The Challenge of Creating Sustainable Environmental Policies

An Investigation of the Combination of Political and Natural Science

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Abstract:

This thesis investigates the issues of creating sustainable climate mitigation policies focusing on Nature-Based Solutions (NBS). It combined the theory of critical political ecology with the concept of NBS and creates the NBS Policy Evaluation Model which is used to determine the degree of sustainability in climate mitigation policies in Nationally Determined Contributions from Belize and Papua New Guinea under the Paris Agreement. This combination addresses a gap in knowledge between Critical Political Ecology, which does not include enough natural science, and NBS, which does not include enough political science. The combination is, therefore, a middle ground between political and natural science. At its foundation, the model has *nature* which determines the natural boundaries and possibilities for developmental practices. It further has three pillars – *social, environmental,* and *economic* similarly to other sustainability models. And lastly, a roof of *NBS policies.* The thesis concludes that the NBS Policy Evaluation Model can help policymakers include the natural context of the implementation site, the overlapping issues affecting the foundation and the pillars, and detailing the phrasing of the policy actions. Furthermore, the model could help shift climate mitigation towards a more holistic and nature-related perspective.

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List of Acronyms:

AFOLU	Agriculture, Forest, and Other Land Use
BNCCC	Belize National Climate Change Committee
CAEP	Climate Action Enhancement Package
CCDA	Climate Change and Development Agency
CDC	Centres for Disease Control
CEPA	Conservation and Environmental Protection Authority
COP	Conference of Parties
CTCN	Climate Technology Collaboration Network
DAL	Department of Agriculture and Livestock
DLPP	Department of Land & Physical Planning
DNPM	Department of National Planning and Monitoring
EC	European Commission
EU	European Union
FOLU	Forestry and Other Land Use
GDP	Gross Domestic Product
GHG	Greenhouse Gasses
HCVHCS	High conservation Values and High Carbon Stock
HDI	Human Development Index
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
IUCN	International Union for Conservation of Nature
LULUCF	Land Use, Land-Use Change and Forestry
MDGs	Millenium Development Goals
MLG	Multi-level Governance
NBS	Nature-Based Solutions
NCCO	Belize National Climate Change Office
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisation
NPA	National Pattern Approach
NSWMP	The National Solid Waste Management Policy
OECD	Organisation for Economic Co-operation and Development
PACT	Belize Protected Areas Conservation Trust

PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
PSA	Policy Sector Approach
REDD+	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
SDGs	Sustainable Development Goals
TPA	Temporal Pattern Approach
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPNG	University of Papua New Guinea
WMO	World Meteorological Organization
WWF	World Wildlife Fund

1.0: Introduction

> "Nature is a key ally, whenever we restore the wild, it will recapture carbon and help us bring back balance to our planet"
>
> - David Attenborough (United Nations, 2021).

The global climate crisis has for multiple years occupied the minds of the international society, scholars, and individuals. And despite significant efforts to slow the effects of increasing climate changes, viable and efficient solutions allowing us to reach the 1,5ºC goal of the Paris Agreement have not been implemented. These solutions have during the last couple of years developed immensely and the focus on finding sustainable and eco-friendly solutions has increased across all sectors.

Previously the focus was on adapting to the new climate and finding solutions to protect against climate disasters whereas today the focus seems to shift to mitigating the accelerating effects of the climate crisis. Hence, the focus shifts from adaptation to mitigation. Furthermore, the focus also seems to shift from man-made or 'grey climate mitigation' solutions like dams, canals, wave-breaking sandbars, and seismic dampers. Instead, the focus is now on eco-friendly or 'green climate mitigation' solutions such as restoration of ecosystems, protection of biodiversity, and conservation of wild areas such as rivers, oceans, grasslands, and forests (Kabisch et al., 2017, p. 95). The shift influences the global climate debate where people discuss how to manage the climate crisis – shifting from treating the 'symptoms' of climate changes to finding and solving the underlying root causes. The importance of solving these root causes to protect vulnerable communities is reaching the top of the international agenda and many believe that nature will play a vital role here.

Most recently the progress and ambitions of the world's nations to combat climate change were debated at the 2021 Conference of Parties (COP) 26 in Glasgow. Also here, one of the main themes was nature's role in climate mitigation. Nature was spoken of as an ally amongst others by Emmanuel Macron, the French Prime Minister who argued that "The #COP26 will succeed if the protection of nature, our essential ally against climate disruption, is genuinely enhanced" (@EmmanuelMacron, 2021).

At COP26 nature was often equivalated with Nature-Based Solutions (NBS). This not only strengthens the notion of viewing nature as a major resource to combat climate change but also shows that nature and NBS are interchangeable and intertwined. Therefore, when following the current green

climate mitigation strategy we must include nature as a major part of the equation since as argued by conservationist Harvey Locke “none of the climate models work if we don't get the nature part right” (Now This News, 2021, pt. 11:52). The need for integrating nature in climate mitigation is therefore vital for our chances to minimize the damages of the climate crisis.

However, issues within the conceptualisation of NBS still exist – mainly due to its relatively young age as a concept which is not more than a few years. Therefore, practically testing the NBS concept is relatively limited, and scientists and policymakers are forced to rely on predictions and forecasts instead of actual data. Furthermore, getting NBS integrated into policies and governance also continues to be an issue. The World Wildlife Fund’s (WWF) global debut leader for climate and energy, Vanessa Pérez-Cirera, argues that we need to be seeing a “step change in both finance and policy” (WWF, 2021).

Meanwhile, within social science one of the prominent theories combining policymaking and climate - political ecology - the issue of including the natural or environmental aspects also persists. This is characterised by scholar Matthew Turner (2016) who argues that political ecology is focusing too much on the social, political, and economic aspects of political ecology which then further limits the field in solving environmental issues. This viewpoint is mirrored in both the Dasgupta report (2021) which is based on the notion that “economies- are ‘embedded within nature, not external to it” (WBCSD, 2020, p. 2) and the theme of COP26 being the inclusion of nature into all aspects of society including policymaking and governance. Therefore, the time for a more environmentally oriented approach within political ecology seems fitting - that nature should, as in all other aspects of human existence, be the foundation for all policies.

Therefore, finding a middle ground between policymaking and NBS could be a solution to create a 50/50 concept or model intersecting between policies and climate.

Due to this, I want to investigate the following question:

How can a new model intersecting the theory of critical political ecology and the concept of NBS help evaluate the Nationally Determined Contributions under the Paris Agreement?

2.0: Methodology

2.1: Introduction

In this section, I will explain the methodological underpinning and usages which have gone into the development of this thesis. This includes a comprehensive overview of the case and research design, the Centres for Disease Control (CDC) policy process model, data collection and limitations.

2.2: The Case Study Approach

Due to its inherently differentiating character the case study approach has always been debated within academia (Flyvbjerg, 2006, p. 219–220). Therefore, it can be difficult not only to know when you are working with a case study but also to comprehend the advantages of using this approach for conducting research. To avoid misunderstandings regarding the use of the case study approach Bent Flyvbjerg (2006) has, for instance, theorised the five most common misunderstandings about case studies. In his paper, he goes on to critique these common misconceptions and argues why they are nothing but misunderstandings thus increasing the legitimacy of the case study approach. The five misunderstandings are:

1. *That practical experience outweighs theoretical knowledge*. He argues that this is false since predicting theoretically based knowledge which can stand on its own cannot be found within social science and therefore context-based knowledge is essential to reach valid conclusions (p. 4-7).
2. *That making generalisations based on a single case is impossible*. This is a misunderstanding since this would be case-dependent. He argues that formal generalisations are overvalued compared to the force of an example which can add valuable contributions to the development of fundamental scientific research (p. 8-12).
3. *That the case study approach is only used for the generation of new hypotheses and therefore does not offer concrete results*. Flyvbjerg (2006) argues that this is incorrect since the case study approach offers multiple structures and can therefore be used for both generating and verifying a hypothesis (p. 13-17).
4. *That the verification bias in a case study is shaped by the preconceptions of the researcher*. This is yet another misunderstanding since the case study approach holds no greater bias from the researcher than any other method of research (p. 17-21).
5. *That creating new theories based on case studies is close to impossible since summarising the results from a case study into a theory is too complicated*. He negates this misunderstanding as well by arguing that these complications are due to the complexity of reality and not the case study approach (p. 21-26).

2.3: Case Study Design

Case study designs can take different shapes and sizes since the field of case studies is so varied. Therefore, it is important to identify and clearly define the case study design used in this thesis.

Here I once again rely on Flyvbjerg (2006) who distinguishes between random selection and information-oriented selection strategies when choosing samples and cases for investigation. Of these two, the **information-oriented selection** is the best match for this thesis since it seeks "to maximize the utility of information from small samples and single cases" (p. 230). This will allow for generalisations to be drawn based on a few cases and not a large set of data which would not be feasible within the timeframe of this thesis. Concretely, this means that I will be investigating two cases both with a smaller data size to investigate the performance of a new comprehensive model for evaluating the degree of sustainability within NBS policies.

2.4: Case Strategy

Additionally, Flyvbjerg (2006) distinguishes between four types of information-oriented selection strategies which are illustrated below:

Information-oriented Selection Strategies for Samples and Cases	
Type of Selection	*Purpose*
Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
Maximum Variation Cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organization, location, budget).
Critical Cases	To achieve information that permits logical deductions of the type, "If this is (not) valid for this case, then it applies to all (no) cases."
Paradigmatic Cases	To develop a metaphor or establish a school for the domain that the case concerns.

Table 1: Exempt from "Table 1: Strategies for the Selection of Samples and Cases" (Flyvbjerg, 2006, p. 230).

These four strategies look for specific types of cases that either build upon: (1) deviance in pre-existing knowledge; (2) the importance of changes in results due to one aspect; (3) critically confirm or disprove common knowledge; or (3) investigates new paradigms and aims to expand or

create new fields. Given the objective of this thesis - to combine natural science and social science and create a new holistic model for environmental policy development the **paradigmatic strategy** is the best fit. This case strategy has at its foundation that it "operates as a reference point and may function as a focus for the founding of schools of thought" (Flyvbjerg, 2006, p. 232) meaning that the paradigmatic strategy for case selection helps expand fields and create new ways of thinking or new approaches to the subject matter. Therefore, the paradigmatic strategy fits well with this thesis as it seeks to change how policymakers think about the role of nature when navigating the policy process and creating policies for human-nature relations.

2.5: Use of Case Design

Based on the above sections, it is, therefore, possible to use the case study approach as a reliable and legitimate form of research method which seeks to draw on real-life examples to further academic and real-life solutions and methods. Additionally, it is possible to attempt to create a how new way of integrating natural sciences and political ecology under the same paradigm – to make a new evaluation tool for environmental policymakers. With that, it may be possible to change how environmental policies are developed since the use of a new theoretical framework and applicable evaluation tool will give policymakers a chance to include vital elements of environmental policies before the implementation phase. Finally, the use of the paradigmatic case design removes restrictions concerning which kind of data from what fields could be used in the investigation, making the thesis inherently interdisciplinary and holistic. It also allows a primarily social science study to focus on something that is predominantly viewed as a natural science – the concept of NBS – the ideal focus area when investigating the combination of politics and climate.

2.6: The Core of the CDC Policy Process Model

The CDC policy process method is a circular model containing five domains which make out the policy process (see appendix 1). These steps enclose a middle section containing two elements: **Evaluation**, **Stakeholders** and **Education**. This means that the model at its foundation considers the need for evaluation of policies important and the intended use and users of these policies – communicating evaluation results and facilitating improvement of policies (Centers for Disease Control and Prevention, 2022). Furthermore, it means that the model identifies relevant stakeholders, analyse their needs, attitudes and characteristics and finally builds communication strategies for each and gathers feedback. For this thesis, I will be looking at actors at the macro-, and meso-level. This

includes national actors such as governments, departments, ministries, organisations, communities, and other social groups. The investigation will, however, only be taking the actors included in the case material into account. This, however, does not mean that only policymakers will be considered but also stakeholders such as local communities which are not usually involved in the policymaking process. The core of the model, therefore, seeks to not only have a continuous evaluation of the policy but also puts emphasis on ensuring the inclusion of relevant stakeholders to facilitate better development and implementation of the policy.

2.7: The Five Domains of the CDC Model

The five domains of the policy process model explain the process of how a policy moves from a problem to a solution. Before explaining the five domains it is important to note that the CDC policy process, like most policy processes, underlines that policymaking is rarely a linear process meaning that often "the domains of the policy cycle overlap or occur out of order" (Centers for Disease Control and Prevention, 2022). This means that the model represents an idealised process for developing policies going through the five main domains of the model established by the CDC (2022) which are:

1. *Problem Identification*, where policymakers seek to identify both the effects, causes and character of the problem and identify gaps in data or knowledge which when framed correctly can lead to the identification of a solution.
2. *Policy Analysis* where policymakers seek to research, identify policy options, and describe the impact, cost, and feasibility of the chosen options for implementation. Finally, this domain also includes the assessment and prioritization of policy options.
3. *Strategy and Policy Development* where policymakers create a strategy for how the policy will operate and how it can be adopted. They identify relevant stakeholders and elaborate upon how the policy will function when implemented. Finally, they start drafting the finished policy.
4. *Policy Enactment* where policymakers enact laws, public procedures, and administrative action to pass the policy and move on to implementation.
5. *Policy Implementation* where policymakers translate the now passed piece of policy into action and have it implemented and monitor the success of the implementation. This involves finding resources, building capacity, ensuring concrete actions to take, establishing evaluation criteria, and supporting "post-implementation sustainability of policy" (Centers for Disease Control and Prevention, 2022).

The use of the CDC policy process method in this thesis is essential to create a framework for the analysis of the two cases. Since the scope of the NBS Policy Evaluation Model is to identify missing elements from the policy before implementation I will only be using the first three domains of the CDC policy process. In practice, this means that I will use the first domain of the policy process to create a context for national climate issues in both cases. Following this, I will use the second domain for the main part of the analysis. Here I will use the NBS Policy Evaluation Model to evaluate the inclusion of the foundation and sustainability pillars within the specific NBS policies. I will specifically be focusing on the different positive and negative outcomes which the current Nationally Determined Contributions (NDC) could have and whom these policy choices may affect. Finally, I will use the third domain to elaborate upon the NDC implementation plans as they are concrete policy strategies. I will further evaluate these strategies and how they will or will not function during implementation. Through this, I will, before the fourth and fifth domain, show how the NBS Policy Evaluation Model can identify missing elements from the NDCs which need to be included or detailed before continuing the policy process.

2.8: Choice of Case Studies

For this thesis, I have chosen to investigate the NDC from Belize and Papua New Guinea (PNG). The choice of cases will be built on the most-similar case comparisons meaning that the high degree of similarity in the cases makes them easier to compare and generalise from (Lamont, 2015, p. 133). The choice criteria for these cases are that they are both small countries which means lower national variability in social issues, natural environments, economic complexities, and environmental challenges. Furthermore, both countries are parties to the Paris Agreement, and both have NDC which specifically focuses on NBS. They are also both developing countries that are heavily affected by climate disasters such as droughts, sea level rises, extreme weather etc. Finally, the cases have smaller differences the biggest being geographical placement. They also have diverse cultures – although both have indigenous tribal structures – and slightly varied natural climates. Nevertheless, these differences should not be deciding factors for the investigation. These differences mean that the analysis could demonstrate that the NBS Policy Evaluation Model can function within different contexts in cases with different foundations.

2.9: Data Collection

The data collection for this thesis consists of both qualitative and quantitative data. The primary documents used for the investigation are the two NDCs from Belize and PNG. The NDCs are slightly

different in that the Belizean NDC is from 2021 and the PNG NDC is from 2020. However, due to the lack of more similar reports, I will be evaluating them based on the same criteria. These documents, although mostly qualitative builds on and contains various quantitative data such as measurements and statistics detailing the various national conditions in the respective countries – including social demography, environmental assessments, and economic structures. This makes the NDCs a mix of qualitative and quantitative data. This combination of qualitative and quantitative data is also used when creating the NBS Policy Evaluation Model – combining qualitative data from critical political ecology in the form of scholarly papers and analysis with quantitative data from NBS. In terms of the field, the thesis is situated within policy development but seeks a more interdisciplinary approach including fields such as social science, economy, environmental management, politics, and social development.

Furthermore, the data from the NDCs illustrated in country-specific tables listing each target for NBS climate mitigation and each subsequent action under these targets. The actions will then be further categorised by colour corresponding to each element in the NBS Policy Evaluation Model: blue = *Nature*; yellow = *Social*; green = *Environmental*; and red = *Economic* (see appendix 2 & 3). This will help provide an overview of the specific elements being analysed and clarify under which element each action belongs – although there are of course overlaps.

2.10: Limitations

The research and case design above has clear limitations mainly because of time and page constraints and limited access to field research for this thesis. Firstly, the investigation will only focus on the NDCs from Belize and PNG meaning that other legislation will only be included as context and not as the subject of investigation. Even though this limits the representation of national policies it can be argued that important details, considerations and connections to other legislation and policies should be included in the NDCs to mainstream and connect national policies. Such important current policies should be visible in the development of the NDCs and their specific policy actions. Therefore, looking solely at the NDCs make sense as they are national policies overarching sector-specific policies. Secondly, the investigation solely will be done on climate mitigation which pertains to NBS. This means that adaptation strategies and other means of technological or manmade climate mitigation are not included. I have done this for several reasons: (1) to limit the scope of the thesis to a feasible size; (2) to focus on a more bottom-up and nature-oriented approach, by choosing NBS as the investigative area, which will counteract the academic and technocratic tendencies within Political

Ecology; and (3) to focus on the proactive work done to combat the climate crisis by investigating mitigation rather than adaptation. Finally, this thesis is limited by its focus on two cases meaning that the successful application of the NBS Policy Evaluation Model to other and larger cases is unknown and can only be estimated.

3.0 Literature review:

3.1: The Anthropocene and Human-Nature Relations

The interaction between humans and nature has always been a challenging relationship. From the first humans trying to survive their rough and untameable environments to the modern ages where humans have explored and exploited all surfaces of the planet and ultimately changed its climate.

We have during our millions of years in existence, therefore, evolved from being the subject of the earth's climate to being the masters of it. This shift in the power between nature and humans called the Anthropocene was coined in 2002 by Paul Crutzen (2002) who argued that this new age was 'human-dominated' and highlighted that "because of these anthropogenic emissions of carbon dioxide, [the] global climate may depart significantly from natural behavior for many millennia to come" (p. 23). He goes on to argue that the emissions are rising concurrently with mankind's expansion and exploitation of the planet's resources which he can link back to the invention of the steam engine in 1784. In his findings he is stating that 25% of climate changes are caused by an increase in the global population while the rest are due to the increase in; (1) global cattle population producing methane, (2) land use covering 30-50% of the earth's surface; (3) dam-building; (4) freshwater consumption; (5) fishing; (6) energy consumption; (7) use of fertilizer; and (8) the burning of fossil fuels and deforestation (p. 23).

This conclusion is also supported by the Millenium Assessment from 2006 which reports that the rapid change to ecosystems and levels of emissions is largely occurring due to "growing human demands for food, fresh water, timber, fiber and fuel" (Powledge, 2006, p. 881). This conclusively demonstrates that the changes to the global climate are man-made as is reflected in today's global climate change debate. However, the process of including this fact as legitimate evidence in the global debates and legitimising the massive impact humans have had on nature through the ages has taken a long time.

3.2: An Overview of the Global Debate on the Climate Crisis

The global debate on the climate crisis has been developing for more than half a century. While investigating this debate the common denominator for all international legislation and agreements on climate change is the United Nations (UN) and will therefore be the focal point for this section.

The first significant event marking the beginning of global political mobilization to combat environmental changes was the First Earth Summit in Stockholm in 1972. From this summit world leaders decided on an action plan with recommendations for international environmental action. This included investigation into and monitoring of especially the development in atmospheric changes in the search for causes of climate change putting it on the global agenda. The summit would also lead to the establishment of the UN Environment Programme (UNEP). Unfortunately, the initial focus of UNEP was not climate change but water resources, marine life, renewable energy, desertification, forests and the legal framework of the environment and environmental development (Jackson, n.d.).

In 1979 UNEP decided to create the Earth Watch Programme to monitor long-term air pollution leading to the adoption of the Convention of Long-Range Transboundary Air Pollution. This indicates progress since air pollution – which causes climatic changes – was now added to the agenda. This development was a steppingstone for the Vienna Convention for the Protection of the Ozone Layer, which was adopted in 1985. This convention was even more specific in that it singled out sulphur emissions which were to be reduced by 30% due to the increase in acid rain in both the United States and Europe (Jackson, n.d.).

As the world got closer to the turn of the millennium the UN General Assembly adopted a new set of guidelines the “Environmental Perspective to the Year 2000 and Beyond” in 1987. These aimed to help develop nationally and internationally sound policies and programmes focusing on the environment. Despite the increased focus, climate changes were still not the centre of these new guidelines but instead positioned under energy policy directives. Nevertheless, the guidelines were the first appearance of sustainable development marking an important pivotal moment in the global climate debate (Jackson, n.d.).

The following year UNEP made important progress in combating climate change when a seminar held to identify environmentally vulnerable sectors led to the establishment of the Intergovernmental Panel on Climate Change (IPCC) to further develop international cooperation and partnerships. Together with the World Meteorological Organization (WMO) UNEP was asked by the UN General Assembly for advice on creating new global climate strategies. In 1989 their recommendations were approved and became the Helsinki Declaration on the Protocol of the Ozone Layer. This meant that the focus was still on air pollution and protection of atmospheric changes

instead of climate changes. However, global collaboration and development of global political mechanisms like programmes, councils and organizations were being established (Jackson, n.d.).

Just two years after climate change was recognised as a global issue at the World Climate Conference in 1990, the Rio Declaration was adopted at the 1992 Earth Summit which focused on the Environment and Development. This Earth Summit set the framework for international collaboration on protecting the global climate and led to the establishment of the UN Framework Convention on Climate Change (UNFCCC) signed by 158 states. This new framework convention aimed to stabilize atmospheric concentrations of greenhouse gasses (GHG) – not just sulphur – to prevent dangerous changes to the global climate system. The Rio Declaration has later been a pivotal piece of global environmental strategy and is well integrated into the existing network of strategies. Additionally, the convention is also praised for its multi-sector approach that focuses on holistic solutions to complex global problems since the "impacts and root causes of desertification, climate change and biodiversity issues cut across a wide variety of economic sectors" (OECD, 2002, p. 16). Nevertheless, it was critiqued for being difficult to integrate into mainstream development policy and planning processes which is essential for the success of any convention – that it works not only across multiple sectors but also across multiple levels.

A few years later, in 1997, the UNFCCC adopted the Kyoto Protocol. This was another pivotal piece of global environmental strategy that aimed to reduce the global level of GHG below 5% of 1990 levels from 2008-2012. This meant a large commitment from the 160 nations who had signed the protocol by 2005 to reduce their national emissions impacting global levels. However, the protocol was predicted to fail as it lacked: (1) capable political structures considering the unpredictability of some GHG and not set fixed goals for emissions reduction; (2) consideration of the international market's ability to control the permit trade for carbon emissions; and (3) a realistic timeframe for implementation (Victor, 2001, pp. 109–110). Furthermore, the flexibility of the protocol is not sufficient and the need for developing a separate protocol under the UNFCCC which "may have the greatest potential to deliver the flexibility needed to provide incentives to curb deforestation" (Forneri et al., 2006, p. 291) was argued to be necessary.

The next pivotal policy was the adoption of the UN Millennium Declaration in 2000 which resulted in UN countries committing to the implementation of the UN Millenium Development Goals (MDGs) going forward to 2015. The goals were the precursor for the 2015 UN Sustainable Development Goals (SDGs) and consist of eight goals: (1) eradicate extreme hunger and poverty; (2) achieve universal primary education; (3) promote gender equality and empower women; (4) reduce

child mortality; (5) promote maternal health; (6) combat HIV/AIDS, malaria, and other diseases; (7) ensure environmental sustainability; and (8) global partnership for the goals. These goals, although important and foundational for the UN SDGs were very broad, giving little detail to the implementation or to specific targets under each goal such as goal 7 or very specific meaning the exclusion of important aspects such as goal 6 (United Nations, n.d.-a).

The MDGs and the SDGs are, as mentioned, directly linked. The SDGs were launched at the 2012 Earth Summit in Rio – 20 years after the launch of the Rio Declaration and the establishment of the UNFCCC. These goals set out clear and practical measures for how to implement and ensure sustainable development while still being flexible enough to adapt them to local contexts and thereby function on multiple levels correcting previous policy mistakes (United Nations, n.d.-a). One article even categorizes the new goals as having the "potential to create a more holistic rubric for the ways in which countries undertake climate action and make commitments to one another" (Morgan & Waskow, 2013, p. 21). However, the same scholars also stress that for these goals to be successful, **equity,** in the form of social, environmental, and economic equality, needs to be included even though it is not specifically mentioned in the declaration. They, nevertheless, appear optimistic and argue that there is "palpable readiness to consider new and innovative approaches to solve this challenge" amongst the signing countries (Morgan & Waskow, 2013, p. 21). This finally led to the adoption of the 2030 Agenda for Sustainable Development and the launch of the concrete UN SDGs in 2015 at the UN Sustainable Development Summit in New York.

In the same year, the Paris Agreement was also adopted and signed by 175 parties – today 194 parties. The agreement to keep global temperature rises below 1,5°C. Alongside this, the signing partners will also monitor and report their progress and goals to reach this agreement through NDCs (United Nations, 2022). Through this system, it is possible to reach transparency of each party's pledges for action and long-term goals for mitigating the climate crisis. This kind of system has both pros and cons. The major concern with it is that compared to the Kyoto Protocol the Paris Agreement is not legally binding and therefore has "no established state practice and judicial procedure" (Turkamani, 2021, p. 335). Instead, the agreement focuses on the principle of public and international pressure or "name-and-shame" (Turkamani, 2021, p. 322) and thereby relies on pressure from the global public to incentivise radical changes to national environmental policy. Using the name-and-shame system might cause issues due to a lack of accountability but at the same time, it also ensures that countries have more flexibility for implementation. This would in turn ensure the largest emitters with the most resources and capacity is put under the most pressure to create change.

The latest development of the global environmental strategy was formed at the 2021 COP26 in Glasgow. This broad along the finalisation of the Paris Agreement rulebook which was changed at the last minute and parties signed on for phasing down and not phasing out coal. A decision which has met a lot of critiques. Nonetheless, the parties also agreed to halt and reverse deforestation, reduce methane emissions, and speed up the switch to electric vehicles (UN Climate Change et al., 2021, p. 5). The topic of nature and NBS were also a big topic at the COP indicating an acceleration of the global development, and a shift in perspective of nature now being viewed as an important ally in solving the climate crisis.

3.3: Environmental Policy Making

The development approaches to environmental policymaking have been defined and refined by scholars through decades as a framework for how these policies are developed. This has resulted in four major approaches used in policymaking today: National Pattern Approach (NPA); Policy Sector Approach (PSA); Multi-level governance (MLG); and Temporal Pattern Approach (TPA). All of these are included in the creation, implementation, and current policy development practices of the NDCs.

NPA emphasizes national institutional features that affect public policies such as the relationship between state and church, central and federal-state system or polarized government, and cross-party political coalitions (Hill & Varone, 2017, p. 108). Hill & Thorne (2017) uses the argument of Arend Lijphart who gives the example that public policies will differ depending on the character of the democracy being either consensus or majority. In a consensus democracy, the minority would be able to veto certain policy changes meaning a long and gradual policy process whereas in a majority democracy the majority rule would speed up this process. These national processes are also found in the NDCs since the implementation of policy changes depends on how fast governments can pass these through (p. 108-109).

PSA assumes that the generic character of policy sectors is “more influential than constitutional institutions and national patterns to explain policy processes and outputs” (Hill & Varone, 2017, p. 112). This means that policymakers should pay more attention to policy stakeholders and the technical and economic context of these sectors since the advocacy coalition framework would suggest that the “policy process is seen as a fierce competition between coalitions of actors who advocate beliefs about policy problems and solutions” (Hill & Varone, 2017, p. 112). This means that the groups of stakeholders who agree on the most basic values are more likely to form policy

coalitions. Within the NDCs this is seen as well, since the groups of stakeholders who have environmental sustainability as a value are more likely to collaborate with stakeholder groups who do the same.

MGL is one of the most common areas within the international regime approach to policy making. It relies on multiple-jurisdiction political, global, or regional decision-making which is built on complex forms of governance and intertwined networks of political actors. Within this approach, multiple mechanisms are at work such as the supranational imposition of law on domestic policy such as European Union (EU) laws, voluntary engagement in global negotiation and cooperation, strong economic interdependence affecting regional markets and transnational communication inspiring the spread of favourable domestically adopted policies (Hill & Varone, 2017, pp. 114–115). Within the NDCs this is also seen since countries voluntarily engage in signing the Paris Agreement and in setting their NDCs and draw inspiration from other countries' strategies and cooperate across borders.

TPA is the study of public policy creation over time and is at its foundation analytical. Therefore, decision-making is not rational-comprehensive meaning that not all policy opportunities are assessed since preconceived notions of what is rational are dependent on the existing system. In short, this means that old habits die hard and that the relation between facts, values, ends and means will always be socially and not rationally constructed. Policymaking is therefore dependent on stakeholders negotiating and bargaining favourable outcomes. This results in policy changes being small and incremental unless there are multiple of them occurring simultaneously (Hill & Varone, 2017, p. 116). In the NDCs this is also seen by countries having difficulties creating radical changes to existing policies resulting in incremental expansions of existing sustainable practices instead. Furthermore, it means that decision-making depends heavily on the outcome of political negotiations which often involves compromises resulting in smaller policy changes. However, radical changes are slowly emerging on the international level due to simultaneous incremental changes made by many countries driving the global sustainable transition.

3.4: Contemporary Environmental Policy Making

Despite the positive progression in the global debate on the climate crisis, contemporary environmental policymaking still must overcome many challenges. The main challenges include questions of coherency, equity, approach, and risk assessment.

Asselt & Zelli (2014) argues that the positive progression cannot continue before policymakers start focusing on linking climate mitigation strategies and ensuring inter-policy coherence instead of

searching for a perfect governance architecture to solve fragmentation in global climate mitigation (p. 138). This fragmentation means that there exists a lack of coherence between different levels of climate mitigation causing confusion and dragging out an implementation which needs to happen fast. However, one of the progress seen in the global climate debate is the shift from a conversation about what is causing global warming to how we are going to "ensure that billions of at-risk people and businesses around the world can rapidly adapt and ensure that their communities are as resilient as possible" (Verkooijen, 2018). Simultaneously, we have also shifted to accepting that "climate extremes are not the new normal" (Verkooijen, 2018). This means that for policymakers, adaptations to these damages are still essential and large insurance-related obstacles are foreseen to escalate related to losses within industry affecting national GDP. And since the largest emitters usually go unscathed from climate disasters, which tend to hit those with the lowest emissions, the debate is shifting focus to who is responsible and who should pay for the damages? (Verkooijen, 2018). This implies that the global community to a larger degree is starting to concern itself with questions of equity when it comes to developing sustainable policies.

Scheyvens et al. (2016) also argue that policymakers are using the wrong approach since they expect businesses to carry the heavy load of sustainable development. They argue that the implementation of the UN SDGs focuses too much on the contributions of the private business sector and argue that the "reality is that business is not a superhero or 'magic bullet'" (p. 380). They believe that the first step is for policymakers to acknowledge the problematic duality in the corporate industry simultaneously causing and solving the climate crisis. Furthermore, they argue that what is needed is a holistic approach to sustainable business management which "move beyond a 'business-as-usual' approach and towards the transformation of the fundamental neoliberal agenda shaping how business and society operates" (p. 381). They argue that the UN SDGs do just that by suggesting a move from corporate social responsibility to corporate social obligation. The distinction between the two is that responsibility is voluntary whereas obligation is not which would force corporations to take responsibility. Similarly, Stahl & Cimorelli (2020) argue that policymakers need to apply a more transdisciplinary approach to policymaking since it "seeks to build knowledge not previously known to any of the single disciplines" (p. 49) making it a more holistic approach as well. They further argue that having a transdisciplinary approach can contribute to the 'cross-fertilization' of ideas and understanding leading to "achieving innovative goals, enriched understanding and a synergy of new methods" (p. 49).

The assumption that the approach to sustainable development requires a transdisciplinary and a more holistic view, is agreed upon by Collins & Sachs (2021), who argue that "a more holistic and proactive approach is needed to avoid small risks becoming significant barriers to change". They specifically identify the large focus on economic trade-offs for decarbonization as a large barrier and argue that proceeding with this strategy will affect all facets of life. Additionally, they identify 7 other risk categories: financial, societal, environmental, technological, energy-related, geopolitical, and corporate. This indicates that the issue of creating sustainable development is affected by and affects all sectors of society underlining the need for a holistic approach. Finally, they argue that this development will cause a lot of turmoil and that therefore "being proactive about this disruption must be an integral part of the world's climate change strategy" (Collins & Sachs, 2021).

3.5: Moving Forward

From all of this, it can therefore be said that what is needed to go forward with the development of sustainable climate mitigation policies is a foundation building on the latest addition within global environmental policy: Nature. Furthermore, the issue of making this foundation equitable, coherent, multi-level, transdisciplinary and holistic is also essential. Diving into the realm of the Anthropocene and finding common ground between man and nature, the theoretical principles of Political Ecology and the rational and fact-based characteristics of NBS could prove to be a combination yielding the radical changes to global environmental policy that is needed to solve the climate crisis.

4.0: Theory

4.1: Introduction

The question of the degree and evaluation of sustainability in environmental policies has for some time been an issue for those who seek to mitigate the climate crisis. How can we successfully know if environmental policies will give the predicted sustainable outcome? This question is of course also a matter of circumstances and modes of implementation but ensuring that sustainability is at the top of the list of priorities in the policy development process could save valuable resources and prevent the implementation of 'greenwashed' policies. When focusing on NBS policies this is increasingly relevant since the concept overlaps both social and natural sciences.

In this section, I seek to explain the definitions, shortcomings, similarities, and possibilities of both the theory of political ecology and the concept of NBS. Due to the scope of this thesis being the investigation of the degree of sustainability in environmental policies I will first make a clear definition of what constitutes sustainability.

4.2: The Concept of Sustainability

As mentioned in the literature review above, the "Environmental Perspective to the Year 2000 and Beyond" guidelines from 1987 were the first appearance of sustainable environmental development (Jackson, n.d.). Multiple definitions of sustainability have since emerged.

In an article from 2017 Purvis, Mao & Robinson details three different models for sustainability as shown below:

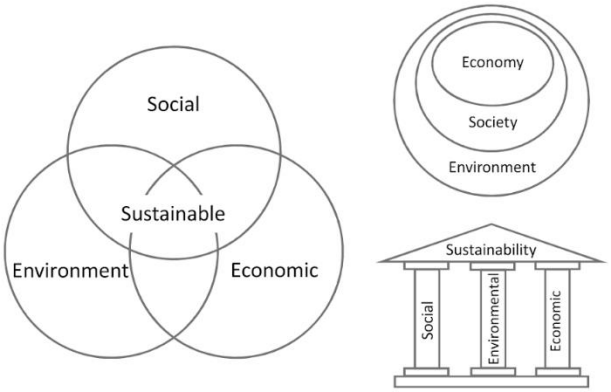

Fig.1, 2 & 3: Three pillars of sustainability (Purvis et al., 2019, p. 682).

Fig. 1 above consists of three spheres - *social*, *environmental*, and *economic* which intersect and in the intersection between all three *sustainable* is placed. This indicates that the inclusion of all three elements is essential. At the same time, the three elements also take the same priority. This is also commonly known as the **Venn-diagram model** (Purvis et al., 2019, p. 682).

Fig. 2 shows the same three spheres as the first model but placed within each other. Here the inner circle is *economy* enclosed by *society* enclosed by *environment*. This indicated **interdependence** between the three spheres meaning that *economy* is dependent on *society* which again is dependent on *environment.* It is then implied that taking the interdependence between these spheres into account would create sustainability. This is also commonly known as the **bulls-eye model** (Purvis et al., 2019, p. 682).

In Fig. 3, we see the same spheres - *social*, *environmental*, and *economic* but represented as pillars instead. On top of that sustainability creates a roof for these pillars. This suggests a greater separation of the three elements but that all three are still equally important to reach sustainable results. This model is sometimes also represented as a **three-legged stool** and is therefore also known as such (Purvis et al., 2019, p. 682).

In the process of developing the "2030 Agenda for Sustainable Development", in order to implement the UN SDGs, a foundation for what constitutes sustainability was also created – the five P's (United Nations, n.d.-b):

1. *People* entail the involvement of individuals and communities. Here the main goal is to secure safety and a minimum standard of living for all people so they may "fulfil their potential in dignity and equality" (United Nations, n.d.-b).
2. *Planet* entails the entirety of the globe and every living organism on it and complex ecosystems. Here the main goal is to protect against natural degradation, overconsumption and exploiting resources. This is solved through taking actions to combat climate changes and ensuring a stable environment for this and future generations.
3. *Prosperity* entails that all humans and society including the global economy, social progress, and technological advances are made in collaboration and harmony with the natural environment and ecosystems.
4. *Peace* entails that societies be inclusive, peaceful, and just so that all humans get the opportunity to live without fear and violence. The main assumption in this is that sustainable development is impossible without the creation of peace and security.
5. *Partnership* entails the mobilization of the means necessary for the implementation of the 2030 Agenda through global partnerships. These are based on solidarity, the needs of the poor and vulnerable and the participation of all – countries, communities, and individuals.

From this definition of sustainability, we again see the three elements - *social, environmental,* and *economic,* repeated respectively in P's 1, 2 and 3. Whereas P's 4 and 5 concern themselves more with strategy, foundations for sustainability and necessary actions for implementation.

Based on the above definitions I will therefore use the following interpretation of the concept of sustainability: Sustainability contains within it three foundational and intertwined elements - *social* including the well-being of present and future societies, communities, individuals, and their related challenges; *environmental* including all ecosystems, organisms, and resources and their related challenges; and *economic* including individual, national, and international economic stability and opportunity including related challenges. The inclusion of all factors and overlapping effects within and between all three elements into solutions will lead to sustainable practices.

4.3: The Theory of Political Ecology:

The core of political ecology lies within the social and not natural sciences. However, the core of political ecology is difficult to specify despite its many scholars and decades of research. The many definitions of what characterizes political ecology vary greatly, but all scholars centre around understanding, analysing, explaining, and predicting human-nature relations.

Most recently the authors of the Political Ecology Playbook, Osborne et al. (2021), have defined political ecology as ecosystems that reflect unequal political, economic, and power-related relations. They argue that human and nature relations are intertwined and that political ecology is built on the assumption that:

"If no environment can be understood outside of politics – the asymmetrical power relations that shape environments and land use – then restoration initiatives must attend to social, political, and economic processes" (p. 2).

They further argue that the fundamental matter of equity in human-nature relations can create conflicts over access to ecosystem services, resources, and control across borders if it is not balanced.

Previously the primary focus of political ecology was defined by Heynen et al. (2006) as the task to "untangle the interconnected economic, political, social and ecological processes that together form highly uneven urban socio-physical landscapes" (p. 16). Again, this suggests that political ecology is the study of human-nature interactions which are often unequal. Nevertheless, this definition also implies that the economic, political, social, and ecological processes are elements that can be 'untangled' suggesting that they can be studied separately from nature. This could cause issues if not all aspects of complex human-nature relations are included.

Compared to the definition of political ecology developed by Robbins (2020) this is an interpretation which attempts to separate the spheres of politics and nature even though they are closely connected. This is the case since he views the interconnection of these processes as a holistic system meaning that political ecology is "predicated on the assumption that any tug on the strands of the global web of human-environment linkages reverberates throughout the system as a whole" (p. 10). He further distinguishes between political and apolitical explanations for environmental changes. The distinction he makes lies between decision-makers "blaming proximate and local forces" (p. 10) and investigating larger systemic issues in society which according to Robbins (2020) can be "fixed" (p. 10). An example of this would be to explain poverty with overpopulation or eco-scarcity instead of investigating underlying political structures which keep people in poverty. Together with the close

connection between human-environment linkages, Robbins view human-nature relations as interrelated and interdependent meaning that any change in these processes will affect the others.

More specific to this thesis case the notion of human-nature relations within environmental policies is detailed the best by Forsyth (2003) who characterizes the roles of both natural science and politics. He critiques scholars of political ecology for separating the natural and social sciences and upon that develops a sub theory called **Critical Political Ecology**. His theory assumes that "a "critical" political ecology may be seen to be the politics of ecology as a scientific legitimization of environmental policy" (p. 4). By this, he means that natural science should act as a way of legitimising environmental policies and preventing the separation of the two fields.

Another view on what constitutes political ecology is Peet & Watts (1996) who argue that the academic fields involved in political ecology can be categorized as "a confluence between ecologically rooted social science and the principles of political economy" (p. 6). This means that, in their view, the role of political ecology is to connect the fields of social science, ecology, economy, and politics functioning as an interdisciplinary field supplying a holistic overview of complex issues. However, what needs to be considered is the relatively new age of the concept of the Anthropocene which did not enter the field until 2002 (see p. 14). Therefore, what is often seen with political ecology academia is an overrepresentation of social science, economy, and politics and underrepresentation of ecology. This reinforces the unequal power relations within the Anthropocene where humans have the upper hand.

When comparing these four elements of political ecology to the three elements of sustainability - *social, environmental,* and *economic* (see p. 22), we see a large overlap. The only element which is missing is politics. However, it can be argued that politics is the governing agent and therefore exists intrinsically within all three elements either in the middle of the three spheres (see fig. 1) or lying on top of the pillars (see fig. 3). Moreover, the core elements of political ecology also have similarities with the five Ps for the "2030 Agenda for Sustainable Development" (United Nations, n.d.-b). As mentioned, the *social, environmental,* and *economic* elements are represented by the first three P's while the strategy elements of the P's 4 and 5 would include more political aspects – although politics could be argued to be included in all three P's. Compared to all the models for sustainability, whether in general or for the UN SDGs, we can see that political ecology not only works with the same elements and incorporates them into the core of the field, but also that political ecology could play a vital role in conceptualizing sustainability, especially within sustainable environmental policies – connecting human-nature relations to modern-day politics.

4.4: The Ecological Pitfalls of Political Ecology

As with all theories, there are pitfalls within political ecology as well which must be addressed before I continue the investigation. Two main points of critique dominate the field: the insufficient inclusion of nature; and academic elitism resulting in distance to the real-life context.

Firstly, the insufficient inclusion of nature has been critiqued by many scholars. Osborne et al. (2021) give the example of the international forest agenda (UNFCCC, n.d.) which does not properly include nature since they implement large-scale operations where they plant monocultures that do not create biodiversity. Furthermore, the authors also argue that the project disregards the abundance of ecosystem services such as food security, protection from extreme weather, and access to clean water that comes with rich biodiversity – something which the project does not consider.

This insufficient inclusion of nature was earlier argued by Heynen et al. (2006) to be a tendency in Western culture and civilisation which, in the view of the authors, have developed for centuries along with the belief that separating culture from nature is possible. Heynen et al. (2006) argue that "the stunning question today [is] [...] how western ideologies could have got to the point of flattering themselves so successfully that they were somehow separate from nature" (p. xii). When looking at the example above, this belief in separation is still applicable today.

The separation of humans and nature is exactly what Forsyth (2003) is warning against in his theory of Critical Political Ecology. He builds this on the back of several scholars including Shephard & McKinley who argue that the basis for human life is not humans but "ecology in general where human ecology is to be found. Ideas themselves are inseparable from nature and the study of man in nature" (In: Forsyth, 2003, p. 6). Forsyth (2003) also makes use of the scholar André Gorz who argues that human-nature relations are dependent on ecological life meaning that "all productive activity depends on borrowing from the finite resources of the planet and on organizing a set of exchanges within a fragile system of multiple equilibriums" (In: Forsyth, 2003, p. 7). From these scholars, it becomes clear that nature is vital for all human activity and that human-nature relations might be more accurately called nature-human relations – putting nature first. Forsyth (2003) continues to argue that the consequences of not including nature properly can have dire consequences for the global climate. He argues that the critique of natural science amongst constructionists is an immature approach to political ecology which is "harmful because […] it undermines efforts to save wilderness and biodiversity." (pp. 19-20).

Another consequence of the insufficient inclusion of nature is that it limits the entire academic field of political ecology since the core elements of political ecology - *social, environmental, economics* and *politics* would not be equally included and ultimately downplaying the role of nature

and the effects of climate changes could have catastrophic consequences for the quality of life for people on the planet. This is, for instance, argued by Turner (2016), who stipulates that "if scholars were to see political ecology as inhospitable to ecological engagement, there would be a cost to the study of human-environment relations more broadly" (p. 418). He furthermore argues that the demise of political ecology as a field involving itself with natural science is false and that the possibility for a deeper inclusion of nature into the core of political ecology is still achievable (p. 417). Essentially, the tendency among scholars within political ecology to exclude the ecological part of political ecology by excluding the importance of nature.

Therefore, an alternative way of including nature in political ecology is necessary to move toward more sustainable environmental policies. An alternative to the current practices could be found in a more holistic approach with a foundation in nature like Critical Political Ecology where natural science is used as a legitimation for political decision-making.

4.5: The Political Pitfalls of Political Ecology

The second critique of political ecology is that there is a growing tendency for scholars to be distant from the 'action' of the field and only pursue academic research.

It is argued by Walker (2007) that this distance creates an enhanced sense of academic elitism within the field – meaning that political ecology is only being practised for academic purposes and for speaking at conferences with other like-minded individuals. He, therefore, argues that academics spend their time agreeing with other elites about issues concerning underdeveloped nations that are suffering the real-life consequences of social, economic, and environmental issues (p. 365). Walker (2007) continues to argue that this is in part due to internal structures in the field which does not focus enough on 'giving back' to the vulnerable communities that the field centres around. He argues that since "political ecology has no articulated guidelines to effect positive change; that it is largely extractive as well as ineffectual, powerless [and] apolitical" (p. 366). To alter this, he suggests beginning internally by applying "vigilant, critical self-awareness" (p. 366) to academic work such as investigating what the field contributes to societal changes and developing guidelines for 'giving back'. Finally, Walker (2007) argues that political ecology could have a much broader application within i.e., policymaking. This is, however, hindered by scholars' tendency to only criticize existing policies instead of guiding policymakers and the unnecessarily complicated use of language means that scholars' "work is unlikely to be read and understood, much less acted upon." (pp. 366-367).

Political ecology is also criticized for current practices which do not properly take social issues into account. Osborne et al. (2021) exemplify this by arguing that to obtain true sustainability you must include social equity in society since **environmental issues reflect social inequalities**. Just as above, Osborne et al. (2021) use the example of the international forest agenda (see p. 26) that instead of focusing on improving social inequality "overvalued market logics and return on investment, while downplaying social goals, prioritizing top-down project design at the expense of community engagement and local governance" (p. 2). From both Walker (2007) and Osborne et al. (2021), it is clear to see that the main issue is the normative and strictly political approach which does not consider actual quantitative evidence but instead is driven by top-down political agendas, capitalist market models and academic overthinking. What is desperately needed is something concrete that can guide policymakers in developing sustainable environmental policies which are not based on winning votes, making profits, or speaking to the elite.

Osborne et al. (2021) suggest such a solution in their "10 principles for Ecosystem Restoration". Their principles function on local, national, and international levels and can help to guide policy processes toward sustainability. These principles are: (1) investing in Indigenous People's knowledge and rights; (2) increasing participation by local marginalized groups; (3) ensuring that restoration benefits go to local communities; (4) ensuring local stewardship guided by local needs; (5) align national policies to support restoration efforts and not degradation; (6) decentralize political responsibility and make rights-based governing structures; (7) align international finance, policies and laws with restoration and not degradation of ecosystems; (8) shift the view on restoration to a means to an end - securing social and economic equity rather than economic cast-off; (9); finance restoration in the global south with resources from the global north; (10) create cross-border international collaboration on restoration.

The principles are not only concrete strategies and actions which can guide governments on local, national, and international levels with decision-making; they are also an addition to other strategies. This means that they "can be used to shape restoration agendas worldwide, alongside [...] Naturebased solutions" (p. 2). However, they are still very broadly defined and need more specific details before the level of implementation and would probably be suited best for national rather than local levels as they are good for making broad overarching strategies. Nevertheless, these principles do not offer small-scale evaluation of policies or specific guidance on the elements which must be included to create sustainable environmental policies – whether these be concerning restoration or not. Therefore, a concrete tool for policymakers to help guide the development and creation of

environmental policies is still missing. However, these principles do move away from the top-down technocratic approach within political ecology and offer something closer to the 'action' within the field. This is an important point since creating a system that only works on paper is worthless.

4.6: The Concept of NBS

As a counterweight to the concept of the Anthropocene where humans have power over nature, the concept of NBS has been developed to refocus attention on the power of our natural environment. NBS as a concept has over the last couple of years gained enormous attention and backing amongst experts in both climate change, policies, and development. This is argued by Cousins (2021) who agrees that "in a short amount of time, NBS have seen a rapid rise in academic and policy discourse" (p. 1) and further details that the NBS agenda is thriving especially within the International Union for Conservation of Nature (IUCN) and the European Commission (EC). This can be seen within the IUCN (2022), an independent international organization working to protect the global environment, which developed several programmes such as the Global Ecosystem Management Programme, the Global Protected Areas Programme and the Global Forest and Climate Change Programme. And within the EC (n.d.), the executive branch of the EU, they have developed programmes such as Horizon 2020 and BiodivERsA ERA-Net. Actively using nature as a method for environmental policies can therefore be argued to be one of the up-and-coming methods within climate mitigation.

4.7: Defining NBS

Despite this newly regained traction amongst decision-makers, not many NBS initiatives have been implemented successfully which might be due to the tricky size of the concept which is hard to define. Therefore, a short overview of different definitions is necessary to determine the nature of NBS.

NBS was first used in 2009 at COP15 in Copenhagen. NBS was used by the IUCN (2009) which urges and stipulates that these solutions can be an "integral part of broader adaptation and mitigation plans and strategies [...] [and] can harness the potential of healthy and well-managed ecosystems to build resilience and reduce the vulnerability of people to the impacts of climate change" (p. 3). Despite the unambitious outcome of COP15, this indicates heavily that just like political ecology NBS is mainly involved with human-nature relations, confirms the aforementioned traction of the concept and indicates how it could help reshape the narrative of the Anthropocene that puts man before nature.

Since COP15 more definitions of NBS have been developed. Firstly, the IUCN has made a more clear-cut definition defining NBS are "actions to protect, sustainably manage, and restore

natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (IUCN, 2022). This definition, although containing some of the same traits as the first version, has the added elements of different ways to work with ecosystems and the direct services these could provide to local communities. This approach has therefore become easier to adapt and focused on local levels.

Another definition is by the EC (2015) who defines NBS as "actions inspired by, supported by or copied from nature; both using and enhancing existing solutions to challenges, as well as exploring more novel solutions, for example, mimicking how non-human organisms and communities cope with environmental extremes" (p. 24). Compared to the IUCN the EC's definition is positioned more within the realms of nature and therefore focuses less on the human element of *human-nature* relations – meaning that the definition to a larger degree can be described as a *nature-human* relation. This could be an issue since these relations are always intertwined and interdependent so excluding one side of the equation could result in increased inequality or failing solutions that would not benefit vulnerable communities.

NBS has also been defined by the WWF (2020) who defines them as "ecosystem conservation, management and/or restoration interventions intentionally planned to deliver measurable positive climate adaptation and /or mitigation benefits that have human development and biodiversity co-benefits managing anticipated climate risks to nature that can undermine their long-term effectiveness". In contrast to the previous definitions, it builds on separate human and nature elements which, with the indication of 'and/or', can be included together or separately in the solutions. This separation of environmental and social issues is similar to what Forsyth (2003) warns about – the separation of natural science and politics. Similarly to the EC definition, the WWF definition also risks excluding either the *human* or *nature* part of human-nature relations which NBS works with. This can result in the failure of solutions due to the intertwined nature of these two where one will always affect the other.

4.8: The Risks of Exclusion

As a result of the exclusion of either *human* or *nature* in the above definitions Cousins (2021) argues that two major risks must be corrected in the current definitions of NBS for successful implementation. He argues that NBS is intended to restructure human-nature relations more sustainably but that the risks represent a 'dark side of transformation' which could result in "shifting burdens of adaptation onto vulnerable populations or maintaining the status-quo" (Cousins, 2021, p.

2). The first risk, he argues, is that "the inclusion of the wider public and the equitable distribution of benefits and risks is a key component of designing NBS" (Cousins, 2021, p. 2). He further argues that we need to "reframe nature-based solutions around issues of justice and empowerment—towards just nature-based solutions" (Cousins, 2021, p. 2) and that this must be done through addressing the "social, political, and economic relationships that produce inequality and injustice" (Cousins, 2021, p. 2).

The first risk which needs correction is therefore the inclusion of justice in the design of NBS through addressing the interconnected relations between social, political, and economic components, similarly to the IUCN definition. This is in agreement with the viewpoints of Forsyth (2003) since the separation of science and politics needs to be prevented with the inclusion of equity of benefits and resources for local communities. Finally, this viewpoint is also shared by Osborne et al. (2021) and Heynen et al. (2006) who agree that equity or inequality set the boundaries for social and economic activity which humans depend on, and which is produced and reproduced.

The second risk is that successful NBS requires that we "define nature as a site of power, which produces an uneven distribution of risk and opportunity" (Cousins, 2021, p. 2). This is also similar to the arguments of Forsyth (2003) who also defines nature as the site of power by arguing that natural science should be used as legitimation for environmental policies – hence nature defines the boundaries and possibilities for human activity. Based on these risks, it is therefore essential that when defining NBS it is extremely vital for the success of the implementation phase to (1) include social justice to ensure social progress (2) and acknowledge nature as the site of power containing the natural boundaries and possibilities in which these NBS are to be implemented.

4.9: NBS and the Lack of Social Science

Another similarity between NBS and political ecology is their common overlap with sustainability and therefore also the foundational pillars of sustainability (see p. 22). However, the concept of NBS is much more rooted in the environmental pillar than in the social and economic pillars. Nevertheless, it can be argued to contain all three since the NBS seeks to solve social and economic issues such as health, infrastructure, nutrition, access to resources, employment, financial independence etc. through the implementation of NBS such as restoration of forests.

Despite these recommendations to include social issues better into NBS the global deputy lead for climate and energy from WWF, Vanessa Pérez-Cirera, argues that NBS can play a vital role in mitigating the global climate crisis but that we need to see a "step change in both finance and policy"

(WWF, 2021). Contrary to the critique of political ecology NBS is being criticized for not including social and political elements properly and therefore, opposite to political ecology, being founded too much in natural science – essentially regarding human-nature relations as nature-human relations.

4.10: NBS in This Thesis

The similarities between NBS and political ecology can therefore be seen above. Specifically, they overlap in their inclusion of the three pillars of sustainability – *social*, *environmental*, and *economic*. However, the concept of NBS is, as mentioned, more rooted in the environmental pillar due to its focus on nature as the solution.

When considering definitions, risks, and the character of NBS it is, therefore, important to ensure a holistic inclusion of all three pillars when developing NBS. Concretely in this thesis, the concept of NBS will therefore be defined as: (1) actions taken to mitigate risks of environmental and interrelated social and economic degradation; (2) nature as the site of power determining the boundaries and opportunities for actions taken; (3) environmental issues in the form of ecosystems, biodiversity or restoration; (4) social issues in the form of uneven opportunities, human development, vulnerable populations or communities and social justice; (5) economics in the form of employment and independence related issues and distribution of benefits and expenses; and (6) sustainable NBS policies as the means for implementation.

From this section, we can therefore see that political ecology and NBS have similar but opposing foundational issues. Both agree on including the three pillars of sustainability – *social*, *environmental*, and *economic* but both fail to include all three holistically. Where political ecology is criticized for not including enough natural science and relying too much on political explanations for the academic elitism in their practice, NBS is accused of the opposite - not including social and economic issues properly and not making use of policies enough. Therefore, when investigating the degree of sustainability in environmental policies a fusion of political ecology and NBS could lead to a foundation that considers both environmental and social issues and recognises nature as a boundary-setting agent and utilizes policies that push forward the mitigation of the climate crisis. To sum up, what is needed is a tangible model which can evaluate the degree of sustainability of NBS in environmental policies.

4.11: Critical Political Ecology and NBS - A New Approach

A new and tangible model which combines critical political ecology and NBS would be built on the assumptions stipulated above: (1) that political ecology inherently is too far removed from the action

of the field and criticized for exclusively working from a theoretical and nature-remote perspective; (2) and that NBS is being criticized for not sufficiently including social issues in the policy suggestions and not utilizing policies adequately to push forward sustainable climate mitigation. The alternative model will therefore be based on the hypothesis that **a combination of Critical Political Ecology and NBS** will balance them out – combining the theoretical and political basis of critical political ecology with the tangible and scientific approach of NBS. Therefore, the theoretical viewpoints of critical political ecology as developed by Forsyth (2003) in combination with the critical viewpoints on NBS as developed by Cousins (2021) are the best candidates to support this new model.

Drawing on Forsyth (2003) and Cousins (2021) we must therefore place nature as the bedrock, foundation, and site of power for policy development of NBS and we must ensure the inclusion of social and political issues ensuring justice for local communities – all of which must be done holistically to avoid the separation of *humans* and *nature* when working with *human-nature relations*. In practice, this means that a prior investigation into planetary boundaries and the complexity of ecosystems to determine how to use NBS as a sustainable solution is necessary. It further means that investigating justice and equality for local communities and Indigenous Peoples at the site of implementation must be done as well. This includes both social, environmental, and economic justice. Finally, the findings from these investigations must be prioritised in the final NBS policy design and implementation plan to create long-lasting sustainable solutions. By doing this the premises of both critical political ecology and NBS will guide the policy process.

A new model would therefore serve the purpose of evaluating current NBS policies and help determine their degree of sustainability as I will do in the analysis. This means that the new model in practice will fuse critical political ecology and NBS and consider that solutions should aim for: (1) being the main driver for actual action and not just an academic discussion to mitigate the climate crisis; (2) having nature as the site of power and foundation but bringing more tangible methods of natural scientific investigation to the table; (3) incorporating the three pillars of sustainability - *social, environment, economic* (see p. 22); (4) and lastly developing concrete holistic solutions to these complex and intertwined issues.

4.12: The NBS Policy Evaluation Model

Based on the theory above a tangible model to evaluate the degree of sustainability in environmental policies can be constructed. For this thesis, the model will only take into consideration the policy process of the NDCs and not work with transnational, regional or global levels. The elements of this model are: a foundation of *Nature*; pillars of *Social, Environment* and *Economic*; and a roof of *NBS Policies*. The model is constructed like a house to illustrate the interdependent relations between the different elements. Hence, the roof is dependent on the pillars which are dependent on the foundation as illustrated in the figure below:

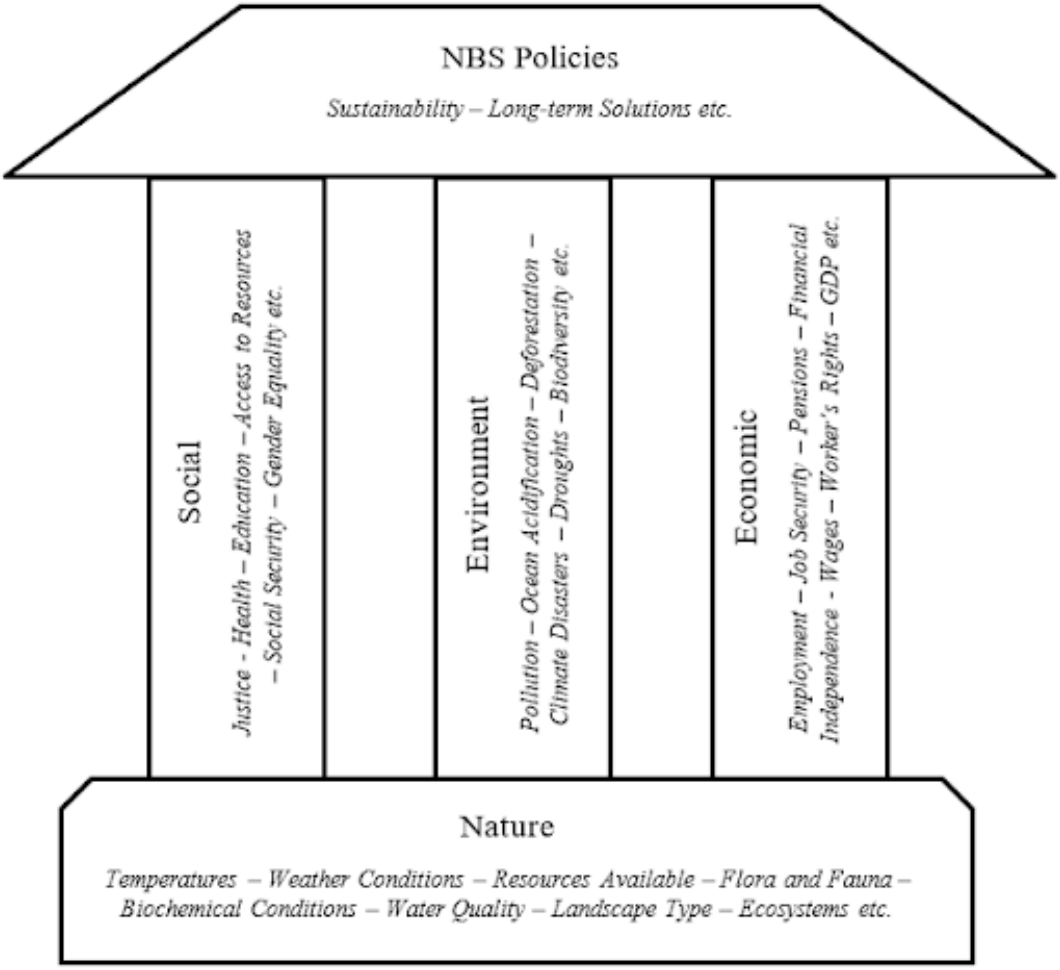

Fig 4: The NBS Policy Evaluation Model

Foundation: Nature

The foundation of the model is *nature*. What is meant by nature is the circumstances and surroundings of the geographical site of implementation. Nature consists of the naturally occurring planetary boundaries which dictate what is possible, and what is not for human development and which human activity depends on. Included in these planetary boundaries are temperatures, weather conditions,

resources available, flora and fauna, biochemical conditions, air quality, water quality, type of landscape i.e., forest, desert, swamp, ocean, lake, tundra etc. Also included in nature as a foundation are the solutions which can be implemented, meaning that nature dictates what is possible to implement, and ultimately which solutions will be successful, and which will not. The foundation of the model is therefore mainly based on natural science, testing, and tangible facts legitimising which solutions would be feasible and sustainable for implementation. This is the first step in developing sustainable NBS policies to be taken by policymakers – without it, the natural context will not be considered creating a mismatch between policy actions and the possibilities at the implementation site

Pillars:

The pillars of the model are the next step in the development of developing sustainable NBS policies. The pillars are based on the premise that all three of them must be included since *social*, *environmental*, and *economic* issues are intertwined and that one often has a spill-over effect into the others. Therefore, they should be used in the same sense as the pillars of sustainability (see p. 22) to create long-lasting sustainable solutions. Concretely, what must be considered is how the effect of the developmental changes will affect the local and global environment, indigenous and vulnerable communities as well as local and globally connected economic conditions and stability.

Pillar 1: Social

The first pillar, *social*, contains within it issues directly connected to the well-being of human individuals and the communities in which they are a part i.e., justice, health risks, education, access to resources, social security, social justice, gender equality, sanitation, civil rights, quality of livelihood etc. Hence, what lies within this pillar are social issues and challenges. Furthermore, the pillar contains the potential solutions which, within the planetary boundaries, can improve several social problems i.e., Indigenous land rights, increased local resources or ecosystems improving livelihoods, increased knowledge of local resources, increased knowledge of ecosystem management, increased certainty of solutions benefitting the coming generations etc. It is worth noting that these NBS must be based on local needs and interests meaning that the involvement of local and especially Indigenous people and vulnerable communities is essential.

Pillar 2: Environment

The second pillar, *environment*, contains issues directly connected to the degradation and exploitation of ecosystems i.e., pollution, ocean acidification, deforestation, climate disasters, melting ice caps, rising sea levels, droughts, the decline of biodiversity, and destruction of animal habitats etc. In other words, what lies within this pillar are environmental issues or challenges. Additionally, the pillar contains the potential solutions, within the planetary boundaries, that can help restore, conserve, and integrate complex ecosystems i.e., reforestation, restoration of coral reefs, sustainable farming, rehabilitation of species etc. Finally, it is important to note that this pillar is distinguished from the foundation in the sense that the foundation of *nature* dictates boundaries and possibilities whereas the pillar of environment describes problems and solutions.

Pillar 3: Economic

The third pillar, *economic*, contains within it issues directly connected to the economic stability of locally, nationally, and globally connected communities i.e., employment, job security, pension plans, financial independence, fair wages, worker's rights, financial stability, GDP, funding of development etc. Concretely, the pillar contains economic challenges and issues. Additionally, this pillar also contains possible NBS solutions that, within the planetary boundaries, can help improve economic problems i.e., jobs creation in ecosystem restoration, income from sustainable farming, improved working conditions, increased financial stability, fewer children in the workforce, financial independence for local communities from large capitalistic conglomerates etc.

Roof: NBS Policies

The roof of the model, *NBS Policies*, contains within it the ongoing political strategy for the implementation of NBS as well as the goal to push forward and raise awareness about sustainable development and reach agreements across communities and country lines. The NBS policies are placed in the roof of the model and depend on the foundation and the three pillars to be stable and resilient enough to truly be sustainable and have long-term solutions. In other words, the roof is dependent on the NBS policies being built on a foundation of *nature* within the planetary boundaries and with consideration and inclusion of *social, environmental,* and *economic* issues as well as how policies will affect these pillars during implementation. An example of this could be a policy seeking to rehabilitate coral reefs. The policy would mitigate local climate risks, increases local access to

ecosystem services, such as fish, and creates economic independence by increasing tourism, local community maintenance jobs and a steadier food source.

5.0: Analysis

5.1: Introduction

The attempt to practically apply the *NBS Policy Evaluation Model* will be shown in this section. In this section, I utilise the first three domains of the *CDC Policy Process Model*: (I) Problem Identification; (II) Policy Analysis; and (III) Strategy and Policy Development (see pp. 11-12). Under the first domain, I will give a short overview of the current issues within each case - *I: Problem Identification.* Under the second domain, I will apply the NBS Policy Evaluation Model when analysing the NDC policy reports from each case - *II: Policy Analysis*. Under the third domain, I seek to explain the implementation plan and the positive and negative traits of the respective policy strategies for each case - *III: Strategy and Policy Development*. The NDCs will by this be evaluated based on the inclusion of the elements of the model: *Nature, Social, Environmental* and *Economic.* As mentioned in the methodology section (see p. 12-13) I seek to analyse the cases of NBS policy actions in NDCs from Belize and PNG. This is done to investigate how the NBS Policy Evaluation Model can help evaluate the degree of sustainability of the NDC policy reports.

5.2: Belize

Belize is a small upper-middle-income country in Central America that had a population of 400.000 in 2018. The country consists of 22.967 km2 of land with 280 km of coastland – of this 95% is mainland while 5% are islands. In 2019, Belize ranked 110 out of 189 on the Human Development Index (HDI) and had a gross domestic product (GDP) of USD$ 2 billion with an annual growth of 2-3% over recent years (State of Belize, 2021, p. 3).

5.2.1: I - Problem Identification

Belize is highly affected by the climate crisis and has over the last decades experienced an increase in several types of climate disasters. Apart from this Belize also has social issues with 42% of the population living in poverty in 2009 and an average gross national income of $USD3.970 per capita in 2020 (Starista, 2022). Gender equality in Belize is also below the global average ranking 89 out of 189 countries. The Belizean economy is also experiencing difficulties such as high national dept of approx. 90%, a 9,4% unemployment rate in 2018, and a 15% decrease in the tourist sector in 2020 due to COVID-19 (State of Belize, 2021, p. 3).

In terms of climate changes, Belize is experiencing natural events such as droughts, floods, coastal erosion and changing patterns in rainfall. These climate disasters resulted in the Belizean economy losing 4% of its GDP annually (State of Belize, 2021, p. 5). Of these climate disasters river floods, urban floods, cyclones, extreme heat, and wildfires rank as a high risk of occurrence. Hereafter, coastal floods, earthquakes, landslides and water scarcity rank as medium risk of occurrence and only tsunamis ranked as low risk of occurrence (ThinkHazard, 2020, pp. 1–19). All these events not only affect the environment of Belize but also the vulnerable communities already living in poverty as well as the national economy which is primarily based on the service, tourism, agriculture and industrial sectors (State of Belize, 2021, p. 3). Amongst the smaller states of the world, Belize is ranked the third most susceptible to climate disasters and fifth among at-risk countries for climate change. More specifically the key vulnerabilities of Belize in terms of climate change are:

- Storms and hurricanes causing physical damages and flooding.
- Belize City which is prone to flooding due to its low geographical position and proximity to the coast – both in cases of hurricanes and sea level rises.
- Extreme heat affecting the agricultural sector - both crops and livestock.
- Ocean acidification and risk of water temperatures damaging the barrier reef.

And these are just the risks which are urgent matters today. Belize is projected to have temperature rises between 2-4°C by the year 2100. With that follows a 7-8% decrease in the rain season, a 6-8% increase in the dry season and a 20% increase in the intensity of rainfall in short periods which could damage agriculture, and infrastructure, and affect tourism even further. Additionally, Belize is also projected to experience an increase in erosion, contamination of coastal areas, sea level rises, flooding and the occurrence and intensity of natural disasters such as hurricanes (State of Belize, 2021, pp. 5–6).

This could result in Belize losing 10-20% of the value of their agricultural sector compiling to millions of dollars lost in revenue by 2100. The fisheries sector would also be heavily affected by warmer sea surface temperatures, ocean acidification, sea-level rises, and extreme weather events not to mention the 3.500 licensed fishers whose livelihoods would be at risk. It would also affect the national food security putting vulnerable communities at further risk. And finally, the Belizean GDP is also projected to lose an annual USD$12.5 million affecting heavily their ability to pay back their large national dept (State of Belize, 2021, p. 6).

When looking at the GHG inventory of Belize we can see that the largest emitters are the energy and agriculture sectors. Whereas the Waste, Industrial Processes and Product Use (IPPU) and International Bunkers (Caribbean Community Climate Change Centre, 2020, p. 20)[1] are the smallest emitters as illustrated in the table below:

Inventory sector (Total GHG Emissions/year)	2012	2015	2017
Energy	538.07	781.81	786.36
Industrial Processes and Product Use (IPPU)	31.43	42.50	43.69
Agriculture, Forestry and Other Land Use (AFOLU)	-7,771.37	-6,194.27	-6,683.66
Waste	22.73	19.89	26.81
International Bunkers	40.37	40.23	71.89
Total without FOLU (Forestry and Other Land Use)	832.19	1,107.46	1,194.71
Total with FOLU	-7,179.14	-5,260.07	-5,286.79

Table 2: Exempt from "Table 1. GHG emissions in the historical period (Gg CO2-eq)" (State of Belize, 2021, p. 7).

The Belizean NDC further elaborates on the numbers in the table above. The NDC states that they indicate an increase in the energy sector which primarily depends on biomass (50,1%) and crude oil (26,1%) but also relies on wood (11,7%), hydro (11,4%), and petroleum gas (0,7%). Additionally, Belize also imports 37% of their electricity from Mexico. The increase in the use of energy and the need for transporting energy into the country is an unsustainable problem leading to increased GHG emissions. Finally, it also risks creating a negative feedback loop with warmer weather requiring more air-conditioning which further increases the need for energy (State of Belize, 2021, p. 7).

Besides the energy sector the Agriculture, Forest, and Other Land Use (AFOLU) sector is also increasing in emissions. This is happening primarily due to forest land being converted into either grass or cropland due to the expanding agricultural sector. This is also an unsustainable problem since the forests of Belize function as a net sink for GHGs. Despite these developments Belize still acts as a net sink for GHG, meaning that the total GHG inventory is negative, since Belize stores more carbon than they emit (State of Belize, 2021, p. 7).

5.2.2: II - Policy Analysis

Within this domain, *II - Policy Analysis*, I will apply the NBS Policy Evaluation Model. More specifically I will detail and analyse the inclusion of the different aspects of the elements from the

[1] Covering international aviation for Belize.

NBS Policy Evaluation Model: *nature, social, environmental,* and *economic*. But first, a brief overview of current and relevant policies supporting climate mitigation in Belize is necessary:

The "BELIZE Updated Nationally Determined Contributions" report (2021) builds on the first Belize NDC report from 2016 and details the NDC continued strategies for Belize. These national strategies are formulated by the State of Belize (2021) and involve many local and national stakeholders. The report outlines the following national policies as relevant for the decisions made on their updated NDCs:

- *HORIZON 2030* is the framework for national development in Belize which has been developed in collaboration with multiple national stakeholders – both public, private, and political. The framework works under four primary areas: (1) Democratic governance for effective public administration and sustainable development; (2) Education for Development – Education for Life; (3) Economic resilience: Generating resources for long-term development; and (4) The Bricks and the Mortar – a policy seeking to achieve healthy citizens and a healthy environment. All four of which seek to steer Belize in the direction of creating sustainability – in government, in education, in finance and for citizens and the environment (Government of Belize, 2010, pp. 13–39) including both local and national stakeholders in the process. Furthermore, the framework seeks to implement "responsible environmental stewardship" (State of Belize, 2021, p. 6) as well as promote sustainable energy planning.
- *The National Energy Policy Framework* is a framework seeking to produce and distribute sustainable energy while mitigating the local costs and market prices as well as creating national awareness of energy consumption patterns (Tillett et al., 2011, pp. 150–151). Concretely, it details opportunities for creating sustainable energy development from biofuel and waste streams going forward to 2040. Finally, it seeks to develop sustainable energy following the social, environmental and economic goals and policies set by the Belizean government (State of Belize, 2021, p. 8).
- *The National Climate Resilience Investment Plan 2013* is a framework which seeks to mitigate climate risks and built resilience against climate changes, especially for vulnerable communities. It further seeks to do this by creating economic and social resilience (State of Belize, 2021, p. 8).
- *The Growth and Sustainable Development Strategy* is a systemic approach and guidelines to improve economic development, poverty reduction, and long-term sustainability (State of Belize, 2021, p. 8-9). It further details specific actions and priorities such as land-use planning,

agriculture, fisheries, tourism, employment, coastal zone management, and health (Government of Belize & Ministry of Economic Development, 2016, p. 5).

- *The National Climate Change Policy, Strategy and Action Plan (NCCPSAP) 2015-2020* is a set of guidelines seeking to create legislation on low-carbon development – which includes the NDCs and oversee general communication with the UNFCCC (State of Belize, 2021, p. 9).
- *Roadmap For the Development of a Low Carbon Development Strategy* is a platform which complements the NCCPSAP and helps it build the necessary technical capacity, strengthen institutions and partnerships, and increase the engagement of important stakeholders (State of Belize, 2021, p. 9).
- *The National Solid Waste Management Policy (NSWMP)* is a policy instrument ensuring sustainable management of solid waste including industrial, hazardous, and municipal types. Furthermore, it also works toward preventing the generation of waste as well as recycling or reusing waste materials (State of Belize, 2021, p. 9).

Overall, it can be seen in the current policies that some social and economic problems are being addressed alongside a small fraction of environmental issues such as energy consumption and waste management. The overall policy development approach with including relevant stakeholders, creating strong and sustainable institutions, and making national strategies moving towards sustainable practices is also included well. However, a more holistic approach to sustainable development which addresses all issues of society is missing from the equation. The following sections will detail the degree of inclusion of these aspects from the elements of the NBS Policy Evaluation Model as well as which aspects are being overlooked. The implementation plan for these policy actions will be detailed later under the third domain *III: Strategy and Policy Development.*

5.2.2.1: Nature

The foundation of *Nature* in Belize's NDCs is not very elaborately included in their climate mitigation strategies. The aspects which are included are the assessment of flora and fauna and further only include implicitly or to a very small degree the remaining aspects within *nature* (see p. 35). This means that only a small subset of the different aspects of the *nature* foundation are included.

An instance of the assessment of flora and fauna can be seen under target 2, action 4 where it is stated that they want to "assess the value of seagrass habitat contributions to climate regulation" (see appendix 2). Even though accessing seagrass is a positive development the focus is still only on

one species of plant which automatically limits the lens through which the ecosystem is viewed. Fauna is also implicitly included under 'habitat' indicating the fauna living in the seagrass. Nevertheless, which types of fauna are not included and since it is only seagrass which is in focus this will further limit the assessment and not give a comprehensive overview of the entire ecosystem.

Another example of this way of limiting assessments can be seen under target 2, action 5 where they want to "complete an in-situ assessment of the below ground carbon stock of mangroves by 2022" and make a "comprehensive assessment of mangrove-based carbon stock" (see appendix 2). This limits the assessment to mangroves meaning that it will end up being a partial assessment of a single species and not an assessment of the ecosystem. Even though large areas of Belize are covered in mangroves these ecosystems are still immensely complex. Furthermore, this also indicates that the mangroves are being investigated to measure carbon stock meaning that you limit the assessment even further not only by looking at one species but also only by looking at one aspect or function of mangroves in terms of acting as a carbon sink.

A similar tendency is seen in target 2, action 5 but concerning seagrass. Here it is stated that the Belizean government want to investigate the "feasibility of including seagrass in a wetlands component" (see appendix 2). Even though it is a positive development that they wish to investigate how seagrass can be either introduced to or expanded within different regions we still see the limitation to one species. Furthermore, the detail of how this will be investigated is not included either. This approach has the potential to cause damage to other species in the ecosystem or for seagrass to become invasive. In the worst-case scenarios, you risk that the implementation of monocultures leads to depletion of minerals from the soil which deserts the area.

Finally, this type of assessment is also present in target 1, action 1 where they want to "complete the REDD-plus Strategy, including [...] a National Forest Reference Level covering 2006-2020, and [...] stock-taking for tropical forest and mangrove cover" (UNFCCC, n.d.)[2]. However, what this includes is not clear. The concrete REDD-plus strategy for Belize cannot be accessed meaning that the National Forest Reference Level and Stock-taking for tropical forest and mangrove cover is the only information to take into consideration. These two strategies, however useful for a general overview, limit the assessment of the natural environment to specific species and do not go into detail about the complexity of the ecosystems. Moreover, had it been possible to get access to the REDD+ strategy these details would still not have been included in the policy action.

[2] REDD-plus is an international framework created by the UNFCCC to Reducing Emissions from Deforestation and Forest Degradation in Developing Countries to combat climate changes.

From this, it is evident that the inclusion of aspects from the *nature* element in the Belizean NDC such as temperatures, weather conditions, available natural resources, biochemical conditions, water quality, type of landscape and ecosystems are missing. Excluding these important facts could have major impacts on which plants or trees are being planted in the implementation phase if the weather shifts, if the temperature drops, if you have to import plants from abroad, if you introduce monocultures or invasive species, if the soil quality is not checked, if the implementation negatively affects the water quality, if the plants do not match the natural landscape or affect other species in the ecosystem negatively. Details or at least mentioning the investigation into these conditions are crucial to include before the implementation phase and therefore are necessary for creating a comprehensive, successful, and holistic NDC.

5.2.2.2: Social

The *social* pillar is primarily characterised by aspects of justice within the NDC. This is shown in target 1, action 6, and target 2, action 7. Here justice is described as "community land stewardship practices" as "local community and indigenous people's lands" and as "stewardship of local community and indigenous people" (see appendix 2). This specifies that the government of Belize are not only focusing on having a bottom-up and locally involved approach by giving local and Indigenous communities stewardship for development but are also establishing legal rights to land as a concrete method for facilitating this development. This could improve the level of independence for these communities which are usually living in poverty and are therefore socially vulnerable. The inclusion of both local and Indigenous people also indicates that the NDC is taking a more inclusive approach to development recognising both socially and culturally vulnerable groups of society. Finally, justice is also being angled as "partnerships with landlords [...] local communities, bilateral and multilateral agencies" (see appendix 2). This further indicates that private landlords and local communities are being included in the political decision-making process on equal terms and is therefore viewed as a relevant and important stakeholder in creating sustainable policies. However, how the government of Belize intends to create these stewardships and include these communities is unclear.

Other social elements of the Belizean mitigation targets include several mentions of access to resources for local communities such as target 1, action 4 where they state that they want to assess how "social and cultural impacts and collection of data on current fuelwood use in local communities throughout" (see appendix 2). By this statement, they recognise the intertwined relationship between

nature and people in human-nature relations. They do this by implying that social and cultural behaviour has an impact on fuelwood consumption. However, they do not recognise that the relationship between nature and people is reciprocal. Therefore, they exclude assessing issues such as access to shelter in the forest, the impact of removing forests for fuelwood for local community livelihoods, and health implications connected to burning fuelwood instead of other sources of energy. Furthermore, access to resources is also mentioned in target 2, action 2 where they aim to "restore at least 2,000 hectares of mangroves, including within local communities" (see appendix 2). This is again recognition of the role local communities must play in developing and implementing the NDCs.

Finally, social security is also briefly implied in the NDC in target 1, action 5 where it is stated that they want to "incorporate and monitor agroforestry practices into at least 8,000 hectares of agricultural landscapes" (see appendix 2). These practices, although also involving elements of *environment* and *economic*, imply the expansion of a new type of livelihood for local communities which could help counteract the high rates of poverty while also implementing sustainable practices.

Despite the relatively sufficient inclusion of social issues such as justice, access to resources and social security, several aspects of the *social* element are excluded from the formulated NDC. Such as directly including aspects like education, access to medical care, access to clean water and sanitation, and gender equality. This could widen the gap between social layers and keep large parts of the population in poverty. What is even more striking is that the updated NDC already have "undergone a gender and vulnerable group scoring analysis" (State of Belize, 2021, p. 12) yet gender equality or more aspects of social security is not included specifically in the NDC policy actions. Even though the inclusion of minorities indicates that the government of Belize considers more vulnerable groups of society, the inclusion of important groups is still missing. Nevertheless, these groups may be included in the next NDC report since the NDCs on principle are improved over time. Whether this exclusion of these important social groups is a deliberate decision or if such issues were deemed less important at this time in the process of developing the NDC is unclear. Under any circumstances, the inclusion of social issues such as gender equality, education and social security should be increased in the NDC policy actions to ensure social justice and sustainability in the long term.

5.2.2.3: Environment

The *environment* element in the NDC from Belize is mainly focused on deforestation as well as subtle inclusions of other aspects of the element and references to other elements *social* and *economic*. Furthermore, the *environment* element is the most dominant in the NDC's mitigation section. This, however, is to be expected since the NBS aspect of the approach automatically puts the focus on the natural environment. However, the other elements and the foundation of *nature* still need to be included sufficiently to obtain sustainable and long-lasting results from the policies.

The first main element of deforestation in the NDC concerns itself with the deforestation of forests. To remedy this, they want to "implement reforestation practices for 1,400 hectares in forest areas [...] [restore] 6,000 hectares of degraded and deforested riparian forests12 by 2030, with 750 hectares of this being restored in key watersheds by 2025" (see appendix 2) as stated in target 1, action 2. This not only includes the reforestation in different types of landscapes but also proposes concrete measures for reducing deforestation. Furthermore, they also propose to "reduce degradation in 42,600 hectares of forest within protected areas by reducing fire incidence, improving logging practices, and controlling other human disturbance by 2030" (see appendix 2) in target 1, action 3. This not only indicates the consideration of at least one climate disaster – wildfires – but also the *social* drivers of deforestation such as logging and other disturbances. Even though this is a positive development the exclusion of other types of climate disasters such as cyclones, floodings, extreme heat and landslides can all lead to negative outcomes since all of these can influence reforestation practices as well. However, it indicates that the Belizean government not only want to re-establish reforestation practices but also reduce exploitative practices. Finally, conservation practices are also included in the deforestation aspect. Here, however, the focus is on funding conservation practices and not assessing current practices or expanding them. Given the limited resources in Belize, this development is understandable. But it does demonstrate the interlinkages between the *environment* and the *economic* elements – illustrating the limitations for further development of sustainable practices without sufficient monetary capacity and how it affects political decision-making.

The second main aspect of deforestation within the NDC is the deforestation of mangroves. Here they propose in target 2, action 2 to "restore at least 2,000 hectares of mangroves" (see appendix 2) which set a specific measure for reforestation. Similarly, to the measures proposed for combatting deforestation in tropical forests they also propose to "halt and reverse net mangrove loss by 2025" (see appendix 2) in target 2, action 3. This means that they also want to reduce exploitative practices in mangrove areas. However, both proposed actions are less detailed than those concerning tropical forests. They do not explain the distinct linkages between the forests and exploitative practices nor

the link to the mutual impacts of mangroves and local communities. The only link is that mangrove areas are positioned within local communities and collaboration with them is, therefore, necessary to reach successful implementation. Finally, the conservation measures are also very similar to those for tropical forests. They are partly focused on financing conservation practices as stated under target 2, action 6 creating linkages to the *economic* element. This again shows the interconnection between the different elements and the impact of limited financial resources which has an estimated gap of just under USD$30.000 for reforestation, forest protection and sustainable forest management (State of Belize, 2021, p. 22). However, the measures for mangrove conservation are more ambitious than for tropical forests since the mangrove conservation not only seeks to continue to conserve the "12,827 hectares of mangroves currently under protection" (see appendix 2) but also to expand the conservation by "at least a further 6,000 hectares of mangroves" (see appendix 2) as stated in target 2, action 1.

The third main aspect of deforestation in the NDC is related to deforestation or reforestation practices which interact more with humans. The first instance of this is target 1, action 4 where they state that they want to "reduce emissions related to fuelwood collection" (see appendix 2). This is, as mentioned under the *social* element (see pp. 43-44), closely interconnected with livelihoods, consumption patterns, and health. The second instance is the collaboration between public entities and "privately owned mangroves" (see appendix 2) as stated in target 2, action 1. This once again suggests the important role that local communities and the collaboration with these have for the implementation of the NDC. Finally, the last instance of human-nature relations is the social linkages tied to agroforestry in target 1, action 5: "incorporate and monitor agroforestry practices into at least 8,000 hectares of agricultural landscapes by 2030 by planting shade trees" (see appendix 2). This indicates that they also want to reverse and expand reforestation practices in the agricultural sector transitioning into sustainable farming practices.

Despite the relatively sufficient inclusion of deforestation in different policy actions in the NDC the exclusion of pollution patterns by the industries sectors, the implications of ocean acidification or other types of ecosystem degradation, and the exclusion of other climate disasters, and biodiversity can have negative impacts during the implementation of the policies. Implementing reforestation programmes or protecting environmental areas are at risk of failing if the effects of industrial polluters degrading natural ecosystems such as freshwater are not considered. And restoration of mangroves is also at risk if issues such as ocean acidification affecting nearby flora and fauna, and coral reefs are not included in the equation. In general, what is lacking from the

environmental element in the Belizean NDC is a more overall, comprehensive, and holistic approach which would allow policymakers to include the complex interaction and interconnection between different ecosystems.

5.2.2.4: Economic

The *economic* element is limited in its representation in the Belizean NDC since the only economic focus in the climate mitigation actions falls under the area of climate finance.

The aspect of climate finance is mentioned in three different policy actions in the NDC. The first of which is target 1, action 1 where the REDD+ strategy is singled out to be a viable climate financial solution providing "performance-based payments for emissions reductions" (see appendix 2). The strategy provides a reward-based system where lower emissions result in direct financial output.

Secondly and thirdly, the REDD+ strategy is also mentioned as a way of financing climate mitigation under both target 1, action 7 and target 2, action 6 – making it applicable for both land-use changes and ecosystem capacities. Additional methods are also mentioned under these targets such as different funds, debt-for-nature swaps, investment plans, carbon credits and insurances (see appendix 2). This is overall a positive development since it implies different strategies for financing climate mitigation where diversification of strategies is the most sustainable approach if some of them do not provide sufficient financial cover. Furthermore, it implies that the Belizean government seek to collaborate with different financing partners both internationally, such as REDD+ and debt-for-nature swaps, and nationally, partners providing private investments or funds. Therefore, the aspect of GDP is also included implicitly in these actions. Working on multiple levels provides more stability and a larger network of partners increasing the security of managing their climate finances. These strategies, especially the debt-for-nature swap, would also be a great assist in eradicating Belize's foreign debts.

Nevertheless, what is excluded from these actions is the micro-level of individual citizens – which makes sense when looking at financing climate mitigation considering the relatively limited financial capacity of the average Belizean citizen. However, the individual is also excluded when it comes to other financial aspects of the *economic* element. These include aspects such as employment, ensuring job security, facilitating financial independence and worker's rights. Excluding these aspects of the element could result in exploitation of the national workforce, an increase in unemployment rates, and an overall worsening of livelihoods keeping citizens in poverty and risking that they live

hand to mouth – which increases the vulnerability of the individual as well as the national economic system. Once again, the NDC would benefit from a more holistic approach to development, highlighting the intertwined character between the different elements in the model.

5.2.3: III - Strategy and Policy Development

5.2.3.1: Introduction

Within this second domain – Strategy and Policy Development – I will explain briefly how the Belizean government intends to implement their NDC including which actors, stakeholders, and timeframes they intend to use. This will, like the rest of the analysis, only be focused on the climate mitigation concerning NBS initiatives. Furthermore, I will evaluate how the NDC is going to function – more specifically which positive and negative traits their current strategy has.

5.2.3.2: The Belizean NDC Implementation Plan

The implementation plan for the Belizean NDC is set to uphold the overall target of the Paris Agreement – keeping emissions below 1,5°C preindustrial levels by the end of 2030. Additionally, Belize is also planning to decrease their emissions by 2050, even though they are already a net sink nationally (State of Belize, 2021, p. 14). This means that despite having a negative emissions level, due to their large carbon sinks, Belize still plans to decrease their emissions further.

The concrete plan to implement the NDC involves several actors. The main actors are the Belize National Climate Change Office (NCCO) which is responsible for coordinating national climate policies and therefore acts as coordinator of the actions to be implemented in the NDC. They are supported with advice and guidance by the Belize National Climate Change Committee (BNCCC) – a committee consisting of relevant national ministries and stakeholders who are responsible for guiding and leading national climate management. Furthermore, both the NCCO and the BNCCC are going to manage the financial resources required for implementing the NDC. Additionally, for financial resources, a working group called the Climate Finance Working Group has been established under the BNCCC to specifically deal with managing the NDC's required financial resources. Working alongside this working group is the Belize Protected Areas Conservation Trust (PACT) acting as the national implementing entity for the Adaptation Fund and the Green Climate Fund (State of Belize, 2021, p. 32). The total cost of the NDC implementation plan is USD$1,71 billion without the costs of feasibility studies. Furthermore, promoting public-private partnerships for the implementation and financing is the newly established Economic Development Council which has

already “mobilized over USD$ 200 million in energy sector investment” (State of Belize, 2021, pp. 32–33).

Finally, the implementation plan will hold annual outlines of targets, funding, and responsibilities prepared through the Climate Action Enhancement Package (CAEP) process. This includes assistance from the Commonwealth Secretariat, the International Renewable Energy Agency, the NDC Partnership Support Unit, the Rocky Mountain Institute, the Climate Technology Collaboration Network (CTCN) and Fundación Bariloche and the UNFCCC Regional Collaboration Center in Grenada and with the Caribbean Climate Change MRV Hub. Working alongside the CAEP process are also other partners helping the implementation of the NDC. This includes the UN Development Programme (UNDP), the WWF, the Pew Charitable Trusts, the Initiative for Climate Action Transparency and the Coalition for Rainforest Nations in conjunction with the Belize FOLU roundtable (State of Belize, 2021, p. 10).

5.2.3.3: Positive and Negative Traits of the Current Strategy

Based on the inclusion of the different elements of the NBS Policy Evaluation Model detailed in the analysis above the function of the current NDC strategy can be argued to have both positive and negative traits. A positive trait of the strategy is that all elements of the NBS Policy Evaluation Model are included (see p. 35) – both the foundation of *nature* as well as all three pillars, *social, environmental* and *economic.* This is overall a positive development which shows that Belize is improving and changing its view on sustainable development shifting it towards a more inclusive and holistic approach. Some of the NDC policy actions also contain aspects of several elements, such as the inclusion of both *social, environmental* and *economic* elements in the action aiming to expand agroforestry (target 1, action 5) (see appendix 2). Having multiple elements within the same action further points to the argument of Belize developing a more holistic and inclusive approach.

Nevertheless, the NDC also has several negative traits. Even though Belize is developing a more inclusive approach containing all elements the current strategy is not sufficient to ensure long-term sustainability in the implementation phase. Concretely, the NDC fails to include several vital aspects of all four elements of the NBS Policy Evaluation Model – foundation and pillars – in a sufficient manner. As mentioned in the theory section (see pp. 31-32) the risk of excluding these important aspects within each element of the model increases the occurrence of several dangerous tendencies.

The first dangerous tendency is the exclusion of aspects within a single element – foundation or pillars – from the policy actions. When excluding single aspects of the elements in the NBS Policy Evaluation Model (see p. 35) such as biodiversity within *nature,* education within *social,* pollution within *environmental* and employment within *economic* the risk is to overlook or worsen issues affecting the livelihoods of Belizeans or endangering animal and plant species. The second dangerous tendency is the exclusion of aspects which overlap between the elements – foundation or pillars – from the policy actions. When excluding overlapping aspects between the different elements such as access to resources which affect the state of the *environment,* the livelihoods of communities under *social* and their *economic* capacities the risk of overlooking how solving this issue can become unbalanced and exclude important aspects from the elements. Therefore, a more holistic connection detailing how the different elements interact and affect each other needs to be considered. Finally, there are also the dangers of overlooking the importance of different issues – both national and international. Issues such as poverty, health care, declining biodiversity or gender equality are not dealt with in the NDC implying one of two things: either they were not deemed important enough to be specifically included in the actions, or they were not deemed relevant enough when working with climate mitigation – both of which are wrong.

5.3: PNG – Another Case in Point

PNG is a small low-income country with a size of 46.13 million hectares where 97% is owned and managed by Indigenous People and 3% by the state (Government of Papua New Guinea, 2020, pp. 1, 3). PNG is geographically located within the ring of fire – a highly tectonically active area. This brings a lot of diversity to the landscapes, ecosystems and flora and fauna in PNG (Government of Papua New Guinea, 2020, p. 1). Finally, PNG ranks 155 out of 193 on the HDI and has a gross national income per capita of $USD 4,301 million (UNDP, n.d.).

5.3.1: I - Problem Identification

PNG is highly affected by climate change and currently ranks as the tenth most vulnerable country in the world affected by and at risk for climate-related disasters (Government of Papua New Guinea, 2020, p. 2). The year-round hot and humid tropical climate of PNG has, because of its geographical position, a dry and a wet season respectfully from June to September and from December to March (Government of Papua New Guinea, 2020, p. 1). Coupled with the climate crisis these seasons might change in both intensity, duration and time of occurrence affecting the local climate significantly.

Therefore, PNG, as a signatory of the Paris Agreement, aspired to reduce GHG emissions to 50% by 2030 and be carbon neutral by 2050 (Government of Papua New Guinea, 2020, p. 4).

Apart from issues with climate change PNG also has socioeconomic difficulties with 75-80 of the population living in poverty. These people are additionally very susceptible to climate-related hazards since they mostly depend on subsistence farming. Furthermore, PNG also has problems with a lack of infrastructure limiting access to utilities such as health care, education, and other development opportunities. Especially, women and girls are vulnerable in these rural groups since they often do not have access to resources or land and are overrepresented within the subsistence agricultural sector making them more vulnerable to the changing climate. Finally, PNG also has a noticeably young population with approximately 60% of the population being under the age of 25. Combined with a high rate of unemployment and literacy, and a low level of education the capacity of the workforce to support a stable economy is limited (Government of Papua New Guinea, 2020, p. 2).

Returning to the climate crisis, PNG is specifically affected in two regions. The Highland regions of PNG are mostly affected by heavy rainfall which leads to landslides and inland flooding and the coastal zones are more affected by storm surges, sea-level rises, and coastal floodings (Government of Papua New Guinea, 2020, p. 2). Furthermore, PNG is also at high risk of a long list of other climate-induced hazards. Additionally, PNG is also at high-risk of disasters such as earthquakes, tsunamis, volcanic activity, cyclones, and wildfires and at medium-risk of experiencing extreme heat (ThinkHazard!, 2020, pp. 1–24). These risks are however projected to increase over time as illustrated in the table below:

Climate variable	Projection	Confidence level
Surface air temperature	Projected to increase	Very high confidence
Sea surface temperature	Projected to increase	Very high confidence
Annual mean rainfall	Projected to increase	High confidence
Seasonal mean rainfall	Projected to increase	High confidence
Intensity and frequency of days of extreme heat	Projected to increase	Very high confidence
Intensity and frequency of days of extreme rainfall	Projected to increase	High confidence
Incidence of drought	Projected to decrease	Moderate confidence
Frequency of tropical cyclones	Projected to decrease	Moderate confidence
Ocean acidification	Projected to continue	Very high confidence
Mean sea-level rise	Projected to increase	Very high confidence

Table 3: Exempt from table 1 "Climate Projections for Papua New Guinea" (Government of Papua New Guinea, 2020, p. 2).

As seen the climate variables or risks that are projected to increase are surface air and sea surface temperatures, intensity, and frequency of days with extreme heat and mean sea-level rise. This could result in more damage to ecosystems, crops, and thereby also the vulnerable communities of PNG (Government of Papua New Guinea, 2020, p. 2).

The increase in climate disasters also affects the already unstable economy of PNG which primarily relies on mining and petroleum production, and forestry, fishing, and commercial agriculture – sectors which employ 15% of the population (Government of Papua New Guinea, 2020, p. 3). The rest of the population is, as mentioned, highly dependent on informal incomes in the form of subsistent agriculture (Government of Papua New Guinea, 2020, p. 3). This creates a negative feedback loop where an increase in output from a system restricts the future functioning level of the same system. An example of such a loop in PNG could be vulnerable communities being dependent on the mining, petroleum, and forestry industries leading to increased CO2 emissions which leads to more extreme weather conditions which result in the same vulnerable communities being at even more risk and therefore more dependent on the mining, petroleum, and forestry industries. Such a negative feedback loop is difficult to eradicate since the unaffordable prices of infrastructural development alongside the rugged terrain of especially the PNG Highlands limits the earning capacities of local communities. They, therefore, have no choice but to make a living from the exploitation of natural resources (Government of Papua New Guinea, 2020, p. 3).

This development is also visible in PNG's GHG profile over time as illustrated in the table below:

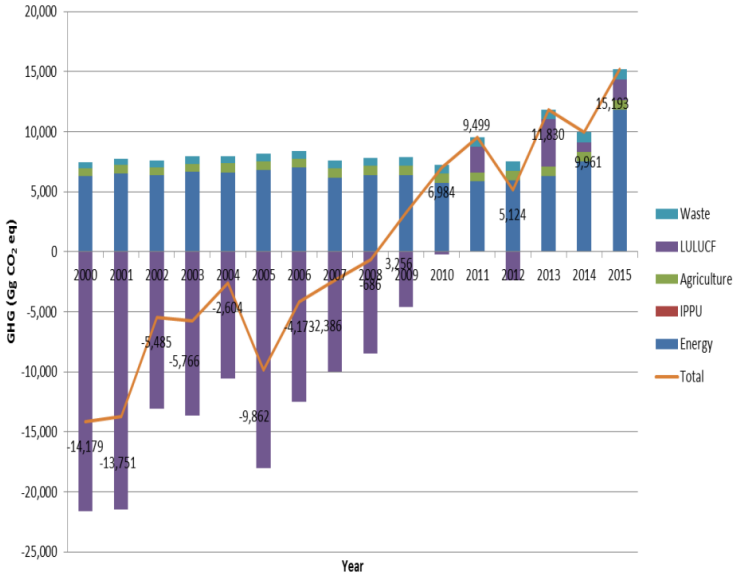

Table 4: Time Series of PNG's Total Emissions and Removals (Government of Papua New Guinea, 2020, p. 5).

Due to the rising population and industry, we can see an increase in the energy sector. Furthermore, we can also see that the Land Use, Land-Use Change and Forestry (LULUCF) sector changed between 2000 and 2015 from a net sink to a polluter. This is mainly due to land-change patterns converting forest lands to subsistence agriculture, logging sites, or palm oil plantations (Government of Papua New Guinea, 2020, pp. 5, 14).

Overall, we see that socio-economic and geographical conditions are affecting PNG negatively. The vulnerable communities of PNG are experiencing increasing climate changes but also have no choice but to continue contributing to this development themselves due to poor human capacity, poverty, and inequality.

5.3.2: II – Policy Analysis

Within this policy analysis, I will apply the NBS Policy Evaluation Model – more specifically detailing and analysing the inclusion of the different elements of the model: *nature, social, environmental* and *economic.* However, a brief and comprehensive overview of current and relevant policies supporting climate mitigation in PNG must first be outlined.

The "Papua New Guinea's Enhanced Nationally Determined Contribution" (2020) report outlines the following policies to be relevant for the development of their NDC:

- *The Climate Change Management Act 2015* is an entity which established the Climate Change and Development Authority (CCDA) which is responsible for the development of facilitation of policies and frameworks addressing climate change in PNG (Government of Papua New Guinea, 2020, p. 1).
- *PNG Vision 2050* was established by a national strategic plan task force responsible for developing a framework for long-term sustainability in PNG. PNG Vision 2050 is a part of the PNG government's plans for mainstreaming climate change into development policies. The framework consists of eight key pillars ensuring sustainability: (1) Human Capital Development; (2) Gender, Youth and People Empowerment; (3) Wealth Creation; (4) Institutional Development and Service Delivery; (5) Security and International Relations; (6) Environmental Sustainability and Climate Change; (7) Spiritual, Cultural and Community Development; (8) Strategic Planning, Integration and Control (Government of Papua New Guinea, 2020, p. 1) (Government of Papua New Guinea, 2021, p. xiv).

- *The National Development Strategic Plan 2010-2030* was developed with the objectives of PNG developing into a middle-income country by facilitating integral human development, equality and participation, national sovereignty, and self-reliance, safeguarding natural resources and environment, and incorporating the PNG ways. It is further based on the conceptual framework with five clearly defined stages for development: (1) Economic policies – exchange rate, fiscal and monetary; (2) Public policies – public-private partnerships, incentives, and international relations; (3) Sector policies & micro-interventions – land, education, health, transport; (4) Economic performance – rapid GDP growth, full employment, economic independence; and (5) High quality of life (Government of Papua New Guinea, 2020, p. 1) (DNMP, 2010, pp. 4, 8).
- *The Medium Term Development Plan III* is a policy working on ensuring a sustainable future for PNG by implementing sustainable economic growth with an inclusive approach. It builds towards achieving eight goals: (1) Increased revenue and wealth creation; (2) Quality infrastructure and utilities; (3) Sustainable social development; (4) Improved law and justice, and national security; (5) Improved service delivery; (6) Improved governance; (7) Responsible sustainable development; and (8) Sustainable population (Government of Papua New Guinea, 2020, p. 1) (Department of National Planning and Monitoring, 2018, p. xviii).

Overall, the information on the different policies through the PNG NDC report is limited. The lack of detail about how the NDC includes national policies in the NDC policy actions makes it less streamlined and adds ambiguity to the role of these national policies in the NDC policy decision-making process. All three elements of sustainability – social, environmental, and economic (see p. 22) are covered in these policies as well as the importance of strong and sustainable institutions and administration. However, the role of the social and economic pillars seems to outweigh the environmental pillar and therefore the focus becomes more on the national economy and the population than on the natural environment of PNG. This could prove problematic in the long term.

5.3.2.1: Nature

The element of *nature* is the element in the PNG NDC report which occur most frequently – and the element is therefore overrepresented compared to the three elements *social, environmental* and *economic*. This overrepresentation could mean that the process from the first investigation of the inclusion of concrete aspects in the three elements has not progressed very far. Otherwise, it could

mean that policymakers do not value the aspects within the three elements as important enough to be included to a larger degree in the NDC.

The most dominant aspect of the *nature* element is the investigation of especially flora. Here the PNG government have a lot of different initiatives to investigate both forest covers and land-use changes. In actions 3, 8, 9, 10, 11 and 12 (see appendix 3) they detail how they want to: strengthen the monitoring of forest change analysis; create a system for land-use change under REDD+; enhance monitoring and reporting on Forest and land-use changes before 2000; complete the National Forest Inventory; make Emission factors for all forest types in PNG available; improve forest monitoring; and mapping out areas with mangroves. This is overall a positive development since it shows that the PNG government is investigating different aspects of forest changes from tree covers, to forest inventory, and forest monitoring. This approach will also take things such as the historical progression of nature in PNG into consideration to determine natural boundaries and possibilities. Finally, doing a forest inventory could prevent reforestation practices from failing as more knowledge about the natural settings will help guide which plant species should be used in the implementation phase. However, the approach excludes different types of flora when only investigating certain types of vegetation like trees and mangroves. Furthermore, it also excludes the key role of fauna which is deeply intertwined in these complex ecosystems.

The PNG NDC also includes the evaluation and investigation of various biochemical conditions. This applies to the same actions as flora except for action 3 (see appendix 3). Here the PNG government seeks to: calculate biomass gain before 2020; create country-specific emission factors; make a Permanent Sample Plot system for estimating post-disturbance CO2 sequestering including annual losses; improve forest monitoring of in relation to emission estimations from logging; include blue carbon in the national GHG inventory - including mangroves; and make carbon stock modelling and reporting. This is a positive development because the policy includes several types of ecosystems and different types of GHG monitoring, evaluation, and reporting systems. Despite this, the approach is still extremely limited in that it does not take things such as natural minerals, weather conditions, and the effects these might have on implementation – i.e., when attempting to calculate the GHG inventory it is important to consider the capacity of the soil to create carbon sinks.

Finally, the PNG NDC also implicitly includes aspects of ecosystems. It specifically mentions the investigation of “Emission Factors for all forest types in PNG” (see appendix 3) in action 9. This

indicates that several forest 'types' or ecosystems will be included in the investigation. Ecosystems are also mentioned in action 12 where blue carbon ecosystems are named specifically. However, the detail of the role of these complex ecosystems which are included in the investigative process is not clear and should be elaborated upon.

Besides the missing aspects of *nature* mentioned above, the PNG NDC also fails to include the available resources for development; the extreme weather conditions in PNG; the quality of water – which is especially important when working with blue carbon; and the different types of landscapes which vary greatly in PNG. This could result in negative outcomes during the implementation phase since these conditions and natural boundaries could become potential roadblocks to further sustainable development.

5.3.2.2: Social

The social element in the PNG NDC is limited and not a large part of the policy actions detailed in the report. The general inclusion of the social element is characterised by being bottom-up and inclusive. This is seen in actions 2 and 7 (see appendix 3) where both a new tracking system for value chains and agroforestry is to be implemented on respectively "farmer's level" and "community level". This indicates, although not detailed or outright stated, that the role of local-level communities and people is important for the stability and extent of the implementation phase.

The inclusion of the social element can also be implicitly seen in the implementation of an "enhanced application of timber legality standards and permitting processes" and a "timer legality verification system" in actions 5 and 11 (see appendix 3). These systems, although environmental in nature, contain aspects of law and could affect the logging industry and its employees. Even though the inclusion of the social element in these examples is implicit the livelihoods of the people in local communities can still be argued to be included. However, the lack of detail on how the implementation of these systems and standards can affect different parts of these communities in different ways makes the policy ambiguous. On the one hand, the implementation of stricter regulations for the logging industry could result in a decline in income for local communities whose livelihoods depend on exploiting this natural resource. This is a big issue for poorer communities, as detailed above in the problem identification. But the stricter regulations could also be a positive development for local communities who are relying on agroforestry or are dependent on ecosystem services – and could in turn provide them with greater access to these resources. Therefore, the

importance and details of how the effects of these policies will affect local communities and how the policy plans to counteract the development of potential negative tendencies cannot be understated.

Finally, the social element is also included slightly in terms of access to resources. This is implicitly stated in target 1, action 8 (see appendix 3) where the "long term historical forest and land use change trend" is assessed. This could imply that an assessment of cultural and other human use of nature would be conducted. However, the lack of detail in the policy makes it unclear if the assessment is solely statistical and quantitative or if the cultural value and social underpinnings of nature are also considered.

Overall, the inclusion of the social element in the PNG NDC lacks detail concerning how social and local level complexities such as employment and access to resources will be affected by and will affect the implementation of the policy actions. Furthermore, the exclusion of larger societal aspects within the social element such as education and literacy, healthcare, social security, and gender equality – which are all problematic areas in PNG – could result in the decline of the livelihoods of local communities and further damage the vulnerable economy of PNG. It could also result in the failure of implementing these policies since the needs and complexities within the local communities might be overlooked even though they are crucial for the success of long-term sustainable solutions. Therefore, a more holistic approach is needed to include and detail the interconnections going from the social elements to the other elements in the model.

5.3.2.3: Environmental

Aspects of the *environmental* element in the PNG NDC do not occur frequently in the policy actions compared to the foundation of *nature*. However, what is included from the *environmental* element has ties to both the *social* and *economic* elements but is nonetheless lacking some details on how these are interconnected and how they will affect implementation.

The first aspect of the environmental element which is included is the aspect of conservation and land use in action 1 where the PNG government wish to create a "policy and regulatory framework for sustainable land use" (see appendix 3) and further adopt a High Conservation Values and High Carbon Stock (HCVHCS) methodology for sustainable agriculture practices. This shows that conservation of the PNG forests and sustainable land-use management are being prioritised by the government. Despite this positive development, the precise details of what these policy actions and methodologies will contain are unclear. Therefore, more details would be needed to determine if important issues such as biodiversity and climate disasters are being considered.

The NDC continues to focus on land use in action 2 where the government wants to enhance the "value chain[s] of climate friendly agriculture products" and action 7 where they want to implement "agro forestry activities [...] at community level" (see appendix 3). This is a positive development since it once again shows the awareness of issues related to land-use changes in PNG within the PNG government. However, these actions also lack details about what constitutes 'climate friendly' products and the scale and practices of agroforestry. These details matter greatly since it is ambiguous if the actions will i.e. consider the level of biodiversity? Will they decrease deforestation by creating a higher crop yield – minimizing the need for cropland? Will agroforestry halt the conversion of forest to agricultural land? Will the solutions consider how it affects climate disasters or local communities? Many questions currently go unanswered making more details necessary.

Finally, the NDC includes deforestation as the upscaling of the "Painim Graun Planim Diwai initiative" (see appendix 3) under action 6 – a national initiative planting trees to restore forest areas. In this program, they want to avoid monocultures by planting both trees and agricultural crops alongside each other (PNG Forest Authority & Government of PNG, 2016, p. 1). Despite the positive development of PNG moving away from monocultural reforestation, there are still key details which are not found in the NDC. It is unclear if this initiative will collaborate with the forest assessments in actions 8-12. The policy action also does not mention the inclusion of Indigenous knowledge, ecosystem services for local communities, the capacity to scale up this initiative, post-implementation forest management, or how these actions might affect the local climate by increasing resilience towards climate disasters. More details into holistic interconnection with the other elements are therefore also needed here.

Overall, the inclusion of the environmental pillar in the NDC addresses some of the larger issues climate-related issues in PNG. However, a lack of holistic perspective where more details of how the different elements are interconnected and how decisions affect the entire system could result in issues during implementation. Furthermore, issues such as pollution from the large mining and shipping industries in PNG, the issues with ocean acidification, biodiversity levels, and a general inclusion of PNG's different climate disasters were also missing from the policy actions. This could result in further escalating current climate issues. Despite the implementation of conservation, agroforestry, and deforestation measures an upscaling of the more lucrative mining industry, an increase in the need for consumer goods, and a decrease in biodiversity levels could increase the severity of climate disasters. The holistic approach therefore also needs to be included here to help prevent creating these negative feedback loops.

5.3.2.4: Economic

Similarly, to the other elements, aspects of the *economic* element are also not included sufficiently in the PNG NDC. However, what is focused on are two major economic sectors: the agricultural and logging industries.

The agricultural sector is firstly included on a sectoral level in action 2 where the PNG government wants to enhance the "value chain of climate friendly agriculture products" (see appendix 3). This is a positive development as it creates a clear line from the farmer to the manufacturer and makes the entire process of production more transparent for everyone involved including consumers. This also implies that more profitable products will be the result of such a system which most likely will create a higher monetary yield which could help stabilise local income levels. But the details about who benefits from this are unclear from the policy which does not provide any information about how this could benefit the vulnerable national economy of PNG or vulnerable communities living in poverty. It also does not detail if the benefits go to the long line of international middlemen as seen time and time again in these types of enterprises.

Secondly, the agricultural sector is included on a business level specifically targeting "agri-businesses in PNG" (see appendix 3) in action 1. Here the PNG government wants to adopt HCVHCS methods to increase "more sustainable, agricultural practices" (see appendix 3). This development is positive since it involves local businesses in sustainable development plans and involves the local community level linking it to the *social* element. Nevertheless, details about if this action is also targeting non-commercial agriculture, which a large part of the population is dependent on, or solely focuses on commercial agriculture are missing. The policy action also does not make it clear how the adaptation of these systems will translate economically at the national level. Is this action intended to help the local businesses or the national economy? – or in other words: who is benefitting from this development? Lastly, as argued above in the *environmental* section for the PNG NDC the missing clarity of exactly what the HCVHCS methods includes makes it unclear how these methods are supposed to be adopted by local businesses. How do they benefit from applying these methods?

Lastly, the agricultural sector is included at a local level in action 7 where the goal is met when "agro forestry activities are implemented at community level" (see appendix 3). Once again details about how this development will affect the rest of the economic system and who will benefit from it are missing. It would be beneficial to be more transparent about how it could help PNG reduce national debts or if farmers would receive help to transition to agroforestry – and finally whether this would increase ecosystem services, provide climate resilience, increase local income levels or provide

more economic independence. The holistic and interconnected insights into how these actions will function are therefore missing.

The logging industry, although not as included as the agricultural industry, is also included in the NDC. In action 4 the PNG government aims to have the "export of round logs in the country [...] reduced by more than 50% in 2025" (see appendix 3). This is approaching the sector on a national level which is positive since this could decrease deforestation, make local areas more climate-resilient, and help communities who depend on vital ecosystem services. Despite this, the policy action does not include how to manage the decrease in livelihoods for communities that depend on the logging industry for survival. This could, in the worst-case scenario, push more people into poverty. Detailing who benefits from this development and who suffers the drawbacks from it is therefore crucial.

Overall, the inclusion of the economic element in the policy actions is similar to the *social* and *environmental* elements. The inclusion is limited to specific industrial sectors and overlooks key aspects such as the large unemployment rates in PNG, financing sustainable development, worker's rights, and job security. Furthermore, the general lack of details about the interconnectedness between the economic element and the other elements in the model makes important issues such as who is benefitting from this NDC and how it will function on different levels of society unclear.

5.3.3: III – Strategy and Policy Development

5.3.3.1: Introduction

Within this Strategy and Policy Development section I will briefly explain how the PNG government intends to implement the NDC which includes the involvement of different actors, stakeholders, and the intended implementation timeframes. This will, as with Belize, only be focused on climate mitigation actions containing NBS initiatives. Additionally, the function of the NDC will also be evaluated detailing both positive and negative traits of the current strategy.

5.3.3.2: The PNG NDC Implementation Plan

The implementation plan for the PNG NDC strives to fulfil all obligations under the UNFCCC including the Paris Agreement as well as the general obligations under the Rio de Janeiro Agreement. This means working to uphold the global 1,5°C limit to temperature rises by 2030. PNG has also shaped its relevant national policies (see pp. 53-54) around the UNFCCC obligation to mainstream "climate change in its development priorities" (Government of Papua New Guinea, 2020, p. 1).

More specifically, the PNG implementation plan aims to be implemented from 2020 to 2030 building on the commitments made in 2015 when they entered the Paris Agreement (Government of Papua New Guinea, 2020, p. 6). However, the specific involvement of both national and international actors is not elaborated upon in the NDC. The actors are solely divided into three sections: Lead Implementing Agencies; Supporting Agencies; and Funding Source.

In these three categories, the PNG NDC has included more national than international actors. Furthermore, more national actors are involved in the on-ground implementation than in the funding process. The most frequent national actors are the PNG Forest Authority (PNGFA) and the CCDA who mostly take the roles of Lead Implementing Agency and Supporting Agency respectively. Following this are some smaller actors like the Department of Agriculture and Livestock (DAL), the Department of Land & Physical Planning (DLPP) and the Conservation and Environmental Protection Authority (CEPA) who mainly take the role of Supporting Agencies. Finally, we have smaller actors such as the University of PNG (UPNG), the Department of National Planning and Monitoring (DNPM) and the PNG University of Technology – all of whom take the role of Supporting Agencies. All of this indicates that larger and more cross-sectional authorities like the PNGFA and the CCDA are put in charge of leading the implementation with the support from relevant departments from various ministries and minor national actors such as universities.

Additionally, to being the Lead Implementing Authority on multiple policy actions the CCDA is also the National Designated Authority in PNG meaning they oversee the coordination of all national issues related to climate change. Furthermore, the CCDA is tasked with working "in collaboration with stakeholders" (Government of Papua New Guinea, 2020, p. 4). Even though these stakeholders are not mentioned specifically in the implementation plan, some groups of society are implicitly included in the means of implementation. This includes the PNG gender gender-based disadvantaged groups, women, and youth. The choice not to directly include them could, however, be risky as it makes their role more ambiguous and undefined. This could result in potential damage in the implementation phase since how the groups should be included could lead to misunderstandings.

The inclusion of the three groups has similar issues. Firstly, gender-based disadvantaged groups are included in a technical needs assessment, an assessment of the needs within each mitigation and adaptation sector, by stating that the assessment should be "gender-responsive" (Government of Papua New Guinea, 2020, p. 31). Firstly, what constitutes gender-responsive policy

is not elaborated upon. Secondly, separating the issue of gender equality from the concrete issues addressed in the policy actions makes the inclusion of this group less defined. In other words, gender equality is made into a general overarching issue – meaning that no concrete solutions seek to mitigate gender equality issues in the implementation plan. The same tendency applies to issues concerning women and women's rights. As mentioned in the problem identification, women in PNG have less access to healthcare, education, jobs, rights etc. This is again seen as an overarching issue meaning that specific actions addressing it in the implementation plan have not been made. Finally, the inclusion of the PNG youth is also characterised as an overarching issue with non-specified solutions. Even though most of the young population in PNG are involved in climate activism, working for a non-governmental organisation (NGOs) or are active in the National Youth Commission, their specific needs are not addressed in the policy actions. Therefore, they risk getting overlooked in the implementation phase (Government of Papua New Guinea, 2020, p. 31).

Despite the poor inclusion of specific ways to address the issues with gender-based disadvantaged groups, women, and youth in PNG, the groups are still listed as important stakeholders in the NDC. Therefore, the issue is not the inclusion of these groups but more the issue of how they are included. Finally, other national stakeholders such as local businesses, ethnic groups, smaller organisations, NGOs etc. are not included in the implementation plan. This could lead to a mismatch between the policy actions and the needs of the local communities. It shows that even though the PNG government intends to take a bottom-up approach, by including local communities in the policy actions, they still lack the inclusion and detail of important local stakeholders and actors.

The international actors in the NDC are, as mentioned, with only one actor, the Government of Australia, taking the role of Supporting Agency in only one policy action. Other international actors are exclusively listed as either existing Funding Source like the UNDP or as potential financing possibilities for climate mitigation. Here the PNG Government (2020) plans to make use of "results based payments under a range of mechanisms including the Green Climate Fund, bilateral, market or non-market mechanisms under Article 6 of the Paris Agreement" (p. 31). The funding for climate mitigation in the PNG NDC is therefore not particularly diverse meaning policymakers might be forced to choose between which important mitigation actions should be implemented.

5.3.3.3: Positive and Negative Traits of the Current Strategy

The function of the PNG NDC has positive as well as negative traits. A positive trait is that the policy actions include all elements of the NBS Policy Evaluation Model – both the foundation of *nature* and all three pillars *social, environmental,* and *economic*. This is a positive development as it indicates that the PNG government is moving towards a more holistic approach to the sustainable development of their NBS.

However, the NDC also has negative traits. As mentioned above, it lacks details of many of the policy actions and is not sufficiently include all the national problems in the proposed actions – overseeing issues such as available resources, gender equality, polluting industries, and unemployment rates. Finally, the overrepresentation of *nature* in the NDC policy actions means that issues pertaining specifically to the three pillars are not being addressed sufficiently in the implementation plan either.

These negative tendencies could have dangerous consequences for the implementation of the NDC. The lack of details on the policy actions makes the role of different actors and the concrete actions themselves ambiguous and therefore difficult to implement since important details might be overlooked. Furthermore, not addressing important national issues such as poverty, gender equality, literacy, biodiversity, pollution etc. in the context of NBS climate mitigation could worsen livelihoods if: the crops do not fit the lifestyles of local communities; women's rights to land are not addressed; the youth do not get better access to education; the entirety of ecosystems and its biodiversity level are not protected and restore; and if the effect of polluting industries is not minimised. Finally, the interconnection between these left-out issues could have a negative spill-over effect between the elements putting an already vulnerable system at further risk.

6.0: Discussion

The *issue of making climate policies more sustainable* is both a very relevant and highly debated area – this also applies to climate mitigation policies focusing on NBS. With the application of the NBS Policy Evaluation Model, it can be discussed firstly what it brings to policymakers as a new evaluation tool. It can further be discussed how this model can change the perspective on sustainable policies and finally what the model might be used for going forward.

6.1: A New Evaluation Tool for Policymakers

What sets the NBS Policy Evaluation Model apart from existing sustainability models (see p. 22) is the addition of *nature* as a foundation to the three pillars of sustainability. When looking at the cases of Belize and PNG we can see that this foundation could help discover crucial issues with policies before implementation.

In the case of the Belizean NDC, the policy actions do not include *nature* sufficiently meaning that things such as preliminary assessments of the natural environment in Belize are missing from the policy actions. By not including the foundation of *nature* more in the NDC they risk overlooking the local natural context in which to implement the policy. This includes the insufficient inclusion of entire ecosystems, landscape types, weather conditions etc. Hence the risk of a failed policy, because of the mismatch between the policy goals and the contextual needs, increases. By using the model policymakers would be able to evaluate the inclusion of the natural context and from that reshape current policy actions to ensure a deeper inclusion of local needs and conditions. This should decrease the risk of failure in the implementation phase since the actions and the needs would be more streamlined.

Compared to the Belizean NDC the policy actions in the PNG NDC mainly focus on the foundation of *nature* and therefore include many different preliminary assessments of the local natural context. However, the connection between the foundation and the three pillars, *social*, *environmental*, and *economic*, is not clearly defined and therefore becomes ambiguous. Furthermore, the assessments are also missing elements such as different types of landscapes, biodiversity, and water quality. This could result in non-holistic assessments of the natural context which lay the foundation for policy actions that could negatively impact important aspects both in the foundation and in the pillars. The NBS Policy Evaluation Model could therefore help policymakers specify the phrasing of these preliminary assessments in the policy actions to avoid misunderstandings during implementation. It could further help policymakers ensure a stronger connection between the foundation and the three pillars ultimately increasing the guarantee of the inclusion of all aspects of the foundation; the pillars; the overlaps aspects; and the potential spill-over effects between them.

When looking at these two cases it can therefore be argued that the NBS Policy Evaluation Model could add: more detail to the current policy actions; better inclusion of critical aspects from all elements in the model; a deeper and more thorough assessment of the natural context which lay the basis for the development of sustainable NBS policies.

6.2: Changing the Perspective on Sustainable Policies

With the application of the NBS Policy Evaluation Model, the perspective on developing sustainable NBS policies could shift the focus of policymakers to a more holistic approach. The benefits of a more holistic approach would be a broader perspective that considers the complex issues overlapping multiple elements – both foundation and pillars – such as the interconnections between climate changes and poverty. However, the model does not bring anything revolutionary to the field given its main function being sufficient inclusion of the natural context and its interconnection to the three pillars of sustainability. Nevertheless, the model can still help conceptualise already ongoing practices of conducting feasibility studies, assessments, and initial research and help make them requirements before implementing NBS policies. What the conceptualisation of these practices would add is guiding policymakers in: when they should be conducted; which elements and aspects should be considered; and increasing the level of detail for policy actions when developing policy strategies. Hence, with the model, a new conceptualised framework for evaluating climate mitigation policies is added to the toolbox of policymakers.

More specifically the model could help shift the perspective on sustainable NBS policies by detailing comprehensive guidelines for evaluating how the different elements affect each other and how excluding or not detailing policy actions can have negative spill-over effects. Furthermore, the holistic and in-depth approach of the model could help to ensure that interdisciplinary and complex problems will be solved with interdisciplinary and complex solutions that consider the consequences for multiple actors.

Lastly, since the foundation of the model is initiating the policy development process by investigating the natural context and its planetary boundaries and opportunities, the model could also help promote a more bottom-up and non-technocratic approach to policymaking in the long run.

6.3: Future Usages of the Model

Besides promoting a bottom-up approach the NBS Policy Evaluation Model might also expand its usage to other climate mitigation areas or a different domain in the policy development process.

The model's main purpose is to evaluate the degree of sustainability of NBS policies. But the application to other climate-related policies might also be feasible. This could be possible since climate mitigation policies require natural resources regardless of their character, as argued by Forsyth (2003) "all productive activity depends on borrowing from the finite resources of the planet" (p. 6). Therefore, the model could be applied to other climate mitigation areas such as sustainable energy, production and consumption, waste management, or sustainable infrastructure. However, the

addition of the foundation of *nature* is still more relevant for policies implementing natural solutions such as NBS.

Furthermore, the model could also be used in the initial stage of the policy development process. Instead of using the model as an evaluation tool, it could be used as a guidance tool for the creation of new policies and function as a template for policymakers to follow when developing sustainable policies. For example, when creating new policies for a national reforestation programme the model could be used as a step-by-step guide to creating policies as illustrated below:

1. Inclusion of *nature* would mean an assessment of the natural environment of the implementation site – determining how local ecosystems function; which flora and fauna are present and which are missing or invasive; what resources are available and which will be the best fit for the programme; what biochemical conditions are damaging the area and which new ones need to be established; which landscapes are we implementing in and how do these affect what plant and animal species we introduce; how is the quality of the water and how does it affect the existing and new species; and how does the ecosystem function as a whole.
2. Inclusion of the *social* pillar would mean an assessment of the local social structures – how do we ensure justice for local people in terms of land rights; how do we maintain the access to healthcare through this programme; how can we support the further education of local people; how do we increase the access to resources such as ecosystem services; how do we increase local communities access to social security; how do we ensure that gender equality is increased with this programme.
3. Inclusion of the *environmental* pillar would mean an assessment of local environmental issues – how is pollution and ocean acidification affecting nature and people and how can the programme help decrease the damages; what is the connection between the deforestation of the local area and the increase in climate disasters such as droughts, heavy rainfalls and depleted soil; how do the environmental conditions affect the level of biodiversity and how can the programme help increase it.
4. Inclusion of the *economic* pillar would mean an assessment of the local economic conditions – how are the local employment rates and how do they affect the vulnerability of local communities; are local people provided with job security, pensions, fair wages and worker's rights and how is this stabilising or destabilising the local workforce and levels of poverty; how does poverty affect local health, education, and access to resources; how can the programme help local communities gain financial independence.

Based on the answers to all these assessments policymakers could increase the degree of sustainability when developing new policies since the more holistic approach, which considers the interconnection between these issues, has been applied. The model could also be applied to work on a transnational or international level although the increase in the size of the project would require more resources and several evaluations of the natural contexts. Because of this, using the model on an international level would be using the model several times under a larger project and a cross-examination of the individual evaluations would need to be applied as well.

7.0: Conclusion

The development of sustainable environmental policies continues to be a challenge for policymakers which must be solved soon to meet the requirements of the Paris Agreement and solve the climate crisis. Therefore, improving how these policies function is an important task. Both scholars, policymakers, and society seem to agree that the way forward for these policies is constructing them on a foundation of nature. However, the involvement of nature in current policies and theories, such as political ecology, is limited and those which do involve nature such as Nature-Based Solutions often fail to include social issues. For that reason, I chose to investigate Nature-Based Solutions in the Nationally Determined Contributions under the Paris Agreement and answer the research questions: *How can a new model intersecting the theory of critical political ecology and the concept of NBS help evaluate the Nationally Determined Contributions under the Paris Agreement?*

In answering this question, I constructed the NBS Policy Evaluation Model. I did this by building a framework which would provide policymakers with concrete guidelines for developing sustainable climate mitigation policies – adapt for real-life scenarios and not just on paper. I chose to combine the theory of Critical Political Ecology, critiquing policies for not including natural science and nature, with Nature-Based Solutions, criticised for not including policy-making and social issues. The combination of the two addresses a gap in knowledge between political and natural science and counteracts the top-down, academic approach within Political Ecology and the lack of social justice within Nature-Based Solutions. Concretely, I constructed the model with a foundation of *nature,* pillars of *social, environmental,* and *economic* and a roof of *NBS policies* – making all the elements of the model interdependent and linked. The model's objective is to evaluate if policies place nature as the site of power and ensure equal, interdisciplinary, and holistic solutions that capture the bigger picture of complex problems – and by this evaluate their degree of sustainability. What sets the model

apart from other definitions of sustainability is the inclusion of *nature* as the foundation that determines the natural boundaries and dictates the possibilities for developmental practices.

As demonstrated by the policy process analysis of the Nationally Determined Contributions from Belize and Papua New Guinea the NBS Policy Evaluation Model can help policymakers increase the degree of sustainability for both cases. For Belize, the insufficient incorporation of *nature* in the policy actions such as ecosystems, landscape types, and weather conditions risks creating a mismatch between the local community needs, the environmental conditions, and the policy actions. The model could, therefore, help policymakers streamline these needs to avoid misunderstandings and wasted resources. For Papua New Guinea the insufficient inclusion of overlapping issues such as poverty and biodiversity risks non-holistic assessments of structural problems and negative spill-over effects between the elements in the model. The model could therefore help policymakers rephrase and detail policy actions to include these interconnecting issues and prevent negative outcomes from the policies.

Based on the analysis this thesis demonstrates that the NBS Policy Evaluation Model has the potential to become a valuable tool in the toolbox of policymakers. Furthermore, the model could also help change the perspective within climate mitigation policies to a more holistic and nature-based policy approach. The model could further be expanded to other climate mitigation areas such as sustainable energy or to work as a framework for new policies and is not necessarily limited to the evaluation of policies. Overall, the model has the potential to function as a practical framework which helps recentre climate mitigation policies around its foundation: nature.

The role of nature within climate mitigation seems to be changing and becoming more important. Where it has been largely overlooked and underrepresented in policy actions before, it is now, gradually, taking the role of a vital partner and ally in the creation of sustainable climate mitigation policies. Policies have for long downplayed the importance of nature or have not included it actively in policy actions – increasing the severity of the climate crisis significantly. To change the trajectory of the planet's climate the power of nature must, therefore, be reflected in the fabric of climate policies. Only by realising how much power nature holds will we be able to use it to "help us bring back balance to our planet" (United Nations, 2021).

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Appendix:

Appendix 1:
The CDC Policy Process Model (Centers for Disease Control and Prevention, 2022).

Appendix 2:
The Belizean NDC focusing on NBS Climate Mitigation - targets and actions. Colour coded: Nature (blue); Social (yellow); Environmental (green); and Economic (red) (State of Belize, 2021, pp. 14–17)

Target 1	**Reduce GHG emissions and increase GHG removals related to land-use change totalling 2,053 KtCO2e11 cumulative over the period from 2021 to 2030**
Action 1	Complete the REDD-plus Strategy, including options, implementation framework and assessment of social and environmental impacts, publish and maintain a National Forest Reference Level covering 2006-2020, and design systems for monitoring, information and safeguards; including stock-taking for tropical forest and mangrove cover and promotion of community land stewardship practices. Participate in REDD+ for performance-based payments for emissions reductions and removals increase achieved above and beyond the commitment in this NDC.
Action 2	Implement reforestation practices for 1,400 hectares in forest areas inside protected areas, as well as the restoration of 6,000 hectares of degraded and deforested riparian forests12 by 2030, with 750 hectares of this being restored in key watersheds by 2025

Action 3	Reduce degradation in 42,600 hectares of forest within protected areas by reducing fire incidence, improving logging practices, and controlling other human disturbance by 2030.
Action 4	Assess potential to reduce emissions related to fuelwood collection and use including an assessment of social and cultural impacts and collection of data on current fuelwood use in local communities throughout Belize and incorporate findings into forestry sector strategies.
Action 5	Incorporate and monitor agroforestry practices into at least 8,000 hectares of agricultural landscapes by 2030 by planting shade trees in line with the draft National Agroforestry Policy, with 4,500 hectares of this being implemented by 2025 conditional on adoption, implementation and financing of the agroforestry policy
Action 6	Promote and monitor the stewardship of 10,000 hectares of local community and indigenous people's lands as sustainably managed landscape to serve as net carbon sinks
Action 7	Explore alongside Article 6 of the Paris Agreement, new financing options to support forest protection and restoration, including REDD+ performance-based payments, multilateral and bilateral funds, insurance products, debt-for-nature swaps, private investment, carbon credits and bonds, and other innovative conservation financing mechanisms

Target 2	**Enhance the capacity of the country's mangrove and seagrass ecosystems to act as a carbon sink by 2030, through increased protection of mangroves and by removing a cumulative total of 381 KtCO2e between 2021 and 2030 through mangrove restoration.**
Action 1	Building on the 12,827 hectares of mangroves currently under protection, protect at least a further 6,000 hectares of mangroves by 2025, with an additional 6,000 hectares by 2030. This includes the establishment of new and/or improvement of existing public conservation measures to cover 100% of publicly owned areas identified in the Government's mangrove priority areas from the Forests (Protection of Mangroves) Regulations 2018; partnerships with landlords of privately owned mangroves, local communities, bilateral and multilateral agencies and the continued enforcement of the 2018 mangrove regulations. This is a non-CO2e commitment since baseline mangrove loss has been negligible over the 20-year period from 2001 to 2020.
Action 2	Restore at least 2,000 hectares of mangroves, including within local communities, by 2025, with an additional 2,000 hectares by 2030
Action 3	Halt and reverse net mangrove loss by 2025 through public measures and partnerships with private landowners local communities, and other relevant stakeholders
Action 4	Assess the value of seagrass habitat contributions to climate regulation to inform development and implementation of a national seagrass management policy, updated national seagrass mapping as part of an updated marine habitat map and identification of a portfolio of priority seagrass areas for protection to enhance conservation
Action 5	Complete an in-situ assessment of the below ground carbon stock of mangroves by 2022, leading to the application of relevant IPCC methodologies to assess the feasibility of including seagrass in a wetlands component, alongside a

	comprehensive assessment of mangrove-based carbon stock, in the National Greenhouse Gas Inventory, and other relevant reports by 2025
Action 6	Explore alongside Article 6 of the Paris Agreement, new financing options to support mangrove protection and restoration, including multilateral and bilateral funds, insurance products, debt-for-nature swaps, private investment, blue carbon credits and bonds, and other innovative conservation financing mechanisms
Action 7	Throughout delivery of land use interventions related to this target, promote the stewardship of local community and indigenous people's coastal lands as sustainably managed landscapes to serve as net carbon sinks

Appendix 3:

PNG NDC focusing on NBS Climate Mitigation - targets and actions. Colour coded: Nature (blue); Social (yellow); Environmental (green); and Economic (red) (Government of Papua New Guinea, 2020, pp. 41–43).

Target 1	**PNG aims to reduce an estimated emission of 10,000 GgCO2eq by 2030 from deforestation and forest degradation due to commercial agriculture expansion and comercial logging.**
Action 1	Sustainable Land-Use and Development Planning: • Policy and regulatory framework for sustainable land use and development planning are developed and implemented across concerned sectors. • A national central information system to store all data relating to land use in PNG is developed. A prototype to be in place before 2025 • HCV and HCS methodology are adopted for more sustainable, agricultural practices by agri-businesses in PNG.
Action 2	Enhancing value chain of climate friendly agriculture products: • A tracking system (e.g. a mobile app) for tracking production line from farmer's level to manufacturers is established.
Action 3	Strenghthening monitoring of FCA: • PNG REDD+ and National Forest Monitoring Web-Portal is updated with latest FCA data
Action 4	Promoting downstream processing of logs in the country: • Export of round logs in the country is reduced by more than 50% in 2025 through proper enforcement by PNGFA.
Action 5	Enhanced application of timber legality standards and permitting processes - strengthening monitoring of timber concessions: • Near-Real-time Deforestation and Degradation Alerts Monitoring System for PNG is established at all relevant government institutions and agencies by 2025 to enhance the PNG of timer legality system.
Action 6	Prepare strategic action plan based on detailed studies to scale up the Painim Graun Planim Diwai initiative: • First draft action plan in place no more than 3 years after the submission of PNG's Enhanced NDC
Action 7	Development and Encouraging agro-forestry Initiatives in line with the National Reforestation Strategy and the National Agriculture Development Plan (NADP) • Agro forestry activities are implemented at community level throughout PNG by 2026.

Action 8	Enhances monitoring and reporting on regeneration by conducting Forest and land use change assessment prior to 2000 to enable more realistic calculations of the biomass gain of the forest degrade before 2020 and to determine long term historical forest and land use change trend. • System for generating LULUCF activity data on land use and land use change under REDD+ MRV is upgraded with new capacity accurately measure forest regeneration before and after 2000.
Action 9	Complete National Forest Inventory to Improve the country specific Emission Factor (EF) and to enable space borne forest carbon estimation and monitoring: • Country specific Emission Factors for all forest types in PNG are available before the submission of PNG's first BTR to UNFCCC.
Action 10	Conduct PSP data and growth model update to enable estimation of post-disturbance CO2 sequestration of the forests calculation of annual loss/gain and creation of Post disturbance forest carbon recovery model: • PSP data and growth model are updated by 2023.
Action 11	Improve forest concession monitoring to allow more accurate emission estimation from the logging operation (75% of emissions in LULUCF) and to contribute timer legality verification system (TLVS): • All forest concessions areas in PNG are registered in the PNG's Near-Real-time Deforestation and Degradation Alerts Monitoring System for receiving activity alerts by 2023.
Action 12	Enhance ambition in PNG's 2025 NDC by including blue carbon ecosystems in the GHG inventory and UNFCCC reporting, including: Identify pathways to incorporating blue carbon by build upon existing AFOLU and REDD+ capabilities; Considering how to reflect mangroves and seagrasses in climate policies; Data collection, mapping and modelling: • PNG has technical capacity for blue carbon estimation and reporting, and policy making • Mangrove mapping • Carbon stock modelling and reporting • Mangroves incorporated in GHG inventory and BUR.