (and more desirable) futures (Paprocki, 2019).

In this article we investigate how conceptions of the future in influential anticipation processes impact governance actions in various regional sustainability contexts of the Global South. Do they provide openings for more inclusive and reflexive action, or are these processes closed down by incumbent interests and dominant framings of what is considered relevant and credible knowledge for present day action? In earlier work, some of us have developed an analytical framework that provides a lens through which to examine assumptions about the future and their steering effects in the present (Muiderman et al., 2020). In this article, we connect this framework to the notion of opening up/closing down (Stirling, 2008) to empirically examine the dynamics of anticipatory governance in diverse regions of the Global South. We argue that this question is particularly urgent in developing countries since futures work is seen to be largely based on Global North ideas, methods, research and technologies (Escobar, 2020). While a critical research agenda on anticipatory governance is now emerging, most research has focused on the Global North (Biermann & Möller, 2019; Vervoort & Gupta, 2018). This clashes with the fact that many parts of the Global South are particularly vulnerable to challenges such as climate change (Adger & Vincent, 2005; Okereke, 2018) and climate governance actions should fit local and national contexts (Derbile et al., 2016).

Here we present a case study-based empirical analysis that extends across four global regions, in which we qualitatively analyze a number of anticipation processes through investigating written and spoken statements in anticipatory processes, as captured in policy documents, process reports, interviews and focus group discussions. Building on these regional analyses, this paper provides novel insights into anticipatory climate governance in diverse contexts of the Global South, a crucial gap in the literature.

2. Opening up or closing down anticipatory governance: Frames of the future and possibilities for action?

2.1. Anticipation and anticipatory governance: Four approaches

The notion of anticipatory governance captures the challenge of how uncertain futures can be imagined and governed in the present (Boyd et al., 2015; Muiderman et al., 2020; Vervoort & Gupta, 2018). Anticipatory governance as a concept was developed in the context of the

responsible innovation of technologies and their future societal impacts (Barben et al., 2008; Guston, 2014), and then adopted in environmental governance (Gupta, 2001, 2011), social ecological systems literature (Boyd et al., 2015), public planning (Boston, 2019; Fuerth, 2009), and science and technology studies (Davies & Selin, 2012). A wide variety of approaches to anticipatory governance exist in the social sciences and sustainability sciences, which are diverse in terms of their conception of the future, implications for the present and ultimate aims (Muiderman et al., 2020). Based on a critical interpretive literature review, Muiderman et al. (2020) identified four approaches to anticipatory governance commonly found across a diverse body of anticipation literatures:

1. Approach 1 assesses futures in terms of probability in order to help inform strategic policy planning to reduce future risks.
2. Approach 2 explores plausible futures in order to build capacities and preparedness to reflexively navigate diverse uncertain futures.
3. Approach 3 focuses on imagining pluralistic futures in order to mobilize diverse societal actors to co-create new futures.
4. Approach 4 scrutinizes the performative power of future imaginaries in order to interrogate and shed light on their political implications in the present.

In a follow-up study investigating a global network of foresight-for-food practitioners in terms of this framework, Muiderman et al., 2022 illustrate that in practice, anticipatory processes might align with one approach or (more often) with multiple approaches. Approaches less clearly signposted as anticipation or futuring, such as environmental impact assessments or budget analyses can also be anticipatory in character. Across these approaches, a plethora of methods and tools of anticipation exists, such as modelling (Mason-D'Croz et al., 2016; Sampson et al., 2016), participatory scenario analysis (Kok et al., 2007; Vervoort et al., 2014) and visioning and back casting (Quist et al., 2011; Robinson et al., 2011). Such anticipation methods are not tied to a single conception of the future – they are typically flexible enough to be included in different conceptions of the future as embodied in the four approaches. The framework that developed the four approaches to anticipatory governance has turned out to be a useful tool to examine how assumptions about the future steer actions in the present in specific empirical contexts.

In this article, we take a step further and connect this framework to Stirling's notion of opening up or closing down more expansive notions of the future and their implications for present-day actions.

2.2. Opening up or closing down governance processes

The focus on stakeholder participation has resulted in the development of new institutions, process, and tools in sustainability governance (Stirling, 2008). Diverse knowledges, and perspectives from outside (of science) are increasingly acknowledged to be important to legitimately formulate decisions about the future (Ravetz, 1999; Macnaghten, 2009) as conflicts persist about the nature of and solutions to future problems (Esguerra, 2019; Gupta, 2011). As a result, much of the futures work in sustainability governance is at least partially participatory and involves stakeholders such as policymakers, local NGOs and researchers to balance diverse interests and knowledge. However, processes that involve diverse stakeholders are often still dominated by linear, deterministic or technocratic processes, which may affect policy debates as much as 'narrower' expert-based processes (Stirling, 2008). Stirling points to a tension in the growing calls for stakeholder participation by incumbent interests, who then close down the range of possibilities rather than opening them up (Stirling, 2008). This expresses itself, for instance, in implicit and predetermined policy commitments that push for clear, authoritative, prescriptive policy recommendations rather than allowing for open-ended political processes (Stirling, 2008; see also Bellamy et al., 2013).

Closing down, in short, also happens in processes that aim to open up

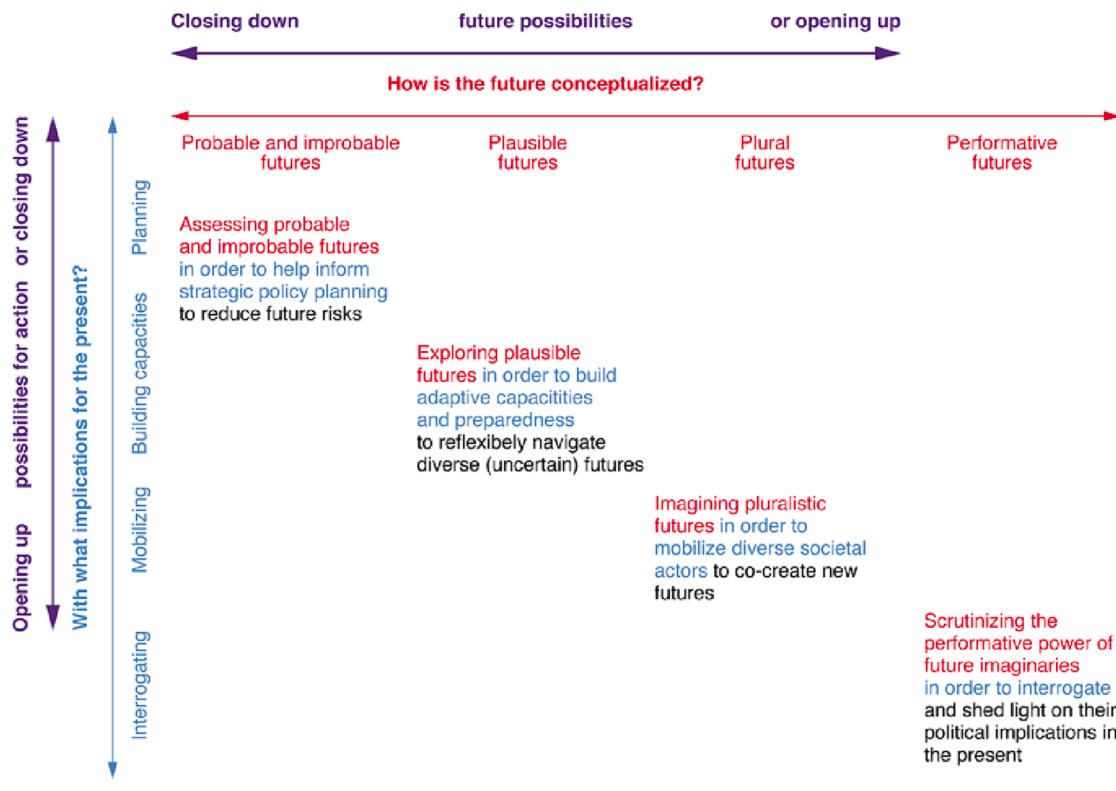
future possibilities. This can be through both deliberate and unconscious actions (Stirling, 2008). More deliberate and strategic choices that contribute to closing down include, for example when knowledge is repackaged to make it attractive to and respond to the needs and political agendas of policymakers (Sarkki et al., 2017). A similar dynamic is at play in the selection of what is considered policy relevant knowledge (Turnhout et al., 2016). Less conscious forms of closing down can take place when processes educate instead of empower participants and do not necessarily lead to more democratic processes and social agency (Stirling, 2008). Another example would be the calibration of a variety of deliberation-generated inputs into consensus and unanimous recommendations for standardized procedures (Turnhout et al., 2016). Closing down is thus shaped by factors generally considered as 'external' to analysis and appraisal and therefore not always rendered visible. But it can have a decisive role in determining what actions are considered possible in the potential to realize diverse futures.

In contrast, maintaining a truly open dialogue means to focus on questions of power. As Stirling (2008) points out, important questions come to the fore. For example: Who determines what futures are included? How are uncertainties interpreted? How are alternative futures characterized (e.g., as relevant or not)? To what extent are findings rationalized rather than criticized? Processes that open up possibilities might discuss neglected issues, marginalized perspectives, ignored uncertainties, disputing knowledges, and alternative options in a pluralistic rather than consensual form (Dryzek and Niemeyer 2006). The key is reflexivity regarding different framings, alternative assumptions and possibilities (Stirling, 2008). Opening up also means to transparently report on divergent interpretations in policy advice - if and how alternative courses of actions would be preferable under different framing conditions and also in relation to the real world of divergent contexts and values (Stirling, 2008). This avoids premature lock-in effects and the devaluing of alternative futures.

In the figure below, we bring together the Muiderman et al. (2020) framework on the four approaches to anticipatory governance with the notion of opening up/closing down, as discussed by Stirling.

Fig. 1 first presents the original Muiderman et al. (2020) analytical framework, which maps four approaches to anticipatory governance along the horizontal and vertical axes in blue and red. These depict diverse conceptions of the future and their implications for present-day actions, respectively. The purple lines added on above these axes juxtapose how anticipatory governance processes might open up or close down more expansive future possibilities or options for present-day actions. The figure thus brings together the 'four approaches' framework on anticipatory governance with the notion of opening up and closing down. It suggests that closing down or opening up anticipatory governance relates to different framings and assumptions about the future (purple line above the horizontal axis in Fig. 1), and to possibilities for present-day action, which may be opened up to a broader range of options or closed down towards remaining within existing policy frames (purple line above the vertical axis in Fig. 1).

Fig. 1 also posits that, as we move from approaches 1 to 3, anticipation processes are increasingly explicit and sensitive to diverse framings and assumptions about multiple desired futures. In terms of their connections to present day action (the vertical arrow), plural approaches may be understood by incumbent actors (governments, business leaders) as being more distant from familiar or commonly used approaches to planning. This does not mean that these plural approaches are necessarily less actionable – for instance, approach 3 focuses on pluralistic futures but often for the purpose of mobilizing concrete political and transformative action by new groups or coalitions of actors. This notwithstanding, classic planning approaches can often be perceived as the most 'actionable', compared to the actions in the present envisaged in the other perspectives. In the context of these four approaches, approach 1 closes down future possibilities through limiting



Key: Red: what conception of/engagement with the future; blue: how these intersect with actions to be taken in the present; black: why/to what end: the desired ends of engaging in/with anticipatory governance; purple: opening up or closing down future possibilities and options for present-day actions in anticipatory governance.

Fig. 1. Diverse approaches and the opening up or closing down of anticipatory governance.

assumptions about probability. While these may seem to provide a comprehensive image of future risks and thus provide the basis for salient forms of present-day action, assumptions about probability may be challenged for the non-inclusive and limited ways in which they frame the world. Approach 2 opens up to more diverse courses of action and involves diverse stakeholders (including also communities affected by measures) but the exploration of uncertainties and complexities, is often bounded by a prioritization of drivers and consensual recommendations. Its technical, systems-based nature can close down possibilities because of the prominence of this approach in exclusive and technocratic processes. Approach 3 focuses on pluralistic processes with societal stakeholders, where the focus is on agency to bring about change. As such, it certainly offers more opportunities for opening up possibilities for present-day action, although this often means the need to create new organizations, communities and institutions to realize action. Approach 4 explicitly opens up issues of power in assumptions and framings of the future. It is slightly different from the other three approaches in the sense that it is a critical perspective largely found in academic literature, rather than in policy practice or design of anticipatory processes. Approach 4 thus offers a critical reflective academic lens through which to consider the political implications of the various other conceptions of the future and associated implications for present-day action captured in the other three approaches. For it to be applied to practice, it needs to be integrated with one of the other approaches (mainly 2 and 3). As an integrated approach, it can help the other approaches to be designed in a more inclusive and just manner. For example, combining approach 2 and 4 can help to critically interrogate plausible futures and their implications for actions, while combining approaches 3 and 4 can help to transform anticipatory processes to realize more just and inclusive futures.

In the remainder of this paper, we examine the nature and dynamics of anticipatory processes in the Global South in practice. We do so by applying the analytical framework of Fig. 1 to assess diverse approaches to anticipation and their opening up or closing down dynamics.

3. Methodology

3.1. Data collection

We selected four diverse regions in the Global South: West Africa, Central America, Southeast Asia and South Asia. We selected four regions where the Climate Change, Agriculture and Food Security (CCAFS) Program, which is an organization that is part of the research consortium that led this research, held foresight processes to guide climate decision-making. The regions are diverse in socio-economic, political and security conditions, but have climate vulnerability and dependence on foreign assistance in common. The authors (four of whom worked for CCAFS at the time of research) have extensive networks and experience working on foresight for anticipatory governance in these four regions, and could therefore rely on valuable access to anticipation processes (Vervoort et al., 2014). In these regional contexts, we wanted to focus on the most vulnerable countries and therefore limited our scope to five countries in each region. We included those countries with the lowest GDP: a) Ghana, Senegal, Mali, Niger and Burkina Faso for West Africa, b) Honduras, Belize, El Salvador, Nicaragua and Guatemala for Central America, c) Laos, Vietnam, Cambodia, Philippines and Indonesia for Southeast Asia, and d) Bangladesh, Sri Lanka, Pakistan, Nepal and India for South Asia. We later added Costa Rica as a 21st country; while Costa Rica does not fit our GDP criteria, its unique approach to anticipation helps support a stronger analysis by contrast. Our overall set includes 3 low income countries, 14 lower middle income countries and 1 upper middle income with high poverty and inequality and 1 upper middle income country with high inequality (The World Bank, 2020). Within these countries we searched for influential examples of anticipation and limited our scope to processes that aimed to inform climate governance.

Regarding data sources, for each region we looked for public

documentation of anticipation processes and sustainability policies and proceeded as follows. A team of four researchers (one for each region, of which the first author was the global coordinator) searched in academic literature for publications on processes of anticipation. We searched on Scopus using the following keywords to include anticipation that intended to inform policy: [country] AND development AND policy AND climate AND change AND future. We read all abstracts and included papers with at least two of the following keywords: future, adaptation, anticipation, scenario, and foresight. This resulted in 11 academic articles on anticipatory processes in West Africa, 1 paper in Central America, 5 in Southeast Asia, and 0 in South Asia. We then systematically looked for publicly available documentation of national climate policies on Google, including the governmental websites of each country and on UN websites all country profiles (e.g., adaptation-un.org lists the processes of National Adaptation Plans and National Adaptation Programs of Action) to examine if anticipation was used. Third, as we noticed that many policies were not published online, we used a snowball technique and asked foresight experts in each region to help verify and complement the selection of anticipation processes and sustainability policies found. The snowballing started with the regional CCAFS experts, who pointed to influential anticipation processes and climate policies. Based on these findings were other experts contacted, and so on (Verschuren & Doorewaard, 2010). Through this snowball technique, another 4 processes were included for West Africa, 0 for Southeast Asia (because there were already many relevant policy documents included that had used anticipation), 13 for South Asia and 14 in Central America. In addition, we included national and sectoral policy documents that address climate change and had been initiated in the last decade (since 2008, as the research started in 2018). In addition, 15 policy documents were selected in West Africa, 16 in Southeast Asia, 13 in South Asia and 12 in Central America. This set of academic papers, reports and policy papers were first analyzed to identify the methods and tools of anticipation and their relation to decision-making.

We continued our search for more implicit assumptions about the future and its implications for the present with an in-depth scrutiny of twelve anticipatory climate governance processes (three per region, see Table 1). From the broader set, we selected processes that were similar in their explicit recommendations for policy impact, yet different in the type of method or tool that had been used. As such we focused on diversity in the types of processes to see if they aligned with some or multiple approaches. In each region, interviews were held (41 in total) with people working on the anticipation-policy interface, including at least the designer/facilitator of each anticipatory process (e.g., the workshop facilitator, modeler, etc.), an intermediary person (e.g., responsible for stakeholder participation and policy engagement), and a policymaker or person responsible for policy follow-up.

As a final step, we organized six focus group discussions dedicated to the inquiry of opening up or closing down of anticipatory governance: in Bangkok, Thailand (17–18 July 2019), Dhaka, Bangladesh (17 August 2019), Guatemala City, Guatemala (3 October 2019), San Salvador, El Salvador (19 October 2019), Niamey, Niger (31 January 2020) and Ouagadougou, Burkina Faso (6 February 2020). In each session, we shared and discussed findings with groups of 10–20 participants, including policymakers, researchers, and representatives from civil society. We asked participants in an open-ended manner about their perspectives regarding opportunities and challenges for formulating actions in the present based on anticipation and conveying this to incumbent actors. We made notes of each workshop which we then analyzed. In Niamey and Ouagadougou, a survey was also shared with similar questions to equally capture each participant's input. Table 1 below provides an overview of the methods used and data collected for each region.

3.2. Comparative analysis

We used a qualitative-comparative case study method to describe,

Table 1
Overview of research methods and data collection.

Region	Methods used in the qualitative case study	Data collected
West Africa	Scopus search	11 academic articles on anticipation in the climate domain
	Snowball technique	4 anticipation process reports + 5 national and sectoral policies that address climate change
	Interviews	13 interviews with foresight practitioners, people working on the foresight-policy interface, and policymakers
	Focus groups and small survey (qualitatively analyzed)	2 focus groups in Niamey and Ouagadougou with 10–20 participants. Participants were researchers, representatives from local and international civil society organizations and policymakers
South Asia	Scopus search	0 academic articles on anticipation in the climate domain
	Snowball technique	13 anticipation process reports + 13 national and sectoral policies that address climate change
	Interviews	8 interviews with foresight practitioners, people working on the foresight-policy interface and policymakers
	Focus groups	1 focus group in Dhaka. Participants were researchers, local representatives from international civil society organizations and policymakers
Southeast Asia	Scopus search	5 academic articles on anticipation in the climate domain
	Snowball technique	0 anticipation process reports (because we had already selected many policy documents that had used anticipation) + 18 national and sectoral policy documents that address climate change
	Interviews	7 interviews with foresight practitioners, people working on the foresight-policy interface and policymakers
	Focus groups	1 focus group in Bangkok. Participants were researchers, local representatives from international civil society organizations and policymakers
Central America	Scopus search	1 academic article on anticipation in the climate domain
	Snowball technique	14 anticipation process reports + 12 national and sectoral policies that address climate change
	Interviews	13 interviews with foresight practitioners, people working on the foresight-policy interface and policymakers
	Focus groups	2 focus groups in Guatemala, and San Salvador with 10–20 participants. Participants were researchers, representatives from local and international civil society organizations and policymakers

interpret and further conceptual understanding of anticipatory climate governance processes in the Global South. We identified what methods and tools are used by practitioners and policy makers to anticipate climate futures and their intended role in decision-making in 21 countries. Then, we scrutinized for 12 processes how assumptions about the future impact actions in the present and to what ultimate aim (see Table 2). Finally, we analyzed for each of the 12 processes dynamics of opening up and closing down, as well as for the broader region.

The comparative method is a well-established method in the social science to test theoretical propositions and analyze phenomena in fields of study where controlled experiment are impossible (Hopkin, 2010).

Table 2
The twelve processes examined in detail.

West Africa
Climate modelling and policy workshops as part of the African Monsoon Multidisciplinary Analysis Program (AMMA-2050)
Data generation and collection workshop under the West African Biodiversity and Climate Change (WABiCC) Program
Scenario-guided policy reformulation of Burkina Faso's Rural Development Plan II as part of the Food Security, Agriculture and Climate Change (CCAFS) Future Scenarios Project
South Asia
Quantified participatory scenario narratives for the 12th Five Year Plan for India
The CCAFS participatory foresight process for the 7th Five Year Plan in Bangladesh
Two sets of scenarios for the Bangladesh Delta Plan 2100
Southeast Asia
Climate change and sea level rises scenarios of the Vietnam Institute of Meteorology, Hydrology and Climate Change
Climate forecasts and foresight for Climate Action for the Association of the Southeast Asian Nations (ASEAN) Agriculture Resilient Societies 2020
Qualitative and quantitative scenarios for the Lower Basin Mekong Development Strategy
Central America
Urban development scenarios for the Sustainable Tourism Master Plan in Belize
Environmental assessment for the National Climate Change Adaptation Strategy for the Agri-Food Sector of Honduras
Quantitative and qualitative scenarios for Costa Rica's Intended Nationally Determined Contribution process

The case study method also helps to explain phenomena such as anticipatory governance within their context (Flyvbjerg, 2006; Verschuren & Doorewaard, 2010) and allows for interpreting similarities and differences across the diverse contexts in this research. We thus considered this method highly suitable to our aim to interpretatively and comparatively analyze if anticipatory governance opens up or closes down future possibilities in future visions and associated present day actions.

We took a theory-driven approach and proceeded as follows. We followed the logic of a hierarchical approach to comparative case study research (Verschuren and Doorewaard 2010), which consists of two separate phases. We first examined the anticipation processes as a sequence of separate cases for each region (Sections 4.1–4.4) and then compared across the regions (Section 5) what approaches to anticipatory governance are taken and if they open up or close down future possibilities. The analytical framework with the four approaches to anticipatory governance (Muiderman et al., 2020) provided the theoretical context for our research as well as the notion of opening up and closing down (Stirling, 2008) (see Fig. 1). We used the four approaches in this framework as heuristics (Bartlett & Vavrus, 2017) to discover and 'trace' approaches to anticipatory governance in anticipation processes across diverse sites, and the notion of opening up/closing down to further interpret the external dynamics within approaches.

The qualitative multi-sited case study allowed for an open way of gathering and triangulating data – in this case the interpretation of texts and perspectives. We used several techniques in parallel - literature and document review, snowballing, semi-structured interviewing and focus group discussions – to an iterative and open-ended exploration and refining of research findings. These synchronous processes also increases the validity of the study (Kleining & Witt, 2000; Yin, 2003).

Our unit of analysis is the anticipation process. However, we decided to structure our comparative analysis according to the four regions instead of analyzing the processes one-by-one, to open-endedly explore if regional differences and similarities exist that help explain why certain approaches dominate and dynamics of opening up/closing down occur.

4. Approaches to anticipatory climate governance in four regions

This section discusses the findings in the four regions: West Africa,

South Asia, Southeast Asia and Central America.¹ The table below lists the 12 processes that were examined in detail. Annex 1 provides more details for each region the anticipation reports, literature and policy documents reviewed, and the interviews and focus groups that were held.

We used the four approaches to anticipatory governance by Muiderman et al. (2020) to analyze these 12 processes:

1. Approach 1 assesses futures in terms of probability in order to help inform strategic policy planning to reduce future risks.
2. Approach 2 explores plausible futures in order to build capacities and preparedness to reflexively navigate diverse uncertain futures.
3. Approach 3 focuses on the imagining of pluralistic futures in order to mobilize diverse societal actors to co-create new futures.
4. Approach 4 scrutinizes the performative power of future imaginaries in order to interrogate and shed light on their political implications in the present.

4.1. Anticipatory governance processes in West Africa

4.1.1. Anticipation processes

Following the ratification of the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement most West African countries have shifted their priorities from adapting to present-day vulnerabilities towards the anticipation of more long-term climate vulnerabilities (Noblet et al., 2018). The anticipation processes reviewed for West Africa (see Annex 1 for a full list of anticipation processes analyzed) combine methods and tools; the majority starts with model-based scenarios, such as climate modeling (e.g., impact of precipitation) and crop modeling (e.g., impact of temperature rise and precipitation changes on crop yields) to assess future climate change (e.g., Burkina Faso's National Climate Adaptation Plan). And then combine this with participatory methods to discuss policy options, for example serious gaming and a policy forum (e.g., AMMA-2050 in Senegal), or a participatory approach to monitoring and evaluation (A practical consensual tool for water policy in Burkina Faso, Gahi et al., 2015). A few processes started with participatory scenario methods to explore multiple plausible futures with diverse stakeholders (academia, policy, private sector, and civil society) – and sometimes quantified these narratives. Only a few processes used budget analysis.

The policy documents we reviewed often start with a normative future vision for the country and to this end use quantitative (and sometimes qualitative) scenarios to determine which policy measures are needed to realize this future, for example macroeconomic trend analysis (e.g. Ghana's Shared Growth and Development Agenda II) or climatic trend analysis (e.g. Senegal's National Adaptation Plan for the Fisheries and Aquaculture Sector in the Face of Climate Change Horizon 2035 uses the IPCC scenarios RCP 4.5 and 8.5 in two global models). Visions are also developed in a participatory way (e.g., Niger's Strategic Framework for Sustainable Land Management), but some policy documents stated that visions were legitimized through elections (e.g., Ghana's Coordinated Program of Economic and Social Development Policies).

Almost all of these processes were organized by consortia of academic institutes and governmental agencies and were organized and funded by international organizations and donors, including the World Bank and United Nations Development Program, donor governments and agencies, such as USAID and DFID, and developmental research

institutes such as CIRAD and CGIAR. These organizations collaborate with West African partners, such as ministries and research institutes, to co-design the processes and involve more stakeholders.

4.1.2. Assumptions about the future, implications for actions and ultimate aims

The first example, the West African Biodiversity and Climate Change (WABiCC) Program organizes, amongst others, participatory workshops to improve access to and understanding of high-quality portals and models to increase preparedness and resilience to future climate risks for coastal areas, in a hybrid approach of 1 and 2. The focus on science-based risk mitigation was needed because according to one interviewee, “looking at the NAP (National Adaptation Plan) reports and the NAPA (National Adaptation Program of Action) process, national communications, I often found that the climate information provided in this region that were leading to the selection to adaptation policies was oftentimes not very good” (Interview, 19 March 2019). The project hopes to change the mind-sets of policymakers to plan under scientific uncertainty through reliance on robust data and strengthened interaction with external experts.

The African Monsoon Multidisciplinary Analysis (AMMA-2050) Program uses mainly crop and convection permitting modeling to assess probable futures and organizes workshops with policymakers to build their capacities for science-based planning to mitigate future risks, which is mainly approach 1 with some approach 2 action.

The Food Security, Agriculture and Climate Change (CCAFS) Future Scenarios Project sees futures as more fundamentally uncertain and complex and explores plausible futures to be able to navigate them as they emerge (approach 2). The CCAFS scenarios were used to guide the reformulation of Burkina Faso's Rural Development Policy II (2016–2020) to make it more robust to diverse futures. However, the policy document and policy makers stated to appreciate the processes for its technical assistance in reducing future risks, thereby using approach 1 language.

4.1.3. Opening up/closing down

Both the WABiCC and AMMA-2050 programs embed an approach 1 conception of the future and pursue a combination of approaches 1 and 2 actions – embedding language on deep uncertainty and capacity building within a linear planning approach. Both programs also aim to reduce risk and increase resilience (also 1 and 2). These processes opened up to include multiple sources of scientific information but maintained a relatively exclusive processes. The CCAFS process followed approach 2 but ended up being used by policy makers for linear planning strategies – thereby reducing equally plausible futures to a consensual and most likely future and reframing futures as technically informed in a way that was not originally intended by the anticipation process.

Focus group participants shed further light on the closing down dynamic. Participants saw the future as a relatively closed and pre-determined space - credible futures are those that can be assessed by science. As one participant noted, “our plan was to build evidence-based science as opposed to perceptions” (Focus group Ouagadougou, 6 February 2020). Multiple interviewees argued therefore that anticipatory governance should therefore support the evidence-base of policies and get the science right about future climate change to inform decision-making more accurately beyond subjectivity and perception. Future uncertainty was considered a problem of science - it can result in underestimation or overestimation (e.g., of yields) and misinform planning. Processes that explicitly engage with inherent future uncertainties and subjectivity, such as participatory scenarios work, are considered less authoritative than model-based scenarios. Some described participatory scenarios as the second-best option, “it depends on your projection and on your resources what you can do, because if you don't have the capacity to do a simulation, then you cannot do anything. You can go to participatory scenario because you don't have anything else so you do what you can” (Interview, 19 April 2019). Others very much appreciated

¹ Each section presents a synthesis of a study that is also published as a standalone regional working paper by one of the co-authors of this paper: South Asia (Muzammil et al., 2021), Southeast Asia (Peou et al., 2021) and Central America (Veeger et al., 2021). The West Africa analysis will also be published as a journal article (Muiderman, 2022).

the methodology for the inclusion of voices, and open yet structured dialogue. As another participant said, “it made them [policymakers] aware of the importance of the synergy with national research institutions and to take advantage of knowledge at different levels: from community, national, regions.” (Participant to the focus group discussion in Ouagadougou, 6 February 2020).

Participatory scenarios processes are thus valued for the process, but not necessary the outcome, which may explain why the knowledge produced in the participatory processes is not transparently communicated in the policy document while it does visualize two quantitative scenarios that were developed in a parallel FAO process. As an interviewee stated, “the way of wording things in the policy document cannot be as clear as from the recommendations. [...] They won't mention - thanks to the scenario process, we were able to do this etc.... it's not the right jargon” (Interview, 08 October 2018). Different hybrids thus exist of approaches 1 and 2, but there is a tendency to align actions with approach 1 and connect to existing policy frames.

4.2. Anticipatory governance processes in South Asia

4.2.1. Anticipation processes

South Asian countries demonstrated a technocratic stance to anticipatory governance and focus anticipation on risk management. As a participant noted, “the General Economic Division is very pro-active and supportive of allowing their officials to spend time in engaging with external experts to build technical knowledge” (Focus group Dhaka, 17 August 2019). In South Asia, the majority of anticipation processes investigated (see Annex 1 for a full list of anticipation processes analyzed) focused on quantitative forms of foresight, e.g., climatic trends analyses generated by several climate models (Muzammil et al., 2021), and complemented by a variety of other participatory or policy strategizing methods. Four processes included participatory scenario processes. All but three were translated into policy.

Multilateral organizations mostly fund anticipation, such as the World Bank, United Nations Development Program (UNDP), United Nations Environment Program (UNEP), Global Environment Facility (GEF) and European Union (EU), who partner up with donor governments and organizations such as United State Agency for International Development (USAID) and the United Kingdom Department for International Development (DfID), and international developmental research institutes such as the IDRC. They work in consortia to design and run the process and work with governmental organizations in the countries, and in fewer instances with civil society and private sector partners. Only the scenarios for the 12th Five Year Plan for India were initiated and developed by its Planning Commission in collaboration with national research institutes.

4.2.2. Assumptions about the future, implications for actions and ultimate aims

The CCAFS participatory foresight process for the 7th Five Year Plan in Bangladesh used a combination of regional, participatory, qualitative plausibility-focused participatory scenarios created for South Asia, supported by the IPCC's climate and socio-economic scenarios; quantified agricultural economic modelling, and national impact studies. These scenarios were downscaled to create qualitative scenarios specifically for Bangladesh help support workshop participants (the Bangladesh Planning Commission) in their testing of the core elements of the 7th Five Year Plan (Vervoort et al., 2014), as associated with approach 2.

The anticipation process for the 12th Five Year Plan for India quantified participatory scenario narratives with a system dynamics model to ‘add quantitative rigor’ to the narratives. The aim was to understand the major challenges India faces in the future and to ensure more democratic and inclusive outcomes that took voices of all the different regions and societal groups into consideration. The scenario recommendations helped prioritize infrastructure and human capital

investments for the aim of successfully reaping its ‘demographic dividend’ (approach 2 with elements of 1 and 4).

The Bangladesh Delta Plan 2100 used two different scenario processes to develop a robust, adaptive, integrated planning strategy for water secure, flood safe, climate resilient and prosperous delta. First, Dutch research consultants developed four scenario narratives of hypothetical futures including a wide range of drivers (approach 2). Thereafter the General Economic Division invited a team of Ecosystem Services consultants who proposed to validate and extend scenarios drivers through integrated modelling. While the first team disagreed because the scenarios were purely intended as test beds of plausible uncertain futures, two out of four scenarios were developed into policy scenarios and placed in a macroeconomic context that were easily communicable to policymakers and more suitable in the context of development (approach 1) (Hasan et al., 2020). The initial set of four future scenario narratives ended up in the Annex. These examples also illustrate hybrid approaches of 1 and 2, combined with elements of 4. In addition, they demonstrate how anticipation can provide openings for opening up to different frames of the future, but are enforced to close down in the formulation of possibilities for actions in the present.

4.2.3. Opening up/closing down

The CCAFS project followed approach 2 but was used for more linear policy planning in some respects; although the result of the approach 2-based analysis of the 7th 5-year plan did also focus on adding elements that focused on building general resilience. The 12th Year Plan opened a plausibilistic process (approach 2) up to give agency to diverse societal groups (approach 3) but closed down into two macro-economic scenario's that fitted current policy frames (approach 1). The Delta Plan 2100 used approaches 1 and 2 in parallel, which started to compete, and the two macro-economic and policy relevant scenarios won from the four testbed scenarios- illustrating how policy relevancy delimits futures possibilities.

Discussions with participants highlighted that the government of Bangladesh takes a very technocratic and expert-analytic stance on climate change anticipation, funding primarily simulation modeling of flood risks for technical solutions to control floods and other disasters. These presumptions about what anticipatory governance is for shapes the types of processes that are funded and the space available for critical dialogue. A foresight practitioner also said that participatory processes were often less inclusive than initially aimed for, with ‘usual suspects’ such as government officials and researchers joining while local community voices, marginalized perspectives (e.g., women and youth groups) and other groups whose futures are at stake were excluded (Focus group Dhaka, 17 August 2019). A policymaker said that the focus on uncertainty and plausibility in the CCAFS process felt uncomfortable to them initially but was considered to have added value in the end. In the final policy, this also resulted in a focus on resilience and flexibility in the policy changes (around infrastructure and education). However, it remained a relatively closed process in terms of participation, particularly in terms of the voices included and political agendas that shaped the process – policy uptake was prioritized instead.

4.3. Anticipatory governance processes in Southeast Asia

4.3.1. Anticipation processes

In Southeast Asia, there is a growing concern for increasing awareness and reflexivity about future impacts of climate change and strategically work towards more resilient societies. As a result, climate legislation multiplied over the last years and there are numerous new stakeholders and agencies to support and test future-oriented policy formulation. Almost all national policies use some form of anticipation process to inform climate change decision-making and clearly report on their approach (see Annex 1 for a full list of anticipation processes analyzed). A variety of anticipatory processes are used, predominantly quantitative climate scenarios, but also visioning, horizon scanning,

environmental assessments, and participatory foresight. Each policy is nationally endorsed and there is quite a strong political will to implement action. Some anticipation processes are expert driven (e.g. the climate forecasting model in the Philippines) but others seek to develop a common future and involve a wider range of stakeholders (e.g. the ASEAN scenarios). Financial support and technical input come from international organizations such as the European Union, the United Nations Development Program and the World Bank, and donor organizations such as the Swedish International Development cooperation Agency and GIZ.

4.3.2. Assumptions about the future, implications for actions and ultimate aims

The Association of the Southeast Asian Nations (ASEAN) formulated the Climate Action for ASEAN Agriculture Resilient Societies 2020 based on climate forecasts and foresight expertise within international organizations, horizon scanning and visioning in a participatory process, and embedded the ASEAN member countries' Nationally Determined Contributions in plausible future scenarios. Participants were encouraged to share a future they want in the participatory process. The aim was to realize future societal resilience. The normative futures visions in the ASEAN process were complemented by strategies and technologies that allow for achieving its consolidated vision, followed by a timeline for implementing and prioritizing interventions (approach 2 with elements of 1 and 3). As an interviewee stated, "the scenarios exercise help prioritizing in a very short manner and allow all participants to intervene in this process" (Interview, 18 July 2019). The roadmap that resulted from the process still provides the reference framework for several policy processes.

The Ministry of Natural Resources and the Environment Vietnam Institute of Meteorology, Hydrology and Climate Change developed climate change and sea level rises scenarios for a three-year frequency in an approach 1 probabilistic process, with the aim to understand climate risks and its impact on development.

For the Lower Basin Mekong Development Strategy 2016–2020 developed its Mekong River Commission nine climate change scenarios using qualitative and quantitative methods. The scenarios present diverse projections of the magnitude of climate change under low to high carbon emissions, and seasonal precipitation patterns, for four different time horizons. The impacts of these scenarios on the economy and environment, amongst others, were discussed in a two-year participatory process. The Lower Basin Mekong scenarios followed a process of determining long-term objectives as part of its Development Strategy (combining approaches 1 and 2).

4.3.3. Opening up/closing down

The ASEAN processes followed largely approach 2 - a plausibilistic process to increase residence - with approach 1 prediction-oriented anticipation and approach 3 pluralistic elements. The openings were closed down into linear planning in terms of the timeline and roadmap. The Vietnam scenarios followed approach 1 in a closed form of anticipatory governance. The Lower Basin Mekong Development scenarios combined approaches 1 and 2. Despite this participatory process, stakeholders were invited to discuss the future within the confines of the scenarios developed - delimiting future possibilities.

The ASEAN process was a plausibilistic approach that attempted to open up to include pluralistic futures (approach 3). As an interviewee stated, "it is the best way to bring people together and stimulate them to think towards multiple futures" (Interview, 16 May 2017). The co-created desired future visions were first considered impossibly optimistic and naïve by ASEAN members, but they saw its mobilizing potential when the NDC roadmap that resulted from the scenarios was used as the backbone for a joint statement by all ASEAN member countries for resilient agriculture. This example illustrates both a potential and struggle for opening up anticipatory governance.

Participants described the Vietnam scenarios as a strongly

centralized and top-down process with high policy impact - it never opened up to divergent worldviews or contestations and provided strong policy enforcement because the process was directly under the order of the government who ensured policy uptake. The Vietnam Community party reviewed and integrated the scenarios into national and external policy processes as the baseline for all climate decision-making, including several policies, UNFCCC communication, national and sub-national communications campaigns. These examples illustrate hybrids approaches of 1, 2 and 3 and highlight several dynamics of the closing down of opened up futures in the formulation of actions in the present.

4.4. Anticipatory governance processes in Central America

4.4.1. Anticipation processes

The anticipation processes reviewed in the Central American context were similar to those in the other regions (see Annex 1 for a full list of anticipation processes analyzed). Most anticipatory processes are assessments of climate impacts, risks and sectoral vulnerabilities and quantitative climate scenarios. These processes explore current and future impacts of climate change on the environment (biodiversity), health (water availability), development and the economy (agriculture and tourism). Policy documents also report primarily on model-based climate scenarios and climate impacts on e.g., yields, as well as climate impact risks and vulnerability assessments to legitimize decisions. A few used participatory and qualitative foresight methods such as Delphi methods and participatory scenarios development, but always in combination with quantitative climate scenarios and vulnerability assessments.

Most processes were initiated as independent processes that aim to guide decision making and governments also relied on independently designed processes. Nevertheless, some of these independent processes were complemented with foresight in the service of policy formulation. Processes were designed by national and international organization such as the IPCC and the National Institute of Seismology, Volcanology, Meteorology and Hydrology of Guatemala (INSIVUMEH). International organizations provide funding, such as the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Nordic Development Fund (NDF) in Europe, and the Inter-American Development Bank in the region. Policy documents often lack clear descriptions of the method used and how outcomes informed actions.

4.4.2. Assumptions about the future, implications for actions and ultimate aims

The National Climate Change Adaptation Strategy for the Agri-Food Sector of Honduras (2015–2024) explored plausible climate change, agriculture and food security futures for which it combined IPCC climate scenarios, impact studies of climate change on agriculture and food security, and four participatory workshops to validate the policy (Argeñal, 2010; USAID, Tetra Tech ARD, 2014). One of these four participatory workshops was organized by CCAFS and invited critical perspectives from farmers as a marginalized group and bring them into dialogue with national and regional policymakers, farmers' associations, NGOs, teachers, and students. Policy ambitions were initially framed within a more technocratic stance to diversify crops and improve seeds in the face of climate change but ended up increasing awareness for the need to prepare for and build capacities to navigate diverse uncertain futures (approach 2).

The Sustainable Tourism Master Plan in Belize used more conventional methods to increase resilience to sea level rise and flooding, such as SWOT analysis, environmental assessments, and land use scenarios (approach 1). The aim of the project was to understand future risks and opportunities and invite public and private stakeholders to imagine the city they want to live in (approaches 1 and 3). The visions were used to prioritize environmental, social, economic and financial measures in the Sustainable Tourism Plan and the Belize City Master Plan and was also seen to have resulted a paradigm shift that collective action is needed

between policymakers and citizens to live in harmony with water. As an interviewee stated, “more than creating plans, it was about creating public interest. To generate solutions that were perhaps not the most optimal but that stakeholders could identify with” (Interview, 25 September 2019).

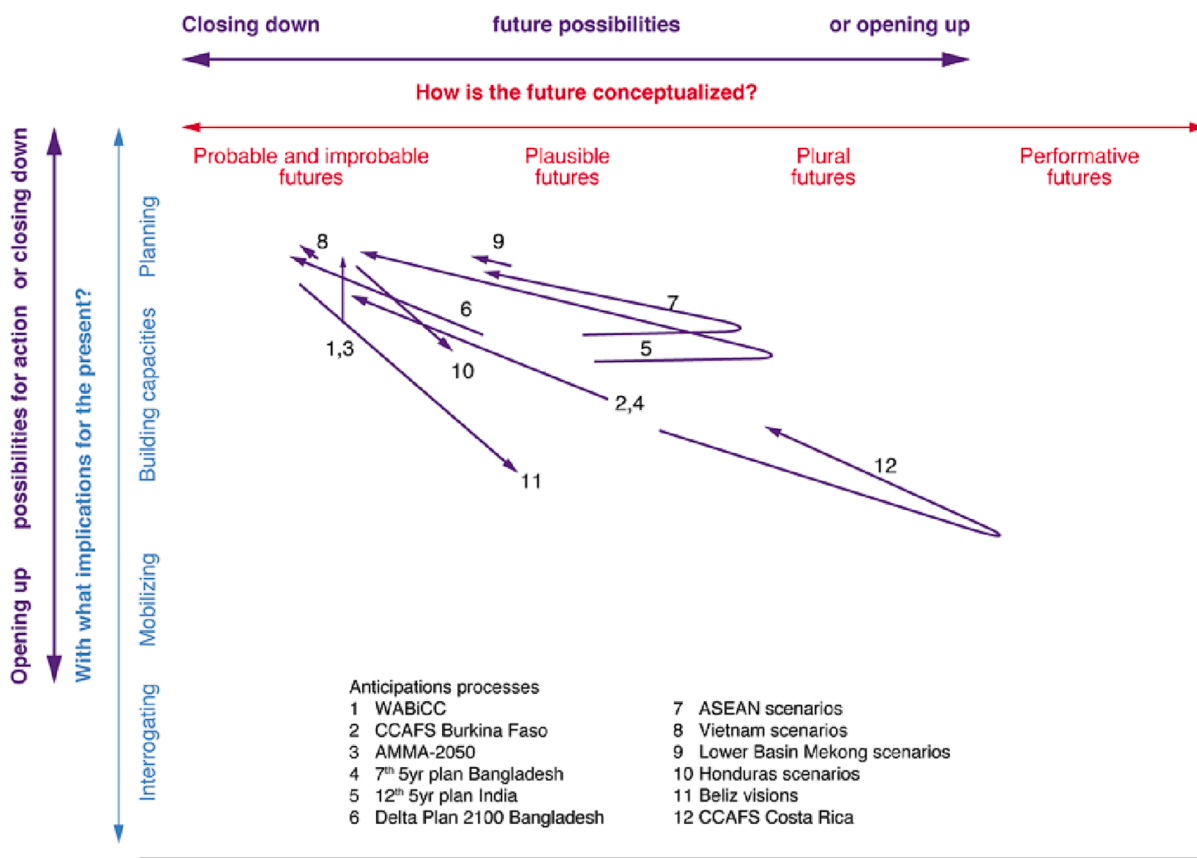
The government of Costa Rica started a collaboration with CCAFS in 2015 to ensure an ambitious Intended Nationally Determined Contribution (INDC). Several qualitative scenario processes took place over the years to collectively imagine alternative futures for more ambitious emission reduction than the initial models were able to show (combining approaches 2 and 3). In a collaboration with IDB and Rand Corporation, a team of modelers from the University of Costa Rica were trained to use open access models to run thousands of climate, energy, land and water scenarios to assess which actions will probably have highest benefits to public health, the economy, climate reliance and mitigation (approach 1). One of the participatory scenario processes in 2020 involved 350 stakeholders from different sectors to explore diverse futures and test if policies are robust to scenario conditions. Actions focused on building capacities to anticipate change in a socially just and equitable way (approach 2 with elements of 4).

4.4.3. Opening up/closing down

Anticipatory governance processes are more open in this context with more transformative outcomes – in the sense of more radically different and deliberate action. Focus group participants pointed to a culture of participatory approaches in Central American countries. An example is the Ministry of Agriculture in Guatemala who receives quite a large number of anticipation studies, and rejects those not formulated in

a participatory manner or including the government at an early state. The Honduras scenarios illustrates how critical futures dialogues (associated with approach 4) can be part of approach 2; diverse perspectives were seen to contribute to navigating diverse futures (approach 2), not to interrogate the performative power of anticipation (approach 4). Here, small-scale farmers were included to make sure the policy would be relevant to them. The futures opened up to include perspectives on plausible drivers of change, not necessarily on political contingencies – but still it aimed to include voices whose futures were at stake. The Honduras’ National Climate Change Adaptation Strategy committee invited critical feedback from regional stakeholders to ensure that the policy would meet the local needs of farmers in an approach 2 type of futures work. The Belize visions combined approaches 1 and 3 by aiming to reduce risks in pluralistic futures work. It was said to have resulted in a paradigm shift – changing participants’ mindset and awareness according to an interviewee. “We would plan with the water, not around it. It was a paradigm that changed because of the scenarios process” (Interview, 24 July 2019).

The Costa Rican scenarios moved from approach 1 to combine all approaches; combining pluralistic futures for radical transformation (approach 3) with policy robustness (approach 2) in an open deliberative process to examining alternative visions and blind spots that may further marginalize vulnerable groups. The futures dialogue was opened up to realize more radically transformative ambitions than the models were able to show, and current transcendental emission efforts are insufficient to stay below a 1,5-degree temperature rise. “A climate goal based solely on currently available climate measures would not be transformative. (...) The scenarios enabled us to take a leap of faith.”



Key: **Red:** what conception of/engagement with the future; **blue:** how these intersect with actions to be taken in the present; **black:** why/to what end: the desired ends of engaging in/with anticipatory governance; **purple:** opening up or closing down future possibilities and options for present-day actions in anticipatory governance. **Purple arrows:** the 12 projects mapped onto the framework. The starting point of the arrow indicates the level of opening up/closing down in the anticipation process, and the end point of the arrow indicates how the outcomes were translated into action.

Fig. 2. The 12 projects plotted onto the framework.

(Interview, 7 October 2016). The Costa Rican government was committed to maintaining an open dialogue in 5-yearly iterative cycles. Like in the other regions, these examples illustrate similar forms of anticipation in hybrids of approaches of 1, 2, 3 and 4, but provided more opportunities for the opening up of anticipatory governance.

4.5. Overview across the four regions

Fig. 2 visualizes the 12 anticipation processes plotted onto the analytical framework. It demonstrates how each of the processes opened up future possibilities in the design of the anticipation process (horizontal axis) and the extent to which they opened up or closed down future possibilities in the formulation of actions in the present (vertical axis). Most processes move toward closing down both future possibilities and actions in the present; though there are some processes that first move toward opening up before closing down again.

5. Discussion and conclusions: opening up or closing down anticipatory governance in the Global South

In this paper, we set out to conduct a cross-regional analysis, investigating how anticipation processes in the Global South open up or close down potential futures and possibilities for action in the present. Our analysis finds that climate futures are predominantly framed in terms of probability or (to a somewhat lesser extent) plausibility - what we refer to as approaches 1 and 2 in our framework. Only a few processes imagine diverse and plural future worlds or critically examine assumptions underlying future visions on their political implications (approaches 3 and 4) and these are mainly concentrated in the Central American context.

The analysis shows that anticipation approaches in practice are typically hybrids of the four ideal types of anticipatory governance approaches - with approaches decreasing in dominance from 1 to 4. Approach 1 processes seem to provide policy recommendations that fit incumbent policy frames and are therefore typically favored in the translation of outcomes to policy. Approach 2 receives growing recognition for its engagement with the deep uncertainty of climate futures; but its implications are harder to connect to linear planning. Approach 3 elements are incorporated in the designs of governance actors who recognize the need for more radically transformative change. Approach 4 is considered the least, but its principles inform some designs, particularly of those projects that are concerned with realizing more equitable and just climate futures.

Most importantly, our research shows that the translation from anticipation outcomes to formulating governance action, regardless of the methodological underpinnings of the anticipation process, often results in linear planning actions - which reflects a belief that futures can be objectified, quantified and managed (Maechler and Graz, 2022). Approach 1 seems to dominate because practitioners feel it adheres most to policy discourses on effective anticipatory actions that favor technocratic and consensus-based advice and expert-analytic solutions for risk mitigation (e.g., seed modifications and water management). This was particularly mentioned in the West African and South Asian contexts. In order to meet such technocratic standards of effectiveness, incumbent actors justify decisions based on technical recommendations - or use subjective outcomes under the guise of technical decision-making (Jasanoff, 1987).

This leads to a process of reframing results, and less transparent reporting of subjective outcomes. It also explains why there is some space to explore some uncertainty through plausibility-based futures, based on the technical arguments of systems thinking and resilience. However, discordant ideas on the future are typically not translated. Even those processes that aimed to open up to pluralistic worldviews, neglected issues and alternative futures (mostly in Central American contexts and some in Southeast Asian and South Asian contexts) were closed down to some degree in practice, even if greater participation and

novel methods can still be said to lead to more inclusive policy making than if these processes would not have happened. In sum, the process of more open participation is seen to have added value, but the outcomes are valued less, or at least recognized less in official documentation.

Several implications emerge from our analysis. Fuller (2017) has pointed to the ways in which probability-focused anticipation, and to some extent, plausibility-focused anticipation as well, can be used to calm anxiety about the unknown rather than accepting the future as inherently uncertain. This is because scenarios do not reflect uncertainties in the sense of unknowns, but a variety of interrelated change processes based on knowable parameters that can be predicted or at least explored. Anticipation, when conducted in this mode, often informs a continuation of the status quo, rather than making a radical turn (Fuller, 2017). This can be quite problematic when those who finance and design anticipation (largely actors from developed countries) intend to create more inclusive and democratic processes but are closing down future possibilities for strategic and implicit rationales. As these implicit predetermined futures can de facto steer anticipatory governance (Gupta and Möller, 2019) in ways that hinder the transformative potential of anticipation (Avelino, 2017).

Framing is an important exercise of power, those who have agency and access can determine the questions and research agenda, prioritize criteria, and interpret uncertainty (Stirling, 2008). Scholars have pointed to the ways in which anticipation reflects a western political imaginary embedded in a modern, capitalist society (Escobar, 2020; Feola, 2015). We see this reflected in the strong reliance on probabilistic approaches to anticipation that embed the idea that the future can at least be partially known based on extrapolations of the past, as well as the dominance of growth-oriented development policy paradigms. Scholars like Hunfeld (2022) for example point to how anticipation reproduces western notions of time, which marginalize indigenous non-linear ideas about histories, presents and futures (Kothari, 2005). Futures studies is rooted in western secular philosophies and produces Eurocentric designs of the future, even those that explore non-Western alternative futures (Escobar, 2020). Reproducing such dominant ontological assumptions without questioning their epistemic privileges is problematic (Dutta, 2020; Hunfeld, 2022). These visions can be incompatible with other ontologies, for example futures imaged by local residents often contrast with expert visions (Paprocki, 2019). Therefore, scholars have warned that these dominant 'global' futures can further marginalize non-Western futures and conquer and colonize new futures (Dutta, 2020; Sardar, 1993).

We thus see a danger in the dominance of approach 1 in pushing for linear planning strategies of climate futures - by means of an expansion of a Global North-dominated foresight industry that closes futures down while pretending to open them up. The foresight industry has been very successful in guiding climate action across the globe. But it also reasserts its epistemic authority at the cost of national structures (Kothari, 2005) and can push back alternative options and worldviews (Dutta, 2020). Much foresight practitioners find it hard to involve participants beyond the 'usual suspects' and end up inviting participation in relatively powerful positions, not those people who represent marginalized groups. This is a matter of concern, as examples in the literature and in one of our focus groups have shown how futures of smallholder farmers have been determined based on dystopian futures that pointed to the cost-inefficiency of certain crops and expelled those farmers of their land. These farmers, whose futures were at stake, did not sit at the table. In general, there is a lack of agency for marginalized groups to co-create their future. Land grabbing is a prime example in which dystopian futures have forecasted future destruction and legitimized dispossession (Boamah, 2014; Paprocki, 2019). Particularly in post-colonial development contexts a lack of reflexive anticipation can create an imperative for disruption before it takes place (Paprocki, 2019).

It is important to be reflexive about these dynamics and support a research agenda that is sensitive to the multiple interpretations of sustainability transformations beyond the dominant capitalist modernity

(Feola, 2015). The contexts in which our research was done were highly diverse in terms of their social, cultural, and political contexts, and much futures work has pointed to the need to represent such diverse societal contexts (Appadurai, 2013; Escobar, 2020). Nevertheless, some processes pluralistic and critical elements to collectively imagine, critique, and transform futures with public and private partners. This we consider explicitly opening up anticipatory governance – and the Costa Rican example in particular provides important insights into how setting an ambitious climate future agenda can open up anticipatory governance. It thus seems important to give the two approaches that are most marginalized in practice a more prominent place; approach 3 for its opening up space to diverse future worlds and setting of more ambitious agendas, and approach 4 for its opening up space to discuss the role of power, mobilizing counternarratives to justify or critique findings (Stirling, 2008), and setting of more equitable and just future agendas. An emergent research agenda focused on bottom-up futures processes provides alternative (and more positive) future images that challenge the status quo (Bennett et al., 2016; Pereira et al., 2021) which has been complemented with approaches to shift power balances in transformations (Rutting et al., 2023). Such bottom-up futures can be successful catalysts for stimulating transformative change, particularly in rural areas (Totin et al., 2018) and steer local governance choices in ways that speak to communities and tap into existing institutional structures (Appadurai, 2013). Important work has also furthered thinking on how to deconstruct and decolonize the imaginary (Dutta, 2020; Escobar, 2020; Feola, 2015).

Our research shows that the opening up or closing down of anticipatory governance is not a matter of mutual exclusivity but that these two dynamics are interwoven. It is important to become aware of these dynamics, also those that happen less consciously, because closing down under the guise of opening up can legitimize inequitable action in a seemingly open, participatory process. Opening up anticipatory governance for more radical transformation means actively challenging the status quo, and this can be frightening to the political elite (Pereira et al., 2021). It can go against the nature of imagining the future based on past experiences (Andersson, 2018). Our empirical research helps call for an anticipatory governance that is reflexive about radical uncertainties, indeterminacies and competing visions (Bellamy et al., 2013; Gupta, 2011; Gupta et al., 2020) including a growing awareness of the unequal

power structures in futures work (Appadurai, 2013; Gram-Hanssen et al., 2022; Sardar, 1993). Connecting the framework on anticipatory governance with the notion of opening up and closing down helps to understand and explain these dominant dynamics in specific contexts across the globe.

CRedit authorship contribution statement

Karlijn Muiderman: Conceptualization, Methodology, Investigation, Validation, Formal analysis, Visualization, Writing – original draft. **Joost Vervoort:** Conceptualization, Methodology, Visualization, Writing – review & editing, Supervision. **Aarti Gupta:** Conceptualization, Methodology, Visualization, Writing – review & editing, Supervision. **Rathana Peou Norbert-Munns:** Investigation, Validation. **Marieke Veeger:** Investigation, Validation. **Maliha Muzammil:** Investigation, Validation. **Peter Driessen:** Conceptualization, Methodology, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Annex 1. West Africa

Methods used in the qualitative case study analysis				
Literature review and snowballing	Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants				
Anticipation process workshop reports	Policy documents	Interviewees and personal communication	Focus group discussants Niger	Focus group discussants Burkina Faso
Senegal: Amma2050 climate models and serious games	Senegal: Emerging Senegal Plan 2014–2035, implemented through Plans of Action (2014)	Climate Change Impacts and Adaptation Expert - PAS-PNA – Senegal for AMMA2050, 26 April 2019	Institut National de Recherche Agronomique du Niger, Département de gestion des ressources naturelles	Professor Centre National de Recherche Scientifique et Technologique CNRST
Senegal: Ordered probit model of how SMEs respond to climate risks	Senegal: National Adaptation Plan for the Fisheries and Aquaculture Sector in the Face of Climate Change Horizon 2035 (2016)	Head of Agence Régionale de Développement (ARD) of Fatick for AMMA2050, 18 April 2019	Regional Coordinator, Mercy Corps	Student Centre National de Recherche Scientifique et Technologique CNRST
Ghana: CCAFS participatory scenarios workshop to guide formulation of the Livestock Policy	Senegal: Program of Acceleration of the Cadence of Senegalese Agriculture (2014)	Scientific Project Manager & Knowledge exchange officer, Centre for Ecology and Hydrology for AMMA2050, January-March 2019	SP/CNRA	Secrétariat Permanent en charge de la gestion des crises et vulnérabilités en élevage
Ghana: EPA & MET downscaled climate change scenarios for the Wa District by the Model for the	Senegal: Prospective Study 2035	Scenarios and Policy researcher Utrecht University for CCAFS, 3 October 2018	CILLS	CNRST/IRSAT/DTA

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Methods used in the qualitative case study analysis				
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Data collected and participants				
Anticipation process workshop reports	Policy documents	Interviewees and personal communication	Focus group discussants Niger	Focus group discussants Burkina Faso
Assessment of Greenhouse-Gas Induced Climate Change Ghana: Amma2050 climate projections and Participatory impact Pathway Analysis Burkina Faso: CCAFS participatory scenarios workshop to guide reformulation of the PNSRII	Ghana: National Climate Adaptation Master Plan (2015) Ghana: Shared Growth and Development Agenda II (2014)	Africa Program leader CCAFS, 4 October 2018 International scientist for the Center for International Forestry Research for CCAFS, January 2019	President of Science-Policy Platform, CNRS/MESRI/Bangoula Director, INRAN	Secrétaire Permanent / Confédération Paysanne du Faso Center for International Forestry Research
Burkina Faso: Practical consensual tool using the ClimProspect Model and a participatory approach to monitor and evaluate Water Policy in response to climate risks Mali: CIRAD participatory foresight to address long-term challenges in an irrigation scheme	Ghana: Coordinated Program of Economic and Social Development Policies (CPESDP) 2017–2024 Burkina Faso: National Climate Adaptation Plan (2015)	Flagship leader International Livestock Research Institute for CCAFS, August-October 2018 Head of Rural Sector Prospects and Policies Department at SP-CPSA, Ouagadougou, Burkina Faso for CCAFS, 29 April 2019	Director, DPER/M. Energy International Crops Research Institute for the Semi-Arid Tropics	Confédération Paysanne du Faso Institute International d'Ingénierie de l'Eau et d'Environnement – Fondation 2iE
Mali: cost-benefit analysis private sector and SMEs to analyze climate risks and develop adaptation strategies Regional: Error correction model to understand the effect of policy integration on agriculture and climate adaptation in ECOWAS	Burkina Faso: National Rural Development Plan II (2018) Niger: Nigeriens Nourish the Nigerian Initiative (2012)	Chief of Party WABiCC, 08 October 2018 Senior Researcher Center for International Earth Science Information Network (CIESIN), Columbia University for WABiCC, 19 March 2019	National council of environment and sustainability, SE/CNEDD Directeur Général Adjoint des Eaux et Forêts République, Ministry of Environment and Développement Durable	ICRAF Chef de Service suivi des politiques (MCEM CC)
Regional: Process-based crop model SARRA-H to assess climate change impacts on yields in the Sudanian and Sahelian savannas	Niger: The Strategic Framework for Sustainable Land Management 2015–2019 (2014)	PI WABiCC, Center for International Earth Science Information Network (CIESIN), Columbia University, 8 October 2018	Direction Générale de l'Environnement et du Développement Durable/ Ministère de l'Environnement et du Développement Durable Plateforme Paysanne du Niger	CPF/Confédération Paysanne du Burkina Faso
Regional: Times series of climatic events in the Sahel Regional: WABiCC capacity building workshop on climate and vulnerability data	Niger: Sustainable Development and Inclusive Growth Strategy (2016) Mali: The National Climate Plan of Action (2011)) Mali: National Climate Adaptation Plan (2016) Mali: National Agricultural Investment Program (PNISA) (2015–2025) (2014)	Chief of Party WABiCC, September 2018 Senior Climate Resilience Expert IRRP for WABiCC, February 2019	Collectif des Associations Pastorales du Niger (CAPAN) Scenarios and Policy researcher UU, CCAFS	Scenarios and Policy researcher UU, CCAFS

South Asia

Methods used in the qualitative case study analysis				
Literature review and snowballing	Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants				
Anticipation process workshop reports and articles	Policy documents	Interviewees and personal communication	Focus group discussants Bangladesh	
Bangladesh: DECCMA Scenarios	Bangladesh: 7th Five Year Plan (7FYP) [CCAFS Scenarios]	General Economics Division, August 2019	Director ICCCAD	Assistant Chief/PS to Member General Economics Division
Bangladesh: Participatory Scenario Development (PSD) Approaches for Identifying Pro-Poor Adaptation Options - Economics of Adaptation to Climate Change (2010)	Bangladesh: Delta Plan 2100	General Economics Division, August 2019	Senior Secretary General Economics Division	Senior Assistant Chief General Economics Division
Bangladesh: Climate change adaptation and migration scenarios in BGD	Pakistan: National climate change policy (2012)	Planning Commission, September 2019	Deputy Chief General Economics Division	Senior Assistant Chief General Economics Division

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South Asia				
Methods used in the qualitative case study analysis				
Literature review and snowballing	Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants				
Anticipation process workshop reports and articles	Policy documents	Interviewees and personal communication	Focus group discussants Bangladesh	
Pakistan: The UNEP Country Studies on Climate Change	Pakistan: Framework for economic growth (2011)	Planning Commission, September 2019	Deputy Chief General Economics Division	Joint Chief General Economics Division
Pakistan: Impacts and Adaptations Assessment (2000)	Pakistan: Framework for implementation of climate change policy (2014–2030)	ICCAD, February 2020	Deputy Chief General Economics Division	ICCCAD
India: TERI socio economic scenarios for climate change impacts	Pakistan: Vision 2025	Policy officer 12th yr plan, February 2020	Deputy Chief General Economics Division	ICCCAD
India: A scenario framework to explore migration and adaptation in deltas: A multi scale participatory approach	India: 12th Five Year Plan (Scenarios for India), Planning Commission	CCAFS, September 2019	Senior Assistant Chief General Economics Division	ICCCAD
India: WRI participatory scenarios development: A tool for effective planning	Nepal: Climate Change Policy (2011)	IFPRI, August 2019	Assistant Chief General Economics Division	IUB
India: Engaging stakeholders in developing food security scenarios in Kerala	Nepal: National Adaptation Plan Process (2018)		Joint Chief General Economics Division	GED
Sri Lanka: CDKN CCD Scenarios for Sri Lanka	Nepal's National Adaptation Plan of Action (NAPA) (2010)		Chief (Attached) General Economics Division	
	Nepal: National Climate Change Health Adaptation		Assistant Chief General Economics Division	
	National Framework on Local Adaptation Plans of Action (LAPA) 2011		Program Manager IFPRI	
	Sri Lanka: Mahinda Chintana: Vision for the future 2010		Assistant Secretary General Economics Division	
	Sri Lanka: National Adaptation Plan for Climate Change Impacts 2016–2025		Research Officer General Economics Division	
	Sri Lanka: National Climate Change Adaptation Strategy (NCCAS) (2011–2016)		Senior Assistant Chief General Economics Division	
	Sri Lanka: National Framework on Local Adaptation Plans for Action		Assistant Chief Programming Division	
	Regional: DECCMA (Deltas, Vulnerability & Climate Change: Migration & Adaptation) project is part of the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA)		Senior Assistant Chief General Economics Division	

Southeast Asia			
Methods used in the qualitative case study analysis			
Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants			
Policy documents	Interviewees and personal communication	Focus group discussants from the region	
Vietnam: Resolution 24/NQ-TW: Active response to climate change, improvement of natural resource management and environmental protection	Senior Advisor Forest and Climate Change (FOR-CC) under the ASEAN-German Program on Response to Climate Change, GAP-CC Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH Based in Jakarta and Philippines	Agriculture Sector Expert, National Environmental Protection Agency (NEPA) Afghanistan	Deputy Administrator, Vietnam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment Vietnam
Vietnam: Decision No. 543/QD-BNN-KHCN: Action Plan on Climate Change Response of Agriculture and Rural Development Sector in the Period 2011–2015 and vision to 2050	Natural Resources Officer- Climate Change (FAO – RAP) Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific Based in Bangkok	TNA Project Specialist/Climate Change Advisor, National Environmental Protection Agency (NEPA) Afghanistan	Deputy Director General, Vietnam Institute of Meteorology, Hydrology and Climate change (IMHEN)

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Southeast Asia			
Methods used in the qualitative case study analysis			
Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants			
Policy documents	Interviewees and personal communication	Focus group discussants from the region	
Vietnam: Resolution 24/NQ-TW: Active response to climate change, improvement of natural resource management and environmental protection	Senior Advisor Forest and Climate Change (FOR-CC) under the ASEAN-German Program on Response to Climate Change, GAP-CC Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH Based in Jakarta and Philippines	Agriculture Sector Expert, National Environmental Protection Agency (NEPA) Afghanistan	Deputy Administrator, Vietnam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment Vietnam
Vietnam: The National Climate Change Strategy and the No: 2139/QD-TTg Decision on Approval of the National Climate Change Strategy	Senior Officer Agriculture Industries & Natural Resources Division Finance, Industry & Infrastructure Directorate ASEAN Economic Community (AEC) Department	Assistant Chief, Ministry of Agriculture Bangladesh	Official, Department of Science, Technology and Environment, Ministry of Agriculture and Rural Development Vietnam
Vietnam: Decision No. 158/2008/QD-TTg on the Approval of the National Target Program to Respond to Climate Change	DDG for international Cooperation Department of MARD Based in Vietnam	Professional Assistant, Department of Meteorology Bangladesh	Principal Spatial Analyst NSW Department of Planning, Industry & Environment Australia
Decision No. 2730/QH-BNN-KHCN: Decision on Promulgation of the Climate Change Adaptation Framework Action	Senior Official Ministry of Agriculture and Rural Development (MARD), Department of Natural Resources and Environmental Economics (IPSARD)	Director, Department of Agriculture, Ministry of Agriculture and Forests Bhutan	CCAFS South East Asia Regional Scenarios Coordinator and Policy Researcher Utrecht University-Copernicus Institute of Sustainable Development, CGIAR CRP7-Climate Change, Agriculture and Food Security (CCAFS) Cambodia
Philippines: Executive Orders no. 43 and no. 24, Cabinet Cluster on Climate Change Adaptation and Mitigation"	Water Management Specialist Investment Center Division - Asia and the Pacific Service (DPIB) Food and Agriculture Organization of the United Nations (FAO)	Head, Climate, Research & Analysis Services, Weather & Climate Services Division, National Center for Hydrology & Meteorology Bhutan	Project Advisor, Remote Sensing-Based Information & Insurance for Crops in Emerging Economies (RIICE), Environment, Climate Change and Natural Resource Management Program (GIZ) India
Philippines: National Climate Change Action Plan	Senior Official Ministry of Agriculture and Rural Development (MARD), Department of Natural Resources and Environmental Economics (IPSARD)	SAO, Agriculture Research and Extension Division, Department of Agriculture, Ministry of Agriculture and Forests Bhutan	Agro-meteorology Division Researcher, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (NARO) Japan
Philippines: Framework Strategy on Climate Change		Deputy Director, Plant Protection Sanitary and Phytosanitary Department, General Directorate of Agriculture, MAFF Cambodia	Research Fellow, Prediction Research Department, APEC Climate Center (APCC) Republic of Korea
Philippines: Disaster Reduction and Management Act (RA 10121)		Deputy Director, Department of Meteorology, Ministry Of Water Resources And Meteorology Cambodia	Administration Department, APEC Climate Center (APCC) Republic of Korea
Philippines: Strategy on Climate Change Adaptation		Head, Applied Climate Information Service Unit, Meteorological, Climatology and Geophysics Bureau (BMKG) Indonesia	Climate System and Analysis Group, Environmental and Geographical Science Department, University of Cape Town, South Africa
Cambodia: Climate Change Strategic Plan		Researcher, Research Institute for Agro-Climate and Hydrology, Research and Development Agency, Ministry of Agriculture Indonesia	Associate Professor, Chair, Department of Applied Mathematics, University of Cantabria Spain
Cambodia: Green Growth Policy		Researcher Institute of Agricultural Technology North Sumatra (AIAT), Ministry of Agriculture Indonesia	Climate Data Analyst/ Project Officer (SERVIR-Mekong), Asian Disaster Preparedness Center (ADPC) Thailand
Indonesia: National Medium-Term Development Plan 2015–2019 (RPJMN 2015–2019)		Climate Information and Analysis Sub-unit, Center of Climate Change Information, Meteorological, Climatology and Geophysics Bureau (BMKG) Indonesia	Senior Project Manager - Climate Risk Management (SERVIR Mekong), Asian Disaster Preparedness Center (ADPC) Thailand
Indonesia: Law 31/2009 Concerning Meteorology, Climatology and Geophysics		Researcher, Research Institute for Agro-Climate and Hydrology, Research and Development Agency, Ministry of Agriculture Indonesia	Team Leader (RS/GIS), Geoinformatics Center (GIC), Asian Institute of Technology (AIT) Thailand
Indonesia: Law 32/2009 Environmental Protection and Management		Head of RS & GIS Center, Ministry of Agriculture Jihad Iran	Dean, School of Environment, Resources & Development, Asian Institute of Technology (AIT) Thailand
Lao PDR: Strategy on Climate Change of the Lao PDR		Deputy of Information & Communication Technology Center, Ministry of Agriculture Jihad Iran	Project Advisor, Remote Sensing-Based Information & Insurance for Crops in Emerging Economies (RIICE), Deutsche

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Southeast Asia			
Methods used in the qualitative case study analysis			
Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants			
Policy documents	Interviewees and personal communication	Focus group discussants from the region	
Vietnam: Resolution 24/NQ-TW: Active response to climate change, improvement of natural resource management and environmental protection	Senior Advisor Forest and Climate Change (FOR-CC) under the ASEAN-German Program on Response to Climate Change, GAP-CC Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH Based in Jakarta and Philippines	Agriculture Sector Expert, National Environmental Protection Agency (NEPA) Afghanistan	Deputy Administrator, Vietnam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment Vietnam
Lao PDR: Environmental Protection Law (2013 version)		Head of the GIS Unit, Department of Agricultural Land Management, Ministry of Agriculture and Forestry Lao PDR	Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Thailand Visiting Professor GeoData, Geography and Environmental Sciences, University of Southampton United Kingdom
Lao PDR: Natural Resources and environment Strategy, 2016–2025		Modelling and Data Analysis, Department of Agricultural Land Management, Ministry of Agriculture and Forestry LAO PDR Database Management, Department of Agricultural Land Management, Ministry of Agriculture and Forestry Lao PDR Mapping and Data Management, Department of Agricultural Land Management, Ministry of Agriculture and Forestry Lao PDR Deputy Head of Climate and Agro-meteorological Division, Department of Meteorology and Hydrology, Ministry Of Natural Resources and Environment Lao PDR Technical Staff of Climate and Agro-meteorological Division, Department of Meteorology and Hydrology, Ministry Of Natural Resources and Environment Lao PDR Deputy Director, Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation Myanmar Assistant Director Department of Meteorology and Hydrology, Ministry of Transport and Communication Myanmar Joint Secretary Ministry of Agriculture and Livestock Development Nepal Senior Meteorologist Department of Hydrology and Meteorology, Ministry of Energy, Water Resources and Irrigation Nepal Senior Scientist, Nepal Agricultural Research Council (NARC) Principal Scientific Officer/Head Global Change Impact Studies Centre (GCISC), Ministry of Climate Change Pakistan Principal Horticulturist, Department of Agriculture & Livestock Papua New Guinea Climatologist National Weather Service Papua New Guinea Weather Services Chief, Climatology and Agrometeorology Division (CAD), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Engineer II, Agro-Hydrology and Rain Stimulation Section, Water Resources Management Division, Bureau of Soils and Water Management. Department of Agriculture Philippines Agriculturist II, Field Programs Operational Planning Division, Department of Agriculture Philippines Policy Officer, Policy, Planning & Communication Division, Ministry of Agriculture and Fisheries Samoa	Climate-Change Scientist World Agroforestry Centre (ICRAF) Vietnam National Field Manager, FAO Afghanistan NPC cum Technical Advisor, FAO Bangladesh Assistant FAOR (Program), FAO Cambodia Programme and Monitoring Specialist, FAO Cambodia Project Coordinator, FAO Laos Disaster Risk Reduction/Climate Change Specialist, FAO Myanmar Programme Officer, FAO Nepal National Technical Coordinator & Project Manager, FAO Nepal GIS Assistant, FAO Pakistan Monitoring and Reporting Assistant, FAO Sri Lanka Senior Environment Officer, Head of Geospatial Unit, CBDS Natural Resources Officer, CBC Climate Impact and Adaptation Consultant, CBC National Technical Advisor, FAO Papua New Guinea Technical Advisor, FAO Solomon Islands Senior Resilience Officer, FAO RAP

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Southeast Asia				
Methods used in the qualitative case study analysis				
Document analysis and snowballing	Semi-structured interviewing	Focus groups		
Data collected and participants				
Policy documents	Interviewees and personal communication	Focus group discussants from the region		
Vietnam: Resolution 24/NQ-TW: Active response to climate change, improvement of natural resource management and environmental protection	Senior Advisor Forest and Climate Change (FOR-CC) under the ASEAN-German Program on Response to Climate Change, GAP-CC Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH Based in Jakarta and Philippines	Agriculture Sector Expert, National Environmental Protection Agency (NEPA) Afghanistan	Deputy Administrator, Vietnam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment Vietnam	
		Principal Scientist Natural Resources Management Center, Department of Agriculture Sri Lanka	Natural Resources Officer, FAO RAP	
		Meteorologist, Climate Change and Research Division, Department of Meteorology Sri Lanka	Natural Resources Officer, FAO RAP	
		Professor Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka	Junior Professional Officer (Climate Change), FAO RAP	
		Geo-informatics Officer Geo-Informatics and Space Technology Development Agency (GISTDA) Thailand	Forestry Officer, UN-REDD Programme	
		Geo-informatics officer Geo-Informatics and Space Technology Development Agency (GISTDA) Thailand	83. Abu Mahmood	
		Chief of Land Use Planning And Policy Group, Land Development Department, Ministry of Agriculture and Cooperatives Thailand	Remote Sensing and Land Cover Assessment Expert, UN-REDD Programme	
		Environmental, Practitioner Level, Policy and Strategy Section Climate Change Management and Coordination Division, Office of Natural Resources and Planning (ONEP) Thailand	Technology and Innovation Consultant, FAO RAP	
		Senior Policy and Plan Specialist, Planning and Technical Division, Department of Agriculture Thailand	GIS Consultant for AGRI-MAP design, FAO RAP	
		Policy and Plan Specialist, Planning and Technical Division, Department of Agriculture Thailand		
Central America				
Methods used in the qualitative case study analysis				
Literature review and snowballing	Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants				
Anticipation process workshop reports and articles	Policy documents	Interviewees and personal communication	Focus group discussants El Salvador	Focus group discussants Guatemala
Belize: Urban development scenarios for Belize City 2010–2030 El Salvador: effects of climate change on agriculture	Belize: National Climate Resilience Investment Plan (2013) Belize: National Biodiversity Strategy and Action Plan, Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development & Immigration (2016)	Policymaker of SAG team in charge of development of the policy, 24 July 2019 Coordinator of SAG team in charge of development of the policy, 17 July 2019	MAG MARN	Universidad de San Carlos - USAC Instituto Privado de Investigación sobre Cambio Climático - ICC
Guatemala: Climate change and Biodiversity; Elements to analyze their interactions in Guatemala with an ecosystem approach	Belize: National Climate Change Policy, Strategy and Action Plan to address Climate Change (2014)	Consultant contracted by GIZ to support SAG in development of the policy, 30 July 2019	MARN	Instituto Interamericano de Cooperación para la Agricultura - IICA
Guatemala: First report evaluating knowledge about climate change in Guatemala	El Salvador: National Climate Change Plan (2015)	Project leader on behalf of PADECO, 25 September 2019	PROTECCIÓN CIVIL	Universidad Rafael Landívar de Guatemala - IARNA
Guatemala: The economics of climate change in Guatemala	El Salvador: National strategy for hydrographic basins of El Salvador (2017)	Ministry of Tourism, Civil Aviation and Culture of Belize - Project Liaison Officer, 15 October 2020	CONASAN	Programa de las Naciones Unidas para el Desarrollo - PNUD

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Central America				
Methods used in the qualitative case study analysis				
Literature review and snowballing	Document analysis and snowballing	Semi-structured interviewing	Focus groups	
Data collected and participants				
Anticipation process workshop reports and articles	Policy documents	Interviewees and personal communication	Focus group discussants El Salvador	Focus group discussants Guatemala
Guatemala: Final Report Climate Impacts for Guatemala: Preliminary Results of Regional and Global Climate Models IPCC AR5	Guatemala: National action plan on climate change (2016)	Project leader on behalf of IADB, 15 January 2021	CONASAN	Ministerio de Agricultura, Ganadería y Alimentación - MAGA
Honduras: Environmental Assessment and Climate Change For the preparation of IFAD's 2012–2016 National Strategic Opportunities Program	Guatemala: Institutional Climate Change Agenda 2013–2016 of the National Forest Institute (2013)	Climate Change Focal Point and Head of the Agricultural Development Unit at ECLAC (CEPAL), 15 October 2019	PNUD	Instituto Nacional de Sismología, Vulcanología e Hidrología - INSIVUMEH
Honduras: Using expert judgments to inform economic evaluation of ecosystem-based adaptation decisions: watershed management for enhancing water supply for Tegucigalpa, Honduras	Guatemala: K'atun National Development Plan: our Guatemala 2032 (2014).	Author of several ECLAC (CEPAL) studies on the economy of climate change, 14 January 2021	FIDA	Instituto Nacional de Sismología, Vulcanología e Hidrología - INSIVUMEH
Nicaragua: Mainstreaming of climate change in Nicaragua: Evaluation of risks and opportunities	Nicaragua: Adaptation Plan to Variability and Climate Change in the Agricultural, Forestry and Fisheries Sector, Ministerio Agropecuario y Forestal (2013)	Policymaker and former executive secretary of the Central American Board on Agriculture and Livestock (CAC), 9 January 2020	PROINTER	Instituto Nacional de Sismología, Vulcanología e Hidrología - INSIVUMEH
Nicaragua: Climate Smart Agriculture in Nicaragua	SICA region: Climate Smart Agriculture strategy for the SICA region 2018–2030 (2017)	Viceminister of Environment when Guatemala's Climate Change Action Plan was developed, 19 October 2018	PRISMA	Ministerio de Ambiente y Recursos Naturales - MARN
Costa Rica: INDC process		Consultant and author of the study Avances a nivel político y estratégico en la adaptación al cambio climático (Global water Partnership), 10 January 2019	FAO	Ministerio de Ambiente y Recursos Naturales - MARN
Regional: Climate Change in Central America: Potential Impacts and Public Policy Options		Expert supporting the development of Costa Ricás Intended Nationally Determined Contributions (INDC). Partnership for Market Readiness, UNDP, 7 October 2016	MAG	Universidad del Valle de Guatemala - UVG
Regional: Impacts of Climate Change on Agriculture in Central America, mitigation and adaptation strategies		Government official leading the development of Costa Ricás Intended Nationally Determined Contributions (INDC). Ministry of ENvironment and Energy (MINAE), 10 October 2016	MAG	Consejo Nacional de Áreas Protegidas - CONAP
Regional: Climate change and challenges for the tourism sector in Central America			MARN	Consejo Nacional de Áreas Protegidas - CONAP
			FAO	Rainforest Alliance - RA
			MARN	Fondo de las Naciones Unidas para la Alimentación y la Agricultura - FAO
			CONASAN	Ministerio de Agricultura, Ganadería y Alimentación - MAGA
			PNUD	Ministerio de Agricultura, Ganadería y Alimentación - MAGA
			FONAES	CCAFS - Universidad para la Cooperación Internacional - UCI / CCAFS
			MAG	Universidad para la Cooperación Internacional - UCI
			CRS	
			UCI	
			UCI/CCAFS	

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