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# The discourses of climate change science: Scientific reporting, climate negotiations and the case of Papua New Guinea

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## ABSTRACT

This paper analyses climate science as a discourse to reveal how it enables and constrains climate change negotiations and action. Focusing on long-term outcomes projected in the Intergovernmental Panel on Climate Change's Fifth Assessment Report and the World Bank's "Turn Down the Heat" reports, this paper examines processes of discourse structuration and institutionalization to identify the dominant discourses which frame climate action. We trace the dominant discourses identified in the scientific reports – Survivalism, Ecological Modernisation and Economic Rationalism – through the Paris Agreement and selected Leader Statements and Intended Nationally Determined Contributions from COP21. From the 24 states included in this analysis, Papua New Guinea (PNG) is developed as a case study to investigate the hybridity and institutionalization of discourses. Even though PNG's rhetoric and commitments at COP21 express Survivalism, the state's policy frameworks rarely move beyond solutions found in Economic Rationalism and Ecological Modernisation. This suggests that states strategically adopt hybrid discourses drawn from climate science in line with their positionality, political economy and interests. Understanding how discourses drawn from climate science manifest in national policies has significant implications not only for how science is communicated at the international level but also for understanding different state positions in the global climate governance regime.

## 1. Introduction

Science is often promoted as the best way to understand, frame and develop solutions to climate change. However, climate science is neither neutral nor objective. Rather than framing climate change solely as a scientific issue, it is imperative to see its framing and communication as a socio-political process (Pidgeon and Fischhoff, 2011; Lorenzoni and Whitmarsh, 2014; Rapley and Macmillan, 2014). The inherent value-laden nature of science is particularly problematic for climate change where science becomes palpably political (Pepermans and Maesele, 2016). Indeed, authoritative scientific knowledge limits climate change policy options and political action (Beck and Forsyth, 2015). To foreground this politics, this paper analyses the science of climate change as a discourse – that is, as a representation or a frame “of how things are and have been, as well as imaginaries and representations of how things might or could or should be” (Fairclough, 2001: 3). By analyzing climate science in this way, this paper critically examines how it enables or constrains climate change negotiations and action.

At the highest levels of world politics, climate change has been recognized as the “most significant threat” to humankind (see esp. Obama 2015, cited in Jeffrey, 2015). The climate science warns against complacency: ocean acidification, rising sea-levels and temperatures, changes in precipitation cycles, loss of biodiversity, extreme weather events, and declining productivity (particularly agricultural), are all widely predicted to accelerate in the near future. The complexity of these processes and predicted outcomes demands a close relation between the scientific analysis of long-term patterns of climate change and international political action. In this privileged position, science becomes what Feyerabend calls a “tyranny” on thought; it makes possible certain ways of thinking and obstructs others (Feyerabend and Oberheim, 2011). The purpose of this paper is not to denounce climate science, nor to make room for climate change denial or skepticism. Instead, the purpose is to bring attention to the social and political construction of scientific discourses and how they manifest in national and global climate governance.

The linkages between climate science and socio-political values are

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particularly visible around the forecasting of long-term patterns of change which determine the timeframes of the causes and effects of climate change. For this reason, we focus on the long-term outcomes of climate change projected in the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (herein referenced as the AR5) and the World Bank's "Turn Down the Heat" reports, namely "Why a 4 °C Warmer World Must be Avoided" (World Bank, 2012) and "Climate Extremes, Regional Impacts, and the Case for Resilience" (World Bank, 2013) (herein referenced as WBR1 and WBR2, respectively). In the AR5, we focus on the chapter on long-term climate change projections and the summary for policy-makers (IPCC, 2013, 2014). As authoritative sources of climate science, we examine how these reports frame what "might, could or should" be done to address this unfolding ecological crisis. Science has become the key variable defining these "appropriate" commitments and by studying the IPCC and World Bank reports, we can identify the discourses that frame global climate negotiations and national action.

Taken together, the IPCC and World Bank reports are the primary sources for the most authoritative and robust scientific data on climate change. This climate science is routinely adopted by political actors in both domestic and international policy debates. This paper makes several moves to understand this discursive process. The initial section begins with a preliminary discussion about discourse theory and the conceptual framework adopted in our research that combines Critical Discourse Analysis (CDA) and Hajer's (1997) classification of dominant discourses. The following section focuses on discourse structuration – when discourses become concentrated amongst actors (Hajer, 1997: 44) – through an analysis of the AR5, WBR1 and WBR2 regarding long-term effects of climate change. Based on this analysis and the identification of discourses in the climate science – namely Survivalism, Ecological Modernisation and Economic Rationalism – the final section concentrates on discourse institutionalization – when discourses become mainstreamed into institutions and organizational practices (Hajer 1997: 44). We trace these discourses from the IPCC and World Bank reports through the COP21 negotiations and resultant Paris Agreement and consider how states have taken up elements of these discourses in their Leaders Statements and Intended Nationally Determined Contributions (INDCs).

In this paper, we analyse the Leader Statements and INDCs for 24 states that participated in COP21; here, the Leader Statement highlights the discourses present in a state's rhetorical and public stance and the INDC offers a concrete measure of the climate change action that flows from these discourses. To varying degrees, most states adopt the discourses of Survivalism, Ecological Modernisation and Economic Rationalism drawn from the climate science. Here, we draw on Janks' (1997) idea of "hybridity" – that texts are actually hybrids that draw on more than one discourse. To understand this hybridity, we develop Papua New Guinea (PNG) as a case study for a number of interrelated reasons: firstly, PNG remains a largely understudied case in the international climate regime; secondly, PNG is uniquely positioned as a Small Island Developing State (SIDS) and a member of the Coalition for Rainforest Nations; and thirdly, because of its stance in the COP climate negotiations, particularly how PNG has become a leading proponent of Reducing Emissions from Deforestation and Forest Degradation (REDD +). Indeed, PNG and Costa Rica first proposed the concept of Reducing Emissions from Deforestation (then known as RED) to the UNFCCC in 2005 as a way to offer economic opportunities to developing countries by commodifying the carbon stored in trees (Babon et al., 2014). As well as being an active participant in climate negotiations, PNG has taken action nationally to implement its mitigation and adaptation commitments, including establishing a Climate Change and Development Authority (CCDA) and national climate change policies and strategies. In addition to considering the context of PNG's positionality,

political economy and interests, we develop examples from other states to illustrate the ways that different discourses are taken up and how they often overlap but can also compete. It is this "clash of discourses" that demonstrates the political and ideological forces at work within texts and their social affect (Janks, 1997). Taken together, this analysis of the Paris Agreement, Leader Statements and INDCs from COP21 reveals how the scientific discourses of climate change enable or constrain policy-making and action and how certain discourses may become dominant, even in cases of hybridity.

## 2. Conceptual framework

### 2.1. Discourse analysis

Before we examine the scientific discourses on climate change emerging from the reports of the IPCC and World Bank, it is important to clarify the interpretation of discourses that informs our project. Discourses are a fundamental attribute of all knowledge claims. Best seen as an "ensemble of ideas, concepts and categorizations" (Hajer, 1997: 44), we view discourses as structures of signification through which social reality is constructed, actualized and bound to the social practices that produce them. Others have previously shown the performative role played by discourses or how they make things possible (Campbell, 2013: 226). We take up this focus on the socially performative role and productive capacity of discourses: how discourses operationalize a particular claim to truth whilst excluding or marginalizing others, and thereby help construct the nature of reality in various social contexts by enabling or constraining certain actions (Milliken, 1999: 229).

The mediated nature of discourses requires a specific method to understand. Critical Discourse Analysis (CDA) allows for such an approach to the historically contingent, intersubjective nature of discourses (Milliken, 1999: 230) and the capacity for "change, discontinuity and variation" within these discourses over time (Doty, 1996: 6). One key benefit in deploying CDA for analyzing climate science is that it rejects the possibility of a "value-free" science, instead viewing it like any other discourse – that is, as inherently part of, and influenced by, social structures and produced in social interaction (van Dijk, 2005: 352-4). As outlined by Fairclough (2010: 3; Fairclough, 1995), CDA is relational, dialectical and transdisciplinary. We use this method to research the "global penetrative power" of climate science (Fairclough, 2001: 6). The method pushes towards questioning the interests behind discourses, exposing through a layered analysis how the text is positioned, whose interests this positioning serves, whose interests are negated or downplayed, and the consequences of this positioning (Janks, 1997).

Reflection on the social role of science is an integral part of this analysis (Wodak and Fairclough, 1997: 271-80), and CDA focuses on how discourses "influence what people see as the most important information of text or talk, and thus correspond to the top levels of their mental models" (van Dijk, 2005: 358). Here, Hajer's (1997: 44) work is an important addition as it offers a framework for the classification of dominant discourses in climate science through two criteria: discourse structuration (when discourses become concentrated amongst actors) and discourse institutionalization (when discourses become mainstreamed into institutions and organizational practices). Taken together, these approaches help reveal how different actors – either intentionally or unintentionally – entrench, disempower, or re-articulate discourses for various political ends. We adopt this approach to examine how the specific scientific discourses derived from AR5, WBR1 and WBR2 have become entrenched in the Paris Agreement, Leader Statements and INDCs of states, with a particular focus on the case of PNG. At the same time, we adopt Janks' (1997) idea of "hybridity,"

where it is the “clash of discourses” that demonstrates the ideological forces at work within texts and their social affect. This exposes not only the intertextual links between science and policy, but between the discourses themselves, that can be used strategically by state actors according to their positionality, political economy and interests.

## 2.2. Discourse analysis of climate science

Many have already demonstrated the capacity for discourse theory to help understand environmental problems. Valuable efforts have been made to show how discourse analysis can further understandings of how “nature” and “environment” have been related as contested concepts in environmental policy and planning (Feindt and Oels, 2005). In terms of climate change, some have shown the dynamics of separate discourses on climate change in science, politics and the mass media, and how these have changed over time (Weingart et al., 2000). Adger et al. (2001) have investigated the political ecology of global environmental discourses and note the ways that such discourses draw authority from science, particularly the IPCC assessments. Indeed, political ecologists have made significant contributions to examining how scientific discourses form and how institutional practices within the IPCC influence the generation of such discourses (Forsyth, 2015).

In this study, we build on this work and use CDA to investigate scientific reporting from the IPCC and World Bank. For many, the IPCC is regarded as an epistemic community that provides the most authoritative knowledge on climate change in the form of scientific reports made from submissions by over one thousand international scientists. This epistemic authority is not simply attributed through scientific evidence and consensus making; it is continually maintained and legitimized by actors (Jasanoff, 2004; Beck and Forsyth, 2015: 115). The IPCC has an institutionally privileged role for knowledge-production because it is tasked with responding to the UNFCCC’s needs for “objective scientific and technical advice” (UNFCCC, 1994, Art. 21(2)). It therefore plays a leading role arbitrating over legitimate forms of climate change knowledge. The success of its privileged position is apparent with the Subsidiary Body of Scientific and Technical Advice (SBSTA) who regularly request its input, and, COP decisions that refer to its work. The World Bank has made similar knowledge claims regarding climate science, though without the same influential position in the UNFCCC nor, arguably, the same public standing. It offers another type of multi-governmental report on climate change that makes assessments of appropriate action based on values and science. At the same time, it has an institutional responsibility to respond to climate change given its operational policies and its international loan structures (Shih, 2000).

To trace the dominant discourses related to long-term patterns of climate change across the AR5, WBR1 and WBR2, 15 codes were developed from the common themes addressed across the scientific reports (see Appendix A for full list). These codes emerged from the problem areas and/or questions to which the scientific data and projections were directed to in each report. These were further broken down into two categories: concrete claims and value judgements, outlined in Table 1. Concrete claims were those statements that pertained directly to the scientific knowledge that states (or other actors) must

turn to when making mitigation and adaptation policy choices. Value judgments were those elements in the reports that contained a definable value or judgment that a state could use, or reject, as the basis for making mitigation and adaptation action or policy choices. The codes must not be taken as mutually exclusive, but internally related to each other. It is this component that allows for the conversation and linkages between discourses – their hybridity and relative dominance – that we take up in the fourth section.

Following this analysis of the concrete claims and value judgements in the climate science, we then identified the dominant discourses present in the AR5, WBR1 and WBR2. By examining the reports produced by the IPCC and WB, we can see a degree of discourse structuration – where discourses become concentrated among the key actors producing climate science. Two caveats are necessary before we proceed. Firstly, by tracing similar language, terms and phrases throughout each report, these discourses emerge from the text rather than being externally read into them or imposed by a priori assumptions. The discourses we have identified, however, are not “new” – they share similarities with the literature on environmental discourses, namely work by Dryzek (2005), Adger et al. (2001) and Mol and Spaargaren (2000). Rather than applying already established categories of discourses, we have allowed the discourses to emerge inductively from the analysis, but we have also drawn on existing literature to formalise such discourses. Secondly, these discourses are not mutually exclusive; our analysis has revealed a high degree of hybridity and overlap, consistent with Janks’ (1997) thesis. As such, we are not interested in drawing bounded, clearly defined discourses, but in critically analyzing how these discourses intersect and are employed strategically to enable or constrain climate change policy-making and action.

After analysing these discourses in the scientific reporting, we examined how they operate in climate change negotiations, particularly the COP21 and resultant Paris Agreement and selected Leader Statements and INDCs. We used the framings outlined in Table 2 to identify the discourses present in these documents. It is important to analyse Leader Statements and INDCs as they present a state’s rhetorical and public stance and offer concrete measures for climate change action. The Leader Statements and INDCs of 24 states were analysed in this study – these states were chosen based on the availability of these documents and the language they were written in (English), and as such there are certain sampling limitations to these findings. A summary of hybrid and dominant discourses in each state’s Leader Statement and INDC is presented in Appendix B. Through this analysis, we develop PNG as a case study to explore how processes of discourse institutionalization are shaped by a state’s positionality, political economy and interests.

## 3. Identifying dominant discourses through an analysis of climate science

This section presents the key findings of our discourse analysis of the projections of long-term effects of climate change in the AR5, WBR1 and WBR2. Firstly, we present the findings from the concrete claims and value judgements identified and analysed in the scientific reports before identifying the dominant discourses which have emerged from these codes.

(1) In the scientific reports, climate change is essentially defined in terms of atmospheric change, including both greenhouse gas emissions and temperature rise. In the AR5 (2014: 3), it is predicted that global mean temperatures will continue to rise, with warming most likely to be between 1.5–4 °C. When adopting longer timeframes, the AR5 (2014: 80) emphasizes the irreversibility of emissions and the positive feedback of anthropogenic warming. Long-term projections of atmospheric change in the World Bank reports are based on a scenario of a 4 °C warming and make links to broader impacts of such a temperature rise. The current scientific evidence adopted in the WBR1 (World Bank, 2012: 1) suggests that there is a 20% likelihood of exceeding 4 °C by

**Table 1**  
Central Codes Traced in the Scientific Reports.

Code Group	Central Codes
Concrete Claims	1 Atmospheric change leading to long-term change 2 Sea-level rise leading to long-term change 3 Change in precipitation and drought leading to long-term change
Value Judgements	4 Claims of predictability 5 Claims of uncertainty 6 Claims/predictions of tipping points

2100, and a 10% chance of 4 °C being exceeded as early as the 2070s. This report also links atmospheric change to sea-level rise, ocean acidification and biodiversity loss.

(2) Sea-level rise leading to long-term change is another important projection across the climate science. In the AR5, the global ocean is predicted to warm and sea-level rise is projected to continue in all model scenarios. This report claims that by the end of the 21<sup>st</sup> century it is “very likely” that the sea-level will rise in more than 95% of the ocean area and it is “virtually certain” that global mean sea-level rise will continue beyond 2100 (2014: 19–20). It also claims that such warming will continue “for many centuries when greenhouse gas emissions are decreased or concentrations kept constant” (2014: 59). In WBR1 (2012: xv), it is predicted that a warming of 4 °C will likely result in a sea-level rise of 0.5–1 meter, and possibly more by 2100, with several more meters in the following centuries. WBR2 (World Bank, 2013: 24) substantiates these concerns by focusing on the impacts of sea-level rise on ecosystems and society, claiming that specific impacts on infrastructure “can have effects on human and economic development, including impacts on human health, port infrastructure, and tourism.”

(3) Changes in precipitation and drought are also significant concrete claims of long-term climate change across the reports. The AR5 (2014: 4) states that it is “virtually certain that, in the long term, global precipitation will increase with increased global mean surface temperature.” However, increased evapotranspiration over land is also predicted to lead to more frequent and intense periods of agricultural drought in the long-term (2014: 51). This is also referenced in WBR1 (2012: 14) which recognizes that climate change will bring about substantial changes in precipitation patterns, with dry regions becoming drier and wet regions becoming wetter. In this report, changes in precipitation and drought are important in terms of the availability of water for human societies that rely on this resource, with water scarcity putting at risk “many societies’ capacity to feed their growing populations” (2012: 47). This point is emphasized in WBR2 (2013: xvii) which predicts a 50% reduction in water availability for some regions under a 4 °C warming scenario, with adverse consequences for human lives and severe losses of livestock and crops.

(4) Claims of predictability around long-term climate change are central value judgements in each report as they serve to give certitude and legitimacy to specific projections or forecasts. The AR5 (2014: 2) is described as “an important basis for information on changing weather and climate extremes.” The WBR1 (2012: 1–5 and 16) recognizes that improvements in knowledge have reinforced the findings of the IPCC and recent work that has begun to link global warming with record-breaking extreme events. In the WBR2 (2013: 4–7), the latest climate science is said to “provide more robust and consistent trends than a

random selection of model results” and predictability is demonstrated in the ability of models to reproduce observed changed.

(5) Claims of uncertainty qualify these claims of predictability. The degree of certainty in the IPCC’s key findings is based on the author teams’ evaluations of underlying scientific understanding expressed through a qualitative gradient of levels of confidence (from “very low” to “very high”) and, when possible, with a quantified likelihood (from “exceptionally unlikely” to “virtually certain”). Findings are also presented as statements of fact without using uncertainty ratings where appropriate. Long-term projections of climate change are primarily dependent on scenarios that are themselves uncertain and rely on incomplete understandings and imprecise models of the climate system (2014: 8). The WBR1 (2012: xvii and 21) also acknowledges that uncertainties remain in projecting the extent of both climate change and its impacts. It focuses on the uncertainty around societies’ ability to adapt to a 4 °C warming and different assumptions around how the world’s population, economy, and technology will develop in the future. WBR2 (2013: 67 and 95) states that socioeconomic conditions add further unknowns to projections, particularly in terms of how many people may be affected by permanent migration and rising sea-levels.

(6) Claims of tipping points are also significant value judgments made in the AR5, WBR1 and WBR2. These claims typically draw on the language of “limits,” “thresholds,” “irreversibility” and “non-linearity.” The AR5 (2014: 77) indicates that there are a “number of components or phenomena within the Earth system” that have been “proposed as potentially possessing critical thresholds... beyond which abrupt or non-linear transitions to a different state ensues.” However, this report also claims that climate impacts are geographically diverse and sector specific so that it is not possible to define a single critical-threshold without value judgments and assumptions (2014: 71). WBR1 is less restrained in this respect and states that, “As global warming approaches and exceeds 2 °C, the risk of crossing thresholds of nonlinear tipping elements in the Earth system, with abrupt climate change impacts and unprecedented degree of high-temperature climate regimes, increases” (2012: xvii). In this report, high temperature thresholds are reported to vastly exceed the adaptive capacities of natural systems and many societies (i.e. substantially undermining food security) (2012: xv-xvi). Critical thresholds in social systems are discussed particularly in reference to SIDS (2012: 34). Nevertheless, the WBR1 is quick to note that climate change is occurring in the context of economic growth and population increases that could place increasing demands on ecosystems that are already approaching or exceeding important limits and boundaries. WBR2 (2013: xxiv) emphasizes the increased risk of critical thresholds being breached and identified tipping points related to crop yields, irrigation systems, coral reefs, and savanna grasslands. Sectoral

**Table 2**  
Main Discourses.

Discourse	Framing of Climate Change	Framing of Actions
<i>Survivalism</i>	<ul style="list-style-type: none"> <li>Views climate change in terms of “limits” in environmental and human systems</li> <li>Argues that tipping points exist in climate change that threaten human development</li> <li>Uses terms such as “thresholds,” “tipping points” and “threats”</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation and adaptation seen as a matter of survival</li> <li>Calls for an “urgent global response”</li> <li>Argues for transformative change to prevent catastrophic impacts</li> </ul>
<i>Ecological Modernisation</i>	<ul style="list-style-type: none"> <li>Assumes that technology, human ingenuity and innovation can overcome climate change</li> <li>Rejects the idea of “limits” and resists transformative change to institutional structures in favour of incremental change</li> <li>Science and experts central agents in understanding and addressing climate change</li> </ul>	<ul style="list-style-type: none"> <li>Promotes mitigation and adaptation in the form of technology development and transfer and capacity building</li> <li>Privileges institutional and administrative structures</li> <li>Frames the market as contributing to, rather than obstructing, mitigation efforts</li> </ul>
<i>Economic Rationalism</i>	<ul style="list-style-type: none"> <li>Views climate change primarily in terms of costs and economic impacts, like GDP and economic growth</li> <li>Environment valued economically and in terms of services provided to human society</li> </ul>	<ul style="list-style-type: none"> <li>Promotes market-based mitigation approaches</li> <li>Focuses on the economic feasibility, effectiveness and cost-efficiency of mitigation and adaptation responses</li> <li>Favours “business-as-usual” over transformative change</li> </ul>

and regional tipping points are also examined and while the assessments here are considered tentative, the risk of transgressing thresholds within sectors and in vital human support systems is said to increase rapidly with higher levels of warming (2013: 161–3).

Through this analysis of the concrete claims and value judgements of long-term projections of climate change contained in the AR5, WBR1 and WBR2, three dominant discourses emerge: Survivalism, Ecological Modernisation and Economic Rationalism, as outlined in Table 2.

The discourse of *Survivalism* – which views climate change in terms of systemic “limits” – was common across the AR5, WBR1 and WBR2, and expressed in terms of value judgements around “tipping points” and “thresholds.” In the AR5, long-term climate change is framed using different scenarios ranging in severity and emphasizes the necessity for action to avoid the worst scenarios. For example, the AR5 (2013: 89) states that, “...there may be critical thresholds or abrupt or irreversible changes in the climate system.” Concrete claims of atmospheric change and rising sea-levels draws on the idea of limits and proposes that targets are needed to stabilize the climate system. The language highlights the necessity of action to avoid the worst predictions. However, the AR5 is hesitant in making direct statements about “tipping points” and “critical thresholds” and highlights the uncertainties around such claims. It draws on claims of uncertainty around “irreversibility” and emphasizes that even if action is taken to reduce emissions, it may not stabilize the climate in the long-term.

The World Bank reports, on the other hand, adopt the Survivalist discourse far more readily. WBR1 and WBR2 assume that limits exist in the climate system which threaten human development. These reports frequently employ the language of “tipping points” and “thresholds” including references to “critical limits,” “adaptive capacity,” “irreversible transition,” “non-linear responses” and “ecosystem collapse.” In terms of atmospheric change, WBR1 states that, “[r]ecent research suggests that large-scale loss of biodiversity is likely to occur in a 4 °C world, with climate change and high CO<sub>2</sub> concentrations driving a transition of the Earth’s ecosystem into a state unknown in human experience” (2012: xvi). WBR2 adds, “human-induced global warming can lead to relatively rapid, large-scale state shifts, which can lead to nonlinear impacts for human systems” (2013: 116).

While the IPCC and World Bank reports draw on the Survivalist discourse, they also employ *Ecological Modernisation* (linked to ‘sustainability’ discourses – see also Seippel, 2000; Dryzek, 2005; Mol and Spaargaren, 2000) which assumes that technology will overcome environmental problems and privileges institutional structures and markets as offering opportunities for environmental solutions. As experts and scientific knowledge are key agents which frame problems and solutions, value judgements in relation to claims of predictability and uncertainty are key indicators of this discourse. Within the AR5, climate change policy and action are overwhelmingly seen as within the remit of the IPCC’s scenarios and models, which are given legitimacy through rankings of confidence and likelihood. By way of comparison, the World Bank reports turn to claims of uncertainty to substantiate Ecological Modernisation. This is particularly evident in claims of uncertainty where “development” and “economic growth” are seen to provide opportunities for societies to address and adapt to climate change. WBR1 explains that some uncertainty in long-term atmospheric change is “...due to different assumptions about how the world population, economy and technology will develop during the 21<sup>st</sup> century” (2012: 21). This implies that human ingenuity, economic growth and technological development may be able to overcome long-term climate change impacts.

*Economic Rationalism* (also known as ‘environmental economics’ and linked to discourses of ‘sustainable development’ and ‘green growth’) – with its emphasis on costs, economic impacts and market-based solutions – was comparatively muted in the AR5. In the AR5 *Summary for*

*Policy Makers* (2013), no mention is made of the economic effects or financial costs of climate change. Comparatively, WBR1 and WBR2 frame concrete claims of long-term climate change in relation to economic impacts and, as such, value the environment economically. This is typified in one of the guiding questions of WBR1 (2012: 59): “Will increasing wealth in the future be sufficient to reduce vulnerability to acceptable levels, or will climate change reduce economic development prospects and exacerbate vulnerabilities?” Changes in precipitation and drought are also expressed in terms of economic indicators and how the impacts on agriculture and food production will affect markets and world food prices. Similarly, WBR2 (2013: 24) focuses on the long-term impacts of sea-level rise on human and economic development. Nevertheless, WBR1 (2012: xiv and 23) repeatedly asserts that there are economically feasible emissions pathways to hold warming below 2 °C. The World Bank reports are confident that economic growth and population increases over the 21<sup>st</sup> century will add to human welfare and increase adaptive capacity in most regions, suggesting overlap and intersections between Ecological Modernisation and Economic Rationalism.

Within the scientific reports on climate change, there is hybridity between the discourses around concrete claims and value judgements of long-term climate change. In this section, we have identified the dominant discourses of Survivalism, Ecological Modernisation and Economic Rationalism in the climate science and analyzed the degree of discourse structuration amongst scientific actors. The following section will explore processes of discourse institutionalization in the climate change negotiations, including the Paris Agreement, Leader Statements and INDCs from COP21.

#### 4. How are the discourses of long-term climate change institutionalized in COP21?

##### 4.1. The Paris Agreement

Building on the previous analysis, we examine how the scientific discourses of long-term climate change have been employed strategically and rhetorically and in climate negotiations and policy, to enable or constrain different approaches to climate change mitigation and adaptation. Each of the scientific discourses we identified in the previous section are represented in the Paris Agreement, though Economic Rationalism and Ecological Modernisation are far more prevalent than Survivalism. This suggests a degree of discourse institutionalization within the climate change negotiations and highlights how discourses manifest in global climate governance.

The dominance of the overarching frame of Economic Rationalism is particularly evident in how the threat of climate change is situated in the context of economic growth and “sustainable development” in the Paris Agreement (UNFCCC, 2015). In line with this discourse, the Paris Agreement promotes “results-based payments” for implementation actions and “domestic policies and carbon pricing” (however, non-market approaches are also provided for in Article 6) (UNFCCC, 2015). Explicit references to market-based mitigation mechanisms, namely REDD+, exemplify the dominance of this discourse. In this way, the Economic Rationalist discourse concentrates on which changes are compatible with least harm to the economy, rather than acknowledging the causal links between political economy and carbon emissions (Bücher et al., 2012; Fletcher, 2010). The links between Economic Rationalism and Ecological Modernisation are evident in the Paris Agreement, although the actions that they each foreground highlight their differences – in this case, Economic Rationalism foregrounds economic growth and market-based mechanisms, where Ecological Modernisation privileges technology transfer and expert knowledge.

Ecological Modernisation was also central in the Paris Agreement

which emphasised technology and capacity-building as part of the legal obligations of developed states to “enable enhanced pre-2020 action” of developing states (UNFCCC, 2015). For example, the “Technology Mechanism” in the Paris Agreement promotes technology transfers with financial support for developing states (Article 10) and capacity-building (Article 11). Technology development, diffusion, and transfer were cast as a general good, that is, as a key means for dealing with climate change. The Agreement also makes repeated references to climate change action being based on “the best available scientific knowledge” and, at the same time, emphasizes the need to strengthen such knowledge in terms of research, systematic observation and early warning systems (UNFCCC, 2015). In addition, one of the most important enforcing clauses in the Paris Agreement states that implementation is to be made by an “expert-based” committee (UNFCCC, 2015), which strengthens the role of experts and scientific knowledge.

An important distinction between Economic Rationalism and Ecological Modernisation emerges in relation to the nature and degree of change promoted in the Paris Agreement. The underlying prevalence of Economic Rationalism within the Paris Agreement relies on markets to solve environmental problems which have been largely created by neoliberal growth paradigms, thereby maintaining the status quo. However, the Agreement also draws on Ecological Modernisation with its focus on existing governance and administrative structures; for example, the development of INDCs is an effort to change some practices within existing institutional structures. This reflects a belief in the efficacy of existing institutional and administrative processes with the assumption that parties can enhance their “level of ambition” without specifying how such contributions are to be accounted for or verified. The “Transparency Framework” (Article 13), for instance, elides such faith in administrative structures “to build mutual trust and confidence” by states regularly providing inventory reports and tracking of implementation of their INDC (UNFCCC, 2015).

Despite its subordinate role, Survivalism was still present in the Paris Agreement in its recognition of the urgency and “potentially irreversible” threat of climate change (UNFCCC, 2015). However, the active clauses of the Paris Agreement were framed largely outside of this discourse. This ambivalence is reflected in how the Paris Agreement straddles between 1.5 °C and 2 °C threshold, stating its goal is to limit to the former and remain well below the latter. It could be suggested that this hesitance to draw on Survivalism may in part be because the discourse necessitates radical change to political, economic and administrative systems (Bryner, 2008: 36) – which is not required under the dominant Economic Rationalist and Ecological Modernisation discourses. It is here that the distinctions between the three dominant discourses become most apparent: Survivalism necessitates radical change, Ecological Modernisation calls for incremental change, while Economic Rationalism is intent on “business-as-usual.” Along these lines, some have argued that whilst the Paris Agreement has the status of a treaty it was not named a “Protocol” or “Implementing Agreement,” something that reflected the desire by some states to avoid the implications for radical change (Bodansky 2015: 296–300). While Survivalism has not achieved prominence within the Paris Agreement, its emphasis on “limits” and radical action have received attention in other discursive arenas, particularly in the media and activist circles (Santos, 2012). By tracing these dominant discourses through the Paris Agreement, we can see how processes of discourse institutionalization play out in the international climate change negotiations.

#### 4.2. Discourses in leader statements and INDCs - the case of Papua New Guinea

In addition to analyzing the dominant discourses within the Paris Agreement, it is also important to consider how these discourses may be

taken up by individual states and shape policy-making and action on climate change. This section examines how discourses are institutionalized through the practice of rhetoric (Leader Statements) and the commitments (promised or actual INDCs) made by states to address climate change. While we have analysed the Leader Statements and INDCs of 24 states at COP21, PNG is developed as a case study to explore the hybridity of discourses. This is important because discourse hybridity allows us to see the ideological forces at work within texts and their social affect (Janks, 1997), which may help to understand how certain discourses become dominant – that is, institutionalized. Our analysis of PNG’s rhetoric and commitments to climate change action, combined with comparative examples from other states, illustrates both the intersectionality and institutionalization of discourses of long-term climate change. Moreover, we link the relative dominance of Survivalism, Economic Rationalism and Ecological Modernisation within PNG’s Leader Statement, INDC and policies to the state’s positionality, political economy and interests.

Within our analysis, Survivalism was a prominent discourse and was dominant in SIDS – including Tuvalu, Kiribati, Marshall Islands and Micronesia. The common theme of this discourse was the emphasis on the potentially catastrophic effects of long-term climate change, pushing beyond the predominance of economic concerns and/or the capacity of technological innovation or administrative/institutional functions to successfully mediate. In this sense, Kiribati (2015: 7) referred to “the survival of this Planet” and Tuvalu (2015: 1) suggested that a failure to stand united against climate change was “condemn [ing] humanity to tragic failure.” Similarly, PNG displayed elements of Survivalism in their Leader Statement and INDC from COP21, which fits with the country’s positionality as a SIDS. The Leader Statement made by PNG’s Prime Minister, Peter O’Neill (Papua New Guinea, 2015), emphasized the catastrophic threat of climate change:

“Right now there are entire Pacific island nations facing extinction – some of these countries will be gone within our lifetime. ... Their people will become refugees, and tens of thousands of years of culture and tradition will be lost. These countries have a right to exist. ... This ongoing disaster must be stopped, and support given to the victims of climate change to help those who have survived to try to rebuild their lives. ... The countries of the Pacific Islands Forum are seeking a legally binding Paris Agreement – that sets a temperature ceiling of well below 1.5 ° Celsius.”

Likewise, the INDC (2016) stated: “PNG shares the deep concerns of its nearby Pacific Island neighbors in terms of existential threats to some of the more vulnerable low-lying countries. In addition, there are the same existential threats to coastal and low-lying areas of PNG itself.” In line with other SIDS, PNG elides a Survivalist discourse by advocating to limit temperature rise to 1.5 °C. Indeed, PNG explicitly argues against the dominance of the 2 °C limit presented by other states (including Australia, Norway, Kazakhstan, Indonesia, Japan and Brazil, who adopt a 2 °C warming limit within their Leader Statements and/or INDCs from COP21) based on the scientific projections of the AR5. This supports the observation made by Milkoreit (2015: 402), that much depends on the “idiosyncratic threat perceptions” of negotiators from different regions that are largely driven by their collective identities.

While the Survivalist discourse implies weaknesses in existing structures to meet the threats of climate change, it was often linked to Economic Rationalism through the promotion of market-based mitigation mechanisms; this was particularly pronounced in PNG’s rhetoric and commitments at COP21. Here, there seems to be a strange disconnect between the rhetoric of Survivalism and the appeal to Economic Rationalism in framing climate change action. That is, even though the rhetoric of PNG’s Leader Statement and INDC expressed Survivalism and highlighted the necessity of potentially drastic changes

to combat climate change, the country's policy frameworks rarely move beyond the solutions found in Economic Rationalism. While PNG recognizes the existential threat of climate change to SIDS, at the same time its Leader Statement and INDC are largely concerned with economic growth and the cost-effectiveness of emissions reductions. Indicative of the relative weakness of the Survivalist discourse in terms of climate change action, Bodansky (2016) has shown how the INDCs put forward by countries in connection with COP21 will limit temperature increase to 2.7 °C – far shy of the 1.5 °C threshold typically referred to by some states taking up the Survivalist discourse.

By recognizing this hybridity, we can see the political forces behind discursive clashes between Survivalism and Economic Rationalism. The case of PNG suggests there has been a high degree of institutionalization of the Economic Rationalist discourse as the putative policy solution to climate change action. Economic Rationalism was a dominant discourse in the rhetoric and policy action for states at COP21, including developed countries but also BRICs and LDCs states. This dominance forms around two core themes: an emphasis on economic impacts of climate change and commitments to market mechanisms to address long-term effects of climate change. The former creates a hierarchy of concerns in which non-economic issues are subordinate; the latter fails to countenance the necessity of wider structural reforms or alternative mechanisms to address climate change. Like other states, PNG ties its mitigation efforts to satisfactory economic growth rates and even seeks to increase emissions in sectors where there can be economic growth. PNG's INDC (Papua New Guinea, 2016) frequently references economic growth and emphasizes that, “emissions from forestry and agriculture sectors are expected to rise concurrently to national economic growth.” Given that climate change has been primarily framed through scientific methods within a capitalist world economy, it is relatively unsurprising that its solutions are largely framed in modernist, neoliberal terms (see Hulme, 2009). In this way, examining discourse hybridity can help to reveal how discourses may become dominant, particularly in relation to a state's positionality, political economy and interests.

In addition to privileging economic growth, PNG reinforced an Economic Rationalist discourse by promoting market-based mitigation measures. Throughout PNG's statements and commitments at COP21, multiple references were made to market-based mechanisms, especially REDD + . Other states, including Brazil, Uganda, Botswana, and Vietnam, also referred to REDD + and market-based mitigation approaches. Notably, PNG's Leader Statement (2015) emphasized:

“Papua New Guinea supports a Paris Agreement that anchors the REDD Plus Mechanism and its accompanying decisions. This is one of the most cost-effective mitigation options available to the world. Papua New Guinea is committing 2 million hectares of our forest for the REDD Plus initiative – and the reforestation of another eight hundred thousand hectares by the year 2050.”

This commitment to REDD + has translated outside of the COP and become institutionalized in PNG's national policies on climate change – namely the *National Climate Compatible Development Management Policy* (GoPNG, 2014) and *Climate Change (Management) Act* (GoPNG, 2015). We must place PNG's promotion of REDD + within the context of the state's political economy; PNG has significant forest resources (and a large logging industry) which could prove lucrative under a REDD + mechanism (Babon and Gowae, 2013). This alludes to the ways states strategically take up certain themes emanating from the scientific discourses on climate change that further their own interests – and ways in which, even within the hybrid form, certain discourses take precedence, namely that which furthers economic growth.

The hybridity between Economic Rationalism and Ecological Modernisation also points to some of the ways that states selectively

adopt discourses to fit with their positionalities, political economies and interests. Ecological Modernisation is typified by two tenets: a reliance on innovation (especially technological) as the primary means to combat climate change, with these innovations largely assumed to occur within existing economic, political and administrative structures. Japan (2015) provides an example of how Ecological Modernisation can intersect with Economic Rationalism, with its focus on the “development of a low-carbon economy” where innovative technologies are “key to acting against climate change without sacrificing economic growth” (see also Fisher and Freudenburg, 2001). Another example is provided by Kazakhstan (2015) in their Green Economy Concept which seeks, through legislation, to modernise infrastructure and production through energy efficient technologies. This transition is however conditional on “favourable economic conditions and increase in oil prices” from which it can reduce its GHG emissions. Similarly, PNG expressed Ecological Modernisation in its rhetoric and commitment to technological transfer. Its INDC specified: “The key technologies for mitigation are renewable energy deployment technologies in the electricity sector. Considerable assistance will, however, be needed in terms of human resource development and institutional support, technology transfer and capacity building in order to carry out the mitigation measures.” This emphasis on technology and institutions is in line with Ecological Modernization which, thus, forms a hybrid with Economic Rationalism.

PNG is not the only state that demonstrates this kind of hybridity. By examining the hybridity of Brazil's Leader Statement and INDC, we can also see how certain discourses become dominant in relation to a state's positionality, political economy and interests. Like PNG, Economic Rationalism has become institutionalized in Brazil's commitments to climate change action, namely through its promotion of market-based mechanisms, such as REDD + . As a country with large forest resources, this interest in REDD + fits within Brazil's political economy. Brazil combines a move towards a “low-carbon economy” with “technology transfer” through existing institutional structures. Unlike PNG and other SIDS – which adopt a Survivalist discourse and call for a 1.5 °C temperature limit – Brazil calls for 2 °C. This suggests that, even though Brazil utilizes some Survivalist language – including calls to establish “upper limits to prevent dangerous anthropogenic interference with the climate system” (Brazil, 2016) – Economic Rationalism and Ecological Modernisation still dominate that state's INDC.

Despite the overlap between Ecological Modernisation and Economic Rationalism in some states' Leader Statements and INDCs, like PNG and Brazil, these discourses can be in tension with each other. Ecuador (2015: 3), whilst looking to technology diffusion in a specific sector (i.e. agriculture), stated that technology and efficiency can “push back the boundaries, but do not eliminate them.” Moreover, their Leader Statement posited, “in addition of being undesirable, unlimited economic growth is – above all – impossible.” This highlights the potential disjuncture and competition between two seemingly overlapping discourses. India (2016: 2) exemplified this, indicating the need for technology innovation and its transfer to replace “an exploitative market driven mechanism.” Here, the rejection of Economic Rationalism in favour of the promotion of technological innovation was most apparent. It is within this hybridity that the political and ideological forces at play in processes of discourse institutionalization become most visible.

Such hybridity and clashes between discourses are shaped by the long-term climate science. Many countries adopted IPCC Guidelines in their COP21 INDC and there was a largely unquestioned acceptance of the climate science and deference to expert knowledge. In this respect, PNG (2016) referred directly to the AR5 in their INDC: “While there is considerable attention in terms of mitigation to keep the world average temperature increase below 2 ° Celsius and effort in the Pacific Island countries to limit this increase to below 1.5 ° Celsius, the scientific

opinion expressed in the latest 2014 IPCC AR5 reports suggests otherwise.” Comparatively, Brazil (2006) notes that, according to the IPCC, “the most appropriate metric and time horizon will depend on which aspects of climate change are considered most important to a particular application. No single metric can accurately compare all consequences of different emissions, and all have limitations and uncertainties.” In this way, the discourses of long-term climate science are used strategically and politically in processes of discourse institutionalization.

## 5. Conclusion

This paper has traced the dominant discourses of long-term climate change in the key scientific reports – the IPCC’s AR5 and the World Bank’s “Turn Down the Heat” reports – through to the COP21 climate negotiations. Starting with an analysis of the concrete claims and value judgements in these reports, this paper has shown how the discourses of Survivalism, Ecological Modernisation and Economic Rationalism emerge from climate science and manifest in national and global climate governance. By paying attention to discourse structuration and discourse institutionalization, our analysis has shown how certain discourses can become dominant within the international climate regime and mainstreamed into national institutions and policy-making. As we have shown in our analysis of the COP21 climate negotiations, the ambiguities around limiting temperature rise to either 1.5 °C or 2 °C within the Paris Agreement illustrates the hybridity of discourses, and may, partly, explain how certain discourses become dominant. The main distinctions between the discourse revolve around the degree and nature of change that they entail – Survivalism necessitates radical change, Ecological Modernisation calls for incremental change, and Economic Rationalism is intent on “business-as-usual.” As such, Economic Rationalism and Ecological Modernisation may become dominant within global climate governance because they are the paths of least resistance that neither challenge nor necessitate the transformation of administrative or economic structures.

Due to the politicised nature of these discourses, it is important to recognise not only the degree of convergence and overlap, but also the battle for discursive hegemony between them. Drawing on Janks’ (1997) idea of “hybridity,” we have explored the political forces behind these discursive struggles. As we have seen with our case study of PNG,

actors frame climate science to fit within their vision of what is appropriate action within their positionality and political economy. While an analysis of a single case study may present the potential for bias, comparative examples from other states highlight that, like PNG, all states frame climate science in a way that benefits them politically and economically and in ways that are sometimes contradictory, requiring them to hybridise the discourses accordingly. These struggles are evident in the way that PNG takes up Survivalism, Economic Rationalism and Ecological Modernisation in their Leader Statement and INDC with, seemingly contradictory calls for a 1.5 °C limit to warming, promotion of market-based mitigation measures and deference to expert-knowledge. Even though the rhetoric of PNG’s Leader Statement and INDC expressed Survivalism and highlighted the necessity of potentially drastic changes to combat climate change, the country’s policy frameworks rarely move beyond the solutions found in Economic Rationalism. While PNG recognizes the existential threat of climate change to SIDS, at the same time its Leader Statement and INDC are largely concerned with economic growth and the cost-effectiveness of emissions reductions. This sets up a paradox between the rhetorical commitments made in the international climate regime – which recognise the need for urgent action – and national policies and actions – which privilege economic growth and development.

Such hybridity produces three worrying scenarios: (1) where one discourse becomes so dominant that all other competing perspectives and discourses are silenced, excluded or significantly downplayed; (2) where no single discourse dominates or where they become so divergent, that there can be no common ground for policy action; or, (3) where multiple discourses co-exist but actors have different ideas about a common concept producing so-called ‘boundary objects’ (Star and Griesemer, 1989). By identifying the hybridity of discourses being constructed through climate science, we can begin to understand how certain discourses manifest in global climate governance and how they may become dominant. This helps us to recognise the social and political construction of scientific discourses and question the “tyranny” on thought where climate science makes possible certain ways of thinking and obstructs others. While this analysis is a starting point, further research is needed into the ways different states adopt hybrid discourses and how they enable or constrain climate change action.

## Appendix A

Full list of codes used in the discourse analysis of scientific reports:

- 1 Atmospheric change leading to Long-Term change
- 2 Sea-level rise leading to Long-Term change
- 3 Oceanic acidification leading to Long-Term change
- 4 Change in precipitation and drought leading to Long-Term change
- 5 Claims of predictability (ability of models to predict climate change)
- 6 Ratings of predictable outcomes/normative or value judgements
- 7 Claims of uncertainty (models, data, predictions)
- 8 Disparities between models
- 9 Claims/predictions of extreme weather events
- 10 Claims/predictions of effects on human communities
- 11 Claims/predictions of effects on specific geographic areas
- 12 Claims/predictions of effects on economy
- 13 Claims/predictions of effects on agriculture and food production
- 14 Claims/predictions of tipping points
- 15 Assertions of adaptation and mitigation strategies

Appendix B

See Table B1

**Table B1**  
Hybrid and dominant discourses in Leader Statements and INDCs for selected states at COP21.

State	Discourses in Leader Statement	Discourses in INDC	Dominant Discourse
Australia	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Botswana	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Brazil	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
China	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Ecuador	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Egypt	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
India	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>
Iran	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Japan	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Kazakhstan	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Kenya	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Kiribati	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>
Marshall Islands	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>
Micronesia	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>
Norway	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Papua New Guinea	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> <li>● Survivalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
South Africa	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>
Switzerland	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Tuvalu	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> </ul>
United States of America	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Uganda	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Survivalism</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Economic Rationalism</li> </ul>
Vietnam	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> <li>● Economic Rationalism</li> </ul>	<ul style="list-style-type: none"> <li>● Ecological Modernisation</li> </ul>

References

Adger, W.N., Benjaminsen, T.A., Brown, K., Svarstad, H., 2001. Advancing a political ecology of global environmental discourses. *Dev. Change* 32, 681–715.

Babon, A., Gowae, G., 2013. The Context of REDD+ in Papua New Guinea: Drivers, Agents and Institutions. CIFOR., Bogor, Indonesia.

Babon, A., McIntyre, D., Gowae, G., Gallemore, C., Carmenta, R., Di Gregorio, M., Brockhaus, M., 2014. Advocacy coalitions, REDD+, and forest governance in Papua New Guinea: how likely is transformation change? *Ecol. Soc.* 19 (3), 16.

Beck, S., Forsyth, T., 2015. Co-production and democratizing global environmental expertise: the IPCC and adaptation to climate change. In: Hilgartner, S., Miller, C., Hagendijk, R. (Eds.), *Science and Democracy: Making Knowledge and Making Power in the Biosciences and Beyond*. Routledge, London, pp. 113–132.

Bodansky, D., 2016. The Paris Climate Change Agreement: A New Hope? *Am. J. Int. Law* 110 (2), 288–319.

Brazil, 2016. Federative Republic of Brazil – Intended Nationally Determined Contribution – Towards Achieving the Objective of the United Nations Framework

Convention on Climate Change.

Bryner, G.C., 2008. Political science perspectives on climate policy. In: Compston, H., Bailey, I. (Eds.), *Turning Down the Heat: The Politics of Climate Policy in Affluent Democracies*. Palgrave Macmillan, New York, pp. 33–47.

Büscher, B., Sullivan, S., Neves, K., Igoe, J., Brockington, D., 2012. Towards a synthesized critique of neoliberal biodiversity conservation.” *capitalism, nature. Socialism* 23 (2), 4–30.

Campbell, D., 2013. Poststructuralism. In: Dunne, Tim, Kurki, Milja, Smith, Steve (Eds.), *International Relations Theories: Discipline and Diversity*. Oxford University Press., Oxford, pp. 213–237.

Doty, R., 1996. *Imperial Encounters: The Politics of Representation in North-South Relations*. University of Minnesota Press, Minneapolis.

Dryzek, J.S., 2005. *The Politics of the Earth: Environmental Discourses*. Oxford University Press, New York.

Ecuador, 2015. Paris, November 30, 2015 – Unlimited Growth Is Undesirable United Nations Conference on Climate Change 2015. United Nations Conference on Climate Change.

Fairclough, N., 1995. *Critical Discourse Analysis: The Critical Study of Language*.

- Longman, London and New York.
- Fairclough, N., 2001. The dialectics of discourse. *Textus* 14 (2), 3–10.
- Critical Discourse Analysis: The Critical Study of Language. Longman Group Limited, Harlow.
- Feindt, P., Oels, A., 2005. Does discourse matter? Discourse analysis in environmental policy making. *J. Environ. Policy Plan.* 7 (3), 161–173.
- Feyerabend, P., Oberheim, E., 2011. *Tyranny of Science*. Polity Press, Cambridge, UK.
- Fisher, D.R., Freudenburg, W.R., 2001. Ecological modernization and its critics: assessing the past and looking toward the future. *Soc. Nat. Resour.* 14, 701–709.
- Fletcher, R., 2010. Neoliberal environmentalism: towards a poststructuralist political ecology of the conservation debate. *Conserv. Soc.* 8 (3), 171–181.
- Forsyth, T., 2015. Integrating science and politics in political ecology. In: Bryant, R.L. (Ed.), *The International Handbook of Political Ecology*. Edward Elgar, Cheltenham, pp. 103–116.
- Government of Papua New Guinea (GoPNG), 2014. National Climate Compatible Development Management Policy. OCCD., Port Moresby.
- GoPNG, 2015. Climate Change (Management) Act Port Moresby. GoPNG.
- Hajer, M., 1997. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford University Press, Oxford.
- Hulme, M., 2009. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press, Cambridge.
- India, 2016. India's Intended Nationally Determined Contribution: Working Towards Climate Justice.
- IPCC, 2013. Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: the Physical Science Basis - Summary for Policymakers. IPCC, Geneva.
- IPCC, 2014. Climate change. Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC., Geneva.
- Janks, H., 1997. Critical discourse analysis as a research tool. *Discourse Stud. Cult. Politics Educ.* 18 (3), 329–342.
- Japan, 2015. Speech by Prime Minister Abe at COP21 (draft).
- Jasanoff, S., 2004. The idiom of coproduction. In: Jasanoff, S. (Ed.), *States of Knowledge: The Co-Production of Knowledge and Social Order*. Routledge, London, pp. 1–12.
- Jeffrey, T., 2015. State of the Union Address, 2015. Accessed February 14, 2018. <http://www.cnsnews.com/blog/terence-p-jeffrey/obama-climate-change-greatest-threat>.
- Lorenzoni, I., Whitmarsh, L., 2014. Climate change and perceptions, behaviors, and communication research after the IPCC 5th assessment report. *WIREs Climate Change* 5 (6), 703–708.
- Kazakhstan, 2015. Remarks by prime minister of the Republic of Kazakhstan. K. Massimov At the Opening Plenary of the 21st Conference of the Parties To the UN Framework Convention on Climate Change.
- Kiribati, 2015. President of the Republic of Kiribati His Excellency Beretitenti Anote Tong, On the Occasion of the Leaders Event of COP21, Paris, 30th November 2015.
- Milkoreit, M., 2015. Hot deontology and cold consequentialism – an empirical exploration of ethical reasoning among climate change negotiators. *Clim. Change* 130 (3), 397–409.
- Milliken, J., 1999. The study of discourse in international relations: a critique of research and methods. *Eur. J. Int. Relat.* 5 (2), 225–254.
- Mol, A.P.J., Spaargaren, G., 2000. Ecological modernisation theory in debate: a review. *Env. Polit.* 9 (1), 17–49.
- Papua New Guinea, 2015. Statement by Hon. Peter O'Neill CMG MP prime minister. UNFCCC 21st Conference of the Parties (COP21).
- Papua New Guinea, 2016. Intended Nationally Determined Contribution (INDC) Under the United Nations Framework Convention on Climate Change.
- Pepermans, Y., Maesele, P., 2016. The Politicization of Climate Change: Problem or Solution? *WIREs Climate Change* 7 (4), 478–485.
- Pidgeon, N., Fischhoff, B., 2011. The role of social and decision sciences in communicating Uncertain climate risks. *Nat. Clim. Change* 1, 35–41.
- Rapley, C., Macmillan, D., 2014. Climate Change Is Not Just About Science – It's About the Future We Want to Create." *the Guardian*. Accessed February 14, 2018. <https://www.theguardian.com/science/2014/nov/22/-sp-climate-change-special-report>.
- Santos, F.D., 2012. *Humans on Earth: From Origins to Possible Futures*. Springer, Berlin.
- Seippel, Ø., 2000. Ecological modernization as a theoretical device: strengths and weaknesses. *J. Environ. Policy Plan.* 2, 287–302.
- Shih, W., 2000. The world bank and climate change. *J. Int. Econ. Law* 3 (4), 633–653.
- Star, S.L., Griesemer, J.R., 1989. Institutional ecology, 'Translations' and boundary objects: amateurs and professionals in Berkeley's museum of vertebrate zoology 1907–39. *Soc. Stud. Sci.* 19 (3), 387–420.
- Tuvalu, 2015. Keynote Statement Delivered by The Prime Minister of Tuvalu, the Honourable Enele S. Sopoaga, At the Leaders Events for the Heads of State and Government at the Opening of the COP21, 30th November 2015.
- United Nations Framework Convention on Climate Change (UNFCCC), 2015. Paris, 30 November to 11 December 2015 – Adoption of the Paris Agreement. Paris: UNFCCC, Conference of the Parties, Twenty-First Session 2015. Conference of the Parties, Twenty-First Session.
- United Nations Framework Convention on Climate Change (UNFCCC) 1994. 1771 UNTS 107 / [1994] ATS 2 / 31 ILM 849 (1992), Article 21(2).
- van Dijk, T.A., 2005. Critical discourse analysis. In: Schiffrin, D., Tannen, Hamilton, H.E. (Eds.), *The Handbook of Discourse Analysis*. Blackwell Publishers, Malden, pp. 349–371.
- Weingart, P., Engels, A., Pansegrau, P., 2000. Risks of Communication: Discourses on Climate Change on Science, Politics, and the Mass Media. *Public Underst. Sci.* 9 (3), 261–283.
- Wodak, R., Fairclough, N., 1997. Critical discourse analysis. In: van Dijk, T.A. (Ed.), *Discourse as Social Interaction*. Sage, London, pp. 258–284.
- World Bank, 2012. Turn Down the Heat – Why a 4°C Warmer World Must Be Avoided. World Bank, Washington.
- World Bank, 2013. Turn Down the Heat II – Climate Extremes, Regional Impacts and the Case for Resilience. World Bank, Washington.