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Climate change adaptation strategy in developing countries: justice, fairness, and effectiveness.

The case of Fiji

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'Adaptation is not something that can be done to a community. It is something that needs to be done by a community, determined by its own needs and values' [1]

[1] Barnett, Jon. (2008). The Effect of Aid on Capacity to Adapt To Climate Change: Insights From Niue

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ABSTRACT

Nel corso degli ultimi decenni, nel panorama delle relazioni internazionali, il cambiamento climatico è stato riconosciuto come un problema urgente che richiede un'azione immediata. Di fatto, si è verificato un aumento significativo sia del numero di eventi climatici avversi, sia del numero di persone colpite da tali condizioni. L'aumento delle temperature di superficie medie globali ha visto un incremento di 0.74 ± 0.18 °C portando il Gruppo Intergovernativo sui Cambiamenti Climatici (IPCC) ad affermare l'innegabile aumento della temperatura globale.

Gli effetti del riscaldamento climatico causano gravi conseguenze a livello globale. Tuttavia, tali impatti variano in modo significativo tra stati, soprattutto per quanto riguarda i paesi sviluppati e quelli in via di sviluppo. Viste le recenti circostanze, è possibile affermare che la maggior parte delle ripercussioni climatiche colpiscono in modo più considerevole i paesi in via di sviluppo. Di fatto, l'articolo 7 dell'accordo di Parigi riconosce la gravità degli impatti che il cambiamento climatico ha su tali nazioni portando al peggioramento della loro vulnerabilità. È quindi presente un ampio consenso a livello internazionale riguardo al riconoscimento della maggiore gravità degli impatti subiti dai paesi in via di sviluppo.

La causa principale di tale vulnerabilità concerne il debole potenziale di adattamento che caratterizza i paesi in via di sviluppo. Di fatto, molte di queste nazioni non solo presentano un'elevata percentuale di industrie in settori sensibili al clima, ma sono anche limitati da diversi altri fattori, quali la mancanza di risorse umane, finanziarie e naturali, nonché capacità istituzionali e tecnologiche limitate. La vulnerabilità è quindi definita come la combinazione di diversi elementi, quali l'esposizione, la sensibilità a shock e pressioni, e la capacità di adattarsi.

Per rispondere alle necessità imposte dal riscaldamento globale, due approcci significativi sono emersi per contrastare il peggioramento della vulnerabilità: mitigazione e adattamento. Mentre la mitigazione è legata all'attuazione di misure per ridurre gli effetti del cambiamento climatico, l'adattamento riguarda l'adeguamento dei sistemi naturali o umani in risposta agli stimoli climatici effettivi e attesi. Il concetto di adattamento costituisce un argomento ampio e complesso negli studi sul cambiamento climatico e

sono state proposte numerose definizioni per affrontare questa difficoltà. Adattamento si può definire come un aggiustamento per ridurre gli impatti del cambiamento climatico attraverso alterazioni del comportamento dell'individuo e della struttura economica.

L'adattamento come strategia è apparso relativamente di recente nell`agenda internazionale. Di fatto, la Convenzione quadro delle Nazioni Unite sui cambiamenti climatici ha riconosciuto per la prima volta l'importanza dell'adattamento nel 1997 durante la terza Conferenza delle Parti (COP-3) a Kyoto. Il dibattito sul cambiamento climatico si era dunque spostato da una discussione che prevedeva una scelta fra mitigazione e adattamento, a considerare tali strategie due facce della stessa medaglia. La crescente rilevanza del concetto di adattamento nell'agenda politica ha quindi portato in luce la sua importanza nella salvaguardia dei mezzi di sussistenza e degli ecosistemi.

L'elaborazione di strategie per affrontare il cambiamento climatico a volte può rivelarsi infruttuosa, con conseguente scarso rendimento della misura attuata. Tuttavia, l'esecuzione di una strategia inadeguata può anche portare a un risultato ancora peggiore, il disadattamento. Questa condizione non è solo associata ad una maggiore vulnerabilità dovuta a un impatto negativo, ma anche a una conoscenza inadeguata della vulnerabilità e dell'esclusione dal coinvolgimento pubblico. Pertanto, per prevenire uno scenario di disadattamento legato alla giustizia climatica è importante considerare alcuni elementi. La causa fondamentale del disadattamento è legata a vari vincoli nei processi strutturali che impongono l'attuazione di misure di adattamento. Le misure top-down che sono state attuate fino ad ora, possono causare danni nel raggiungimento di adattamento in quanto aggravano la vulnerabilità. È quindi fondamentale formulare una strategia olistica che consideri il contesto politico ed economico nello sviluppo di politiche di adattamento che portino alla promozione della giustizia e della sostenibilità a lungo termine.

Di conseguenza, è fondamentale valutare l'adattamento dal punto di vista dell'equità e della giustizia climatica. Gli attuali sviluppi della ricerca dimostrano che gli effetti sproporzionati del cambiamento climatico sui paesi in via di sviluppo pongono anche alcune considerazioni etiche. In effetti, le concentrazioni di gas a effetto serra nell'atmosfera sono state prodotte principalmente dai paesi industrializzati. Tuttavia, le nazioni vulnerabili in via di sviluppo che hanno prodotto una porzione minima di gas serra e che non hanno gli strumenti di base per proteggersi dalle ripercussioni del cambiamento climatico, sono quelle che stanno soffrendo di più. Il cambiamento

climatico antropogenico ha di conseguenza dimostrato di causare ingiustizie alle comunità più vulnerabili.

Il concetto di adattamento ai cambiamenti climatici valutato in termini di giustizia climatica ed equità è un fenomeno piuttosto recente. Di fatto, l'equità nelle strategie di adattamento è cruciale perché una crescita disuguale riduce la possibilità di benefici sociali futuri e porta ad una minore probabilità di ottenere un adattamento effettivo. Tale concetto è emerso sia nel mondo accademico che nella società civile a partire dagli anni ’90, con l'obiettivo di ottenere giustizia per le persone svantaggiate che sono state gravemente colpite dal cambiamento climatico nonostante abbiano contribuito di meno. Un importante progresso verso il riconoscimento della giustizia climatica a livello internazionale è stato compiuto dall'ultimo rapporto dell'IPCC che caratterizzata la giustizia climatica in tre principi: giustizia distributiva legata alla giusta ripartizione degli oneri e dei benefici tra individui, nazioni e generazioni, la giustizia procedurale che implica chi decide e partecipa al processo decisionale e il riconoscimento che riguarda l'equa considerazione di valori diversi, culture, visioni del mondo e prospettive.

Questo fenomeno cerca di fatto di trovare soluzioni alla crisi climatica che non solo riducono le emissioni, ma anche misure che generano una società più equa. Quindi l'adattamento ai cambiamenti climatici in quest’ottica può essere definito come il processo di pianificazione e attuazione dell'adattamento, che riconosce gli svantaggi passati e presenti nella società, individua le potenziali disuguaglianze nella distribuzione degli impatti e dei costi e dei benefici delle misure di adattamento, si basa su processi inclusivi durante la pianificazione, l'attuazione, il monitoraggio e la valutazione e ripristina le disuguaglianze passate attraverso l'adattamento.

Il presente elaborato mira quindi a dimostrare attraverso l'analisi dei contributi determinati a livello nazionale delle Fiji, che è fondamentale considerare i contesti culturali, sociali, economici e politici in cui le politiche di adattamento sono sviluppate e attuate in condizioni vulnerabili. È evidente, come illustrato dal caso di disadattamento della costruzione di una diga nelle Fiji, che sottovalutare questi elementi porta a una mancanza di considerazione dell'equità nell'adattamento che causa un rafforzamento delle disuguaglianze esistenti, portando allo sviluppo di nuove disparità. Il presente progetto cercherà quindi di fornire una risposta riguardante lo sviluppo di una strategia di adattamento che tenga conto del contesto specifico dei paesi in via di sviluppo che mirano

a raggiungere l'equità nell'adattamento. Per quanto riguarda il primo obiettivo, la tesi analizzerà la strategia di adattamento attuata nelle Fiji, quali le misure basate sulla natura, un processo decisionale più partecipativo e inclusivo, l'empowerment dei leader delle comunità vulnerabili e l'implementazione di conoscenze locali nelle politiche di adattamento. Per affrontare il raggiungimento dell'equità, verranno invece valutate le teorie della giustizia climatica per sviluppare un adattamento giusto, giusto ed efficace.

La tesi è strutturata in otto capitoli: il primo capitolo presenta il concetto di adattamento, analizzandone le caratteristiche e le definizioni fornite dalla Convenzione quadro delle Nazioni Unite sui cambiamenti climatici, dal Gruppo intergovernativo sui cambiamenti climatici e da diversi accademici, tra i più rilevanti, Smith, Burton e Stakhiv. Il secondo capitolo analizza la storia e l'attenzione emergente sull'adattamento nei programmi di sviluppo. Infatti, attraverso una prima valutazione della dicotomia tra adattamento e mitigazione e l'inizio delle negoziazioni politiche, si mira ad illustrare l'evoluzione dell'adattamento e come esso sia emerso predominante nell'agenda internazionale. Il terzo capitolo affronta la vulnerabilità ai cambiamenti climatici nel contesto dei paesi in via di sviluppo, asserendo che tali mutamenti rappresentano un ostacolo significativo nella realizzazione di misure più focalizzate sugli aspetti socioculturali. Il terzo capitolo fornisce una serie di politiche governative che possono essere adottate per ridurre i potenziali impatti negativi dei cambiamenti climatici. Il capitolo descrive un quadro generale di strategie di adattamento e un quadro più specifico che si concentra sulle regioni vulnerabili e sui settori più sensibili al clima. Il quinto capitolo analizza le future strategie di adattamento e l'attuazione dell'integrazione del clima nelle politiche generali di sviluppo. Partendo dalla valutazione delle difficoltà di adattamento, presenta una serie di future strategie di adattamento per i paesi in via di sviluppo e di future politiche per raggiungere un percorso di giustizia climatica. Il capitolo si conclude con la valutazione delle misure per conseguire un adattamento efficace nei paesi in via di sviluppo. Il sesto capitolo presenta i limiti dell'adattamento e analizza il caso del disadattamento. Di fatto, l'adattamento al cambiamento climatico può essere prevenuto non solo da una serie di ostacoli tecnologici, fisici, macroeconomici, sociali e di norme culturali, ma anche da casi di disadattamento. In questo caso, lo stato risultante dopo gli sforzi di adattamento rende le comunità ancora più esposte alle conseguenze dannose del cambiamento climatico rispetto a prima. Il settimo capitolo riguarda l'analisi approfondita dei Contributi determinati a livello nazionale delle Fiji del 2015 e 2020. Si procede poi con un'analisi

comparativa di entrambi i contributi determinati a livello nazionale evidenziando le numerose iniziative e programmi adottati Fiji ed infine, viene presentato un caso di disadattamento riguardante la costruzione di una diga. Tale situazione di disadattamento, dimostra l'importanza di effettuare una profonda analisi riguardo ai contesti culturali, sociali, economici e politici in cui i programmi di adattamento sono formulati ed eseguiti in condizioni vulnerabili. L'ultimo capitolo analizza il concetto di giustizia climatica esaminandone i tre principi fondamentali stabiliti dal sesto rapporto del gruppo intergovernativo sui cambiamenti climatici: giustizia distributiva, giustizia procedurale e riconoscimento. Attraverso questa analisi, emergerà l'importanza delle misure bottom-up e l'attuazione dell'approccio 'advocacy coalition framework' (AFC).

INTRODUCTION

'Parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems, taking into account the urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change' [2].

Over the last few decades, there has been a significant rise in both the number of adverse climatic occurrences as well as in the number of people affected by such climatic conditions. Climate change has indeed been addressed by the Intergovernmental Panel on Climate Change as global concern that is likely to cause serious consequences for every country. Yet, the impacts of these events will be significantly different throughout the world, especially concerning the developed and developing countries. Indeed, the majority of these menaces end up affecting in a more considerable way the developing nations. Article 7 of the Paris Agreement indeed not only recognizes that adaptation to climate change is a major factor in the safeguarding of 'livelihoods and ecosystems', but it also acknowledge the serious impacts that climate change has on developing countries leading to the worsening of their vulnerability. Therefore, there has been wide consensus on the recognition that developing countries endure the greatest damages and have suffered the most from climate change repercussions [3].

Developing countries find themselves in a vulnerable situation due to their weak adaptation potential. Most less-developed countries are in fact more sensitive since a greater percentage of their industries are in 'climate-sensitive sectors', and their adaptation capacity is restricted because of a lack of 'human, financial, and natural resources, as well as limited institutional and technological capability'[4]. Two significant approaches have arisen to contrast the worsen of vulnerability and the adverse impact of climate change, namely mitigation and adaptation. While mitigation is related to the

[2] United Nations, Paris Agreement, 2015, article 7(2)
[3] IPCC. 'TAR Climate Change 2001: Impacts, Adaptation, and Vulnerability, Adaptation to Climate Change in the Context of Sustainable Development and Equity' (2001)
[4] McCarthy et all. 'Climate Change: Impacts, Adaptation, and Vulnerability' (2001)

implementation of measures to reduce climate change effects, adaptation concerns 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects' [5]. The term adaptation constitutes a wide and complex subject in the climate change studies and a great number of definitions have been proposed in order to address this complexity [6]. Indeed, after adaptation strategy emerged as the prominent option in the international agenda, it was mainly addressed as an adjustment to reduce climate change impacts through alterations of the individual's behaviour and economic structure. [7] [8] [9]

These definitions however do not provide a complete framework of adaptation since they do not take into consideration the complexities that developing countries face. Indeed, as Barnett recites 'adaptation is not something that can be done to a community. It is something that needs to be done by a community, determined by its own needs and values' [10]. Recent literature indeed highlight the importance of implementing adaptation measures that address the specific needs and cultural aspects of vulnerable and marginalized communities in order to achieve effective adaptation. As a result, the concept of climate justice emerged both in academia and civil society with the purpose of achieving justice for disadvantaged people that have been severely impacted by climate change and yet have contributed the least to it [11].

The thesis therefore aims to demonstrate through the analysis of Fiji nationally determined contributions that it is paramount to consider the intrinsic cultural, social, economic, and political context in which adaptation policies are developed and implemented in vulnerable conditions. It is evident that, as illustrated with the maladaptation case study of seawalls construction in Fiji, underestimating these elements leads to a lack of consideration of equity in adaptation causing a strengthening of existing inequalities that can lead to the development of new disparities. The present project will

[5] Intergovernmental Panel on Climate Change. 'Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.' (2007)
[6] Barry Smit. 'An anatomy of adaptation' (2000)
[7] Ibid
[8] Burton, Ian. 'Adapt and thrive options for reducing the climate-change adaptation deficit.' (2005).
[9] Smit, Barry & Burton, Ian & Klein, Richard & Street, Roger.' The Science of Adaptation: A Framework for Assessment.' Mitigation and Adaptation Strategies for Global Change. 4. 199-213. (1999). 10.1023/A:1009652531101.
[10] Barnett, Jon. 'The Effect of Aid on Capacity to Adapt To Climate Change: Insights From Niue.' Political Science 60. 31-45. (2008). 10.1177/003231870806000104.
[11] Holifield Ryan, Chakraborty Jayajit , Walker Gordon. 'The Routledge Handbook of Environmental Justice.' Routledge (2018), p.149.

thus attempt to provide an answer concerning the development of adaptation strategy that takes in to account the specific context of developing countries aiming to achieve equity in adaptation. Concerning the former objective, the thesis will analyse the adaptation strategy implemented in Fiji regarding nature-based measures, a more participatory and inclusive decision-making process, the empowerment of leaders of vulnerable communities and the implementation of local knowledge in adaptation policies. To address the latter issue of achieving equity in adaptation, the theories of climate justice to develop a fair, just, and effective adaptation will be assessed.

The thesis is structured in 8 chapters: the first chapter presents the framework and the concept of adaptation, analysing its definitions and characteristics. It considers the definition provided by the United Nations framework convention on climate change, by the Intergovernmental Panel on Climate Change and also by many academic scholars such as Smith, Burton and Stakhiv therefore considering adaptation from different perspectives. The second chapter analyses the conceptual history of adaptation and the emerging focus on adaptation in development programs. Indeed, through an initial evaluation of the dichotomy between adaptation and mitigation and the beginning of political negotiations on climate change convention, it aim to explain the evolution of adaptation and how it emerged predominant in the international agenda. The third chapter address the context of developing countries and vulnerability and through an analysis of the definition of vulnerability, it explains why developing countries are more vulnerable to climate change. It establishes that climate change represent a significant obstacle for them different approaches more focused on socio-cultural aspects must be considered. The third chapter provides a number of government policies that may be enacted to reduce the potential adverse impacts of climate change. It describe a general framework of adaptation strategies and a more specific one that focuses on vulnerable regions and climate-sensitive sectors. The fifth chapter analyses the future adaptation strategies and the implementation of mainstream climate into general development policies. Starting from the assessment of the difficulties to track adaptation, it presents a number of future adaptation strategies for developing countries and of future 'Paris-alignment' policies in order to achieve a climate justice pathway. The chapter concludes with the evaluation of measures to achieve effective adaptation in developing countries. The sixth chapter presents the constrain and limits of adaptation and it analyses the case of maladaptation. Indeed, adaptation to climate change can be prevented not only by a number of obstacles

such as technological, physical, macroeconomic, social values and cultural norms, but also by a maladaptive outcome. In this instance, the resulting state following adaptation efforts makes communities even more exposed to the harmful consequences of climate change than they were before. The seventh chapter concerns the in-depth analysis of Fiji 2015 and 2020 Nationally Determined Contributions. It then proceeds with a comparative analysis of both NDCs highlight the many important lessons that Fiji has learned demonstrated by the numerous initiatives and programs that were adopted. Lastly, a maladaptive case study of seawall building in Fiji is presented to demonstrate the importance of analysing the intrinsic cultural, social, economic, and political contexts in which adaptation programs are formulated and executed in vulnerable conditions. The last chapter will analyse the emerging concept of climate justice analysing the three main principles established by the Sixth Assessment Report of the Intergovernmental Panel on Climate Change: Distributive justice, procedural justice, and recognition. Through this analysis, it will emerge the importance of bottom-up measures and the implementation of advocacy coalition framework approach (AFC).

CHAPTER 1 FRAMEWORK AND CONCEPT OF ADAPTATION

1.1 Intro

Throughout the last decade, there has been a considerable increase in both the number of climate events and the number of individuals impacted by climate conditions [12]. Indeed, the past century has witnessed an increase of the global average surface temperatures by '0.74 ± 0.18 °C' [13]. The Intergovernmental Panel on Climate Change (IPCC) after a thoroughly analysis of air, ocean temperatures, changes in ice extent and sea level, has determined that it is undeniable that the global temperature has warmed [14]. According to these studies, climate change can be therefore considered a global concern with possible serious consequences for every country. However, the impacts of these events will be significantly different throughout the world and in particular in the developed and developing countries [15].

In recent decades, two significant approaches to climate change have arisen, namely mitigation and adaptation. According to the IPCC, mitigation is defined as a process that is expected to limit the effects of climate change, for instance, by diminishing greenhouse gas emission[16]. Adaptation instead is referred as 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities' [17]. These approaches go hand in hand since both of them are needed in order to reduce the impacts of climate change. Mitigation is needed because depending just on adaptation may eventually result in a situation in which 'effective adaptation is possible only at very high social, environmental and

[12] Paul Chinowsky , Carolyn Hayles , Amy Schweikert , Niko Strzepek , Kenneth Strzepek & C. Adam Schlosser. 'Climate change: comparative impact on developing and developed countries'. limate change: comparative impact on developingand developed countries, The Engineering Project Organization Journal. 67-80. (2011), p.2.
[13] IPCC, 'Climate change 2007 : the physical science basis'. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change A. (2007).
[14] Ibid, p.62
[15] Paul Chinowsky , Carolyn Hayles , Amy Schweikert , Niko Strzepek , Kenneth Strzepek & C. Adam Schlosser. 'Climate change: comparative impact on developing and developed countries'. climate change: comparative impact on developing and developed countries, The Engineering Project Organization Journal. 67-80. (2011), p.2.
[16] IPCC, 'Climate change 2007 : the physical science basis'. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change B. (2007), p.47
[17] Ibid, p. 17

economic costs' [18]. However, if the focus concerns the vulnerabilities to climate change, the adaptation approach became crucial because 'even the most stringent mitigation efforts cannot avoid further climate change' [19].

In this framework, adaptation to climate change has become 'a core issue in international development'[20] and, in the last decade, at the centre of the debate of policymakers, experts and scholars, it has been examined the relationship between 'climate change and development and how the latter is affected by the former'[21]. Recent studies have focused on the significant disparity between developed and developing countries concerning the potential negative consequences of climate change and have found that 'developing countries suffer the greatest losses'[22].

The threat that climate change impacts poses on the developing world has been thoroughly analysed and it has been officially recognized by the United Nations Framework Convention on Climate Change (UNFCCC). The framework currently acknowledges the 'potential threat that climate change poses on a global basis'[23] and the fact that the majority of these menaces end up affecting in a more considerable way the developing countries. Only with the United Nations Framework Convention on Climate Change (UNFCCC) of 2009 and 2010, significant steps have been taken for developing countries in order to address their vulnerably. In particular, it has been agreed on the importance of 'identifying the threats posed' and consequently 'adapting to the predicted changes, incorporating the changes into mid-range and long-term development plans' and lastly 'securing funding for the proposed and necessary adaptations'.[24] [25] [26]. Moreover,

[18] IPCC, 'Climate change 2007 : the physical science basis'. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change B. (2007), p. 81
[19] Ibid
[20] Katrina Brown. 'Sustainable adaptation: An oxymoron?'. Climate and Development, 3:1, 21-31. (2011)
[21] Patel, Sejal, and Binyam Yakob Gebreyes. 'What Is Effective Climate Adaptation? Case Studies from the Least Developed Countries.' International Institute for Environment and Developmen. (2020)
[22] IPCC, TAR Climate Change 2001: Impacts, Adaptation, and Vulnerability, Adaptation to Climate Change in the Context of Sustainable Development and Equity. (2001), p.22.
[23] Paul Chinowsky , Carolyn Hayles , Amy Schweikert , Niko Strzepek , Kenneth Strzepek & C. Adam Schlosser. 'Climate change: comparative impact on developing and developed countries'. climate change: comparative impact on developing and developed countries, The Engineering Project Organization Journal. 67-80. (2011), p.3
[24] United Nations, UNFCCC. 'Report of the Conference of the Parties on its fifteenth session', Part Two: Action taken by the Conference of the Parties at its fifteenth session, (2009).
[25] United Nations, UNFCCC, 'Report of the Conference of the Parties on its sixteenth session', Part One: Proceedings, (2010).
[26] Paul Chinowsky , Carolyn Hayles , Amy Schweikert , Niko Strzepek , Kenneth Strzepek & C. Adam Schlosser. 'Climate change: comparative impact on developing and developed countries'. climate change: comparative impact on developing and developed countries, The Engineering Project Organization Journal. 67-80. (2011), p.3

the United Nations Framework Convention on Climate Change (UNFCCC) of 2009 states that developed countries should support vulnerable countries providing adequate 'financial resources, technology and capacity-building' [27].

From the global scale point of view, there is a significant divergence in the capacity of the countries to adapt to climate change. This variation depends on the economic stability, on 'their institutions and infrastructures' and on 'their access to capital, information, and technology'[28]. In this framework, developed nations are more predisposed than developing regions to have better adaptation capability. In fact, the disparity between developed and developing countries will lead the poorer regions to deal with 'stricter constraints on technology and institutions' and to face higher financial costs as a result of climate change [29].

Climate change management in the poor countries is challenged by two main factors, namely the lack of infrastructure and the future impacts expected as a result of climate change [30]. Moreover, many times developing countries adaptative ability goes 'beyond their infrastructure and economic means' [31]. Indeed, other obstacles prevent these countries' effective adaptation, namely financial impediments as 'uncertain pricing, availability of capital, lack of credit', Institutional and legal difficulties for instance 'weak institutional structure, institutional instability', socio-cultural barriers regarding 'rigidity in land-use practices, social conflicts', technological obstacles and lastly Informational and educational impediments like 'lack of information or trained personnel' [32].

Climate change will have a greater impact on poor developing nations due to several reasons, for instance, developing regions will have significant increase in already high temperatures are estimated to result in substantial evaporation losses. Likewise, many developing countries national income is primarily reliant on agriculture, which is 'directly

[27] United Nations, UNFCCC. 'Report of the Conference of the Parties on its fifteenth session', Part Two: Action taken by the Conference of the Parties at its fifteenth session, (2009), p. 6.
[28] IPCC, TAR Climate Change 2001: Impacts, Adaptation, and Vulnerability, Adaptation to Climate Change in the Context of Sustainable Development and Equity. (2001)
[29] Ibid, p. 22
[30] Paul Chinowsky , Carolyn Hayles , Amy Schweikert , Niko Strzepek , Kenneth Strzepek & C. Adam Schlosser. 'Climate change: comparative impact on developing and developed countries'. Climate change: comparative impact on developing and developed countries, The Engineering Project Organization Journal. 67-80. (2011), p.3
[31] IPCC. 'The Regional Impacts Of Climate Change: An Assessment of Vulnerability Intergovernmental Panel on Climate Change' (1997).
[32] IPCC, TAR Climate Change 2001: Impacts, Adaptation, and Vulnerability, Adaptation to Climate Change in the Context of Sustainable Development and Equity. (2001), p.21.

affected by climate change'[33]. In addition, economic and technical capacity to respond to climate change can sometimes be limited and lastly, individuals in these nations are more sensitive to climate change and are more likely to experience its negative consequences [34]. Climate variability will therefore exacerbate and contribute to an already extensive list of challenges in developing countries [35].

Current research developments show that the disproportionate effects that climate change have on developing countries, also poses some ethical considerations. Indeed, the GHG concentrations in the atmosphere has been primarily produced by industrialised countries. However, vulnerable developing nations that produced a minimal GHG portion and that lack the basic tools to protect themselves from climate change repercussions, are those that are suffering the most. Anthropogenic climate change has consequently been demonstrated to cause injustice and unfairness to the most vulnerable communities and climate change adaptation has recently started to be assessed in term of justice [36] [37].

1.2 Definition

The United Nations framework convention on climate change (UNFCCC), product of the Rio de Janeiro 1992 united nations conference on environment and development (UNCED), provide crucial information concerning the adaptation concept. Two articles in particular require specific attention, namely Article two, that express the ultimate objective of the convention, and article four that instead focus its attention on the responsibilities and commitments of the parties [38] [39].

Article two of the UNFCCC reads as follow:

> 'The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant

[33] Ole Mertz, Kirsten Halsnæs, Jørgen E. Olesen & Kjeld Rasmussen. 'Adaptation to climate change in developing countries'. Environmental Management volume 43, pages743–752 (2009). P. 1-2
[34] Ibid
[35] Ibid
[36] Steve Vanderheiden. 'Atmospheric Justice: A Political Theory of Climate Change' (2008), p. 45
[37] IPCC. Sixth Assessment Report. 'Climate Change 2022: Mitigation of Climate Change', (2022), p. 5.
[38] Barry Smit. 'An anatomy of adaptation' (2000)
[39] UNEP. 'Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies'. (1998).

provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner' [40]

The article provide substantial information regarding the 'determination of what might be regarded as dangerous' as Smit argues and being able to determine this crucial information is a critical aspect in order to achieve adaptation. Indeed, 'natural ecosystem, global food supplies and sustainable development' can be considered at risk depending on their exposure to 'the magnitude, rate and nature of climate change', and on 'the ability of the impacted system to adapt' [41] [42]. Therefore, in order to evaluate the capacity for adaptation to climate change, an impact assessment of 'ecosystems, food production and sustainable development' is required. Indeed, the main concern is about 'understanding adaptations', approximating the conditions under which they can be anticipated and predicting their repercussions for the system [43]. The analysis of 'expected adaptations' is crucial to the studies of impact and vulnerability and is therefore essential to 'estimating the costs or risks of climate change' [44].

Instead, article four of the UNFCCC is more concerned with the implementation of the adaptation measures as a response strategy. Specifically, the UNFCCC commits parties to:

'Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change' [45]

More in particular, parties are required to:

[40] UNFCCC. 'United Nations Framework Convention on Climate Change' (1992)
[41] Barry Smit. 'An anatomy of adaptation' (2000)
[42] IPCC (2001), p.5
[43] Barry Smit. 'An anatomy of adaptation' (2000)
[44] IPCC. TAR Climate Change (2001), p.5
[45] UNFCCC. (1992)

‘Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods’ [46]

Even though the framework is more focused on the ‘stabilisation of greenhouse gas concentrations in the atmosphere’ [47], adaptation has acquired an increasing importance in the academic community and in Convention negotiations [48]. Moreover, the development of adaptation strategies is considered an important strategy and it is considered a crucial complement to mitigation actions in order to deal with threats concerning the increasing of global temperatures and the rise of sea level. Indeed, both article 4.1 of the UNFCCC and article 10 of the Kyoto Protocol, commit parties to seek ‘measures to facilitate adequate adaptation to climate change’ and to promote adaption and the implementation of adaptation technologies in response to climate change [49].

The term adaptation constitutes a wide and complex subject in the climate change studies and a great number of definitions have been proposed in order to address this complexity [50].

‘Adaptation to climate is the process through which people reduce the adverse effects of climate on their health and well-being and take advantage of the opportunities that their climatic environment provides’ [51]

‘Adaptation to climate change includes all adjustment in behaviour or economic structure that reduce vulnerability of society to changes in the climate system’ [52]

‘The term adaptation means any adjustment, whether passive, reactive or anticipatory, that is proposed as a means for ameliorating the anticipated adverse consequences associated with climate change’ [53].

[46] UNFCCC. (1992)
[47] Ibid
[48] UNEP (1998), p. 119
[49] IPCC (2001), p.5
[50] Smit (2000)
[51] Burton. (1992)
[52] Smith, J. B., Bhatti, N., Menzhulin, G. V., Benioff, R., Campos, M., Jallow, B. & Dixon, R. K. (2012). ‘Adapting to climate change: an international perspective’. Springer Science & Business Media.
[53] Smit, Barry & Burton, Ian & Klein, Richard & Street, Roger. ‘The Science of Adaptation: A Framework for Assessment’. Mitigation and Adaptation Strategies for Global Change. 4. 199-213. (1999). 10.1023/A:1009652531101.

‘Adaptability refers to the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes of climate. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of changes in conditions’ [54].

These definitions provide an elaborate framework and analyse different aspect of the concept of adaptation. In order to provide a comprehensive definition of what adaptation means, three main questions must be answered, namely: ‘adapt to what?’, ‘who or what adapts?’ and ‘how does adaptation occurs? [55].

First and foremost, the question ‘adapt to what’ can be interpreted as an adaptation to climate change, or to ‘change and variability’ or simply to climate. Otherwise, concept of adaptation can be understood as more related to the ‘response to adverse effects or vulnerabilities’ or in ‘response to past, actual or anticipated conditions or opportunities’ [56]. According to this latter perspective, adaptability to current climate and its unpredictability can be overcome with the implantation of a ‘prudent adaptive response’. Indeed, the improvement of adaptation should not only be a substitute for ‘preparing for adaptation to longer-term climate changes’, but also an initial and preliminary step that enhances the current capacity to deal with future problems [57].

In second place, adaptation must be interpreted as a constant process of change and evolution in order to fit the new circumstances of the changing climate situation. Therefore, it is a continuous mechanism that ‘involves ecosystems and socio-economic systems in their entirety’ [58]. Thus, the question ‘who or what adapts?’ not only imply ‘people, social, economic sector and activities’ but also ‘managed or unmanaged natural or ecological systems’, or even ‘practices, processes or structure of system’ [59]. Indeed, adaptation research involves two major goals: one is to give opportunities and alternatives to support effective adaptation, and the other is to achieve a better knowledge of vulnerability [60].

[54] IPCC. ‘Revised IPCC Guidelines for National Greenhouse Gas Inventories’ (1996).
[55] Smit. (2000). P.6
[56] Ibid
[57] UNEP (1998). P.122.
[58] Ibid, p.123-124
[59] Smit. (2000), p.6
[60] UNEP (1998), p. 124

Lastly, the question 'how does adaptation occur' may be answered based on a variety of criteria linked to processes and results. Indeed, it is important to understand that adaptive responses to climatic events can take numerous shapes and forms. Scholars and researchers have proposed many distinctions and typologies in order to identify the characteristics that describe and differentiate how the adaptation responses occur [61] [62]. The first attributes are distinguished on the basis of 'intent or purposefulness'. Indeed, according to Carter, it is important to differentiate between autonomous adaptation, intended to be 'automatic, spontaneous, passive or natural' [63] that happens on its own, and the planned adaptation which need active involvement and planning [64] [65] [66]. Likewise, the distinction can be related to the 'timing of the action' therefore the adaptation can be reactive, concurrent, or anticipatory. It can be analysed following the 'short term and long term 'characteristics and lastly it can be related to the 'spatial scope or institutional extent' [67].

Therefore, according to the Intergovernmental Panel on Climate Change, adaptation can be defined as 'the process of adjustment to actual or expected climate and its effects' [68] [69]. Adaptation is indeed interpreted as a modification of the 'ecological, social, or economic systems' [70] as a result of the 'experienced or future climatic conditions' [71] and their positive or hostile consequences and impacts of the climatic threats [72]. Moreover, adaptation to climate change will result in an improvement of the harmful impacts of climate threats and eventually benefit from new opportunities [73]. This term implies that adaptation generates alterations in procedures, methods, or structures created to mitigate or counteract the anticipated consequences. It entails taking steps to diminish the vulnerability of regions to climate change. Adaptation is crucial in dealing with climate change in two main ways: one concerning the assessment of consequences and

[61] Ibid
[62] Smit. (2000), p. 17-18
[63] Carter et all. (1994)
[64] UNEP (1998), p. 124
[65] Smit. (2000), p. 18
[66] Carter et all (1994)
[67] Smit (2000), p. 18-19
[68] IPCC 'Glossary' (2014)
[69] Patel & Gebreyes (2020)
[70] IPCC (2001), p.5
[71] Ibid, p. 6
[72] Carter (1994), p.44
[73] W. Neil Adger, Nigel W. Arnell, Emma L. Tompkins, 'Successful adaptation to climate change across scales'. Global Environmental Change, Volume 15, Issue 2, Pages 77-86, (2005), p.2

vulnerabilities, and the other for developing and evaluating response choices [74]. Adaptation is therefore related to 'all those responses to climate change that may be used to reduce vulnerability' and concern also the activities aiming to taking advantage of the new possibilities that may occur as a result of climate change impacts [75].

Lastly, the wide adaptation concept concerns also the enhancing of 'adaptive capacity' that can be defined as the ability of 'individuals, groups, or organisations to adapt to changes and implementing adaptation decisions' [76]. The improvement of the adaptive capacity is a fundamental means in order to deal with the uncertainties in climate because it diminishes risks and encourages sustainable development [77] . The adaptive capacity can be achieved both before or after the impacts of climate change. Therefore, adaptation may be regarded as a 'continuous stream of behaviours, actions, decisions, and attitudes' that influence all aspects of life and 'reflect current cultural norms and processes' [78].

A system is expected to develop greater adaptive capacity if some conditions are present, namely: the nation economy is steady, there is a high level of accessibility to technology, the government has clearly defined the duties and responsibility of the adaptation strategy at the national, regional, and local level, there is a strong system for the distribution of climate change and adaptation information and the presence of forums for the discussion of adaption measures at all levels, and lastly, there are steady social institutions that ensure and control that the 'access to resources is equally distributed' in order to avoid discrepancies that would lead to poorer adaptive ability [79].

1.3 Characteristics

Adaptive responses to climatic events come in a wide range of forms depending on numerous characteristics. Many academics have proposed different forms and attributes in order to recognize and analyse the features that differentiate how the adaptation responses occur [80]. According to Burton, for instance, it is important to differentiate

[74] IPCC (2002), p. 5
[75] UNEP (1998), p.117
[76] Adger (2005),p. 2
[77] IPCC (2001), p. 5-6
[78] Ibid, p.2
[79] Ibid, p. 22-23
[80] IPCC (2001), p. 7

between the ‘adaptation behaviours’ that can be ‘prevent loss, tolerate loss, spread loss, change use or activity, change location, restoration’ [81]. Smit instead classified them according to the ‘time frame’ of the stimulus that can be ‘long range, tactical, contingency and /or analytical’[82]. Following Carter analysis instead, adaptation is analysed through ‘management measures’ that can be distinguished between ‘structural or infrastructural, legal and legislative, institutional, administrative, organizational, regulatory, educational, financial, research and development, market mechanism, and technological change’ [83]. According to Bijlsma, adaptation can be differentiated on the basis of the ‘function’ hence by retreat, accommodate or protect [84] and lastly, Smither and Smit, classified adaptation according to ‘intent or purposefulness, the role of government, the spatial and social scale, duration, form and effect’ [85].

According to a distinction based on ‘intent or purposefulness’, many scholars agree that an important distinction must be made between autonomous or spontaneous adaptation and planned or deliberate intentional adaptation. Adaptation is usually concerned as the result of a conscious response to a climatic stimulus [86] . The concept of planned adaptation is founded on the premises that the condition are likely to alter and that interventions are needed. This type of response is related to the outcome of those measures that are actively taken ‘from deliberate policy decisions’ by governmental institutions and require direct intervention. These are measures that aim to limit the risks associated with climate change and 'benefit from opportunities' [87] [88] [89].

However, it is frequent that actions taken as a result of a climatic event have the unintentional or ‘incidental effect’ of diminishing the impacts [90]. This form of adaptation is called autonomous adaptation, also known as spontaneous, automatic, passive, natural, or preventive, and it is a type of response to a climatic stimulus that is expected to occur

[81] Burton (1993)
[82] Smit (1993)
[83] Carter (1994), p.18
[84] Bijlsma, L. & Ehler, Charles & Klein, Richard & Kulshrestha, S. & Mclean, Roger & Mimura, N. & Nicholls, R. & Nurse, Leonard & Nieto, H. & Stakhiv, Eugene & Turner, R. & Warrick, R. ‘Coastal zones and small islands.’ (1995).
[85] John Smithers, Barry Smit. ‘Human adaptation to climatic variability and change’. Global Environmental Change, Volume 7, Issue 2, Pages 129-146, (1997).
[86] Smit (200), p. 17-18
[87] Smit (2000), p. 17-18
[88] Pittock, Albert & Jones, Roger. ‘Adaptation to what and why?’ Environmental Monitoring and Assessment. 61. 9-35, (2000).
[89] IPCC (2001), p.8
[90] Smithers and Smit, (1997)

‘without the directed intervention of a public agency’. For instance, the process of adaptation in a natural ‘unmanaged systems’ is an example of spontaneous adaptation [91] [92]. According to Leary (1999), autonomous adaptation is described as a private-sector drive activity, instead of a public agency endeavour, and that is generally prompted by 'market or welfare' alterations caused by climate change [93]. Other scholars, such as Smith et al. (1996), agree that autonomous adaptation is bound to occurs ‘naturally’ without the involvement of government institutions, whilst planned adaptations are more related to ’intervention techniques.’. Therefore, it can be said that autonomous and planned adaptations are roughly equivalent to 'private and public adaptations, respectively' [94] [95].

Adaptations that are originated by public agencies are usually conscious response strategies while adaptations forms taken by individuals can be both autonomous or planned, or ‘some combination of the two’ [96]. According to Smithers and Smit, it is in fact important to also distinguish the adaptations strategies depending on the ‘role of government’[97]. In terms of private-sector actions, communities are thought to be capable of adjusting to climate concerns on their own through a variety of options and significant 'technological improvements’. Regarding instead the 'public agency' responses, the government is responsible for promoting, enforcing, and financing adaptation measures [98]. In addition, the implementation of these measures can be directly or indirectly. In certain circumstances, governments may directly undertake adaptation strategies, for instance the 'modifying port facilities' or the 'water control structures'. These direct measures can also be 'proactive or reactive' and can be 'short-term or long-term' responses. Moreover, governments may provide indirect aid through 'research, information dissemination, public education, or the provision of financial or other incentives' [99].

Another differentiation can be made on the basis on the ‘timing of the action’ of the climatic events. In this case, it is distinguished between three kind of adaptation strategies.

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[91] IPCC, TAR Climate Change (2001), p 17-18
[92] UNEP (1998), p.124
[93] Leary, N.A. ‘A Framework for Benefit-Cost Analysis of Adaptation to Climate Change and Climate Variability’. Mitigation and Adaptation Strategies for Global Change 4, 307–318 (1999). https://doi.org/10.1023/A:1009667706027
[94] IPCC, TAR Climate Change (2001), p.8
[95] Leary. (1999)
[96] Smithers And Smit. (1997), Pag. 11
[97] Ibid, p. 11-12
[98] Ibid
[99] Ibid

The first one is the reactive type of adaptation, also known as responsive or ex post, that is common in 'unmanaged natural systems'. Secondly, there is the concurrent adaptation that is taken during the event, and lastly the anticipatory form, also called proactive or ex ante, and it is employed in order to 'avoid or reduce harmful impacts and/or benefit from opportunities'. These latter types, concurrent and reactive, are usually common in 'socio economic' systems [100].

The adaptation strategy can also be analysed according to a 'temporal scope' [101]. This distinction results in two different forms of adaptation, namely short-term, or longer-term measures that analyse the difference between an 'effect' and a 'response' [102]. Short-term changes, in fact, can be considered the first protective barrier against climate change, while long-term strategies are more related to the capability of a system to alter its functions 'in response to repeated disturbance' [103]. This concept can be enhanced linking the latter distinction to the difference between the 'resiliency of a system versus the adaptation of a system' [104]. In this context, resiliency is to be understood as the capacity of an 'organism, community or ecosystem' to handle threatening climate events and to deal with its recover to the starting condition [105].

According to Burton (1993), another important differentiation must be made on the basis of the 'adaptation behaviours' of individuals, since it can 'prevent loss, tolerate loss, spread loss, change use or activity, change location and restoration' [106]. People who deal with environmental uncertainty are expected to consider anticipated economic implications, but their actual behaviour hardly matches what would be desirable according to their utility standards. Moreover, people are frequently unaware of all of their alternatives and even when the actual outcomes are known, they differ significantly in how they interpret the repercussions of various activities [107]. Kates propose the most elaborate rational model so far that approximates how individual behave in an environmental uncertainty situation. The 'process of choice' starts when people perceive an 'actual or anticipated loss', however, people perception varies widely, thus in some

[100] Smit (2000), p. 18-19
[101] Ibid
[102] Smithers and Smit. (1996), p. 6
[103] Easterling, William E. 'Adapting North American agriculture to climate change in review.' Agricultural and forest meteorology 80.1, 1-53. (1996)
[104] Ibid
[105] Ibid
[106] Carter et al (1994), p.18
[107] Burton (1993)

cases the issue may be overlook or failed to recognize [108]. Hence, individuals must consider and analyse an extreme scenario and find strategies to deal with. Secondly, once the first barrier has been crossed, conscious action is necessary to modify or correct the damage, thus people look for alternatives that include adjustments in resource utilization or technology. Finally, the third limit is reached when moving to another area appears to be the best option. This model is repeated every time harm happens or threatens will occur [109] [110].

Lastly, there are still other important criteria of distinction to be made in order to better analyse adaptation responses, namely the 'spatial scope or institutional extent' that is related to a form of adaptation that might be 'localized or widespread'; or it can be differentiated on the basis of their nature that can be 'technological, behavioural, financial, institutional or informational' [111].

This categorization can be considered as an evolution of the three main pillars of adaptation. The first component is the decrease in the 'sensitivity of the system to climate change' caused by the enhanced 'reservoir storage capacity', by the cultivation of crops that can survive climate threats, or by ensuring that new structures in flood zones are built with a 'floodable ground floor'. Secondly, the adjustment of the system's response to climate events is another aspect of adaptation that may be accomplished by 'investing in hazard preparedness and implementing climate change mitigation efforts'. Lastly, the third factor is increased 'resilience of social and ecological systems' in order to deal with the alteration that can be accomplished not only with actions that seek to improve the well-being and the resources, but also with measures that allow specific targeted communities to heal from the damage [112]. The accomplishment of these three adaptation aspects vary depending on the specific area, on the 'role of international and national policy,' and on the 'individual and collective' efforts. While adaptation measures can be applied in certain cases, in others, they can result in a change in the 'physical characteristics of impacts' [113].

[108] Kates, R. W. (1971). Natural Hazard in Human Ecological Perspective: Hypotheses and Models. Economic Geography, 47(3), 438–451. https://doi.org/10.2307/142820
[109] Burton (1993), p. 88-89
[110] Kaes (1971)
[111] Smit (2000), p. 18-19
[112] W. Neil Adger, Nigel W. Arnell, Emma L. Tompkins, 'Successful adaptation to climate change across scales'. Global Environmental Change, Volume 15, Issue 2, Pages 77-86, (2005), p. 3.
[113] Ibid

CHAPTER 2 - CONCEPTUAL HISTORY OF ADAPTATION AND EMERGING FOCUS ON ADAPTATION IN DEVELOPMENT PROGRAMS

2.1 Analysis of the dichotomy between adaptation and mitigation and the beginning of political negotiations on a climate change convention

There is a fundamental difference between adaptation and mitigation since mitigation focuses on the cause of climate change while adaptation focuses on its effects. The link between adaptation and mitigation must consequently be seen as a combination that will need research and assessment to determine the optimal combination, rather than as 'separate domains' perceived as choices in response to the threat of climate change [114]. These tow processes share a fundamental relationship: the more the mitigation, the fewer the repercussions, and hence the fewer the effects to adjust to. Furthermore, greater mitigation efforts will pave the way for fewer dangers to be expected. In contrast, a greater number of preliminary adaption measures will result in a weaker impact of climate change [115] [116]. Nevertheless, due to global climate inertia and delays in implementing adequate policies, the consequences of mitigation will not be immediately apparent. The consequences of adaptation efforts, on the other hand, will have very near visibility due to tight linkages with development programs [117].

Adaptation has not always been regarded as critical or significant in climate research and politics, indeed, notwithstanding the UNFCCC's consideration of both mitigation and adaptation, domestic and global environmental policy has mostly focused on mitigation. On the one hand, this depicts the ambiguity regarding whether climate change is induced by anthropogenic activities that occurred prior to the introduction of the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 1996. On the other hand, it also implies an absence of knowledge of climate change adaptation, which stems from the scientific community's lack of attention to adaptation [118].

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[114] Saleemul Huq and Michael Grubb. 'Scientific assessment of the inter-relationships of Mitigation and Adaptation', (2003), p. 3.
[115] Schipper, E. Lisa F. 'Conceptual history of adaptation in the UNFCCC process.' Review of European Community & International Environmental Law 15.1 (2006): 82-92.
[116] Saleemul Huq and Michael Grubb. (2003), p. 3.
[117] Schipper, E. Lisa F. (2006), p. 84
[118] Klein, Richard JT. 'Adaptation to climate variability and change: what is optimal and appropriate.' Climate Change in the Mediterranean: Socio-Economic Perspectives of Impacts, Vulnerability and Adaptation 32 (2003): 32-52.

During the first negotiations of the United Nations Framework Convention on Climate Change, adaptation received less emphasis than mitigation since it was a concept that, at the time, presented several weaknesses. Indeed, adaptation measures were considered to have a 'passive, resigned' and 'accepting' [119] nature and that was consequently thought to be 'unconstructive' [120] in order to counteract the climate change threats. Adaptation was therefore seen as a 'defeatist option' [121] since it required changes that would alter the standard conduct of individuals. Moreover, implementing adaptation actions would have resulted in the acknowledge that mitigation efforts were not effective and adequate enough to contrast the effects of climate change, and most importantly, it would openly confirm that climate change was indeed happening[122].

Therefore, in times where scientific uncertainty was high and division between 'believers' and 'climate sceptics' was very clear, it was consequently imprudent to discuss adaptation during the negotiations since there was a strong consensus to take careful measures in order to mitigate climate change [123] [124]. Moreover, opting for the implementation of adaptation measures, could not only highlight a country's weakness in terms of greenhouse gas reductions, but also could make the nations offering adaptation, be perceived as 'closet polluters' [125].

In addition, addressing the adaptation aid issue was perceived as an 'implicit acceptance of responsibility for causing climate change' [126] which was considered a delicate matter that would emphasize too much the controversial debates on accountability of climate change [127]. Indeed, industrialized nations were seeking to avoid discussing the 'liability and compensation' issue since developing nations could be able to leverage this matter on their advantage [128].

Furthermore, also from the political perspective, adaptation was in disadvantage with respect to mitigation. Due to a scarcity of empirical data, the United Nations Framework

[119] I. Burton, 'Deconstructing Adaptation and Reconstructing' (1994), p.1
[120] Schipper, E. Lisa F. (2006), p. 84
[121] Ibid
[122] Ibid
[123] I. Burton, 'Deconstructing Adaptation and Reconstructing' (1994), p.1
[124] Schipper, E. Lisa F. (2006), p. 84
[125] Ibid
[126] UNFCCC (1992), p. 275
[127] Schipper, E. Lisa F. (2006), p. 85
[128] I. Burton, 'Deconstructing Adaptation and Reconstructing' (1994), p.1

Convention on Climate Change merely focused on the anthropogenic climate change, and it did not address the climate variability issue leading to another obstacle in the consideration of adaptation measures in the UNFCCC [129]. Indeed, the UNFCCC outlined in article 2 that its main role was the 'stabilization of greenhouse gas concentrations'[130], thus demonstrating that mitigation was prioritized over adaptation since it was thought that it was the most efficient strategy in dealing with climate change [131].

Moreover, adaptation was considered to be in subordinate position than mitigation since adaptation entails a longer-term approach that was thought to be implemented only after the consequences of climate change were more visible [132]. Lastly, from a financial standpoint, nations that were the root of the issue were also accountable for enacting mitigation measures and, as a result, had to pay the relative expenditure. Governments were therefore concerned about the potential costs, and particularly for those related to financing the developing nations in response to climate change [133].

The disparities in mitigation and adaptation views during the early stages of the UNFCCC negotiations resulted in an imbalance in research and investigations into these approaches. As a result, mitigation became the primary focus of study, whereas adaptation suffered from a significant lack of understanding [134]. The great majority of policymakers' research has mostly focused on the mitigation issue, as indicated by the UNFCCC and the negotiations for the ratification of the Kyoto Protocol in 1997. The emphasis on 'adaptation as a reaction' has been largely ignored, and it has only been considered in the context of mitigation studies. According to some experts, one significant rationale for this behaviour is that it is commonly acknowledged that adaptability will not be enough in the long run since the greenhouse gas concentration in the atmosphere must be kept at a reasonable level [135].

[129] Schipper, E. Lisa F. (2006), p. 85
[130] Report of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change on the work of the second part of its fifth session, held at New York from 30 April to 9 May (1992), Article 2.
[131] Schipper, E. Lisa F. (2006), p. 86
[132] Ibid, p.85
[133] Ibid
[134] Ibid, p.86
[135] Burton, Ian & Huq, Saleemul & Lim, Bo & Pilifosova, Olga & Schipper, Lisa. (2002). 'From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy'. Climate Policy. 2. 145-159. P. 147

2.2 Conceptual evolution of adaptation

From the international policy point of view, adaptation has only recently acquired prominence. Indeed, Burton et al agree that it has now achieved the position of a 'legitimate policy response' [136] to climate change in the United Nations Framework Convention on Climate Change (UNFCCC) [137].

Only by the end of the 1990's, adaptation started to be recognized as a possible option to respond to climate change threats. In fact, the United Nations Framework Convention on Climate Change first acknowledged the significance of adaptation in 1997 during the third Conference of the Parties (COP-3) in Kyoto [138] [139] [140]. In this conference, the Kyoto protocol envisaged a 'Clean Development Mechanism (CDM)' that target as its main goal the adaptation strategy [141]. The importance of the concept of adaptation was therefore understood and confirmed by the international community.

In this context, a significant decision was made in 1998 during the Fourth Conference of the Parties (COP-4) in Buenos Aires. It was the first time that governments agreed to provide fundings for preliminary adaption projects in developing countries [142]. However, during COP-6 (The Hague, 2000), while governments were trying to make this decision functional, the parties were unable to reach an agreement on the enforcement of the Kyoto Protocol leading to delays of its execution [143]. However, even though the integration of the Kyoto Protocol objectives was bound to have little effect on the consequences of climate change, the delays in executing the Kyoto Protocol paved the way for a more adaptation focused policy since it became evident that mitigation was not suitable to contrast the effects of climate change and that adaptation was required [144].

[136] Ibid, p. 148
[137] Ibid, p. 145
[138] Schipper, E. Lisa F. (2006)
[139] Klein (2003)
[140] Tilman Santarius, Hans Jakob Walnum, Carlo Aall. 'Rethinking Climate and Energy Policies', New Perspectives on the Rebound Phenomenon. Springer Cham. (2016)
[141] Klein (2003), p.1-2
[142] Ibid
[143] Ibid
[144] Tilman Santarius et all (2016).

Only in 2001 at the Seventh Conference of Parties (COP-7) in Marrakech, a deal was reached to create 3 separate funds, each containing a portion for adaption [145]. As a result, the previous mainstream paradigm that distinguished between reducing emissions and adjusting to new alterations was fading from the general perception. Instead, it was acknowledged that, while mitigation is still required to implement purposeful adjustments, adaptation would no longer be a choice, but would be embraced in the mainstream[146].

Therefore, a major shift happened in the early 1990s where the debate on climate change shifted from a discussion 'framed as a choice between mitigation and adaptation' [147]to an increasing relevance of the concept of adaptation strategy in the political agenda [148]. It had indeed become evident that it was a tough challenge 'if not impossible' to reduce greenhouse gas emissions rapidly enough to avert all climate change consequences. Furthermore, numerous challenges remained unavoidable, such as technological limitations in eliminating the use of fossil fuels, as well as the economic and political repercussions of this rapid transition. Additionally, developing nations could not grow if developed countries placed further limits[149].

Nonetheless, even though adaptation was gaining momentum in the international discussion, there was an evident absence of framework to voice adaptation under the UNFCCC. This lack of context led to the creation of an 'Adaptation Protocol' this lack of context prompted the development of an 'Adaptation Protocol' and even if there was not an official proposal on this topic, the awareness, and the debate that this issue had created, is proof of the potential that was being recognized in adaptation. At the same time, the continuous emphasis on the establishment of a 'larger platform for adaptation policy' suggests that the present measures were not considered enough [150].

The absence of clear provisions in the UNFCCC created confusion over the issue of 'how to address adaptation'[151]. However, the adaptation strategy was mainly discussed in the

[145] Burton et all, (2022), p.148
[146] Schipper, E. Lisa F. (2006), p. 86
[147] A. D. Tarlock, 'Now, Think Again About Adaptation', 9 Ariz. J. Int'l & Comp. L 169 (1992), p. 170. Available at: https://scholarship.kentlaw.iit.edu/fac_schol/639
[148] Burton (1994), p. 1
[149] Ibid
[150] Schipper, E. Lisa F. (2006), p. 89-90
[151] Ibid, p. 90

context of ‘adaptation funding’. In fact, in many international frameworks, funding is intended to be made available to underdeveloped countries. For instance, parties are expected under Article 4.9 of the Convention to pay special attention to LDCs concerning finance and technology transfer. COP-7 also approved particular funding under the Agreement to promote a work program for the least developed nations [152].

Indeed, according to Bodansky, incorporation of financial means in the convention was part of the deal [153] and that one of its purposes was to assist developing countries in dealing with the negative repercussions of climate change if efforts under the accord failed to successfully mitigate global warming [154].

In addition, after COP-6 when adaptation began emerging as a possible approach, it was 'scattered' and spread in various negotiations processes. This phenomenon created problems related to the development of 'adaptation policy'. As a result, since adaptations was considered to be an 'equity issue' and that helping adaptation was related to 'supporting development', the promotion of adaptation policy suffered a substantial impediment[155]. As a result, even though the resources established through the Marrakesh Accords are being implemented, concerns linked to the concept of adaptation seem to be ‘halting this process’ [156]. Recently, according to many scholars and policy makers, a strategy was able to overcome this issue of ‘how to address adaptation’. In particular, it had been noticed that the concept of adaptation has mainly been considered within the framework of the developing-country issues in terms of ‘capacity building and technology transfer’ creating a space for adaptation in the legal context [157].

As a result, mitigation was taken out of focus from the international agenda since adaptation appears to be more suitable in light of the recent developments. Indeed, the establishment of the Clean Development Mechanism (CDM), a system that would enable a developed country to earn 'emissions reduction credits for investing in sustainable-development projects in developing countries' did not paved the way to the initially

[152] Yamin, F., & Depledge, J. (2004). ‘The International Climate Change Regime: A Guide to Rules, Institutions and Procedures.’ Cambridge: Cambridge University Press. P. 290. doi:10.1017/CBO9780511494659
[153] Schipper, E. Lisa F. (2006), p. 90
[154] D. Bodansky. ‘The United Nations Framework Convention on Climate Change: A Commentary’ 18:2 Yale Journal of International Law (1993), p. 523
[155] Schipper, E. Lisa F. (2006), p. 90
[156] Ibid
[157] Ibid

anticipated advantages [158] [159]. Furthermore, two other means may have acted as an incentive for developing nations to explore outside the CDM and the Kyoto Protocol for financial alternatives, namely the entrance into force of the Kyoto Protocol and its uncertainty. Evidence of this approach was endorsed at COP-8 with the Delhi Ministerial Declaration on Climate Change and Sustainable Development, which emphasises the role of climate change in development agenda [160].

2.3 Current understanding and status of adaptation under the UNFCCC

Adaptation is currently acquiring more significance in the political and academic agendas. Indeed, as Nordhaus recite, 'Mitigate we might; adapt we must' demonstrating that adaptation has become a key policy approach in the mainstream understanding in the UNFCCC [161].

In 2002, after several negotiations processes, it had been recognized that adaptation is not any longer an 'optional action' but it represents an essential approach to deal with climate change threats [162]. In addition, it has been acknowledged that adaptation and mitigation are not anymore considered to be alternatives but 'two sides of one coin' that share a 'complementary approach' [163].

Additionally, it has been recently acknowledged by the IPCC's Fourth Assessment Report (AR4) that mitigation and adaptation are inextricably related to the concept of sustainable development. As a result, the link between the adaptation and mitigation is considered to be a 'cross-cutting issue' [164] [165]. This new approach goes beyond the merely complementary approach, leading to a more sustainable development framework. In this

[158] Michaelowa, Axel. 'Mitigation Versus Adaptation: The Political Economy of Competition Between Climate Policy Strategies and the Consequences for Developing Countries'. HWWA Discussion Paper, No. 153. ECONSTOR (2001), p. 22
[159] Schipper, E. Lisa F. (2006), p. 91
[160] Ibid
[161] Radetzki, M. 'Review of Managing the Global Commons: The Economics of Climate Change, by W. D. Nordhaus'. The Energy Journal, 16(2), 132–135 (1995). http://www.jstor.org/stable/41323453
[162] Schipper, E. Lisa F. (2006), p. 86
[163] Ibid, p.91-92
[164] Ibid
[165] Saleemul Huq and Michael Grubb (2003), p.3

sense, mitigation and adaptation features can be taken into consideration in a ‘balanced portfolio of responses’ [166].

Indeed, it has been agreed that an ‘optimal mix’ of adaptation and mitigation may be accomplished by assessing how a nation could effectively ‘invest money’ and by the identification of particular initiatives that would ‘contribute both adaptation and mitigation components’[167]. Concerning the case of developing nations, since they are the most exposed to climate change damages, it has been agreed that they will begin to engage in adaptation strategies through the funding obtained from industrialised economies. For instance, the 'Bangladesh's investment in cyclone shelters' following the 1992 accident was made with German funds [168] or the ‘Tuvalu´s government attempt' to obtain legal protection from Australia and New Zealand in the event of 'sea-level rise and disappearance of the islands’ [169]. On the whole, the increased acknowledgement of the possibilities of adapting to climate change in developed countries decreases investment in mitigation while strengthening the need for adaptation in poor countries. until developed nations fund adaptation, poor countries will suffer under a 'mitigation-only' policy [170].

Furthermore, it has been discussed that there are a number of policy initiatives that belong to both categories, one instance that illustrate this point is the ‘energy-efficiency programmes’. This initiative demonstrate that certain mitigation efforts can help to lessen the effects and hence operate as adaptive solutions [171] [172]. Nonetheless, there is still opposition to this complementing method since it would imply trade-offs that may lead to ‘neither the adaptation nor the mitigation component being effective‘ [173].

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[166] Burton, Ian. ‘Adaptation to climate change and variability in the context of sustainable development.’ Climate Change and Development, Yale School of Forestry and Environmental Studies & UNDP: New Haven and New York (2000)., p. 155
[167] Schipper, E. Lisa F. (2006), p. 91-92
[168] McCarthy et al. (2001), p.897
[169] Pacific Islands Forum with United Nations Missions, ‘Pacific Islands Forum Submission to The International Law Commission On The Sub-Topics Of Sea-Level Rise In Relation To Statehood And To The Protection Of Persons Affected By Sea-Level Rise’ (2021)
[170] Michaelowa, Axel. (2001)
[171] Metwalli, Ali & Jongh, Harmen & Boekel, Martinus & Cohen, Stewart & Demeritt, David & Robinson, John & Rothman, Dale. (1998). ‘Climate Change and Sustainable Development: Towards Dialogue. ‘Global Environmental Change. P. 360. 10.1016/S0959-3780(98)00017-X
[172] Schipper, E. Lisa F. (2006), p. 91-92
[173] Ibid, p. 91-92

However, it has been argued that the United Nations Framework Convention on Climate Change may not be the best strategy for adaptation since 'vulnerability to climate change' is driven by elements that are outside the reach of the UNFCCC[174]. Additionally, another concern is that adaptation could undermine the mitigation goals in an attempt to 'mirror mitigation policy in scope and importance.' As a result of these events, mitigation could be regarded as a 'less urgent' matter than adaptation[175]. As a result, the current understanding of adaptation is primarily focused on how adaptation exemplifies 'policy-driven adjustments' in response to climate variations. A more recent trend is focused on how industrialized nations' build specific adaptation measures and incorporate them into their institutional systems [176].

In conclusion, since adaptation has achieved an essential status in the international arena, it is critical to focus on how to guarantee that adaption policies truly affect vulnerability to climate change in an effective and 'sustainable manner'. 'This would be a particular appropriate method to enhance adaptation measures, especially concerning the most endangered nations' [177] [178].

[174] Schipper, E. Lisa F. (2006), p. 91-92
[175] Ibid
[176] Ibid
[177] Ibid
[178] Burn et all (2002), p. 157-158

CHAPTER 3 - DEVELOPING COUNTRIES AND VULNERABILITY

3.1 What is vulnerability? Why developing countries are more vulnerable to climate change?

In recent years, the study of poverty and vulnerability of social ecological systems to climate change has acquired more importance since they are two of the most urgent needs that are impacting human society in the twenty-first century [179]. It is commonly acknowledged that poverty and inequality must be reduced in order to ensure sustainable growth and therefore reduced susceptibility to climate change with adaptation measures has been increasingly considered as a precondition for sustainable development[180].

Even though the notion of vulnerability has been acquiring more prominence, it is a concept that still presents different approaches and interpretations. The most common definition is related to the 'likelihood of injury, death, loss, disruption of livelihoods or other harm as the result of environmental shocks, such as floods, earthquakes or other hazards, or harm resulting from social changes such as conflict or economic restructuring'[181].

Nonetheless, vulnerability still have three different dimensions: the first one is related to the physical dangers caused by environmental instability. This instability includes the rising of the average global temperatures, the rising seas, the reduced or elevated rainfall, land degradation, the shifting of river courses, the modification in storm duration and magnitude and the alterations of weather patterns [182]. The second dimension of vulnerability is concerned with the ability of individuals subjected to the threats of climate change to handle these events and successfully adapt. Lastly, the third dimension is concerned with the intensification of the risks that leads to a limited adaptation ability as a result of social and environmental dynamics. Therefore, vulnerability is considered to

[179] Eriksen, Siri & O'Brien, Karen. (2007). Vulnerability, poverty and the need for sustainable adaptation measures. Climate Policy. 7. P. 337. 337-352. 10.1080/14693062.2007.9685660.
[180] Ibid, p. 338
[181] Ibid, p. 338-339
[182] Ibid

be a ‘dynamic concept’ since it is always evolving as the ecological and socioeconomic systems that define local circumstances and capacity to cope change [183] [184] [185].

Current studies on the vulnerability of social ecological systems show that many social-ecological components, such as the capacity to ‘absorb shocks,’ the self-organization autonomy, and the ability to respond in advance and in response to threats, have a strong effect on vulnerability. It has also been observed that only by examining these characteristics it is possible to determine whether there is an ’underlying vulnerability’ that leads to a reduction in a system resilience [186].

The report of the Working Group II of the Intergovernmental Panel on Climate Change (IPCC) provides fundamental knowledge regarding the concept of vulnerability, evaluating the susceptibility of natural ecosystems to climate change [187]. Indeed, according to McCarthy et al, vulnerability is defined on the basis of the extent to which a ‘natural or social system is susceptible’ to the negative effects of climate change[188] [189]. Moreover, vulnerability is determined by three different factors: in the first place, vulnerability is evaluated on the system's susceptibility to climate change understood as the way a system will respond to a particular climatic shift; the second factor is the ability to adapt, hence how alterations can mitigate or counteract the risk of harm or benefit from a shift in climate; the third element used to study vulnerability is the level of exposure to adverse events [190] [191]. According to this definition, a ‘very vulnerable’ system is one that is extremely delicate to even minor variations in climate. In this framework, adaptation is considered to be a fundamental response since it is a vital factor for a comprehensive response to climate variability. Indeed, even though present emission-

[183] Handmer, J., Dovers, S. & Downing, T. Societal Vulnerability to Climate Change and Variability. Mitigation and Adaptation Strategies for Global Change 4, 267–281 (1999). https://doi.org/10.1023/A:1009611621048
[184] Eriksen et all, (2007), p. 338-339
[185] Thomas, David & Twyman, Chasca. (2005). Equity and justice in climate change adaptation amongst natural-resource-dependent societies. Global Environmental Change. 15. 115-124. 10.1016/j.gloenvcha.2004.10.001.
[186] Adger, W. (2006). Vulnerability. Global Environmental Change. 16. 268-281. P. 269 10.1016/j.gloenvcha.2006.02.006.
[187] McCarthy et al., (2001), p. 3
[188] Adger, W. (2006), p. 269
[189] McCarthy et al., (2001), p. 89
[190] Ibid
[191] Ibid, p. 21

reduction agreements are enforced, they will not moderate the levels of greenhouse gas emissions in the atmosphere [192].

It is commonly acknowledged that vulnerability to climate change is directly linked to 'the wider political economy of resource use'. Vulnerability is caused by accidental or planned individual behaviour that has an impact on the ecosystem [193]. Vulnerability is therefore defined as the combination of several elements, namely the 'exposure and sensitivity' to shocks and pressures, and the capacity to adapt. The exposure to climatic stresses is considered to be the extent to which a structure is subjected to ecological and governmental pressure that consist of 'their magnitude, frequency, duration and areal extent of the hazard' [194]. Instead, sensitivity measures the level of transformation and the impact of disturbances [195]. The last element is the 'adaptive ability' and is referred to the capability of a structure to grow in order to handle environmental threats or legislative change, as well as to broaden the 'range of variability with which it can cope' [196].

According to recent literatures, developing countries have suffered the most from climate change risks. The vulnerability of human societies and natural systems is highlighted by the devastation, misery, and mortality caused by natural catastrophes. These present effects and the future climatic alterations are estimated to severely impact the poor [197]. Indeed, some communities are more susceptible to climate change threats due to their physical vulnerability and their weak adaptation potential. Most less-developed countries are in fact more sensitive since a greater percentage of their industries are in 'climate-sensitive sectors', and their adaptation capacity is restricted because of a lack of 'human, financial, and natural resources, as well as limited institutional and technological capability' [198].

Vulnerability is evaluated on the basis of the access of a specific region to 'resources, information, and technology' as well as the integrity and efficacy of their systems. As a result, climate change effects will pave the way to a substantial negative impact on the opportunities to promote sustainable development in developing countries. Hence, this negative impact of climate change will make it more difficult for individuals to meet their

[192] McCarthy et al., (2001), p. 89
[193] Adger, W. (2006), p. 270
[194] Burton (1993) 'The Environment as Hazard'
[195] McCarthy et al., (2001)
[196] Adger, W. (2006), p. 270
[197] McCarthy et al., (2001), p. 6
[198] Ibid, p. 16

'basic necessities'. According to this perspective, climate change is expected to exacerbate global and national inequalities [199].

Therefore, the different practices that cause vulnerability to climate change are directly linked to poverty [200]. This latter concept has been much debated in recent years leading to overcome the simplistic view based on income. Different investigations have in fact demonstrated that poverty is a much broader concept that the mere lack of income. According to many scholars and institutions, such as Amartya Sen, the international institute for sustainable development (IISD) and the United Nations Environment Programme (UNEP) poverty should be considered as the 'deprivation of basic capabilities' [201] [202] [203]. This lack of essential resources leads to a high mortality rate, a considerable malnourishment, a persistent sickness and an extensive illiteracy, among the main failures [204].

The concept of poverty is therefore linked to the lack of ten main determinants that are proven essential to evaluate human well-being [205] [206]. These elements constitutes the ability to be sufficiently nurtured, to prevent 'avoidable disease', to live in a 'clean and safe shelter', to have 'drinking water' and 'clean air', to have enough 'energy to keep warm and to cook', to 'use traditional medicine', to use 'natural elements found in ecosystems for traditional cultural and spiritual practices', to deal with severe climatic events such as 'floods, tropical storms and landslides' and lastly the ability to 'make sustainable management decisions' to protect natural resources and allowing the development of a permanent income [207].

The concept of poverty has also been defined by the Organisation for Economic Co-operation and Development (OECD) and it is considered to have a multidimension nature

[199] McCarthy et al., (2001), p. 85
[200] Burton, Ian & Huq, Saleemul & Lim, Bo & Pilifosova, Olga & Schipper, Lisa. (2002). From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy. Climate Policy. 2. 145-159. 10.3763/cpol.2002.0217.
[201] Amartya Sen 'Development as Freedom'. Oxford University Press. (1999). 0198297580, 9780198297581.
[202] UNEP. Summary Report Of The Global Women's Assembly On Environment: Women As The Voice For The Environment. (2004). International institute for sustainable development.
[203] Eriksen et all (2007), p. 339
[204] Sen (1999), p. 20
[205] World Bank. World Development Report 2002 Building Institutions for Markets. Oxford University Press
[206] UNEP (2004), p. 13
[207] Ibid, p. 6

that encompasses a variety of aspects of lack of vital capabilities [208]. Indeed, the OECD defines poverty as 'the inability of people to meet economic, social and other standards of well-being' [209]. The incapacity to achieve these latter requirements includes different capabilities, that are considered to be those abilities to ensure the well-being of an individual, and constitutes the 'economic, political, human and social' capability. These capabilities includes the ability to 'earn an income and meet material needs', the power to 'speak up for oneself and have rights', the capacities to 'maintain health and a basic education' and lastly the capability to 'maintain a sense of social and cultural affiliation' [210].

However, academics have acknowledged that there is not necessarily a clear correlation between poverty and vulnerability to climate concerns. Indeed, a country might be prosperous while simultaneously being vulnerable to climate change, such as those that are in a high-risk condition. Similarly, a country may find itself in poverty, but it has the ability to adapt to its new environments. Additionally, not all developing countries are equally susceptible. Poor individuals have different livelihood approaches, social and political relationships, and pressures to which they are subject [211] [212]. Nonetheless, there are still situations where poverty and vulnerability converge with one another. In fact, the great majority of poor individuals are more likely to experience damage and sufferings as a result of climatic calamities, and they have a lower capability to heal [213] [214].

These risks pose hazards to disadvantaged individuals that go beyond just threatening their lives; they can lead to the inability to safeguard their well-being [215]. Indeed, numerous communities that are susceptible to climate change are also under stress from other factors such as 'population growth, resource depletion, and poverty'. [216]

[208] Eriksen et all (2007), p. 339
[209] OECD. 'The DAC Guidelines Strategies for Sustainable Development'. (2001), p. 339.
[210] Ibid
[211] Eriksen et all (2007), p. 339
[212] Nomdo, Christina; Coetzee, Erika. 'Urban Vulnerability: Perspectives from Southern Africa'. (2002) Oxfam International Secretariat. 095842733X
[213] Eriksen et all (2007), p. 339
[214] Kahn, Matthew E. 'The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions.' The Review of Economics and Statistics, vol. 87, no. 2, 2005, pp. 271–84. JSTOR, http://www.jstor.org/stable/40042902. Accessed 28 Sep. 2022.
[215] McCarthy et al. (2001), p.8
[216] Ibid

3.2 What influence may climate change and climate policy have on poverty reduction? Can climate change be a substantial impediment to the goal of reducing severe poverty?

It has been agreed that climate change has a significant impact on economic growth since it tend to reduce development impulse impacting both the industrial and agriculture sector [217]. Extreme weather occurrences have in fact caused alarming economic harm on developing nations reaching, for instance, a sum of US $35 billion in extreme weather events in the past decade [218]. According to the IPCC, this alarming amount of money is expected to rise in the future as the inevitable increase in the repercussions of climate change will exposes developing nations even more to increasingly greater calamities [219] [220].

Developing nations are therefore the most affected by this phenomenon since a great share of their economy rely on the agriculture sector that is be the most predominant target of climatic repercussions. Climate change, in fact, will have a direct impact on agriculture through fluctuation of temperatures, rainfall patterns, moisture levels and fertility of the soil that will lead to variations in the 'length of the growing season' and a higher likelihood of 'extreme climatic conditions' [221] [222]. Climate change will also cause significant losses in agricultural productivity since 'global yields' will fluctuate, leading market prices of 'traded agricultural commodities' to react to these variations in international 'supply and demand', thereby influencing worldwide pricing [223]. In addition, climate threats not only have an effect on developing countries through ‘economic aggregates’ but also affect them in a more direct way impacting the ‘household consumption’. Indeed, the direct

[217] Stephane Hallegatte, Mook Bangalore, Laura Bonzanigo, Marianne Fay, Tamaro Kane, Ulf Narloch, Julie Rozenberg, David Treguer, and Adrien Vogt-Schilb. ‘Shock Waves: Managing the Impacts of Climate Change on Poverty’. World Bank group. (2016), pp. 35-36
[218] Mirza, Monirul & Mirza, Qader. (2003), pp. 233-234. Climate change and extreme weather events: Can developing countries adapt?. Climate Policy. 3. 233-248. 10.3763/cpol.2003.0330.
[219] TAR Climate Change (2001)
[220] Mirza et all (2003), p. 235
[221] Pemadasa, M. (1991). M. Parry 1990. Climate change and world agriculture. Earthscan Publications Limited, London. ISBN 1-85383-065-8. Journal of Tropical Ecology, 7(3), 372-372. doi:10.1017/S0266467400005642
[222] Winters, P., Murgai, R., Sadoulet, E. et al. Economic and Welfare Impacts of Climate Change on Developing Countries. Environmental and Resource Economics 12, 1–24 (1998), p. 5 https://doi.org/10.1023/A:1008204419284
[223] Ibid

effects are likely to be greater than those caused by growth, and they may have little effect on the overall GDP since poor nations represent a small portion of global wealth [224].

Climate change has also several repercussions at the macroeconomic level. Indeed, it can cause the standard of living to grow and commodity prices to fluctuate, harming impoverished people who spend a large percentage of their income on food [225]. It has also a great influence on asset growth because climate change can harm people assets during extreme events and it can also reduce people's interest and capacity to invest in new assets, not only all those 'financial, physical, human, social, and natural capitals that a household owns,' but also all the 'public goods, infrastructure, and institutions that households have access to' [226]. Climate change can also exacerbate the issue of marginalization and mobility restrictions of new opportunities to the raise of revenues since it can increasing tensions, raising rivalry for resources, enhancing risk aversion, or implementing poorly planned adaptation strategies[227].

It has been therefore agreed that poor people are more susceptible, incur more expenses, and have less ability to adopt compensatory actions. Climate change can therefore cause individuals to fall into poverty as a result of the disturbances that it causes. Indeed, climate change impact poverty through three main channels, namely agricultural production, ecosystems, and food security, natural disasters and health [228].

Regarding the first channel, it has been understood that agriculture production is the most significant economic segment in developing countries, yet it is also the most vulnerable to climatic shocks [229]. According to the IPCC, climate change is likely to lead to a consistent and negative influence of agricultural productivity in the foreseeable future [230] [231]. Indeed, crop yields are the most vulnerable to the severe weather calamities and to the variable 'precipitation and temperature' [232]. Climate change may potentially lead agricultural areas to be unsuitable for the production of vital commodities, resulting in significant economic consequences for developing nations that rely heavily on this

[224] Stephane Hallegatte (2016), pp. 35-36
[225] Ibid
[226] Ibid
[227] Ibid
[228] Mirza et all (2003), p. 243
[229] Stephane Hallegatte (2016), p. 50
[230] IPCC. 'AR5 Synthesis Report: Climate Change' (2014)
[231] Stephane Hallegatte (2016), p. 51
[232] Ibid

sector [233]. Additionally, the decrease of agricultural productivity can lead to a reduction of poor individuals' consumptions, forcing them into poverty and creating an even more difficult situation to save and acquire assets [234]. Agricultural production is therefore strongly connected to price shock. Indeed, the impact of climate change will cause shifts in productivity and commodity costs [235].

Individuals that encounter themselves in a situation of poverty are strongly affected by the impacts of climate change on food production and prices. The increase in agricultural costs is likely to affect consumers by raising their spending on basic necessities. In fact, numerous impoverished people do not produce goods to purchase or sell them in marketplaces; rather, they produce them to meet their basic needs, which is a particular climate sensitive situation [236]. Indeed, with few resources and no functional capital or labour, many impoverished rural people rely on 'access to ecosystems' [237] employing it to generate products for personal needs and to balance the revenue fluctuations. Climate change can in fact exacerbate environmental fragility and diminish systems capacity to support people. Many of them live in very precarious habitats leading them to be extremely sensitive to climatic threats [238]. Climate change and climate policy are consequently estimated to have an influence on the cost of vital goods, particularly food, affecting people's purchasing power and income [239].

Concerning the second channel, it has been understood that natural disasters are directly and intrinsically linked to climate change threats. In fact, according to the Intergovernmental Panel on Climate Change (IPCC 2013) and the World Bank [240], natural catastrophes, such as heat waves and cold spells, droughts, tropical and extratropical storms, coastal floods, heavy precipitation, and floods exacerbate indeed poverty [241] [242].

People who live in poverty conditions are more frequently subjected to climatic threats since 'at-risk areas' offer better opportunities not only concerning the economic sector

[233] Stephane Hallegatte (2016), p. 51
[234] Ibid, pp. 36-37
[235] Ibid, p. 53
[236] Ibid, p. 56
[237] Mertz, Ole, et al. 'Climate Factors Play a Limited Role for Past Adaptation Strategies in West Africa.' Ecology and Society, vol. 15, no. 4, 2010. JSTOR, http://www.jstor.org/stable/26268212.
[238] Stephane Hallegatte (2016), pp. 60-61
[239] Ibid, p. 56
[240] Ibid, p. 81
[241] Ibid, p. 79
[242] Karim, Azreen & Noy, Ilan, 2014. 'Poverty and natural disasters: A meta-analysis,' Working Paper Series 3234, Victoria University of Wellington, School of Economics and Finance.

but also the 'public services' offering a 'higher productivity and incomes' [243]. Moreover, it has been agreed that poor individuals suffer 'much more when affected by climatic threats since they have 'lower-quality assets' and in a more susceptible state [244]. Poor individuals tend to have 'less diversified portfolios' since they carry a higher share of their resources in tangible form. For instance, poor urban inhabitants' initial investment are primarily the purchases of their homes, which are particularly susceptible to flooding [245] [246] [247].

Furthermore, poor people are more reliant on low-quality infrastructure and natural resources to gain income [248]. Natural disasters do, in fact, cause major disturbance to public facilities, and poor people are less equipped to defend themselves from these effects. Additionally, poor people frequently rely on more unstable or inadequate facilities [249]. It is crucial to acknowledge that 'many poor people only rely on agriculture and environmental resources for their basic needs that are especially sensitive to hazards' [250]. In addition, poor people are more exposed to the increased food costs following a calamity and children tend to be more susceptible to indirect effects 'through health and education' [251].

Finally, natural disasters are directly related to climate change because the poor households subjected to climatic calamities have been shown a tendency to decrease 'investment in productive assets' and choose 'low risk, low-return' occupations, reinforcing poverty [252]. Extreme climatic events are therefore one of the major causes via which climate change occurrences now influence poor people's capacity to overcome poverty. Climate change is projected to enhance the incidence and gravity of natural disasters [253].

The last channel through which climate change impact poverty, is related to the health concerns that are caused by climatic calamities. Indeed, several studies have

[243] Stephane Hallegatte (2016), p. 83
[244] Ibid, p. 92
[245] Ibid, p. 92
[246] Moser, S. C. & L. Dilling. (2007). 'Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change'. Écoscience, 14(4), pp. 545–546
[248] Stephane Hallegatte (2016), p. 92
[249] Ibid, p. 93
[250] Ibid
[251] Ibid, p. 96
[252] Ibid, p. 80
[253] Ibid

demonstrated that exist a clear connection between climate change and poverty caused by health issues [254].

It has been agreed that the raise of the temperatures, the altered precipitation patterns and the many droughts and floods, will led to extreme temperature, malnutrition, environmental catastrophes, and a rising prevalence of diseases affecting impoverished people [255]. Indeed, climate change will significantly impact health, especially in developing countries that severely lack the means to protect themselves from climatic risks. In fact, they have limited access to water and medical services and are dependent on labour-intensive activities, such as 'agriculture or construction' that led them to be more susceptible to illness[256]. Climate change is in fact expected to cause a considerable additional amount of fatalities by 2030. In particular, heat-related mortality among the elderly will account for 38,000 deaths per year, 48,000 as a result of diarrhoea and 95,000 as a consequence of childhood malnutrition [257] [258].

Moreover, the increase of temperatures will have a significantly impact on productivity growth [259]. Indeed, diseases may deplete human resources by causing persistent health repercussions and impairment, resulting in a decrease in production [260]. Productivity can also be affected due to missed work and school days that in the long run could also led to the impediment of children's growth and learning abilities impacting on wages [261]. These constraint limits their capacity to develop and keep assets, as well as improve their living situations [262]. Children's development suffers as well since they are a sensitive target for illnesses. Indeed, those with 'less mature immune systems' are more vulnerable to disease and malnourishment, which may influence health permanently, and labour supply prospects in the long term. In addition, if impoverished families are unable to shield their children from these consequences, poverty can be passed down through generations, preventing children of an opportunity to evade poverty [263].

[254] Stephane Hallegatte (2016), pp. 36-37
[255] Ibid, p. 116
[256] Ibid, pp. 111-112
[257] Ibid, p. 116
[258] Hales, Simon & Kovats, Sari & Campbell-Lendrum, 'Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s'. Diarmid & Lloyd, Simon. (2014).
[259] Stephane Hallegatte (2016), p. 127
[260] Ibid, pp. 111-112
[261] Ibid, p. 112
[262] Ibid, pp. 111-112
[263] Stephane Hallegatte (2016), p. 116

In severe circumstances, climate change may potentially leads to ’poverty traps.’ Indeed, climate alterations can pave the way to the limit of asset accumulation, forcing them to sell their capital resources in order to cope with shocks. Such techniques can lead to poverty traps, thus preventing people with few assets from investing and increasing their income [264] [265].

As a result, climate change is a substantial impediment in reducing poverty. Indeed, natural catastrophes, among the major stresses, result in the loss of asset and in disabilities; health disruption leads to health expenses and a consequent reduced labour income; and lastly droughts will lead to the loss of crop and to the raise of food prices resulting in crop losses and food price shocks [266]. In addition, people that find themselves in a situation of poverty are more susceptible to climate change because they have limited means to deal with the repercussions. As a result, the effects of climate change will lead to an even more difficult situation to reduce poverty [267].

3.3 The need for sustainable adaptation measures in response to vulnerability and the options that can help reducing the impacts.

It has been accepted that sustainable adaption measures are required to reduce the vulnerability of developing countries. Indeed, such approaches recognize that lowering fragility, poverty, and inequality are all core aspects of sustainable development trajectories. These measures focus on risk management in present methods of ensuring well-being, strengthening the poor's adaptive capability, and addressing the sources of susceptibility among the poor [268] [269].

It is consequently critical to implement policies that reduce resource pressures and aim to enhancing 'environmental risk management' and to the raise of the wellbeing of society's disadvantaged citizens. These policies can 'promote sustainable development

[264] Ibid, p. 38
[265] Dercon, Stefan & Christiaensen, Luc.’ Consumption Risk, Technology Adoption and Poverty Traps: Evidence From Ethiopia’ (2008). Journal of Development Economics. 96. 159-173. 10.1016/j.jdeveco.2010.08.003.
[266] Stephane Hallegatte (2016), p. 2
[267] Ibid
[268] Eriksen et all (2007), p. 342
[269] Mirza et all (2003), p. 239

and at the same time they can improve adaptive capacity and reduce susceptibility to climate and other pressures simultaneously' [270]. The implementation of climatic risks into the formulation and construction of 'national and international development initiatives' can enhance sustainable development while reducing susceptibility to climate change [271].

It has been observed that a key method to reduce vulnerability and ensuring well-being is to avoid relying on 'efforts targeting the sensitivity and performance of just one sector,' as this might result in a non-sustainable adaptation response. 'Measures must address the numerous sectors and realms in which individuals are involved in order to lessen the vulnerability of the rural poor' [272]. Furthermore, a significant approach of sustainable adaptation measures entails civil society's assistance in 'strengthening collective management' of necessary resources for local survival and adapting techniques [273].

As a result, adaptation must be understood as the supplementation of strategies to current activities in order to reduce vulnerability to climate change. Schipper and Pelling (2006) divide these initiatives into three categories: those that 'target the risk posed by climate change to the poor,' those that 'strengthen the capacity to cope with and adapt to climate stress,' and those that 'address the causes of vulnerability' [274].

As a result, achieving 'rapid, inclusive, and climate-informed development' [275] is critical to mitigating the effects of climate change on vulnerability and preventing the consequences of climatic threats on poverty. Indeed, only rapid and inclusive growth will prevent or mitigate the majority of the harmful effects of climate change on poverty by 2030, as well as establish resources to assist poor people in dealing with the repercussions, such as social safety nets and universal health care. It is also crucial that development consists of a 'climate informed' choice which means that 'investments and development patterns' would not generate new weaknesses. Moreover, it must be complemented by 'targeted adaptation' in order to improves socioeconomic circumstances [276].

[270] McCarthy et al., (2001), p. 8
[271] Ibid
[272] Eriksen et all (2007), p. 345
[273] Ibid, p. 347
[274] Ibid, p. 348
[275] Stephane Hallegatte (2016), p. 2
[276] Ibid, p. 2

Furthermore, along with the news development in adaptation, also mitigation measures are required in order to eradicate poverty. Indeed, in order to keep long-term effects on poverty, global average temperatures must be maintained at a healthy level. To attain this aim, all governments must implement emission-reduction programs, and social protection can be strengthened to safeguard impoverished people from the consequences of mitigation measures. Because local resources are insufficient to protect vulnerable individuals in developing countries, international assistance is necessary [277].

Regarding the agriculture sector, climate change is expected to damage agricultural production and hike food costs. However, it has also been agreed that poor people can be partially helped via socioeconomic growth, better facilities and market, improved farming techniques and technical advances, and the conservation and reinforcement of ecosystems [278]. Negative effects on agricultural production can thus be mitigated through 'development and poverty reduction', which will lead countries to be able to respond to and adjust to such decreases. Economic growth and poverty alleviation can help to mitigate some of the worst effects of climate change on agricultural production, but they cannot substitute the tailored efforts to boost the 'food production and distribution system'[279].

Moreover, the improvement of the facilities and the access to the market can improve the management of production shocks. As a result, in order to considerably reduce the impact of a shock, a widely accepted solution is the integration of price volatility-limiting measures with steps to strengthen farm practices. In addition, Countries can also create social protection systems to safeguard vulnerable individuals from food price volatility [280]. Another option that can help reducing the impacts of climate change on poor people is to enhance agricultural practices and technology, which may raise productivity and make farm production more adaptable. [281]. Moreover, 'improved technologies', such as advancements in the variety of crop and strategies to enhance farm tolerance, will be required to address future issues, since 'improved crops and better use of water and soil can increase both farmers' incomes and resilience to climate shocks. Indeed,

[277] Stephane Hallegatte (2016),
[278] Ibid, p. 65
[279] Ibid, p. 66
[280] Ibid
[281] World Bank Group. 'World Development Report 2011 : Conflict, Security, and Development' (2011), p. 68

developing and implementing better productive systems and more climate-resistant agriculture practices is a critical step toward making farming production more climate resilient. [282] [283].

Furthermore, also the conservation and ecosystem-based adaptation represent approaches aimed to the improvement of the strength of the ecosystem. Indeed, the improved 'protection and management of natural habitat', the control of flood plains in bigger river basins, the sustainable forest management, and agricultural methods that incorporate natural vegetation are all measures that help poor people in dealing with the repercussions of climate change. These policies aim to boost 'ecosystem processes and services, as well as the human systems' attempting to create a better protection to climate change [284]. Finally, land-mitigation strategies may be tailored to boost local incomes, leading to reducing the effects of climate change on disadvantaged people. Indeed, these policies have the potential to reduce negative repercussions on agricultural productivity and food security while also creating direct job advantages for local people. Indeed, 'Climate-smart agriculture practices, land restoration, selective logging, and forest protection' are labour demanding and can thus offer jobs and income to poor people[285].

Regulations concerning risk-sensitive land have been devised in order to mitigate the effects of climate change on disadvantaged people. Indeed, poor people are more inclined to build communities in hazardous areas, such as on 'hill slopes, near riverbanks, or near open drains and sewers' since they provide enough access to employment and services. Land use rules can help by assuring that development takes place in areas that are safe and economical to protect [286]. Furthermore, poor people are subjected to numerous calamities due to a lack of protective infrastructure. In fact, millions of people in developing nations lack adequate access to safe drinking water, sanitation, power, and transportation. As a result, improved investments in new infrastructure and public services that stay efficient in the face of changing climate and environmental circumstances are required [287]. Moreover since poor people live in buildings with limited protection to natural dangers, they tend to lose a bigger percentage of their possessions and income. The absence of

[282] World Bank Group (2011)
[283] Stephane Hallegatte (2016), p. 68
[284] Ibid, pp. 69-70
[285] Ibid, pp. 70-71
[286] Ibid, p.97
[287] Ibid, pp. 99-100

explicit and efficiently enforced land and property rights inhibits impoverished households from pursuing more substantial and long-lasting—but also more expensive—investments. As a result, improving property rights is critical in order to motivate resilience investments [288] [289].

Lastly, health-care systems and development strategies are crucial in mitigating the consequences of climate change on poverty. Since low-income nations have 'limited public health infrastructure' and are the most susceptible to the health consequences cause by climate change, health system, accessibility, and quality of healthcare must be prioritized. Indeed, curable diseases are frequently ignored due to a lack of access to proper health care services [290]. Furthermore, 'universal health care coverage' is also a priority since health shocks tend to push individuals farther into poverty by forcing them to ask for loans, frequently at exorbitant interest rates, accumulating debts that they will never be capable of repaying [291]. Thus, improved health-care coverage would be an effective solution to mitigate the health effects of climate change vulnerabilities and alleviate poverty [292].

[288] Stephane Hallegatte (2016), p. 101
[289] Jun E. Rentschler. 'Why Resilience Matters The Poverty Impacts of Disasters'. The World Bank Global Facility for Disaster Reduction and Recovery and Office of the Chief Economist. Sustainable Development Network. (2013).
[290] Stephane Hallegatte (2016), p. 129
[291] Ibid, p. 130
[292] Ibid, p. 131

CHAPTER 4 - PROCESS AND STRATEGIES OF ADAPTATION

4.1 General policy options and adaptation strategies to climate change

Many scientists and academics have agreed that due to increasing greenhouse gas concentrations in the atmosphere, the earth's temperature will rise by several degrees during the next century. Indeed, it has been recognized that the repercussions of climate change are unavoidable, and that humanity must adapt to these changes. As previously discussed, these adaptation efforts constitute a substantial problem particularly for developing nations, who tend to have a significantly bigger percentage of their economy in 'climate-sensitive sectors' and therefore they are in a more susceptible position to respond to climate change [293].

As a result, society must adapt to the changes imposed by climate change, and researchers have found a wide range of strategies that have been designed to minimizing the adversity that climate change may cause [294]. Indeed, identifying the policy alternatives available to address the negative consequences of climate change is the first step in reacting to it. Indeed, many scholars have acknowledged that the adaptation responses caused by environmental events have numerous shapes and arise through a number of methods [295].

According to Smith, a common distinction is made between reactive and anticipatory strategy of adaptation, the former referring to actions made in response to climate change whereas the latter concerning actions taken in anticipation of climate change to mitigate or counteract its impacts [296] [297]. Further analysis also focus on the distinction between 'automatic or build-in' adjustment and those 'adaptation strategies that require deliberate policy decisions'. Concerning autonomous adaption alterations, three categories have been recognized based on their 'degree of spontaneity: inbuilt, routine, and tactical' modifications [298].

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[293] Smith, Joel B., and Stephanie S. Lenhart. 'Climate change adaptation policy options.' Climate Research 6.2 (1996): 193-201. P. 193.
[294] Walter Leal Filho (Editor-in-Chief), Johannes M. Luetz, Desalegn Ayal. 'Handbook of Climate Change Management: Research, Leadership, Transformation' (2021), p. 248.
[295] Smit (2000), p. 239
[296] Ibid
[297] Smith et all (1996), p. 194
[298] IPCC. 'Technical Guidelines for Assessing Climate Change Impacts and Adaptations' (1994), p. 44

Regarding the first category of ‘inbuilt adjustment’, they can be defined as the ‘unconscious or automatic reactions to a climatic disturbance’ [299]. They are normally easily detectable, but they can occasionally present some difficulties, such as identifying the capacity of a 'long-lived organism' to adapt to slow changes in the environment, and they thus necessitate investigations to determine the 'nature of the adjustment mechanism' [300] [301].

Another type of autonomous adaptation concerns the ‘routine adjustments’ which can be defined as regular, deliberate reactions to climatic fluctuations. Another type of autonomous adaptation is related to 'routine adjustments,' which are regular, purposeful reactions to climate fluctuations. This notion is based on the fact that when climatic changes influence the environment, these shocks have an impact on many circumstances. For example, a prevalent concern is the alteration of the agriculture sector, since crop 'sowing dates' may move according to climatic occurrences leading to an adjustment of such dates determined by climate [302].

The last category of autonomous adaptation refers to tactical modifications that are often undertaken following an unexpected climatic scenario and necessitate a ‘behavioural shift’. An instance of this category of adaptation is related to the agricultural sector as well. Indeed, a dry season in a semi-arid zone may prompt farmers to prioritize 'drought-resistant crops,' which are more reliable than drought-sensitive ones [303].

These anticipatory adaptation strategies should improve the capacity to achieve specified goals under a variety of climate situations. As a result, these policies must be 'robust', allowing the system to continue operating under a larger variety of settings, or 'resilient', permitting the system to rapidly adjust to new environments. Therefore, policies must meet at least two criteria, namely 'flexibility' in order to handle a wide variety of variables, and the possibility for advantages to outweigh costs [304].

Besides these two conditions, anticipatory adaptation methods should meet the following criteria: 'net benefits independent of climate change and high priority'. In terms of the

[299] IPCC (1994), p. 44
[300] Ibid
[301] Beuker, E. (1994) Adaptation to Climatic Changes of the Timing of Bud Burst in Population of Pinus sylvestris L. and Picea abies (L.) Karst. Tree Physiology, 14, 961-970. http://dx.doi.org/10.1093/treephys/14.7-8-9.961 PMid:14967662
[302] IPCC (1994), p. 44
[303] Ibid
[304] Smith et all (1996), p. 194

former, many adaptation practices entail the alteration of strategies for reacting to specific climatic occurrences in order to be more flexible to present climatic patterns. These possibilities could generate a 'net benefits even if climate change does not occur', for instance, the institution of 'market-based water allocation systems' would lead to a better water allocation system and would enable a more effective response to climate change rather than 'rigid water allocation schemes' [305].

In regards of the latter, certain adaptation alternatives must be undertaken in advance of climate change since they would be much less successful or ineffective if applied reactively. This category of adaptation actions are defined high priority options and they includes possibilities relating to 'irreversible or catastrophic impacts,' 'long-term decisions,' and 'unfavourable trends' [306]. Concerning the 'irreversible or catastrophic impacts,' these are policies that address irreversible or catastrophic effects of climate change, such as loss of life or species, or resource damage, and must be a preventative measure in order to properly mitigate the effects of climate change. Secondly, long-term initiatives, such as 'dam, reservoir, and bridge' construction, must be addressed since these facilities may be impacted by climate change over time. Therefore, policies influencing the design of such buildings must be considered, as the initial costs of producing facilities less sensitive to climate change are expected to be much cheaper than the cost of adapting afterwards. The last high priority adaptation measure addresses the emergence of unfavourable trends, which can cause some forms of adaptation to be more challenging. One example is the 'fragmentation of wildlife habitats', which can cause issues when species need to relocate to cooler places. As a result, it is critical to examine the development of 'low-cost or politically feasible' climate change measures, as adaptation may become more problematic over time [307].

Concerning the general policy options for adaptation to climate change, it has been agreed that a fundamental part of the planning of long-term strategies, must take into consideration climate change since it can lead to the improvement of the capacity to deal with the alterations caused by climate change. In order to achieve this result, climate sensitive resources must be addressed since alterations in climatic circumstances may

[305] Smith et all (1996), p. 194
[306] Ibid
[307] Ibid

impact the functions they offer. Moreover, changes in population and wealth must be considered since they affect resource utilization and, eventually, climate change [308].

A further policy approach for better managing the climatic consequences is to compile an inventory of 'actual social and economic decisions' front the varying climatic conditions. In fact, this list can gather current 'practices and decisions' used to adapt to diverse environmental conditions. It aims at implementing the various practices in different situations, resulting in a 'cost-effective' technique to find plausible adaptation possibilities. 'This policy can be classified as a high priority option due to the long-term considerations, the irrevocable or 'catastrophic consequences', and 'unfavourable trends' [309] [310].

Moreover, another general policy option for mitigating the impacts of climate change repercussions is the establishment of 'funds for disaster relief' that are connected to the development of 'long-term hazard-reduction programs' [311]. This approach will result in positive overall benefits since current hazard risks will be lowered. Because of irrevocable or catastrophic consequences and long-term decisions, this option can also be labelled as high priority [312].

Lastly, a further strategy connected to the adaptation to climate change is the establishment of 'awareness of the potential risks of climate variability'. Indeed, climate change is frequently not very well comprehended by communities or by policy makers and since climatic adjustment will affect both the individual and policy levels, it is fundamental to increase the 'sensitivity to climatic issues' to of measures to encourage the integration of climatic change impacts. This option is also high priority because of the 'irreversible or catastrophic impacts, long-term decisions, and unfavourable trends' [313] [314].

Indeed, the IPCC (1996) list several important measures to implement at the domestic level that are expected to increase the awareness of climate change and to promote the investigation, education, and the dissemination of knowledge. Among these strategies, a crucial one concerns the enhancing of education particularly among those communities

[308] Smith et all (1996), p. 195
[309] Ibid
[310] IPCC 'Climate Change: The 1990 and 1992 IPCC Assessments IPCC First Assessment Report Overview and Policymaker Summaries and 1992 IPPC Supplement' (1990).
[311] Smith et all (1996), p. 195
[312] Ibid
[313] Ibid
[314] IPCC (1990)

that are heavily reliant on agriculture. Secondly, it is fundamental to recognize the weaknesses of the agricultural production enhancing the farming technique investigation to evaluate the viability of innovative agricultural practices. It is also important to improve 'education and communication' in order to provide farmers new scientific findings. In addition, it is crucial to develop 'food programs and other social security programs to provide insurance against local supply changes' together with the establishment of 'transportation, distribution, and market integration' in order to offer the proper food facilities in case of shortages. Lastly, also the elimination of 'subsidies' is fundamental since it can hide 'climate change signal in the marketplace' [315] [316].

4.2 Specific policy options for adaptation in climate-sensitive sectors: water resources, sea level rise, forest, ecosystem, agriculture

Many researchers have observed that adaptation is a huge concern, especially for developing countries, which have a substantially higher share of their economy in 'climate-sensitive sectors,' making them more vulnerable to climate change [317]. Governments are able to implement a series of specific anticipatory measures related to climate-sensitive sectors in order to mitigate the possible negative consequences of climate change. These policies refer to 'water resources, coastal resources (sea-level rise), forests, ecosystems, and agriculture' [318].

First and foremost, it is critical to comprehend the methods for water resource adaptation. Indeed, assisting with issues of 'water quality and water supply' is critical in order to improve the 'coordination of facility system operations'. This strategy, together with the implementation of contingency planning, can also aid in drought relief [319]. Moreover, it is critical to implement minor modifications in infrastructural developments since it may result in higher unpredictability in runoff or even a requirement for larger storage capability. Indeed, the installation of 'interbasin water transfers' may lead to a better use of water [320]. Additionally, 'water conservation through market-based systems' plays an

[315] IPCC (1996)
[316] Walter Leal Filho et all (2021), p. 250.
[317] Smith et all (1996), p. 191
[318] Ibid, p. 194
[319] Ibid, p. 196
[320] Smith et all (1996), p. 191

important role because through the reduction of demand and the increase of supply, a wider 'margin of safety for future droughts' is implemented. Finally, it is imperative to regulate water pollution so that water is suitable for 'drinking and other uses', since 'climate change will lead to the raise of contaminants in the water' [321].

A second specific policy option is related to sea-level rise adaptation. Indeed, in order to reduce coastal communities' vulnerability, it is critical to focus urban expansion away from susceptible locations' and to limit 'government incentives to expand on fragile territory,' thereby protecting areas vulnerable to the rise of sea [322]. Government should instead implement the development of 'buffer zone' between the coastline and future shore expansion in order to mitigate the negative consequences of sea-level rise. [323]. Furthermore, it is critical to prevent the use of 'permanent shoreline stabilization' in order to progressively recede from the threat of sea-level rise and to 'incorporate marginal increases in the height of coastal infrastructure'. Lastly, it is important to preserve 'coastal wetlands' in order to 'improve water quality, flood control and fish and wildlife habitat in the present climatic circumstances' [324].

A further essential policy to analyse regards the strategies options for adaptation of forests. It is fundamental to improve the range of seeds present in forests in order to ensure the rebred of species and to promote various organization techniques as a 'buffer' in opposition to the risks of climate change [325]. It is also critical to have regulations in place that offer flexible standards for intervening in managerial practices[326] and lastly, It is critical to prevent 'habitat fragmentation' and enhance migratory corridor growth [327].

Another specific policy option concerns the measures to be taken for ecosystem adaptation; indeed, it is crucial to adopt an 'integrated ecosystem planning and management' in order to minimize the governmental disunity in the management of natural ecological system and to focus on defending 'species and natural systems' [328]. (Brunner, 2001). It is also essential to implement policies of safeguard of 'migration

[321] Smith et all (1996), p. 196
[322] Ibid
[323] Ibid
[324] Ibid
[325] Smit (2000)
[326] Ibid
[327] Smith et all (1996), p. 196
[328] Brunner, Ronald D. 'Science and the Climate Change Regime.' Policy Sciences, vol. 34, no. 1, 2001, pp. 1–33. JSTOR, http://www.jstor.org/stable/4532520. Accessed 28 Sep. 2022.

corridors and buffer zones' in order to improve the chance of 'animal and plant species' effective adaptation to climate change and to improve the techniques to safeguard 'biodiversity off-site' [329].

Lastly, it is also critical to comprehend the methods for agriculture adaptation. In fact, providing a wide range of seed types and prevent 'monoculture' allow farmers to diversify and thereby counteracting the risks of climate change. In order to diversify crops, it is important to prevent 'subsidies or taxes to type of crop and acreage' therefore avoiding the shifting to an obsolete crop system not suited to the changing climate situation. It is also essential to reduce the trade barriers in order to achieve a better level of 'global agricultural production' and to develop an 'agricultural drought management' system [330].

4.3 Process and mechanisms for implementing response strategies

According to the Response Strategies Working Group of the intergovernmental panel on climate change, in order to effectively respond to the adaptation efforts, it is important to focus on different significative aspects, namely 'public education and information, technology development and transfer, economic (market) mechanisms, financial mechanisms, and legal and institutional mechanisms'. These elements constitutes the main drivers that pursue adaptation strategies at the 'national, regional, and international' level [331].

The 'public education and information sector' is a vital mechanism because dealing with climate change requires an informed and educated international community since it is a complicated topic that affects practically every sector of society directly and indirectly. Indeed, a comprehensive global awareness of the issue will enable the adoption and execution of effective response alternatives [332]. The fundamental objectives of the 'education and information' sector concern the encouragement of the 'awareness and knowledge of climate change issues', the development of constructive activities to adapt to climate change, the promotion of the contribution of all population, both in developed

[329] Smith et all (1996), p. 196
[330] Ibid, p. 199
[331] IPCC. 'The Intergovernmental Panel on Climate Change. Working Group III Sixth Assessment Report' (2022), p. 46
[332] Ibid

and in developing countries, in addressing climate change concerns and creating suitable remedies, stressing particularly the participation of certain groups such as 'children and youth, individuals at household levels, policymakers and leaders, media, educational institutions, scientists, business and agricultural sectors'[333].

However, different societies will require tailored approaches designed for the particular conditions and assets. Indeed, several actions taken at the domestic and international level, aims to spread knowledge about climate change in different ways. These involve the development of 'national committees or clearinghouses' to communicate information on climate change concerns helping with topics regarding for instance 'energy efficiency, energy savings, forestry, agriculture'. Moreover, it is crucial the use of IPCC and other international organizations studies delivering an appropriate knowledge for future actions [334].

A second essential mechanism is connected to 'technology development and transfer,' since they can provide a method for countries to achieve their energy, food, and other demands while limiting greenhouse emissions. Indeed, the development of new technologies can help absorbing greenhouse gases, examine and forecast future climate change impacts and can help to adapt 'human activities'. Developing countries consider that 'bilateral and multilateral agreements' should be formed to facilitate the 'transfer of technologies on a non-commercial basis'. Indeed, numerous barriers to successful 'technology transfer' exist in poor nations due to an 'insufficient funding, essential infrastructure, and educated people assets' [335].

A further important mechanism that can effectively respond to the adaptation efforts constitute the economic mechanisms since it is fundamental that all measures implemented to reduce and adapt to climate change are 'economically efficient and cost-effective as possible'. Indeed, environmental goals can be met by legislation that requires the use of a certain technology or through economic instruments such as 'emissions fees, subsidies, tradeable permits, or sanctions'. Since these mechanisms can foster the development of new technology and methods for decreasing emissions, they can achieve environmental gains at a cheaper cost than other mechanisms [336].. However, there are

[333] IPCC. (2022), p. 46
[334] Ibid
[335] Ibid, p. 47
[336] IPCC. (2022), p. 48

some obstacles to market mechanisms, namely ‘information problems’ since can lead to not only less effective outcomes but also to hostile environmental results; ‘existing measures and institutions’ that can promote societies to damage the environment and lastly ‘balancing competing objectives’ [337].

Furthermore, financial mechanisms are a vital component since they are required to conduct climate change adaptation strategies. It is also crucial to remember it because developed nations create the majority of emissions, and therefore they have specific responsibility. Indeed, countries must take ‘domestic measures’ by adjusting their own industries to restrict emissions, and they must help poorer nations by providing greater financial resources and technological transfer [338].

Lastly, also the legal and institutional mechanisms that are related to the environment field ‘have a bearing on the climate change issue’. The Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer are examples of present ‘international legal mechanisms’. Nonetheless, these legal instruments are inadequate to handle the issue, so the UN General Assembly established a framework convention on climate change during its 44th session, acknowledging the need to develop a series of basic rules and responsibilities in order to acquire the conformity of the 'most suitably balanced range of countries' [339].

[337] Ibid
[338] Ibid, p. 50
[339] Ibid, p. 51

CHAPTER 5 – FUTURE ADAPTATION STRATEGIES AND THE IMPLEMENTATION OF MAINSTREAM CLIMATE INTO GENERAL DEVELOPMENT POLICIES

5.1 Complexities in tracking adaptation

Since climate change threats will inevitably increase in the future, it has been acknowledged that adaptation strategy is a critical component of environmental policy and research [340] [341] [342]. Governments have recognized the gravity of the problem and have developed many measures to fund adaption methods, such as the 'Green Climate Fund' [343]. As a result, it is necessary to track the development of adaptation to climate change in order to assess how adaptation is occurring as well as the efficacy of adaptations in lowering vulnerability.

However, due to a lack of studies and the complex intrinsic nature of adaptation, there is no 'definable adaptation metric' to evaluate how adaptation is occurring, making it difficult to monitor the progress and evaluate the efforts [344] [345]. Indeed, one of the main impediments to evaluate adaptation strategy concerns the little understanding of what adaptation actually 'looks like in practice'. In fact, adaptation does not always come with the same features but it can take multiple shapes depending on the objectives and mechanisms of adaptation in diverse situations, the different drivers of vulnerability, and industries and scales at which adaptation occurs. A further obstacle regards the fact that the concept of 'successful adaptation' can have different interpretations depending on the diverse situations. Moreover, since adaptation is a concept that concerns the alterations in 'human systems', its impacts are hardly noticeable in the short term and the results will

[340] Pielke, R., Prins, G., Rayner, S. et al. 'Lifting the taboo on adaptation'. Nature 445, 597–598 (2007). https://doi.org/10.1038/445597a
[341] Moser, Susanne & Ekstrom, Julia. (2010). 'A Framework to Diagnose Barriers to Climate Change Adaptation'. Proceedings of the National Academy of Sciences of the United States of America. 107. 22026-31. 10.1073/pnas.1007887107.
[342] Ford, J.D., Berrang-Ford, L. & Paterson, J. A systematic review of observed climate change adaptation in developed nations. Climatic Change 106, 327–336 (2011). https://doi.org/10.1007/s10584-011-0045-5
[343] Fankhauser, Samuel & Burton, Ian. (2011). Spending Adaptation Money Wisely. Climate Policy - CLIM POLICY. 11. 1037-1049. 10.1080/14693062.2011.582389.
[344] Ford et all. (2011)
[345] Ford, James & Berrang-Ford, Lea & Lesnikowski, Alexandra & Barrera, Magda & Heymann, S.. (2013). 'How to Track Adaptation to Climate Change: A Typology of Approaches for National-Level Application'. ECOLOGY AND SOCIETY. 18. 40. P. 1

be visible only in the future. This represents a risk since adaptation strategies may result maladaptive in the long run [346] [347].

As a result, 'comparative systematic approaches' to evaluate adaption progress are required. One measure that can track adaptation consists of the valuation of governance structures to determine the 'readiness' of a nation to adopt to climate change. According to Smith [348], there are nine elements that are crucial for tracking adaptation: a 'political leadership' that highlight the importance of adaptation on its policies, 'institutional organization' to direct adaptation measures, 'stakeholder involvement' to guarantee that the adaptation policies take in consideration people impacted by climate change', 'climate change information', 'appropriate use of decision-making techniques', awareness of 'barriers to adaptation', 'funding for adaptation', 'technology development', 'adaptation research' [349] [350].

Another strategy to monitor adaptation is a 'process-based approach' that involves a comparation between different adaptation features to identify 'general indicators' in order to achieve an efficient adaptation strategy. This measure, however, has certain limits since its application is 'hampered by information and temporal constraints' [351].

Furthermore, an evaluation of 'policies and programs' is an important tool for analysing how 'adaptations are occurring at the national level.' These tools have enabled the assessment of governments to examine their compliance with international agreements. The capacity to estimate the current degree of adaptation using accessible information sources is a basic advantage of focusing on observable adaptation attempts. Nonetheless, many modifications go undetected, and efficiency is difficult to quantify [352].

Finally, another criterion to examine when assessing the effectiveness of adaptation is the assessment of 'indirect or proxy measures of vulnerability reduction'. It is a method that focuses on the examination of 'vulnerability indices' at the national and international

[346] Ford et all (2013), p. 3
[347] W. Neil Adger, Nigel W. Arnell, Emma L. Tompkins. 'Successful adaptation to climate change across scales'. (2005) Global Environmental Change, Volume 15, Issue 2, Pages 77-86, P. 80 https://doi.org/10.1016/j.gloenvcha.2004.12.005
[348] Smith, J.B., Vogel, J.M. & III, J.E.C. 'An architecture for government action on adaptation to climate change'. (2009). An editorial comment. Climatic Change 95, 53–61. https://doi.org/10.1007/s10584-009-9623-1
[349] Ibid
[350] Ford et all (2013), p. 7
[351] Ibid. P. 8
[352] Ibid, p. 9

levels in order to identify 'hot spots' of climatic related risks and to 'predict future vulnerabilities.' However, this processes of determining vulnerability result in outcomes that are mostly 'methodologically driven' and that depict an overall very generic 'socioeconomic development trends' [353].

5.2 Future adaptation strategies for developing countries

Climate change is expected to cause serious repercussions in the agricultural sector since 'Socioeconomic vulnerability to hunger combined with climate-induced yield declines' lead to food insecurities and to the increase of the cost of food. In spite of that, there is a number of policies and interventions that can counteract to some extent climate change agricultural impacts. Indeed, an important policy concerns 'socioeconomic development' since the improvement of these circumstances can 'make countries better prepared to respond to and adapt to declines' [354]. Further policies concern the improvement of 'infrastructure' and the 'access to markets'. Indeed, according to several studies, it has been illustrated that 'well-functioning markets can help countries cope with production shocks'. To minimize these shocks, it is critical to adopt steps aimed at minimizing cost instability, resulting in the development of 'more resilient farm practices' [355].

Another policy concerns the development of new technologies to create new 'climate-smart agricultural practices'. Indeed, vulnerable countries in order to implement better 'farming systems' need improved technologies such as the advancements in 'crop varieties', a 'smarter use of inputs', new measures to support 'crop resistance to pests and diseases', and the 'reduction of postharvest losses' [356] [357]. However, these technologies present some limitation since they may be expansive and problematic to achieve, or worse some technologies cannot be developed because of the little 'investments in agricultural research'[358]. Therefore, farmers may be incentivized to embrace climate-smart technology by having 'secure tenure rights, smart subsidies, and access to long-term'

[353] Ford et all (2013), p. 10
[354] Stephane Hallegatte (2016), p. 67
[355] Ibid
[356] David Tilman tilman, Christian Balzer, Jason Hill, and Belinda L. Befort. 'Global food demand and the sustainable intensification of agriculture' (2011) https://doi.org/10.1073/pnas.1116437108
[357] Stephane Hallegatte (2016), p. 67
[358] Ibid

funding [359] [360]. Lastly, a further policy concerns the ‘reduction of climate stresses on ecosystems’. Indeed, ecosystem needs to adapt to climate change and several measures can strengthen it. In particular, paramount measures consist of the ‘protection and management of natural habitat’, ‘management of flood plains’, and the management of ‘forests sustainably and farming systems’ [361].

Climate change is expected to trigger many natural disasters and it is of paramount importance to enhance the strength of poor people. There are many policies and intervention that can reduce these repercussions. One of the most important policy, concerns the implementation of ‘risk-sensitive land use regulations’. In developing countries, poor people tend to reside in high-risk locations not because of lower prices, but because of the presence of access to employment and services. Through 'land use regulations' it is possible to relocate and create safer residential areas. However, a number of problems emerge. First of all, there is not enough data in order to establish these safer zones; secondly, institutions are required in order to guarantee the correct implementation of land use regulations; third, nations must plan 'land use' in an efficient manner, taking into account the reasons why people choose to settle in such vulnerable locations; Finally, it is critical to evaluate the unexpected implications of land use regulations. Indeed, these regulations can raise the cost of housing and can lead to the aggravation of hazards [362].

As a result, a variety of measures must be established in order to assist vulnerable individuals who suffer the consequences of natural disasters. A critical measure is the development of ‘resilient infrastructure and protective systems.’ Indeed, in order to minimize people's susceptibility, it is critical to evaluate the effectiveness of potential actions against a wide range of possible future scenarios in order to detect weaknesses before adopting them. This method allows for the evaluation of 'trade-offs among different options' and the identification of the appropriate strategy to decrease vulnerability [363]. Moreover, another important policy consists of the improvement of ‘property rights to incentivize resilience investments’. Indeed, the majority of the times, poor people live in buildings with low resistance to natural hazards and therefore lose a

[359] Stephane Hallegatte (2016), p. 68-69
[360] The world bank group. ‘Inclusive Green Growth. The Pathway to Sustainable Development’ (2012). Washington, DC: World Bank.
[361] Stephane Hallegatte (2016), p. 69-70
[362] Ibid, p. 98
[363] Ibid, p. 98-99

larger share of their assets and income. It is thus important to provide better housing, and better access to services [364].

A further policy concerns the improvement of ‘financial inclusion and savings options’ in poor nations. A solution to this problem is to expand 'banking services' through 'mobile money'. According to the United Nations, ‘out of 7.3 billion people, 6 billion’ own a mobile phone, hence they can utilize ‘mobile money accounts’. As a result, the use of mobile money can enhance equality in 'financial inclusion' and can help poor people to create assets [365]. Finally, it is necessary to invest in improved 'weather forecasting' technologies in order to be better prepared for natural disasters, reducing the amount of deaths and financial damages [366].

Climate change is expected to produce a number of health shocks in developing countries; thus the implementation of health care systems represents an essential component in assisting these nations [367]. A critical metric is the development of health infrastructure that delivers improved 'quality of care.' Indeed, improving health-care research is vital to preventing the ‘hazard of new illnesses,’ as is investing in measures to improve the ‘level of health care,’ such as the building of ‘effective risk monitoring systems.’ A social support system must also be built in order to ‘avoid irreversible losses from undernutrition’ [368].

Moreover, developing countries lack the assistance of ‘communities, financial institutions, and the government’ to help them deal with shocks. This system can provide ‘social safety nets, market insurance, savings, access to credit, and remittances’ that are critical tools for decreasing their susceptibility and adjustment to the alteration of the 'environmental and economic conditions' [369] [370]. Indeed, social safety nets can help to lower the effects of climate change as well as encourage 'long-term transformations' to achieve more 'adaptive and resilient societies’ [371]. Similarly, remittances through 'adequate financial and banking infrastructure' can assist 'consumption, finance recovery

[364] Stephane Hallegatte (2016), p. 101
[365] Ibid, p. 103
[366] Ibid, 3
[367] Ibid, p. 128
[368] Ibid, p.131
[369] Ibid, pp. 164-165
[370] World Bank Group. ‘World Development Report 2014 : Risk and Opportunity—Managing Risk for Development’ (2014). Washington DC, World Bank.
[371] Stephane Hallegatte (2016), pp. 147-160

and reconstruction' in order to achieve favourable results[372]. However, in order to execute these policies effectively, it is of paramount importance to gives a 'voice to poor people' and to give them authority in order to manage the 'economic, social, and institutional resources' of the country [373].

Therefore, in order to safeguard poor people against climate change repercussions, it is necessary to develop a strategy that blends all of these tools together. However, if on the one hand these measures can diminish the climate change effects, on the other hand they also reveal the presence of restrictions to achieve adaptation. In fact, considering the possible measures concerning the agriculture sector, the 'land use planning' for instance encounter 'political economy obstacles'. Similarly, it is difficult to 'invest in protection infrastructure' because of the 'financial constraints', it remains challenging to implement 'health care in rural areas' and to make available 'social assistance after a disaster' [374]. In addition, this situation is even more challenging since there is a very high uncertainty regarding the 'long-term impacts of climate change' [375].

As a result, the international community at the 16th conference of the parties of the United Nations framework convention on climate change, has agreed to 'stabilize global temperature' and in order to do so, it is fundamental to reduce 'GHG emissions' globally [376] [377]. However, differently from developed countries, poor nations under the $5,000 GDP per capita threshold do not contribute much to energy consumption and consequently to GHG emissions. Energy consumption increases only after per capita income surpasses $10,000, when economies and growth transition away from the manufacturing industry. When this phase occurs, it is critical to assist poor nations in pursuing a low-emissions development path through 'energy leapfrogging'. This practice enable developing countries to avoid 'intermediate technologies' that are not efficient in term of GHG emissions, and to directly achieve more 'energy-efficient' and 'advanced clean technologies' [378].

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[372] Stephane Hallegatte (2016), p. 162
[373] Ibid, p. 164
[374] Ibid, p. 191
[375] Ibid, p. 192
[376] Ibid
[377] UNFCCC. 'Ad Hoc Working Group on Long-term Cooperative Action under the Convention'. Twelfth session (2010).
[378] IPCC. 'Renewable Energy Sources and Climate Change Mitigation. Special Report Of The Intergovernmental Panel On Climate Change Summary For Policymakers And Technical Summary'. (2011). P. 192

Despite the fact that it is difficult for developing countries to obtain these efficient technologies due to ‘trade barriers and skill mismatch’, energy leapfrogging might eventually occur in the future. Indeed, these countries should implement rules that encourage the development of more effective technologies, and they should address the errors that obstruct technological adoption [379]. As a result, it is of paramount importance to consider the ‘carbon constraint’ while enacting policies, particularly those with long-term repercussions. Developing countries, above all, should pursue such policies because they are now 'building their infrastructure stocks'. In order to adopt effective technologies, it is critical to invest in 'low- or zero-emission alternatives' and implement mitigation policies such as ‘carbon pricing and innovation support to environmental performance standards, information labels, financing facilities, and land use and urban planning’ [380] [381] [382].

To properly assist vulnerable individuals, these mitigation initiatives should be integrated with 'complementary policies' [383]. Indeed, mitigation policies should be combined with 'carbon tax', the taxation of carbon emissions, and direct payment of 'cash transfers' in order to reduce greenhouse gas emissions while also improving the 'income distribution'. Additionally, if the income generated by these policies directed toward assisting the poor, it will be possible to provide greater social protection measures through the development of safety nets [384].

However, these measures do not always succeed, and they fail to safeguard vulnerable people particularly in impoverished nations with a ‘GDP per capita of less than $4,000’[385]. These countries, in fact, 'cannot rely on internal redistribution' since even the ‘middle class’ is impoverished, and hence 'there are insufficient resources for redistribution [386]. The international community's assistance concerns particularly those sectors that require investments with 'high immediate costs’ such as urban transportation. In this instance, substantial costs are required immediately in order to develop an 'efficient and decarbonized transit-oriented' city [387]. The international community provides funding

[379] Stephane Hallegatte (2016), p. 193
[380] Ibid, p. 194
[381] IPCC. ‘AR5 Synthesis Report: Climate Change 2014’. (2014).
[382] The World Bank Group (2012).
[383] Stephane Hallegatte (2016), p. 197
[384] Ibid, p. 199
[385] Ibid
[386] Ibid, p. 201
[387] Ibid

to poor nations with ‘private climate finance through interconnected carbon markets’. Indeed, carbon markets assists financial institutions to find the least expensive choices for meeting a 'short-term emissions reduction target'. As a result, sources focusing on long-term issues are necessary to improve the 'efficiency of global decarbonization’ [388].

Therefore, future policy options should prioritize ‘rapid, inclusive, and climate-informed development' and the implementation of specific adaptation measures in order to deal with the 'short-term impacts of climate change’ while implementing at the same time mitigation strategies focused on the poor in order to 'limit long-term impacts' leading to the 'sustainable eradication of poverty’ [389].

5.3 Future ‘Paris-alignment’ policies in development finance: towards a climate justice pathway

Least developed nations are the most fragile to the impact of climate change because of their weaker adaptation ability and their dependency on 'climate-sensitive sectors'. Although actual and potential emissions increase is concentrated in wealthier emerging nations, 'high-income countries' remain primarily the responsible for the majority of existing greenhouse gasses that emit '11.3 tonnes of CO2 per person per year'. To restrict global warming to 1.5 degrees Celsius, this data must decrease to 'less than one tonne' per person by 2050, and the core technology must be spread with the rest of the world [390].

It has been widely agreed that an important priority for future adaptation measures consists in the establishment of ‘Paris-compatible development pathway’ [391]. According to previous work, the concept of Paris-alignment can be defined as the readjustment of all investments towards low-carbon options in order to adapt in the most efficient way ‘to the changing conditions’. In order to achieve this goal, three main measures must be implemented in countries’ development programs. First of all, development agencies, after assessing their partners ‘climate vulnerability and adaptation’, modify their assistance allocations in order to help them in the preparation of the Paris Agreement

[388] Stephane Hallegatte (2016), p. 201
[389] Ibid, p. 202
[390] Ian Mitchell, Atousa Tahmasebi, Charles Kenny. ‘Principles for Paris-Alignment and Climate Finance in Development’. (2021). Centre for global development.
[391] Patel & Gebreyes (2020), p. 25

‘assessment of climate change impacts and vulnerability’ [392]. Secondly, agencies must examine the effects of ‘mitigation and adaptation' measures on developmental projects, enhancing the possible 'cost-effective adjustments to reduce emissions or increase climate resilience’[393]. Lastly, these projects should meet the country’s Nationally Determined Contributions (NDC) in order to enhance their strategies while also strengthening the global climate agreement [394].

Future adaptation measures should also prioritize the allocation of aid funds for adaptation efforts. Indeed, until recently, climate money has been mainly centred on mitigation, resulting in benefits for the middle-income' nations while leaving the poorest disadvantaged. As a result, the Paris Agreement requires that new programs should prioritize adaptation, especially for least-developed nations. Official development assistance (ODA) funds can be applied in sectors such as 'health, education, and transportation' in order to enhance the 'economic development and welfare' of poor nations, especially when linked to their NDC [395].

In order to deal with future climate change impacts, it is also fundamental to learn from past experience. Indeed, it is critical to learn not only from successful instances but also from ineffective adaptation initiatives since only a 'whole-of-society' strategy can handle the issues of 'climate change at the pace and scale required’ [396]. It is also important to connect global climate issues to domestic growth. In fact, through regional efforts, surrounding nations work together to discover solutions to transboundary issues, and developing countries can 'learn and absorb lessons, experiences, and frameworks' from one another [397].

Furthermore, high-income nations must investigate innovative technologies to guarantee that low-carbon growth options are the most cost-effective for all countries. Development agencies may therefore evaluate and shape their own 'government's efforts to international development'. This should include 'emissions per person, the degree of research and development and technology sharing, carbon subsidies and prices, agricultural subsidies, and financial (and climate) openness in private investment’ [398].

[392] Ian Mitchell et all (2021)
[393] Ibid
[394] Ibid
[395] Ibid
[396] Patel & Gebreyes (2020), p. 25
[397] Ibid
[398] Ian Mitchell et all (2021)

Another crucial factor for future 'Paris-alignment' policies is trade since 'tariffs or other import restrictions' can be enforced in nations where 'policies do not adequately reduce GHG'. However, these regulations may hamper development and should exclude those nations whose 'emissions per head are fractions of those in high-income countries' [399].

Investing in adaptation, therefore, can help reduce losses from lower profitability and maladaptation while providing significant 'economic, social, and environmental' advantages. Countries must address their climate policy responsibilities in order to provide 'financial, planning, and technical support' that guarantees learning and information transfer from international to domestic levels [400].

The previously outlined measures are critical to achieving successful adaptation. However, recent climate literature raises some ethical considerations in relation to the accomplishment of climate change adaptation measures that concerns the issues of justice and fairness. Indeed, in order to achieve a resilient sustainable development, it is fundamental to includes in adaptation policies ‘mechanisms for equitable social development’ that concern ‘health, education, migration and disaster risk reduction systems’. These practices will be provided with 'state-led mechanisms’ that will promote society inclusion, responsibility towards the environment and sustainable economies in order to aid the most vulnerable communities [401]. To attain such results, it is critical to include climate goals within nationwide policies in order to prevent carbon investments while bringing various socioecological and economic advantages [402]. Moreover, this approach ‘go beyond socio-political boundaries' and cope with complex socioecological systems [403]. It is therefore conceivable to develop responses to the climate issue that do not simply reduce emissions, but also build a fairer society.

As a result, after proving that adaptation poses a core issue of justice, many scholars have started to address the achievement of successful adaptation from the perspective of climate justice. Many researchers in fact argue that even if ‘Paris-compatible development pathway’ strategies were successfully implemented in developing countries, these nations would still suffer the effects of previous climate injustices. Therefore, new research must place justice at the centre of the policy development in order to avoid

[399] Ibid
[400] Patel & Gebreyes (2020), p. 25
[401] Ibid, p. 18
[402] Ibid, p. 22
[403] Ibid, p. 12

exacerbating vulnerabilities in already marginalized communities. Stressing the central position of justice and fairness in the debate, is fundamental to achieve a more equal adaptation strategy to climate change. Additionally, this growing corpus of research helps to the development of climate change adaptation considered as a 'transformative social institution' that leads to more fair and 'sustainable political, social, and economic systems' [404].

5.4 Evaluation of measures to achieve effective adaptation in developing countries

In order to determine whether an adaptation approach is successful, it is of paramount importance to define what success means. Indeed, the concept of success should not be interpreted just in terms of accomplishing a specific goal, because in many cases reaching this objective might result in the development of 'negative externalities and spatial spill overs' that can affect other nations and limit their ability to adapt [405]. Thus, the successful adaptation to climate change can be measured using policies that aim to accomplish 'equitable, effective, efficient and legitimate action' compatible with sustainability. At the same time, different levels of importance are attributed to these policies based on the 'world view and perceived limits to responsibility' of the participants involved in adaptation [406].

Concerning the concept of effectiveness, an adaptation action is defined as effective when it accomplish its goals. It may be measured by analysing the diminishing of the effects, the avoidance of risk and the encouragement of security. However this concept is sometimes problematic, indeed, there is a lack of certainty weather a specific measure can perform under certain circumstances; secondly some adaptation measures depend on decisions undertaken by external actors, and these measures rely heavily on the 'future state of the world'. Therefore, the criteria to measure the effectiveness of an adaptation option consists on 'robustness to uncertainty and flexibility' to adjust to changing conditions [407].

[404] Malloy, J.T., Ashcraft, C.M. 'A framework for implementing socially just climate adaptation. Climatic Change 160', 1–14 (2020). https://doi.org/10.1007/s10584-020-02705-6. P. 1
[405] W. Neil Adger,et all (2005), p. 80
[406] Ibid
[407] W. Neil Adger,et all (2005), p. 81

In order to evaluate the efficiency of adaptation, it is important to assess not only the ‘comparison of quantified costs and benefits’ but also a variety of additional factors. In particular, it entails the allocation of the 'costs and benefits of the actions' and of the 'changes in those goods that cannot be expressed in market values’ and ‘the timing on adaptation actions'. Furthermore, in order to evaluate the efficiency of adaptation, it is critical to take into consideration the topic of ‘non-market benefits’. Indeed, the cost of commodities that serve as the foundation for assessing 'costs and benefits of non-traded goods' are the costs that paved the way to 'non-sustainable exploitation of resources'. Thus, it is problematic to quantify and distribute the 'underlying social costs and benefits of adaptation' [408].

Lastly, it is also important to evaluate adaptation from the perspective of equity and legitimacy. Indeed, equity is crucial because an unequal growth reduces the possibility for future welfare benefits (see Boyce, 2002, for example), and it led to a lower likelihood to achieve successful adaptation. Adaptation has an 'intergenerational nature' since current adaptations efforts are the consequence of prior measures. As a result, since the beginning, adaptation presents a 'sub-optimal and unfair starting position'. Another drawback is that the decision-making process is influenced by the 'underlying power distributions inside institutions', which is frequently the source of vulnerabilities (Adger et al., 2005) [409].

As a result, adaptation processes act at various 'spatial' and social dimensions. Therefore, the success of adaptation must be measured implementing distinct approaches at each of these levels. In order to measure success effectiveness, efficiency, equality, and legitimacy are critical, however value attached to these criteria stem from 'societal processes of consent and action'. The ability to adapt, as well as the distribution of that ability, are critical to success [410].

This adaptation process is different when it concerns developing countries. As previously discussed, the least developed countries are the most vulnerable to climate change and will bear the burden of its impacts, resulting in the destabilization of sustainable development initiatives and less opportunities for individuals to escape poverty. It is consequently critical to assist these nations through adaption measures in order to prevent

[408] W. Neil Adger,et all (2005), p. 82
[409] Ibid, p. 83
[410] Ibid, p. 85

the possibility of poorer countries getting locked in a 'vicious cycle of underdevelopment' [411].

Nonetheless, developing nations cannot adopt conventional strategies without considering 'climate change and other social and environmental' concerns, since this would cause them to fall behind. Instead, by establishing 'climate-resilient development paths,' poor nations may 'leapfrog' affluent nations by avoiding inefficient, expansive techniques and instead concentrating on 'advanced, low-carbon' alternatives making progress toward sustainable development [412].

It is therefore challenging to evaluate the success of climate adaptation in developing countries. Indeed, poor countries not only need financial assistance to conduct 'national-level adaptation' efforts, but they also lack the resources to implement the measures such as ‘effective natural resource management, functional institutions with increased capacity and capability, improved literacy and food security’ [413].

It is also paramount to employ tools such as the Global Stocktake to highlight the importance of ‘climate ambition’. This important system provides an overview of the progress of the Paris Agreement's successful implementation, updating members' performance as they modify their nationally determined contribution. As a result, the execution of a ‘national-level adaptation effort’ will represent a powerful message in the global arena promoting the need for more adaptation funds to address the requirements of developing nations [414].

It is vital that developing countries incorporate certain critical elements in their nationally determined contributions in order to boost adaptation planning and execution. Indeed, developing countries should implement a 'top-down policy guidance with bottom-up plans and a circular learning process'; they should also encourage 'long-term, climate-resilient planning with long-term finance for climate resilient investments’; it is critical that the strategies are accompanied by their execution; developing countries must also deliver 'coordinated plans' to achieve international goals so they can prioritize adaptation actions; It is critical to achieve the 'Paris Agreement's commitment to a gender-

[411] Patel & Gebreyes (2020), p. 11
[412] Ibid, p. 12
[413] Ibid
[414] Ibid, p. 13

responsive' strategy; and lastly, strategies that permit the incorporation of 'scientific and technical knowledge within local systems' must be prioritized [415].

[415] Patel & Gebreyes (2020), p. 15

CHAPTER 6 - LIMITS TO ADAPTATION: MALADAPTATION

6.1 Constrain and limits of adaptation

It has been widely agreed in environmental literature, that there is a number of elements that limits the development and execution of adaptation policies, providing restrictions to the ability of actors to adapt to climate change. Actors indeed have to manage various limitations in order to accomplish a particular adaptation target that may dramatically lower the variety of adaptation alternatives and opportunities accessible to actors and hence may represent major limits to adaptation. As a result of these constraints, adaptation attempts are unable to offer an acceptable degree of security against threats and avoid the loss of essential features, components, or services of ecosystems and/or drive players toward potentially maladaptive reactions [416].

According to what emerged from the IPCC Fourth Assessment Report (AR4), eight main constrains may appear while implementing adaptation measures. In particular, they concern the gaps in the knowledge and the obstacles in the spreading of information, the technological limits to implement the measures, the 'physical and biological factors that constraints human and natural systems to adapt to a changing climate', the macroeconomic driving forces and the access to financial capital can influence the adaptive capacity, the adaptive capacity is also constrained by human resources since they represents the 'primary agents of change', social values and cultural norms also influence adaptation, and lastly, the constrains of governments and institutions [417].

In fact, according to the Fourth Assessment Report of the IPCC, the first constrain concerns the gap in the knowledge and the obstacles in the spreading of information. Indeed, even though education and awareness are insufficient to trigger an adaptive reaction, a number of studies suggest that that spreading of knowledge and the access to information constitute a significant possibility to facilitate adaptation [418]. A further constrain regards technology since while it generates great potential, it also has

[416] Klein, Richard & Midgley, Guy & Preston, Benjamin & Alam, Mozaharul & Berkhout, Frans & Dow, Kirstin & Shaw, M.. (2014). 'Adaptation opportunities, constraints, and limits.' 10.1017/CBO9781107415379.021. Pp. 911, 919-920
[417] Ibid, pp. 911-916
[418] Ibid, pp. 911-912

limitations in terms of achieving adaptation response to climate change. Indeed, even if the technology solutions are viable, the not all nations have equal opportunities or resources to implement new technologies to enhance adaptation capacity. In fact, even if the UNFCCC has agreed on the transfer of technologies to poor nations, financing initiatives for the creation and invention of new technologies, as well as their administration and maintenance, is particularly challenging for developing countries. In addition, it is critical to emphasize that not all technologies are universally adaptable to all situations since adaptations measures that work in one environment may not function in another [419] [420].

According to the Fourth Assessment Report of the IPCC, the third elements that represents a constrain to the adaptive capacity concern the 'physical and biological constraints' that individuals and the ecological systems face in order to adjust to climate changes. Indeed, several studies suggest that changes in climatic conditions could trigger environmental alterations that constrains opportunities for adaptation. This is especially true for vulnerable systems that more reliant in the agriculture sector, which may be unable to adjust to climatic changes without compromising their 'functional state and system integrity' [421] [422]. The ability of organisms to adapt to 'climatic stress' is also limited by the biological traits of a system. Ecological degradation indeed decreases the 'availability of ecosystem products and services for human populations' [423].

Economic and budgetary constraints also limit adaptive capability. Indeed, economies disproportionately comprised of climate-sensitive sectors are especially exposed to the consequences of climate change and may face higher limits on their capacity to adapt. While economic expansion and diversity are widely seen as characteristics that can help to alleviate resource shortages, certain economic activities might limit adaptability. Economic expansion may also impose strain on natural resources and ecosystems, limiting their ability to adapt. [424]. Furthermore, the execution of adaptation strategies is

[419] Klein et all (2014), p. 912
[420] Adger, W. & Agrawala, Shardul & Mirza, M.M.Q. & Conde, Cecilia & O'Brien, Karen & Pulhin, Juan & Pulwarty, R. & Smit, B. & Takahashi, Kiyoshi. (2007). 'Assessment of adaptation practices, options, constraints and capacity'. Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change. 717-743. P. 734
[421] Ibid, pp. 733-734
[422] Klein et all (2014), p. 912
[423] Ibid, pp. 913-914
[424] Ibid, p. 914

hampered by a variety of budgetary constraints. Indeed, the World Bank estimates that the 'total costs of climate proofing development ranges from US$10 billion to US$40 billion per year' [425]. In addition, at the local level, there is a 'lack of adequate financial resources that constrains their use of adaptation measures' [426]. Low-income communities suffer the most since they lack the financial resources to implement adaptation measures. As a result, the UNFCCC has established the 'Least Developed Country Fund' in order to 'assist developing nations in generating National Adaptation Plans of Action through the sale of certified emissions reductions(CERs)credits under the Clean Development Mechanism'. Further plans of actions have been established in order to 'channelling financial capital into adaptation programs and projects' such as the Overseas development assistance (ODA) [427].

'Social and cultural' aspects can also impact adaptation. Indeed, different 'societal values, world views, cultural norms and behaviours' can impact the perception that people have on risk assessment, on which adaptation strategies are believed to be the more successful, on the evaluation of the 'vulnerability distribution' and on the 'adaptive capacity among different elements of society'. As a result, depending on how climate change is interpreted and prioritized, many 'social and cultural groups' may have limited adaptive responses [428]. In addition, the success of these attempts to adapt to climate change is based on human resources, who are the key drivers of development. Indeed, they 'provide the foundation for intelligence gathering', the technological adoption and usage, and the guidance in the establishment and execution of adaptation policies and initiatives [429].

Lastly, adaptation is also constrained by governance and institutions. In fact, institutions have a critical role in 'facilitating adaptation' via legal obligations and responsibilities. In some instances, the institutions systems and laws may be inadequately implemented to accomplish adaptation goals and actors can have different 'perceptions of the need for adaptation'. As a result, modifying the legal principles to allow for more forward-thinking adaption solutions is challenging and might lead to constraints [430]. Moreover, 'Adaptation can also be constrained owing to the complexities of governance networks' since

[425] The World Bank Group. 'The World Bank Annual Report 2006' (2006)
[426] Adger et all (2007), pp. 734-735
[427] Klein et all (2014), p. 915-916
[428] Adger et all (2007), p. 736
[429] Klein et all (2014), p. 915
[430] Ibid, p. 916

institutions are composed by multiple actors such as ‘government agencies, market actors, NGOs, as well as informal community organizations and social networks’ [431].

These constrains may lead to the limitation of the capacity to adapt to climate change. Indeed, a limit is presented when the adaptation measure fail to offer an acceptable degree of security against hazard and fail to avert the 'loss of the key attributes, components, or services of ecosystems’ [432]. There are two types of limitations: hard limits and soft limits. Hard limitations are those that 'will not change’ since they are related to 'exceedance of the physiological capacity of individual organisms or communities to adapt to changes in the climate' such as the alteration of temperatures, and to 'climate induced changes in the abiotic environment' such as the 'ocean circulation and stratification’ [433]. Soft limits, on the other hand, are those that may vary with time as a result of new circumstances. Adoption boundaries are, in fact, socially produced by human action, through economics, technology, infrastructure, regulations. As a result, improving these aspects may reduce the constrains to achieve adaptation [434]. In addition, soft limits can alter with time since they are ‘mutable, subjective, and socially constructed’ and they are based on the society's shifting objectives, beliefs, 'risk tolerances, and social choices of society’ [435].

6.2 The concept of maladaptation, manifestations, and solutions

Many scholars and researchers agree that besides the previously discussed constrains and limitation towards the implementation of adaptation strategies, there are more obstacles to the ability of actors to adapt to climate change. Indeed, the design of strategies to address climate change can sometimes prove to be unsuccessful, resulting in the poorly performance of the implemented measure. However, the execution of an inadequate strategy can also lead to an even worse result. In this instance, the implementation with ‘good intentions’ [436] of an action can produce adverse impacts leading to a substantial

[431] Klein et all (2014), p. 916
[432] Ibid, pp. 919-920
[433] Ibid
[434] Ibid, p. 921
[435] Ibid
[436] Schipper, Lisa. (2020). ‘Maladaptation: When Adaptation to Climate Change Goes Very Wrong’. One Earth. 3. 409-414. 10.1016/j.oneear.2020.09.014. P. 413

raise of the vulnerability of the system [437] [438]. This phenomenon is called 'maladaptation' and according to Barnett and O'Neill (2009), it can be defined as the 'action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups' [439]. This outcome, therefore, produce 'conditions that are worse than those which the original strategies were trying to address' making communities more vulnerable to suffer negative effects of climate change [440].

The concept of maladaptation is relatively recent since it has been used for the first time in the 1990s by authors such as Smit (1993), Burton (1997), Scheraga and Grambsch (1998). These authors agreed that maladaptation is caused by inadequate 'policies and practices' that result on critical negative impacts leading to the increase of vulnerability. Only in the Third Assessment Report the IPPC stated its views on the matter, defining maladaptation as 'an adaptation that does not succeed in reducing vulnerability but increases it instead' [441] [442]. Therefore, maladaptation emerged 'as a very serious threat to society' resulting in the development of new research and investigations in order to seek more knowledge on the matter and possible solutions [443].

Many studies suggest that maladaptation can appear in different ways. Indeed, failure to incorporate some factors in the design of an adaptation policy might aggravate vulnerability. These factors include inequality, 'dependency on infrastructure or institutional structures', and the 'interconnectedness of development pathways' [444]. The absence of these components result in the transformation from a pathway towards a 'climate-resilient' outcome to the development of 'irreversibly higher vulnerability' leading to maladaptation [445]. For instance, the construction of seawalls in Fiji was expected to prevent the consequences of sea-level rise, however, it revealed to be an infrastructural maladaptation since it impeded 'stormwater drainage' exposing people even more to risks [446]. Similarly, reliance on institutional structures can lead to

[437] Schipper, Lisa. (2020), p. 409
[438] Barnett, Jon & O'Neill, Saffron. (2010). 'Maladaptation'. Global Environmental Change. 20. 211-213. 10.1016/j.gloenvcha.2009.11.004. P. 211
[439] Ibid
[440] Shipper (2020) pp. 409-410
[441] IPCC, TAR Climate Change (2001), p. 990
[442] Barnett et all (2010), p. 211
[443] Shipper (2020) p. 410
[444] Ibid, p. 412
[445] Ibid
[446] Shipper (2020) p. 412

maladaptation. Indeed, according to several studies concerning the agricultural industry, it has been noticed when farmers are provided with insurance, they became increasingly reliant on it, and they shift their land-use practices. This results in a scenario in which there is no need to evaluate the 'risks of planting different crops on a seasonal basis' lessening the 'overall knowledge base, social capital, and risk awareness necessary to mitigate the uncertainty' [447]. Moreover, adaptation to climate change requires not just 'physical or institutional changes,' but also alterations in attitudes and behaviours. This behavioural adjustment, however, is not always possible, resulting in a maladaptive outcome. Some studies in northern Ghana, for instance, revealed that because of a lack of rainfall, farmers were 'migrating away from rural areas in search of employment' causing shortages of labour. As a result, migration not only affects farming but it also has an impact on 'social structure, resulting in new dynamics and obstacles' [448].

According to Barnett and O'Neill (2009), five types of maladaptation can be distinguished. These categories concern the raise of 'emissions of greenhouse gases', the 'disproportionately burden' that the vulnerable communities suffer, the 'high opportunity costs', the lower 'incentives to adapt', and lastly the 'set paths' that reduce future options [449]. The first kind of maladaptation concerns the raise of the 'emissions of greenhouse gases'. Indeed, a recent instance concern the increasing usage of 'energy-intensive air conditioners' as a result of the implications of heatwaves. This issue generates 'positive feedback' while simultaneously raising greenhouse gas emissions consequently making it necessary to add further efforts in the future [450]. Concerning the second type of maladaptation Barnett and O'Neill (2009) explain that a measure is considered maladaptive when it 'increases the vulnerability of those most at risk'. As a result, it is critical to avoid 'burdening' the most disadvantaged who lack the same alternatives of wealthier communities' [451]. A further type concerns those measures that lead to a maladaptive outcome if 'their economic, social, or environmental costs are high relative to alternatives' [452]. A measure is considered maladaptive also if it reduces 'the incentive to adapt' such as by supporting needless reliance on someone else, it boosts 'rent-seeking

[447] Shipper (2020)
[448] Ibid
[449] Barnett et all (2010), p. 211
[450] Ibid, p. 212
[451] Ibid
[452] Barnett et all (2010), p. 212

behaviour', or it 'penalise early actors' [453]. Lastly, a measure that creates a 'Path dependency' that is hard to modify in the long term, is also considered a maladaptive strategy. Indeed, the investment in 'infrastructural developments' that set a fixed path reduces the ability to adjust to unexpected changes in 'climatic, environmental, economic and social conditions', limiting the 'portfolio of adaptation options in the future' [454].

It is therefore critical to understand what causes maladaptation in order to prevent it. Indeed, in planned adaptation strategies, maladaptation is mainly triggered by 'poor design and sloppy application by outside actors' who do not know the 'social or ecological contexts of the locations' where they are conducting the program'. On the other hand, in autonomous adaptation strategies, maladaptation is caused by lack of knowledge that results in undesirable decisions, the 'lack of support networks to fall back on', and the inability to seek new chances. To overcome these issues, it is necessary to address the unequal 'power dynamics' between individuals that are executing the adaptation plan and those that are expected to adapt trying to involve the latter category in the design of the strategy. It is indeed critical to guarantee that vulnerable people's voices are not ignored. Furthermore, knowing the target context, place, or group before implementing the adaptation strategy ensures that the measure addresses the causes of vulnerability rather than just the 'symptoms of it. Lastly, it is critical to 'look beyond the lifetime of the project' in order to understand potential future implications of a strategy [455].

6.3 Maladaptation and Climate Justice

In recent years, the debate on maladaptation has transitioned towards the emerging issue of climate justice. Indeed, the latest studies have focused on the social structures behind vulnerability and the processes of exclusion of vulnerable people. Indeed, maladaptation is no longer only associated with increased vulnerability due to an adverse impact, but also with inadequate knowledge of vulnerability and exclusion from public involvement. Indeed, according to the Intergovernmental Panel on Climate Change (IPCC), 'co-productive and participatory decision-making processes and knowledge systems often

[453] Barnett et all (2010), p. 212
[454] Ibid
[455] Shipper (2020) pp. 412-413

leads to adaptation action that meets societal needs' [456]. Maladaptation is thus not only the unfair application of an adaptation strategy, but it also entails the improper framing of perspectives on 'what and for whom adaptation is for' [457] [458].

From this standpoint, maladaptation has increasingly been addressed as an issue of 'transformative climate justice'. Transformative justice is a concept that aims to correct the injustices of climate change policies in order to encourage socially excluded individuals to participate in policy development and benefit from it. One of the main ideas of transformative justice concerns the adjustment of the 'power dynamics' in the knowledge generation 'through participatory and inclusive' processes. This method is known as co-production and it is a system that do not entails the implementation of the 'trusted networks', but rather it aims to allocate in a fairer and successful way 'climate policies to specific groups' guaranteeing that powerful individuals 'are not suppressing any voices' [459]. In this way, co-production allows marginalized communities to contribute to influence the knowledge creation and the implementation procedures [460] [461].

As a result, interactions with marginalized people leads to fairer types of adaptation. Co-production does, in fact, fulfil the 'trivalent view of justice', thoroughly examined in the following chapters, that is based on 'distribution, recognition, and participation' of vulnerable individuals. Therefore, the misrecognition of such marginalized communities will, as a matter of fact, cause 'status injury to a group, identity, or community'. Indeed, the prevention of the participation of such group in the social life, will not only represent an unfair and unjust condition, but also it will lead to maladaptation of these communities exacerbating their vulnerability to climate change repercussions and aggravating even more their marginalization [462].

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[456] Peter Newell, Shilpi Srivastava, Lars Otto Naess, Gerardo A. Torres Contreras, Roz Price. "Toward transformative climate justice: An emerging research agenda" (2021) https://doi.org/10.1002/wcc.733 Wires. P. 4

[457] Schipper, Lisa & Eriksen, S & Fernández Carril, Luis & Glavovic, Bruce & Shawoo, Zoha. (2020). 'Turbulent transformation: abrupt societal disruption and climate resilient development'. Climate and Development. 13. 10.1080/17565529.2020.1799738. Pp. 6-8

[458] Forsyth, Tim & McDermott, Constance. (2022). 'When climate justice goes wrong: Maladaptation and deep co-production in transformative environmental science and policy'. Political Geography. 98. 102691. 10.1016/j.polgeo.2022.102691. P. 2

[459] Shipper (2020) p. 413

[460] Schipper et all (2021), pp. 6-8

[461] Forsyth et all (2022), pp. 2-3

[462] Ibid, p. 2

Therefore, in order to prevent a maladaptive scenario related to climate justice it is important to consider some elements. In the first place, the concept of transformative justice which fosters the participation and inclusion in policy development of marginalized groups, must consider not only 'who participates' in such processes, but it must address it 'with reflection about what is being allocated'. Indeed, only by evaluating 'what is being allocated and with whose participation' It will be possible to achieve a fairer process for such communities. This theory is based on the critic of Rawlsian theories of justice, which developed an 'idealized system of fair allocation'. Recent research instead has examined this theory through the lenses of 'universalized assumptions about global justice, individualized rights and responsibilities and the role of nation-states protecting and enforcing rights on behalf of citizens [463]. As a result, these emerging approaches are more concerned with investigating the 'underlying social structures and processes of marginalization'. Indeed, current studies highlight the consequences of marginalized communities in response to authoritarian regimes, widespread violence, and absence of democracy. From this analysis emerged that maladaptation is caused by the 'insufficient understanding of contextual vulnerability, inequitable participation in planning and implementing interventions, misguided attempts to retrofit adaptation into development assistance, and allowing adaptation 'success' to be defined by dominant development agendas' [464].

In second place, not only it is fundamental to address to what extent recognition can resolve injustice, but also it is crucial to evaluate the role of marginalized individuals as 'epistemic subjects'. The common view of co-production, in fact, tend to avoid the consideration of epistemic injustices that base participation on criteria of 'prejudice, social inequality, or because their knowledge is considered irrelevant'. Indeed, it is crucial to understand co-production at a deeper level, therefore assessing the authority allocated to marginalized groups based on 'circumstances of justice'. As a result, a deep co-production approach may evaluate the underlying reasons behind the involvement of such communities. This method have the potential to shift the attention to vulnerable populations as adaptive beneficiaries, instead of individuals involved in 'labour markets, migration, and livelihood diversification', factors that characterize their vulnerability

[463] Newell, Peter & Srivastava, Shilpi & Naess, Lars & Contreras, Gerardo & Price, Roz. (2021). 'Toward transformative climate justice: An emerging research agenda'. Wiley Interdisciplinary Reviews: Climate Change. 12. 10.1002/wcc.733. P. 7
[464] Forsyth et all (2022), p. 2

further than their 'status or gender' [465]. Lastly, it is fundamental to consider the circumstances in which justice arise. Indeed, examining the exclusion of local groups leads to improved adaptation efforts. This analysis should also assess the 'underlying models of risk and visions of planetary justice' since they provide essential knowledge related to 'what adaptation is for, for whom, and how these aspects lead to maladaptation. As a result, greater emphasis must be placed on the 'contexts in which norms of justice become authoritative' [466].

As a result, the fundamental cause of maladaptation is related to various constraints in the structural processes that impose the implementation of adaptation measures 'within narrow parameters with short-term goals'. Indeed, maintaining such systems, lead to 'enclosure, exclusion, and encroachment' of already marginalized populations. The top-down measures that have been implemented until now, can cause harm in the achievement of adaptation since they aggravate the vulnerability. It is therefore crucial to formulate a holistic strategy that consider 'the political and economic context' in the development of adaptation policies leading to the promotion of justice and 'long-term sustainability' [467]. In order to prevent maladaptive outcomes, it is paramount that adaptation programs analyse the linkages between 'social, economic, and political systems', allocating significantly more resources to the ongoing challenge of equity [468].

[465] Forsyth et all (2022), p. 6
[466] Ibid, pp. 4-6
[467] Amanda Bertana, ,Brett Clark, Tabitha M. Benney, Cameron Quackenbush. 'Beyond maladaptation: structural barriers to successful adaptation' (2020). Environmental Sociology. Pp. 5-11
[468] Ibid, p. 11

CHAPTER 7 – FIJI NDCs ANALYSIS

7.1 Climate change impacts on Fiji

Fiji is a South Pacific Island nation that is composed by 332 islands distributed over '1.3 million km2' of ocean recognized as its Exclusive Economic Zone (EEZ) [469]. According to the United Nations, the Republic of Fiji is categorized as a 'Small Island Developing State' (SIDS) due to its 'unique social, economic, and environmental vulnerabilities' [470]. Small Island Developing State are in fact considered to be more vulnerable to climate change effects and are therefore more prone to face more serious impacts such as 'loss of livelihoods, food insecurity and largescale population displacement' [471]. The Republic of Fiji is indeed considered to be one of the most vulnerable countries to climate change, and as a result, it is more exposed to harsh climatic adversities [472]. In recent years, Fiji has suffered many harsh climate impacts that have posed many challenges to its already fragile economy. Cyclone Winston in 2016 was one of the most severe impacts that Fiji had to endure, causing '$1.9 billion' in damage [473]. This vulnerability stems from the interaction of different aspects. Indeed, Fiji's oceanic tropical climate along with its isolated geographical position in the 'South Pacific Convergence Zone' [474], render it more exposed to climate change effects such as rising sea levels and more frequent and heavy precipitations [475].

The environmental vulnerability has also triggered serious impacts on Fiji economic development objectives. The country indeed was suffering low economic growth given the 'low investment, weak exports, and low-productivity jobs'. In order to respond to this situation, Fiji government established the '20-year and 5-year National Development Plan' (NDP) with the ambitious vision of transforming Fiji. Indeed, it aimed at 'more than

[469] The Fijian Government. 'Fiji's Updated Nationally Determined Contribution' (2020). P. 8
[470] United Nations. 'About Small Island Developing States'.
[471] The Fijian Government (2020), p. 16
[472] World Bank. 'Climate Vulnerability Assessment : Making Fiji Climate Resilient'. (2022). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/163081509454340771/Climate-vulnerability-assessment-making-Fiji-climate-resilient. P. 47
[473] The Fijian Government (2020), p. 9
[474] The Fijian Government. 'Fiji NDC Implementation Roadmap 2017-2030. Setting a pathway for emissions reduction target under the Paris Agreement'. (2017). P. 1
[475] World Bank (2022) p. 47

double the real GDP per capita by 2036' and 'to provide universal access to all services, including housing, electricity, clean and safe water and sanitation, high-quality education, and health care' [476] [477]. Climate change, on the other hand, is a serious impediment to the fulfilment of these objectives. Past events in fact demonstrate that Fiji has already experienced the high and increasing level of disaster risks. The impacts of cyclone Winston illustrates the substantial concerns for 'economic activity, livelihoods, and well-being' [478] that results in a loss up to 20% of GDP [479].

These events are likely to happen more frequently in the future [480] leading to the loss of 'up to 6.5 percent of GDP by 2050' [481]. Most studies suggest that there will be an increase of natural disaster that will eventually lead to long-term threats including 'sea-level rise, health impacts, and agricultural losses'. Since a large portion of the population lives on 'low-lying outer islands', sea-level rise is the most serious threat to Fiji in the long run. As it is costly to defend against it, people may be forced to relocate due to the unsustainable living conditions. In addition, as a result of climate change, the Fijian population will face health issue such as 'vector-borne disasters, water-borne disease and noncommunicable disease sensitive to temperatures' which will cause an adverse influence various economic sector, particularly tourism. Long-term climate change effects will also have an impact on agriculture, which accounts for '8% of GDP', and it is the primary source of income for individuals that live under the poverty line. In turn, this will also lead to Hunger, malnutrition, and undernourishment since due to the damages of local production and the raise of international price, 1,000 individuals risk falling below the poverty line, posing major concerns for access to an adequate and healthy diet [482] [483].

'The Government of Fiji (GOF) has a strong commitment to global efforts in combating climate change and its effects on humans and ecology. This commitment is exhibited in GOF's signature of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, the ratification in 1993, and Fiji's continued commitment to

[476] World Bank (2022) p. 42
[477] United Nations Department of economic and social affairs. '2019 voluntary national reviews synthesis report'. (2019).
[478] The Fijian Government (2020), p. 9
[479] World Bank (2022) p. 42
[480] Ibid, p. 47
[481] Ibid, p. 22
[482] Ibid, pp. 22-23
[483] The Fijian Government (2020), pp. 16-17

participate in the framework and address issues faced by SIDS. This continued commitment is shown in Fiji's signature and ratification of the Kyoto Protocol in 1998, and further by GOF's signature and ratification of the Paris Agreement on the same day of the 22nd of April 2016. In addition, GOF has both the honour and pleasure to act as the President of the Conference of the Parties (COP) 23, held in Bonn, Germany in 2017. To highlight Fiji's commitment to the Paris Agreement, the GOF issued its Intended Nationally Determined Contribution (INDC) before COP 21 in 2015, and upon ratification of the Paris Agreement, this is now considered to be Fiji's Nationally Determined Contribution (NDC) [484].

7.2 In depth Analysis of Fiji's 2015 Nationally Determined Contribution (NDC)

Fiji's Nationally Determined Contribution (NDC) was drafted in 2015, it was implemented in 2016 and it has been developed concerning the period of action that goes from 2020 to 2030. This first NDC take as the base year 2013 where the emission were 'at 1500 kilo tonnes of carbon dioxide (kTCO2 e)' and it aimed at achieving '2,341 kTCO2 e by 2030' [485]. Fiji indeed is a developing country with a minor share of emissions compared to the developed world. In 2013 Fiji's generated '1.5 tonnes CO2 emissions per capita' compared to the global average of '5.6 tonnes' [486]. The first NDC was issued by the Fijian government, in particular it was prepared and submitted by the Climate Change and International Cooperation Division (CCICD) in accordance with the Paris Agreement. The Climate Change and International Cooperation Division is part of the Ministry of Economy, and it is the 'responsible national agency' for tackling climate change policy in Fiji. It is directed by the National Climate Change Policy (NCCP) and collaborates with government institutions, 'nongovernmental organizations, regional and international agencies and development partners' [487] [488].NDC 2015

Fiji's first Nationally Determined Contribution (NDC) of 2015 mainly aimed to achieve three targets:

[484] The Fijian Government (2017), p. 13
[485] The Fijian Government (2020)
[486] The Fijian Government (2015), p. 6
[487] The Fijian Government (2020)
[488] The Fijian Government (2015)

‘To reduce 30% of BAU CO2 emissions from the energy sector by 2030’

‘As a contribution to Target 1, to reach close to 100% renewable energy power generation (grid connected) by 2030, thus reducing an expected 20% of energy sector CO2 emissions under a BAU scenario’

‘As a contribution to Target 1, to reduce energy sector CO2 emissions by 10% through energy efficiency improvements economy-wide, implicitly in the transport, industry, and electricity demand-side subsectors’ [489]

Its content therefore concerned the economic sector, in particular the ‘energy, power, industry, transport fields’ and it regarded the ‘power, renewable, bioenergy, geothermal, hydropower, solar, wind’ energy types [490]. Fiji first NDC targets only the possible mitigation efforts in the energy sector, in particular it introduced measures concerning the reduction of emissions through the use of ‘renewable energy for electricity generation’ and through the ‘improvements in energy efficiency economy wide’ in the 'electricity, industry, and transport’ sectors. The main goal is to optimize the use of renewable energy in the electricity generation sector by 100% by 2030 [491]. In order to do so, Fiji aims at reducing the CO2 emissions by 30% in 2030. Indeed, in a business-as-usual scenario where no measures are implemented, the ‘total fossil fuel for energy production’ would reach 2500 Gg in 2030 ‘with an electricity sector CO2 emission level of around 500 Gg’. With the correct implementation of the measures leading to energy sector reductions, ‘the emissions in 2030 would thus be around 1800 Gg’. Thus, in order to decrease the CO2 emissions by 30% in 2030, a reduction by 20% of CO2 emissions must be achieved ‘through the implementation of renewable energy electricity generation’ and through a reduction of 10% of CO2 emissions through ‘energy efficiency improvements in the transport, industry, and electricity demand’ that would result in a total reduction of 30% for 2030. Moreover, out of ‘the 30% reduction of BAU baseline CO2 emissions, the government of Fiji expects that 10% of the BAU baseline emissions mitigation will be achieved unconditionally ‘through the implementation of the Green Growth Framework’

[489] The Fijian Government (2020), p. 4
[490] The Fijian Government (2015)
[491] The Fijian Government ‘Talanoa Dialogue Submission: Where Are We?’ (2015)

using available resources in the country, and the remaining 20% will be to be achieved conditionally through ‘external funding amounting to US$500 million’ [492] [493] [494].

These goals are consistent with the Green Growth Framework and the Sustainable Energy for All (SE4ALL) initiative of the United Nations [495]. Indeed, the Fiji government has already implemented important domestic measures to deal with the impacts of climate change. The Green Growth Framework was in fact established in 2014 to address the expected negative implications of climate change by improving 'environmental resilience,' social progress in poverty reduction, and 'economic growth' to assure sustainable development [496]. The targets set by Fiji are also aligned with the goals of the United Nations initiative ‘Sustainable Energy for All' (SE4ALL), a project launched in 2011 with the aim of guaranteeing ‘universal access to modern energy services’, ‘doubling the global rate of improvement in energy efficiency’, and ‘doubling the share of renewable energy in the global mix' by 2030 [497].

Fiji Nationally Determined Contribution propose short term, medium term, and long-term strategies in order to achieve its goals. The main purpose shared by all of these measures is to minimize the reliance on 'imported fossil fuel as a source of energy for electricity generation’ while increasing the usage of renewable energy. The government indeed had already suggested a 'renewable energy portfolio' that consisted of 'hydro, geothermal, biomass and grid connected solar and wind', however, the final strategy has yet to be chosen [498] [499].

The short-term measures entail a period of action of two years and concern the implementation of renewable energy programs particularly focusing on the study of investment efforts and the enhancement of research. The first measure indeed recognize the paramount necessity of directing resources towards investments in ‘renewable energy projects’ that are viable in Fiji current conditions. Such projects entails ‘solar biofuel, wind, micro hydro projects and biogas power generation’ that in order to be implemented

[492] The Fijian Government (2015), p.4
[493] The Fijian Government (2017), p. 13
[494] The Fijian Government ‘Talanoa Dialogue Submission: Where Are We?’ (2015)
[495] The Fijian Government (2015), p.5
[496] The Fijian Government. ‘A green growth framework for Fiji’ (2014), p. 4
[497] United Nations, The Secretary-General’s High-level Group on Sustainable Energy for All. ‘Sustainable Energy for All A Framework for Action’. (2012), p. 6
[498] The Fijian Government ‘Talanoa Dialogue Submission: Where Are We?’ (2015)
[499] The Fijian Government (2015)

require attentive research in terms of possible investments and feasibility. The second short term policy emphasizes the importance in the contribution of investigation in ‘new renewable energy technologies’ field. Indeed, deeper study on the subject may considerably improve the understanding and implementation of such measures, as well as lead to additional investigations on 'ocean energy, geothermal energy, wave energy, and waste energy generation'. Lastly, the third short term policy concerns the assessment of the possible investment in renewable energy. It is indeed crucial to evaluate if such a strategy may represent a component of the procedure to execute future investments [500] [501].

The implementation timeframe for medium-term policies ranges from three to five years. The Fiji government introduced only one proposal in its 2015 Nationally Determined Contribution (NDC) that concerned the development and the enhancement of the principle, regulations and 'technical standards' for renewable energy technology [502]. Long-term measures, on the other hand, have an action duration of more than five years and concern the deployment of more specific renewable energy initiatives. Indeed, the first long-term strategy emphasizes the need for substantial study into avoiding the use of ‘hydrocarbon resources and hydrogen fuel cells,’ which have a negative impact on the environment by increasing CO2 output. Finally, the second long-term policy is to enhance the proportion of renewable energy used in the electricity industry. Indeed, the Fijian government intends to expand the renewable energy ratio of power from 61% in 2013 to 95% by 2030 [503].

Among the several mitigations opportunities outlined by the Fiji government to enhance the use of renewable energy in the electricity industry as primary mean for power generation, ‘large-scale hydro’ power has been highly effective, and it represents the better option. Indeed, according to Fiji Electricity Authority (FEA) investigations, using hydro power with a capacity of 120MW, it provides a ‘large-scale storage facility for intermittent renewable inputs' to be supplied into the main system [504]. Other options have not been as successful as hydro renewable energy options. For instance, solar power, wind power, large scale biomass production, geothermal energy, wave and ocean energy have

[500] The Fijian Government (2015)
[501] Ibid
[502] Ibid
[503] Ibid
[504] Ibid

been investigated but are not considered to be effective measures [505]. The implementation of policies that seek to enhance the use of renewable resources proved to be crucial also for the transportation industry. Indeed, starting from the 1970's, Fiji has witnessed an increase of 5% in the presence of motor vehicle which are responsible for the raise of CO2 emissions, causing in turn the transportation industry to 'move in the wrong direction' in terms of 'emissions and savings'. Indeed, transportation infrastructure has seen a spike in vehicle numbers, resulting in a 'drain on national resources'. Mitigation measures are therefore challenging to implement on this area since they restrict 'fuel switching to either biofuels or electricity rather than mode changing' [506].

The government of Fiji has also developed different adaptation measures since the country has been facing major climate change repercussions, such as droughts, floods and cyclones, which have severely damaged the 'economy, employment levels, the availability of natural resources and resilience' [507]. Indeed, Fiji government in the development of the National Climate Change Policy, has set as the main goal the identification and the minimization of the vulnerability factors as well as the improvement of Fiji's population's resilience to the effects of climate change [508]. Fiji is committed to achieve its adaptation goals through the implementation of specific policies, institutions, and 'budgetary' mechanisms capable of allocating funds 'toward climate change and disaster risk management' programs. Fiji government has already started implementing adaptation strategies. Indeed, it conducted a 'vulnerability and adaptation assessments' of Fiji, and it financed the enhancement of 'early warning systems, dredging of river mouths, construction of inland retention dams and cyclone proof homes'. Current adaptation measures concerns the agricultural sector, in particular they include the 'planting of traditional tree, root crops and mangroves, the construction of seawalls and the relocation of communities to higher grounds in the agriculture sector' [509].

Fiji Nationally Determined Contribution (2015) propose short term, medium term, and long-term adaptation strategies in response to key climate changed induced challenges. The first issue illustrated by the Fiji NDC concerns the implementation of policies that effectively address climate change. These policies are categorized as short-term measures

[505] The Fijian Government (2015)
[506] Ibid
[507] Ibid
[508] Ibid
[509] Ibid

and they therefore have a period of action of two years. In particular, they regard the creation of a 'National Platform for Climate Change and Disaster Risk Management by 2015' so stakeholders may collaborate on resource allocation, and the development of a 'National Strategic Plan for Climate Change and Disaster Resilience by 2015', both subject to an assessment by 2016 [510]. The second challenge that Fiji confronts, is the necessity to construct 'cyclone-resistant' infrastructure in 'urban and rural' locations. The NDC propose to assess the 'National Building Code by end of 2016' in order to ensure that these measures are being implemented in the short-term period, and as a medium-term strategy, it encourages the fulfilment of the new construction requirements through the implementation of incentives [511]. Fiji NDC also recognize the necessity of reinforcing the position of 'local governments in building resilience'. Indeed, it proposes a short-term solution aimed at creating a 'Local Government Self-Assessment Tool for Climate Change Resilience' and the institution of policies to enable the execution of 'zoning and buffer zones for coastal areas, rivers banks, high risk areas and mangrove areas' [512]. The fourth adaptation strategy that Fiji government seek to pursue, regards the necessity to enhance public awareness of the implications of climate change. It proposes as a short-term strategy the implementation of an 'assessment framework' that incorporate also the 'adoption of the damage and loss assessment methodology'[513].

As a medium-term measure, the Fiji government requires the implementation of a system to assess the data regarding 'hazard, vulnerability and exposure', the development of a 'cost-benefit analysis' related to the 'decision making process in mitigation and preparedness measures' and the execution of investigations regarding 'climate change and disaster risk reduction' [514]. Concerning the improvement of climate change knowledge on the long-term, Fiji government proposes the creation of 'hazard maps' that illustrate the potential threats of climate change, including 'sea level rise, storm surge, flood and tsunami' to chieve by 2020 [515]. A further challenge that Fiji government acknowledge in its NDC, concerns the necessity of introducing the strategies of mitigation and adaptation in Fiji's 'national and sub national development planning and budgetary process', as well as the incorporation of 'disaster risk reduction' assessment. It also aims at analysing the

[510] The Fijian Government (2015)
[511] Ibid
[512] Ibid
[513] Ibid
[514] Ibid
[515] Ibid

‘capital budget appraisal guidelines’ in order to integrate 'hazard and risk management (CHARM)' and 'vulnerability and adaptation (VA) evaluation’ [516]. Fiji government also seek to enhance the resources available for adaptation and mitigation efforts. Indeed, it aims at investigating 'climate change financing modalities' in the short term and it also seek to enhance the entrance to international financial institutions like the 'Global Green Fund’ in the medium term [517]. The last adaptation measures contained in Fiji NDC, concerns the reinforcement of ‘partnerships at all levels for building resilience for climate change’. Fiji government in the short term seek to improve the collaboration with civil society in order to enhance the adaptive capability both at the regional and local level, particularly by encouraging ‘performers/performance’. In the medium run, by 2019, it seeks to begin a ‘vulnerability assessment for all communities’ as well as create a 'climate and disaster resilience plans for urban and rural communities’. Finally, in the long term, it aims at providing ‘capacity building’ to communities identified as vulnerable during the assessment in order to reduce risks [518].

7.3 In depth Analysis of Fiji’s 2020 Nationally Determined Contribution (NDC)

The Paris agreement stipulates that ‘each party shall communicate a nationally determined contribution every five years’ [519]. As a result, after the Talanoa Dialogue in COP23 and COP24, the Fijian government updated its Nationally Determined Contribution in 2020, to be implemented from 2021 to 2030 [520]. This version, as well as the 2015 one, take 2013 as the base year with ‘1500 kilo tonnes of carbon dioxide (kTCO2 e)’ emissions aiming to reach ‘2,341 kTCO2 e by 2030’. This revised version reaffirms Fiji's 2015 NDC mitigation objectives. Indeed, it aims to 'reduce 30% of BAU CO2 emissions from the energy sector by 2030’ by limiting 'CO2 emissions by 20%' through the deployment of '100% renewable energy in power generation', and by decreasing 'CO2 emissions by 10%' through 'energy efficiency improvements' in different industries [521].

[516] The Fijian Government (2015)
[517] Ibid
[518] Ibid
[519] Paris Agreement (2015) article 4 (9)
[520] The Fijian Government (2020), p. 10
[521] Ibid, p. 4

In 2020 Fiji NDC update, new commitments have been established. There is only one policy that address mitigation, while the rest of the new targets focus on adaptation measures. This emphasizes the significance that adaptation have achieved in recent years as well as it underlines that mitigation solutions are no longer central in the efforts against climate change but rather, they complement the adaptation approaches.

The new introduced mitigation target recites as follows: 'As a contribution to Target 1, to reduce domestic maritime shipping emissions by 40%'. According to recent data, Fiji 'domestic maritime transport' used '79 million litres of fuel' in 2016, emitting of 214 Gg of CO2e. Considering a BAU scenario of '2% annual growth rate' in maritime transport industry, 'the total annual fuel consumption will increase to 127 million litres by 2040 with corresponding GHG emissions of 342 Gg of CO2e' [522]. The introduction of this emission reduction policy is indeed crucial since 'this sector has a major role to play in overall decarbonisation efforts for Fiji [523]. This measure represent a significant step forward also because it is the first time that 'maritime transport' has been addressed in Fiji Nationally Determined Contribution and consequently it is more accessible to achieve 'financing for new sustainable sea transport projects from international agencies' [524]. In recent years, the International Maritime Organisation (IMO) has called countries to address the issue of 'emission reduction from shipping'. Fiji's shipping industry, indeed, is 'fully dependent on imported fossil fuels' [525] and 'due to dispersed smaller islands, there is a' high demand 'for inter-island maritime transport for passenger travel and freight transport' [526].

In the updated Fiji NDC, the first adaptation measure is related to the implementation of 'Climate Smart Agriculture practices'. Indeed, Fiji government seeks to enact 'sustainable practices in crop management, livestock and sugarcane farming and fisheries' [527]. Climate Smart Agriculture is a new approach that was developed in the framework of the '2010 Hague Conference on agriculture, food security and climate change' that aims at improving food systems [528]. It address both food security and climate

[522] The Fijian Government (2020), p. 40
[523] Ibid, p. 47
[524] Prasad, Ravita & Raturi, Atul. (2019). 'Fuel demand and emissions for maritime sector in Fiji: Current status and low-carbon strategies.' Marine Policy. 102. 10.1016/j.marpol.2019.01.008. P. 40
[525] Ibid, p. 40
[526] Ibid
[527] The Fijian Government (2020)
[528] Food and Agriculture Organization of the United Nations. 'Climate-Smart Agriculture Sourcebook' (2013), p. 359

change since they are inextricably linked, indeed climate change affect food security and endangers agriculture productivity and at the same time land usage has a strong impact on climate change. Climate Smart Agriculture is therefore considered a necessary strategy in order to guarantee food security. Consequently, the agriculture sector must implement measures in order to increase crop output in a sustainable manner, adapt to the effects of climate change, develop resilience, and minimize CO2 emissions [529]. In order to achieve efficient CSA, strategies aimed at strengthening sustainable production and improving productivity must be implemented, along with 'restoration measures' such as enhanced technology, effective utilization of soil, water, power and other factors, better availability of knowledge and facilities, 'efficient markets and risk management tools' [530]. However, the main issue with the combination of these measures is related to the 'tailoring of these policies to the national political situation and climatic context in a way that builds on existing environmental strategies and ad-hoc programmes' [531]. In accordance with FAO climate-smart agriculture, the Fijian government seeks to improve production, strengthen food system and minimize GHG emissions when feasible. One option concerns the development of interconnected agricultural systems, such as agroforestry, which combines traditional and modern approaches by managing trees alongside crops and animal production systems. It is a strategy that aims to 'diversify and sustain production to increase social, economic and environmental benefits' [532].

The second adaptation target in Fiji 2020 NDC regards the 'upgrading, repairing and relocating' of 'critical public infrastructure' in order to improve resilience. The improvement of public facilities was only briefly mentioned in the first NDC, it was referred to as a 'rehabilitation plan' particularly for 'rural housing and infrastructure such as roads, water and energy'. Instead, in the updated 2020 version, the Fiji government has agreed to commit a more direct adaptation objective to the improvement of public infrastructure. Indeed, infrastructure are extremely vulnerable to climate change threats and, as a result, they need 'investment and resources' in order strengthen their resilience

[529] Ibid, p. 27
[530] Ibid, pp. 359-360
[531] Ibid
[532] Food and Agriculture Organization of the United Nations. 'Pro-Resilient Fiji – Strengthening climate resilience of communities for food and nutrition security' (2019), p. 4

[533] [534] [535]. This adaptation target is linked to the four goal of Fiji 2020 NDC, since it aims at relocating not only public infrastructure, but also at 'relocate highly vulnerable communities, and implement the concept of 'build back better'. Indeed, the projects of 'Building Back Better' are considered essential in order to enhance resilience since, according to research, improved building operations might minimize 'well-being losses' caused by climatic events 'by more than 40%' [536] [537]. The relocation of vulnerable communities is a measure that entail an 'organised movement of people and settlements' to a permanent new location, supported by 'partner agency and/or the state' [538]. The Fiji Government developed in 2018 the guidelines for planned relocation in which it states the 'guiding principles and procedures for Fijian government, donors and other stakeholders, and communities' [539]. Planned relocation presents opportunities and risks, indeed on the one hand, it concerns a solution to vulnerable communities to resettle in a safer area and to minimizing the 'exposure to climatic and environmental biophysical risks'[540], on the other hand, it triggers several risks. In particular, it can cause significant menaces for 'human development' and health since it may produce 'food insecurity, unhealthy water and sanitation system, lack of housing, lack of land, unemployment, homelessness, marginalization, and loss of access to shared assets' [541]. A successful instance of relocation was the case of the Vunidogoloa village that thanks to government support, it managed to relocate in 2014 [542]. As evidenced by several interviews conducted with residents, it has been possible to understand that relocating away from unsafe environments has resulted in numerous advantages such as the 'availability of food, access to drinking water and improved access to schools and health services'. However, the planned relocation 'altered the social determinants of health' causing some unexpected threats to 'health and wellbeing' [543]. Therefore, in order to achieve a successful planned

[533] UN Office for disaster risk reduction. Asia disaster preparedness. 'Disaster Risk Reduction in the Republic of Fiji. Status Report 2019'. (2019), pp. 14-16
[534] The Fijian Government (2020)
[535] The Fijian Government (2015)
[536] Hallegatte, Stéphane & Fay, Marianne & Barbier, Edward. (2018). 'Poverty and climate change: Introduction'. Environment and Development Economics. 23. 217-233. 10.1017/S1355770X18000141.
[537] UN Office for disaster risk reduction (2019) p. 20
[538] Mc Michael, Celia & Powell, Teresia. (2021). Planned Relocation and Health: A Case Study from Fiji. International Journal of Environmental Research and Public Health. 18. 4355. 10.3390/ijerph18084355. P. 1,2
[539] Ibid, p.2
[540] Ibis, p. 13
[541] Ibid, p. 2
[542] Ibid
[543] Ibid, p. 11

relocation, it is fundamental to consider the 'broader socio-political, ecological, economic and cultural contexts and processes' [544].

The third measures introduced in Fiji 2020 NDC, concerns an instance of a mitigation measure coupled with an adaptation strategy. It regards the implementation of 'simplified and standardised early warning and monitoring systems' through 'nature-based solutions to mitigate the impact of flooding and cyclones'. The development of early warning systems was already addressed succinctly in the previous NCD since Fiji had already 'invested in improving early warning systems', but it was only in this updated version that it received proper attention, as well as the introduction of 'monitoring systems' through the application of 'nature-based solutions' [545] [546]. Since the implementation of the first NDC, the Fiji Meteorological Service (FMS), developed early 'hazard warning systems' related to cyclones, rain, drought, and flash floods broadcasting the alert through media networks, such as radio, television and social medias (Fiji Meteorological Service, 2015). In addition, tsunami early alerts have also been developed regionally by the Intergovernmental Oceanographic Commission and locally by the Fiji government [547]. In recent years, a new early warning system was developed by the Coastal Inundation Forecasting Demonstration Project (CIFDP). It is a 'Multi-Hazard' new early warning system successfully implemented in 2020, that provides an 'integrated approach to forecasting, monitoring and warning for coastal flooding' in a short amount of time. This system has shown successful results since its implementation, indeed, in April 2020, it anticipated the wave magnitude created by Cyclone Harold resulting in the successful evacuation of vulnerable population [548]. Early warning system is therefore a crucial factor to prevent climate change induced disasters.

The fifth adaptation target concerns the development of 'strong healthcare system by implementing the guidelines for climate-resilient and environmentally sustainable health care facilities in Fiji' [549]. This target has been introduced for the first time in the 2020 Fiji NDC and it was not mentioned in the previous version. This measure stems from the fact that the healthcare system in Fiji is severely exposed to climate change threats and it can

[544] Mc Michael et all (2021), p. 13
[545] The Fijian Government (2020)
[546] The Fijian Government (2015)
[547] UN Office for disaster risk reduction (2019), p.20
[548] Tonkin, Taylor. 'Early Warning and Early Action: A look at Fiji's Multi-Hazard Early Warning System' (2022) Tonkin+Taylor
[549] The Fijian Government (2020)

also cause significant effects to the environment. According to the World Health Organization (WHO), ‘climate-resilient and environmentally sustainable health care facilities’ can be defined as ‘those capable to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stresses, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, so as to bring ongoing and sustained health care to their target population and protect the health and well-being of future generations’ [550]. As a result, health care institutions must be prepared to withstand and heal from the consequences of climate change, anticipating the effects and taking the required precautions 'before, during, and after' a specific event in order to mitigate adverse impacts and adapt to the new conditions [551]. In order to achieve this goal, the World Health Organization published in 2020 the ‘Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities’ that posed four essential requirements in order to guarantee ‘climate resilient and environmentally sustainable’ facilities. The first condition requires for a sufficient amount of competent 'human resources' who are prepared to react to climatic issues and can perform their services in suitable working circumstances. The second and third requirement concern the ‘sustainable and safe management of water, sanitation and health care waste services’ and the ‘Sustainable energy services’. Lastly, the guidelines call for the development of ‘appropriate infrastructure and technologies’ as well as the proper function of all the procedures that permit the ‘efficient functioning of the health care facility’ [552].

The sixth adaptation goal is related to the preservation of ‘natural environment and biodiversity wealth’ through ‘sustainable long-term provision of ecosystem services, including carbon sequestration potential’ [553]. Fiji has already made considerable progress in this regard, being the 'first small island developing state to sign an Emission Reductions Payment Agreement (ERPA) with the Forest Carbon Partnership Facility (FCPF)'. In fact, Fiji signed a five-year agreement in 2021 that gave access to 'US$12.5 million in results-based payments' for raising carbon sequestration and minimizing greenhouse gas emissions from 'deforestation and forest degradation’ through the implementation of 'integrated land use planning, native forest conservation, sustainable pine and mahogany

[550] Ministry of Health and Medical Services. ‘Guidelines For Climate-Resilient and Environmentally Sustainable.’ (2020) p. 1
[551] Ibid
[552] Ibid, p. 2
[553] The Fijian Government (2020)

plantations, community-driven afforestation and climate-smart agroforestry' [554]. A further method that has been proved to significantly reduce carbon sequestration is the use of mangroves. Indeed, some experts suggest that 'carbon sequestration in mangroves is about 38 Tg C year−1' and it represent a faster mechanism rather than terrestrial forests. In addition, mangroves have also been shown to contribute to the reduction of greenhouse gases since 'decomposition in mangrove soils occurs mainly though sulphate reduction'. As a result, the regeneration of mangroves and the prevention of mangrove degradation can lead to a more efficient carbon sequestration system [555].

Fiji's seventh adaptation target is to plant '30 million trees by 2035', an initiative developed on the basis of the '15 Goal of United Nations 2030 Agenda for Sustainable Development'. The first step toward achieving the target was made in 2020, with the establishment of the '4 million trees in 4 years' project. It was established in 2019 by the President Jioji Konrote, with the primary purpose of preventing soil erosion in river banks. The strategy had a particular positive impact in Naitasiri, a region that was suffering from the depletion of pine trees. Indeed, pines trees were the principal source in the construction of 'houses and boats' and they also had numerous applications in the upgrading of villages. The overuse of pine trees eventually lead to the abuse and exhaustion of such resource. As a result, the main approach focused at the plantation of pine trees in order to provide the community with adequate resources to be able to 'use these trees at a sustainable rate'. Given the policy's success, the government boosted 'the tree-planting target from 4 million trees in 4 years to 30 million trees in 15 years' [556] [557]. To counter climate change issues, the Fiji government implemented the '30 million Trees in 15 Years' project in 2021. This strategy arose from the acknowledge of the environmental value of forest resources, which may counterbalance 'emissions from highly industrialized sectors' and re-establish an equilibrium with environment to 'support lives and livelihoods while making forestry more productive and sustainable'. Even after Tropical Cyclone Yasa struck, the Fiji government program had a favourable impact [558].

[554] The World Bank. 'World Bank and Fiji Sign Agreement to Reduce Forest Emissions and Boost Climate Resilience'. (2021).
[555] Mohd Nazip Suratman. 'Carbon Sequestration Potential of Mangroves in Southeast Asia' (2008). Pp 297–315. In: Bravo, F., Jandl, R., LeMay, V., von Gadow, K. (eds) Managing Forest Ecosystems: The Challenge of Climate Change. Managing Forest Ecosystems, vol 17. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-8343-3_17 Pp. 309-310
[556] The Fijian Government. '30 Million Trees In 15 Years' (2020)
[557] The Straits Time Asia. 'Fiji to grow 30 million trees in 15 years for environment protection' (2020)
[558] Ministry of forestry Fiji parliament. 'Written Question – 37/2021 Hon. Peceli Vosanibola to ask the Minister for Forestry – Can the Minister update Parliament on the extent of damage or destruction by

Fiji was able to make much more progress toward its '30 million trees by 2035' objective in 2022. Indeed, Fiji Development Bank (FDB) managed to be the only ‘bank in the South Pacific to be accredited Direct (National) Access Entity by the Green Climate Fund’. As a result, Fiji Development Bank (FDB) has assumed a significant role in leading climate-resilient projects aimed at assisting the 'economy to adapt to the impacts of climate change’. The Fiji Development Bank (FDB), in collaboration with the Ministry of Forestry and the Taukei Affairs Board, has achieved outstanding results as part of the ‘30 Million Trees in 15 Years’. Indeed, it ‘planted over 3,000 trees since the launch of the Bank’s Reforestation Program in 2019’ and 'more than 1800 seedlings in the North, West and Central/Eastern division’ [559].

The last target aims to ‘establish 30% of our Exclusive Economic Zones (EEZ) as Marine Protected Areas and work towards 100% management of our EEZ by 2030 through the implementation of the National Ocean Policy’. Fiji’s Ministry of Economy ‘with support from the World Bank’, in May 2020 established the first draft of the National Ocean Policy (NOP) in line with the ‘United Nations Sustainable Development Goal 14’, that aimed to ‘designating 30% of its 1.2 million km2 of ocean within its Exclusive Economic Zone (EEZ) as marine protected areas (MPAs) with 100% sustainable management of its EEZ by 2030’. It represented a ‘step forward for Fiji’s ocean governance’ since it seek to provide a ‘healthy ocean that sustains the livelihoods and aspirations of Fiji’s current and future generations’ and it aims to ‘secure and sustainably manage Fiji’s ocean and its marine resources’ [560] [561]. It also represents a ‘framework for integrated action and partnerships on Fiji’s national, regional and global commitments on the ocean with a progression to the integrated management of Fiji’s entire EEZ by 2030’ [562]. Indeed, as expressed in National Ocean Policy second goal, Fiji aims to ‘Protect, restore, and improve ocean ecosystems through the sustainable management of 100 percent of Fiji’s ocean within national jurisdiction, including its internal waters, archipelagic waters,

Tropical Cyclone Yasa to more than 100,000 tree seedlings planted towards the 30 Million Trees Initiative in Vanua Levu?’ (2021) p. 1

[559] The Fiji Times. ‘FDB contributes to ‘30 million Trees in 15 Years’ reforestation initiative’ (2022) Fiji Development Bank.

[560] Republic of Fiji. ‘Republic Of Fiji National Ocean Policy 2020 – 2030’ (2020)

[561] James Sloan. ‘Offshore Marine Protected Areas for Fiji - Essential next steps in terms of sustainable financing’ (2021) Ocean Law Bulletins.

[562] James Sloan, Kevin Chand and Emily Samuela. ‘Fiji’s first National Ocean Policy Analysis and Submission’ (2020) Ocean Law Bulletins.

territorial seas, and the exclusive economic zone (EEZ) [563] [564]'. In order to achieve this goal, Fiji strategy seek to 'raise awareness of the benefits of the ocean since it is currently threated by anthropogenic activities', it aims to implement 'processes and policies' through the use of 'area based management tools to identify where the Marine Protected Areas should be designated to cover 30% of the ocean by 2030'[565] [566]. The management of 30% of Exclusive Economic Zone 'means greater protection of Fiji's exceptional biodiversity and improving ocean health improving food security and bolstering the resilience of vulnerable countries [567]. A successful instance of 'Locally Managed Marine Area communities' concerns the region of Vuna (Taveuni) that is the first marine area to be fully protected in fishing protection level.. A further example of a 'Locally Managed Marine Area communities' is Moon Reef region that is considered to be a 'marine sanctuaries' since it is 'critical in the fight to preserve precious resources' [568]. However, marine protected areas can pose considerable issues in its execution since is an expensive initiative especially for developing countries as Fiji. Indeed, the implementation of MPAs not only require 'political will' but also ling term funding in order to 'monitor, control, and enforce Fiji's exclusive economic zone'. Moreover, the implementation of MPAs may alter the 'existing legal rights in existing productive fishing grounds', it may lead to the 'loss of existing revenue from fishing activity in those fishing grounds', and it may cause 'additional costs associated with both designation, surveillance and enforcement of MPAs and the EEZ' [569].

Fiji's updated NDC contributes towards achieving the objectives set in the Paris Agreement in order to achieve net-zero emissions in all economy sectors by 2050 despite its minimal contribution of '0.006% to global GHG emissions'. In particular, article 2 recites as follow:

> '1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

[563] James Sloan et all (2020)
[564] Republic of Fiji (2020) p.31
[565] James Sloan et all (2020)
[566] Republic of Fiji (2020) p.31
[567] The World Bank. 'Ocean Protectors: How the Old Ways of Protecting the Ocean Are New Again in Fiji' (2022)
[568] James Sloan (2021)
[569] Ibid

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.' [570]

In order to meet the goals outlined in Article 2 of the Paris Agreement, the Fijian government have revised its NDC implementation plans to better reflect these objectives. Indeed, in order to 'limit the temperature increase' and to 'adapt to the adverse impacts of climate change', it is imperative to seek policies aimed to minimize its 'anthropogenic GHG emissions' [571]. Fiji shows its commitment through the implementation of the Low Emission Development Strategy that has set a clear 'low carbon transition pathway' [572] aiming to 'reach net zero carbon emissions by 2050 across all sectors of its economy' [573]. 'To achieve this core objective, the Low Emission Development Strategy has elaborated four possible low emission scenarios for each sector including electricity and other energy use, land transport, domestic maritime transport, domestic air transport, agriculture, forestry and other land use, coastal wetlands and waste' [574]. Moreover, Fiji also counts with the Climate Change Bill that 'improve consistency of practices to reduce GHG emissions' [575]. The main tool that Fiji government employed to reduce its emissions is the '2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories' that provides 'internationally agreed methodologies

[570] Paris Agreement (2015) Article 2
[571] The Fijian Government (2020)
[572] Ibid
[573] The Republic of Fiji. 'Fiji Low Emission Development Strategy 2018-2050' (2019), p. 3
[574] The Fijian Government (2020)
[575] The Fijian Government (2020)

intended for use by countries to estimate greenhouse gas inventories' [576]. Thank to this tool, Fiji government is able to estimate its GHG emissions production and communicating the results in the 'Biennial Update Report or Biennial Transparency Report'. In addition, Fiji account for another important tool to measure its 'CO2, CH4, N2O, HFCs, PFCs, SF6 and NF3' emissions, that is the '2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: wetlands', that offers techniques to assess 'anthropogenic emissions and removals of greenhouse gases from wetlands and drained soils' [577].

Regarding the methodological approaches to measure the GHG emission, the NDC report use the '100-year time-horizon' introduced with the IPCC Fifth Assessment Report that is intended to be the 'time period over which carbon impacts and benefits are considered' and specifically of 100 years since it prevents 'distortions' that 'would lead to decisions inconsistent with societal behaviour in other spheres' [578]. According to the 2020 NDC, the main methodology adopted to reduce the GHG emissions is the National Expert SDG Tool for Energy Planning (NEXSTEP) approach developed by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). This approach permits policymakers to 'make informed policy decisions to support the achievement of the SDG7 targets as well as emission reduction targets' [579]. The NEXSTEP approach is related to the energy industry since is intended to estimate the emissions of 'CO2, N2O and CH4' through the implementation of the Low Emissions Analysis Platform (LEAP) model [580] [581]. This tool is based in some assumptions; indeed, the analysis is affected by a wide array of elements such as 'annual population growth, annual GDP growth and demand sector growth projections' [582]. In the 2020 NDC, the data considered is based on 2018 'growth in GDP, population and urbanization' and its assumption concern a GDP of 'US$ 8.53 billion' with a growth rate of '3.5% per year', population amounting at '884,887' with a growth rate of '0.6% per year', 'household size is assumed constant

[576] IPCC. 'Guidelines for National Greenhouse Gas Inventories' (2006), p. 14 Volume 1.
[577] IPCC. 'Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories' (2013), p. 10
[578] Fearnside, P.M. 'Why a 100-Year Time Horizon should be used for Global Warming Mitigation Calculations'. Mitigation and Adaptation Strategies for Global Change 7, 19–30 (2002). https://doi.org/10.1023/A:1015885027530 P. 12
[579] Republic of Fiji, Ministry of Infrastructure of Meteorological Services. 'Energy Transition Pathways for the 2030 Agenda Energy Transition Pathways for the 2030 Agenda SDG7 Roadmap for Fiji SDG7 Roadmap for Fiji'. (2021), p. 6
[580] The Fijian Government (2020), pp. 13-14
[581] Republic of Fiji, Ministry of Infrastructure of Meteorological Services (2021), p.23
[582] Republic of Fiji, Ministry of Infrastructure of Meteorological Services (2021), p.23

throughout the analysis period at 4.61 people per household' that amounts to a 'total of 191,911 household' and the 'urbanization rate is estimated to be 56.9% and is expected to increase to 61% by 2030' [583] [584].

The Fijian government in its 2020 NDC, also demonstrate its commitment with article 2, paragraph 1(C) of the Paris Agreement that establish the creation of 'finance flows consistent with a pathway towards low greenhouse gas emissions'. Indeed, Fiji government acknowledge that the implementation of adaptation and mitigation strategies aimed at reducing GHG emissions demands a considerable amount of financial resources. Because Fiji is a small island developing state, obtaining funds for these measures presents several challenges. Indeed, Fiji has a scarce budget for climate issues, which has been aggravated even more by the increasing frequency of natural disasters and by the COVID19 economic crisis. Fiji indeed recognizes that the 'cost of implementing this target currently stands at US$ 2.97 billion between 2017 -2030' [585]. As a result, the amount of resources required for the adaptation and mitigation measures exceeds Fiji's existing financial capacity [586]. Nonetheless, according to the Fiji National Climate Finance Strategy of 2022, Fiji government Has developed many projects and institutions for the green climate fund. Indeed, Fiji not only counts with 'national direct access' from the Fiji Development Bank (FDB) and the National Designated Authority (MOE), but also with 'multilateral development banks, bilateral development agencies, regional organizations, and UN Agencies' [587]. The 2022 National Climate Finance Strategy of Fiji has established many mitigation and adaptation initiatives to implement both at the national and at the regional level. Indeed, between the adaptation measures, at the national level, Fiji government has introduced the climate resilient homes project and the coral reef resilience program led by the world wildlife fund, while at regional level it has established the adapting tuna-dependent pacific island communities and economies to climate change, the enhancing resilience of agriculture and food security in the pacific island countries by managing threats from climate-induced transboundary plants and invasive animals and the climate information and early warning systems and the one pacific programme. Regarding instead the Mitigation strategies, Fiji aim to achieve

[583] Ibid
[584] The Fijian Government (2020), pp. 13-14
[585] Ibid
[586] Ibid, pp. 9-10
[587] Government of the Republic of Fiji, Fijian Ministry of Economy. 'Fiji National Climate Finance Strategy' (2022), p. 17

Climate Resilient Forests, Communities and Value Chains in Fiji, the Promoting Electric Bus Transport in Fiji and the Solar Energy for Off-grid hotels at the national level and the 'Komai Haltec: Typhoon-resistant wind power facility installation in the SIDS and Philippines' at the regional level [588].

7.4 Comparative analysis

After the attentive analysis of both Fiji NDCs, some observation can be made. Fiji first 2015 NDC only address the mitigation's measures concerning the energy sector, specifically on the reduction of greenhouse gas emissions since it was the 'largest emissions source in 2013'. These mitigation efforts regarded different sub-sectors of energy, namely the 'electricity generation and transmission', the 'demand-side energy efficiency', and the 'transport (land and maritime)' sector. Its primary target is the minimizing of CO2 emissions by 30% in 2030 through the enhancement of the use of renewable energy mainly in the electricity generation sector by 100% by 2030 [589]. Instead, in the updated version 2020 NDC, Fiji government not only kept the energy related goals adding a reduction of domestic maritime shipping emissions, but it also introduced many important adaptation measures that take in consideration many diverse sectors. Indeed, this NDC address the implementation of sustainable practices in agriculture and fishery sector, the development of public infrastructure and of a strong healthcare system, the creation of early warning and monitoring system, the development of a relocation system, the support of natural environment and biodiversity and the acknowledgement of the importance of the protection of marine zones [590].

It is important to highlight that from the past experience gained with the previous NDC, Fiji has been able to learn many important lessons that are demonstrated with the numerous initiatives and programs that were adopted since 2015. A very significative proposal concerns the development of the NDC Implementation Roadmap in 2017, since it represents a program intended to support the first national determined contributions providing a 'temporal pathway with concrete mitigation actions and financing needs to

[588] Government of the Republic of Fiji, Fijian Ministry of Economy (2022), p. 17
[589] The Fijian Government (2015)
[590] The Fijian Government (2020)

achieve the transformational change called for under the NDC' [591]. In the same year, also the National Adaptation Plan was being implemented in order to 'accelerate the national development pathway towards climate-resilient development' implementing an easier 'process of devising adaptation strategies' [592]. The Low Emission Development Strategy is another significative initiative that was implemented in 2018 in order to 'reach net zero carbon emissions by 2050 across all sectors of its economy' [593]. Other programs that contributed to the preparation of the nationally determined contribution concern the Displacement Guidelines that guarantee the 'sustainable economic and social development and thereby improve the livelihoods of all communities in Fiji' [594], the Planned Relocation Guidelines that ensure the 'planned relocation solutions for the affected communities as part of their adaptation strategies' [595], the Climate Vulnerability Assessment that is intended to 'provides a specific blueprint that quantifies the resources necessary to climate-proof Fiji' [596], and the revised Climate Change Policy 2018-2030 that aims to achieve inclusive 'socio-economic development and transformative strategic thrusts' [597]. These programs facilitated the creation of Fiji updated NDC since they generated awareness and an institutional basis for the NDC design and implementation process, as well as increasing the 'political and public support for climate action nationally' [598].

Therefore, thanks to the thoroughly assessment of the experience gained since the implementation of the first NDC, Fiji has been able to analyse a variety of development opportunities, in particular related to 'oceans, nature-based solutions, biodiversity protection, and health' fields [599]. Indeed, in its NDC, Fiji has demonstrated a particular dedication in pursue of the 'blue economy', an initiative that according to the United Nations, 'comprises a range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable' [600]. It seeks to control the

[591] GGGI, Regional Pacific NDC Hub. 'GGGI Technical Guideline No. 5. NDC Implementation Roadmap Development: Guidelines for Small Island Developing States'. (2018), p.4
[592] Republic of Fiji. 'National Adaptation Plan. A pathway towards climate resilience'. (2018), p. 6.
[593] The Republic of Fiji. 'Fiji Low Emission Development Strategy 2018-2050' (2019), p. 3
[594] The Republic of FIji. 'Displacement Guidelines. In the context of climate change and disasters'. (2019), p. 11
[595] The Republic of Fiji. 'Planned Relocation Guidelines. A framework to undertake climate change related relocation' (2018), p. 7.
[596] World Bank. 'Climate Vulnerability Assessment : Making Fiji Climate Resilient'. (2022), p. 11
[597] Republic Of Fiji. 'National Climate Change Policy 2018–2030'. (2019).
[598] The Fijian Government (2020), p. 9.
[599] The Fijian Government (2020), p. 20.
[600] United Nations. 'Blue Economy Definition'.

marine resilience through the ‘sustainable fisheries' to reduce emissions and through the ‘sustainable management of ocean resources’ [601]. However, this represents a challenging task for Small Island Developing States (SIDS) and Least Developed Countries (LDCs), since they confront substantial constraints in its implementation. Nonetheless, Fiji government committed in its NDC to improving ‘ocean governance' in order to not only achieve 'national ocean conservation', but also to assist the development of the ocean as a 'carbon sink’. It also seek to introduce in its National Ocean Policy the ‘allocation of 30% of its EEZ as Marine Protected Areas and work towards 100% management of its EEZ by 2030’ [602]. This goal, as previously analysed, represents a considerable step forward for Fiji’s ocean governance’ because it aims to develop a secure and sustainable environment system for Fiji ocean and marine ecosystem [603]. Moreover, in its National Adaptation Plan, Fiji also commits to pursuing a ‘Low Emission Development Strategy’ in order to ‘manage and protect marine and coastal ecosystems' in a sustainable way, to 'strengthen their resilience, and restore them’ through the conservation of ‘ocean reservoirs as carbon sinks’, and the improvement of ‘coastal ecosystems such as mangroves, sea grasses and coral reefs.[604]’.

Furthermore, with this 2020 NDC updated version, Fiji government has demonstrated more ‘commitments towards the Paris Agreement’ [605]. Indeed, in the 2015 version, Fiji Intended Nationally Determined Contribution was developed taking in consideration the decisions 1/CP.19 and 1/CP.20. of the Conference of the Parties, that respectively read as the follow:

‘Requests the secretariat to update the synthesis report referred to in paragraph 16 above so as to cover all the information in the intended nationally determined contributions communicated by Parties pursuant to decision 1/CP.20 by 4 April 2016 and to make it available by 2 May 2016’

‘Decides to convene a facilitative dialogue among Parties in 2018 to take stock of the collective efforts of Parties in relation to progress towards the long-term goal referred to

[601] Ibid
[602] The Fijian Government (2020)
[603] Republic Of Fiji. ‘National Climate Change Policy 2018–2030’. (2019).
[604] The Fijian Government (2020)
[605] Ibid, p. 20

in Article 4, paragraph 1, of the Agreement and to inform the preparation of nationally determined contributions pursuant to Article 4, paragraph 8, of the Agreement' [606].

In the 2020 updated version instead, 'the Fijian government is committed to the full, effective and transparent implementation of Article 4.11 of the Paris Agreement in accordance with its provisions and the relevant Decisions of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP) and the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)' that reads as follow:

'A Party may at any time adjust its existing nationally determined contribution with a view to enhancing its level of ambition, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement. [607]'

Fiji therefore communicate the updated NDC version to the UNFCCC that includes 'a reaffirmation of its 2030 target', 'a commitment to achieve net zero greenhouse gas emissions by 2050', 'up-front information to facilitate clarity, transparency and understanding', 'a commitment to enact its Climate Change Bill by 2021' and lastly 'a commitment to operationalise its National Adaptation Plan' [608].

In the 2020 NDC, Fiji government 'has taken into consideration paragraphs 31(c) and (d) of decision 1/CP.21' that respectively read:

'Parties strive to include all categories of anthropogenic emissions or removals in their nationally determined contributions and, once a source, sink or activity is included, continue to include it'

'Parties shall provide an explanation of why any categories of anthropogenic emissions or removals are excluded'[609]

Moreover, a significant aspect that stems from Fiji updated 2020 NDC and was not present previously, concerns the fact that it was developed taking in consideration the principle of 'gender-responsiveness' as defined in the National Climate Change Policy. This principle guarantee that adaptation and mitigation efforts must incorporate gender concerns by enhancing gender parity in 'decision-making processes' and by recognizing

[606] UNFCCC 'Report of the Conference of the Parties on its twenty-first session' (2015), Paris, II (20).
[607] Parsi Agreement. (2015), Article 4 (11)
[608] The Fijian Government (2020)
[609] UNFCCC 'Report of the Conference of the Parties on its twenty-first session' (2015), Paris, III (c) (d)

that gender considerations are critical when 'programming finance and capacity-building' [610]. Ultimately, it is critical to evaluate current global developments caused by the COVID-19 crisis, which have posed financial pressure on Fiji economy resulting in the largest economic recession in Fiji's recent times. Indeed, GDP declined by '15.7% in 2020 and the debt to GDP ratio reached 80% in 2019' [611]. As a result, Fiji's already limited capacity to support 'sustainable development, resilience-building and the pursuit of carbon neutrality', has been exacerbated even more [612]. The COVID-19 crisis did in fact emphasized the necessity for a 'sustainable diversification of the economy and more sustainable use of its resources' [613] [614]. The COVID-19 crisis, on the other hand, provided an unparalleled chance for small island developing states to re-establish their economies in a more sustainable way. The international community has a key role since it can help assist the recovery efforts leading towards greener and inclusive strategies. A recent initiative is the Blue Recovery Hubs, launched in collaboration with the Ministry of Economy of Fiji in partnership with the OECD, Friends of Ocean Action (FOA) and the Sustainable Development Investment Partnership (SDIP), that aims to improve the 'long-term sustainability of existing ocean economy sectors and to generating new, sustainable opportunities that can lead to economic diversification and act as a multiplier of the Sustainable Development Goals across' [615]

7.5 Maladaptation case study

As previously examined, the implementation of an adaptation measure that is inadequate for a certain situation, can pave the way not only to an unsuccessful outcome but also it can produce unfavourable effects that can worse the situation even more. In the context of developing countries, a maladaptation outcome can cause a serious increase of vulnerability leading to suffer the negative effects of climate change [616]. A clear instance

[610] The Fijian Government (2020), pp. 7-8
[611] OECD (2022), 'Towards a Blue Recovery in Fiji: COVID-19 Appraisal Report', OECD Publishing, Paris, https://doi.org/10.1787/a3661a09-en.
[612] The Fijian Government (2020), p. 20
[613] OECD (2022)
[614] Shiri Krishna Gounder, Permanent Secretary for Ministry of Economy, Government of Fiji. 'A sustainable path to lasting recovery for Small Island Developing States lies in the ocean and the building of a robust blue economy' (2022), World Economic Forum.
[615] OECD (2022)
[616] Shipper (2020) pp. 413

of maladaptation result is the construction of seawalls in Fiji. Indeed, this project was developed to avoid the repercussions of sea-level rise, however, not only it failed, but it also exposed people even more to climate change risks. Seawalls presented many design, implementation and socio-cultural issues that lead rural communities to be even more vulnerable to the effects of sea-level rise [617].

In recent times, numerous shorelines around the world have been facing erosions. This issue has particularly affected Small Island Developing States (SIDS) that are developing countries with insufficient 'human and financial resources to undertake environmental protection projects along the coastline', an issue exacerbated by the fact that the in coastline the main 'settlements, infrastructure and livelihoods are typically concentrated' [618]. According to different studies, the main cause of shoreline erosion is typically associated to 'sea-level rise' [619]. Indeed, rising temperatures driven by an increase in the greenhouse gases concentration in the atmosphere, would cause sea level to increase, aggravating the issue of coastline erosion [620]. However, some instances have shown that attributing all the situations of shoreline erosion to sea-level rise is erroneous since the issue can also be induced by 'anthropogenic disturbances' through the elimination of the 'natural coastal protection' such as 'fringing reefs and beach sand' [621].

Because Small Island Developing States (SIDS) lack the financial means to implement measures to prevent coastline erosion, donor nations and international organizations fund such programs. As a result, they are not only responsible for the financial support, but also for their development and implementation. This implies that these initiatives are conducted in the same way as they would be in developed countries, but instead in the context of the Small Island Developing States' economic and social situation [622]. This concept is fundamental to comprehending the reason why such projects frequently fail, resulting in cases of maladaptation. Indeed, solutions designed in the developed world,

[617] Ibid, p. 412
[618] Patrick D. Nunn, Carola Klöck, Virginie Duvat, 'Seawalls as maladaptations along island coasts', Ocean & Coastal Management, Volume 205, (2021), 105554, ISSN 0964-5691. P. 2-9
[619] Ibid, p. 9
[620] Leatherman, Stephen & Zhang, Keqi & Douglas, Bruce. (2000). 'Sea level rise shown to drive coastal erosion'. EOS Transactions. 81. 55-57. 10.1029/00EO00034. P.1
[621] Patrick et all (2021), p. 2
[622] Patrick et all (2021), p. 2

typically do not produce the intended results in the context of developing countries since their particular features are often neglected [623].

One of the solutions that many Small Island Developing States though to be effective and reliable in the prevention of shoreline recession, is the construction of 'hard shoreline-protection structures [624]' that 'commonly takes the form of seawalls' [625]. These structures usually fail for a variety of reasons. In the first place, seawalls are often constructed without regard for where they may be most beneficial. Indeed, seawalls are built in the most profitable section of the retreating shoreline, leaving the remaining of the land, especially low-value areas, unprotected. Moreover, some areas between the seawalls are purposely left open, rendering these barriers discontinuous and therefore completely ineffective [626]. In addition, seawalls require high investments and are frequently poorly designed, indeed, they are often built in' soft foundations' using unreliable materials such as 'reef rock', which is typically left uncemented, and sometimes they are constructed too low to protect from the sea level rise. As a result, the majority of seawalls built in Small Island Developing States ended up failing 'within two years of their construction' [627]. Furthermore, lack of proper understanding leads rural communities to consider seawall as the 'panacea for all the shoreline problems' making it a common solution in all SIDS nations [628].

It is also fundamental to consider the cultural level of implementing such measures in the context of Small Island Developing States. In such context, short-term initiatives, like seawalls, have been shown to be more enticing than long-term projects. In the case of Fiji, for instance, where artificial shoreline protection represents a 'century-long tradition' [629], it was observed that rural communities thought that sea level rise was a temporary phenomenon and that there was no need to implement long term adaptation measures [630]. The unfamiliarity that SIDS experience when confronted with the unprecedented difficulties of rapid sea level rise, combined with the implementation of new systems and methods that differ from with their conventional and 'culturally-grounded' approaches,

[623] Ibid
[624] Ibid, p.4
[625] Ibid, p.9
[626] Ibid, p.2
[627] Idib, pp.4-5
[628] Ibid
[629] Ibid, p.3
[630] Patrick et all (2021), p. 4

leads to the development of erroneous interventions [631]. Failure to execute such challenging measures can aggravates the issue on the one hand, leading to a hesitancy to explore any other solutions PAG 4-5, but it also lead non-government organizations (NGOs) to intervene, bringing innovative preventive solutions such as the 're-planting of mangrove along eroded shorelines' [632]. The construction of seawalls has not only been demonstrated to be ineffective in preventing shorelines erosion, but it also have a maladaptive tendency. Indeed, the enthusiasm that people showed in the building of seawall, can be considered a 'symptom of the maladaptation' that emerged in SIDS context as a result of the foreign initiatives who enforced measures previously developed in industrialized nation [633]. This enthusiasm leads communities to wrongly believe they are in a secure environment, resulting in unsuccessful long-term investments that aggravating even more the financial situation of SIDS wasting their scares financial resources [634].

An instance of seawall construction in Fiji that led to not only the unsuccessful implementation of such structures but also to maladaptive results, occurred in Vunidogoloa. This village was experiencing shoreline erosion in 'low-lying coastal area', 'heavy rain and high tides and severe sea floods' that caused 'inundation and salt water intrusion' 'threatening the safety and health of the villagers' [635]. In response to these challenges, seawalls were constructed to prevent shoreline erosion, however it resulted to be an unsuccessful effort since the structure was 'not extensive enough to protect the entire eroding shoreline'. This solution leads to a maladaptive outcome since seawalls ended up creating 'unanticipated problems' which negative impacts 'outweighed' the positive ones. Indeed, 'wave energy diverted from the artificially protected section of the shoreline, became focused on its unprotected margins, causing rapid agricultural land loss' [636]. The negative effects of the implementation of seawalls forced the community of Vunidogoloa to relocate to a new site '2 km inland from their original village which fell within the customary land boundaries of the community' [637]. These forces relocation led

[631] Ibid, pp.4-5
[632] Ibid
[633] Ibid, p.9
[634] Ibid, p.7
[635] Charan, D., Kaur, M., Singh, P. (2017). Customary Land and Climate Change Induced Relocation—A Case Study of Vunidogoloa Village, Vanua Levu, Fiji. In: Leal Filho, W. (eds) Climate Change Adaptation in Pacific Countries. Climate Change Management. Springer, Cham. https://doi.org/10.1007/978-3-319-50094-2_2. P. 23
[636] Patrick et all (2021), p. 8
[637] Charan et all (2017), p. 23

to serious 'socio-environmental changes while having a very minute contribution to anthropogenic climate change and associated sea level rise'. Another maladaptive effect that the construction of seawalls had in Vunidogoloa, was the 'loss of wild foods from nearshore areas' that lead to a 'forced changes in diets and an accompanying reduction in food and nutritional security' [638]. Fiji also experienced another case of maladaptation in Nadi Town. Due to severe floods, one of the main donor partners of Fiji, the Japan Government, volunteered to finance the expenses of diverting the Nadi River. However, the diversion not only was unsuccessful in the pursuit of its target, but also rendered the situation even worse since it caused 'hinterland deforestation and river-channel sedimentation'[639].

In order to prevent maladaptive outcomes, 'soft protection' measures may be more effective. Indeed, many studies have found that measures based on nature would represent the safest alternative, such as mangrove replanting and coastal revegetation to restore 'nearshore ecosystems'. In the past mangroves forest areas were reduced considerably in order to improve food production and reduce 'insect-borne diseases' [640]. However, it has been demonstrated that the reduction of mangroves have led to 'shoreline erosion and coastal-lowland flooding'. During the early-mid 20th, all mangroves were cleared out in the majority of the villages in the island of Ovalau in Fiji causing 'shoreline erosion and associated flooding'. Two of these villages were never cleared and they never experienced such effects [641]. The replanting of mangroves is therefore an efficient strategy for SIDS since they create a protection from sea level rise [642]. The creation of a 'buffer zone' is also consider a sift measure to protect the shoreline. These areas consist of 'dense, deep-rooting vegetation along soft-sediment shorelines, often combined with setback of the settlement fringe'. Fiji applies this measure using vetiver grass that is expected to stop the destruction of shoreline [643]. However, these gentle treatments have a downside in that they sometimes take a long time to be fully effective. A mangrove forest, for example, requires 25 years to be completely successful [644]. In addition, using soft term measures

[638] Patrick et all (2021), p. 8
[639] Ibid
[640] Ibid
[641] Ibid
[642] Ibid
[643] Patrick et all (2021), p. 8
[644] Ibid

might be counterproductive since the false sense of success that communities perceive, may lead to the disregards of the longer-term measures [645].

Indeed, it is important to understand that the previously analysed efforts are short-term solutions for a serious issue that will endure in the future requiring long term measures. Therefore, it is important to take into consideration as a possible solution the relocation of vulnerable communities to ‘less exposed locations’. Indeed, sea level rise is bound to raise in the next centuries threatening coastal settlement leading to relocation to be one of most effective measures. Relocation however is a delicate topic among SIDS communities particularly if they have little financial means or if their lands are restricted or valued in culturally based ways [646]. As a result, it is fundamental to consider short term measures as a temporary contribution to the shorelines erosion issue since it may lead to the aggravation of coastal flooding and erosion. Indeed, in rural locations, contrary to urban settings, seawalls are often built with unsuitable materials, and they are not properly positioned and designed [647]. According to recent studies, another challenges that many rural communities have faced consists of the lack of effective government communication on the issues posed by climate change. Indeed, it is critical to prioritize the empowerment of rural communities’ leaders 'to make informed and appropriate decisions about their futures’. Moreover, it is also essential to recognize the importance to empowering 'donor partners' and the 'international community'. In order to achieve this goal, it has been found that a suitable solution would be to gather cases of unsuccessful initiatives and communicate this information to communities in order to prevent the implementation of such programs. Indeed, it is fundamental to guarantee an inclusive participation in decision-making process. To address this issue, it is crucial to develop methods that combine ‘human factor and community development practices’ that consider the particular requirements of the excluded communities [648] . Both the Paris Agreement and the recent COP 26, urge public involvement through the civil society engagement in climate change measures debates and the development of 'new forums such as the Local Communities and Indigenous People’s Platform of the UNFCCC work toward this goal'

[645] Ibid
[646] Ibid
[647] Ibid, p.9
[648] Stonewall, Jacklin & Dorneich, Michael & Shenk, Linda & Krejci, Caroline & Passe, Ulrike. (2019). Inclusive Decision-Making. 10.1201/9780429425905-2. P. 3

[649] [650]. Indeed, more varied decision-making groups can achieve better outcomes than more restricted ones [651]. Therefore, the parity in participation necessitates the inclusion of all parties in the climate debates as well as the fair consideration of 'minority groups, vulnerable populations, indigenous peoples and subsistence-based cultures' [652] [653]. In addition, in is also crucial to reduce the 'resistance to relocation' since sea-level rise is expected to intensify in the coming decades. As a result, it is fundamental to replace the deep connection that island inhabitants have to shore regions, with more plausible options [654].

Failures to accomplish an adaptation strategy can therefore lead to maladaptive outcomes that contributes to strengthen the vulnerability of a community. Small island developing states, as previously illustrated, are extremely fragile in comparison to most other scenarios and hence they must adjust in response to the changing environment. However, seen their particular condition, it is fundamental to develop policies that taken into consideration the specific demands and cultural principles of vulnerable communities. Indeed, as Barnett recites, 'adaptation is not something that can be done to a community. It is something that needs to be done by a community, determined by its own needs and values' [655]. Indeed, as this concept suggest, external donors should have a secondary position in the implementation of adaptation initiatives since even if their support is crucial, often vulnerable communities' leaders are not empowered and do not have a voice in the development of such measures. Indeed, the establishment of adaptation initiatives would be more efficient if led by the affected communities that are seeking to adjust to climate change impacts and not by external contributors. Donor support indeed would be more successful if decision-making process would be more participative and inclusive of such communities. As a result, it is crucial to guarantee that the values and needs of SIDS population are central in adaptation strategies, which leads to the implementation of

[649] UNFCCC (2021)
[650] IPCC AR6 WGII (2022), p. 51
[651] Ibid
[652] Minguet, Angèle. (2018). 'Climate Justice and Geoengineering. Ethics and Politics in the Atmospheric Anthropocene' Preston, Christopher J., ed. 2016. Climate Justice and Geoengineering. Ethics and Politics in the Atmospheric Anthropocene . London: Rowman & Littlefield International.. Global Environmental Politics. 18. 160-162. 10.1162/glep_r_00463. P. 36
[653] IPCC AR6 WGII (2022), p. 44
[654] Patrick et all (2021), p. 9
[655] Barnett, Jon. (2008). The Effect of Aid On Capacity To Adapt To Climate Change: Insights From Niue. Political Science - POLIT SCI. 60. 31-45. 10.1177/003231870806000104. https://www.researchgate.net/publication/237499225_The_Effect_of_Aid_On_Capacity_To_Adapt_To_Climate_Change_Insights_From_Niue

environmentally suitable and culturally appropriate strategies. Finally, it is essential to emphasize the fact that a ‘one size fits all’ approach is not a viable option. Instead, it should be implemented a method that recognize the diversity of the varied situations and the 'differing coping abilities' in order to build a more sustainable future path for island communities [656] [657].

[656] Patrick et all (2021), p. 4

[657] Patrick Nunn and Roselyn Kumar ‘Understanding climate-human interactions in Small Island Developing States (SIDS) Implications for future livelihood sustainability’ (2018) International Journal of Climate Change Strategies and Management, Vol. 10 No. 2, 2018, pp. 245-271, Emerald Publishing Limited, 1756-8692, DOI 10.1108/IJCCSM-01-2017-0012. P.16

CHAPTER 8 – CLIMATE JUSTICE

8.1 Climate justice as an ethical issue: distributive justice

As previously analysed, climate change has caused several major consequences, as evidenced by the frequency and severity of extreme weather occurrences [658]. However, the effects that these events had on communities, vary based on the vulnerability of the people and areas impacted, as well as their exposure level [659] [660]. The developed world has contributed the most to climate change impacts. Indeed, the rise of greenhouse gas (GHG) concentrations in the atmosphere was mostly caused by industrialisation and fossil fuels combustion. Poor countries however will incur disproportionate sufferings despite their minor portion of GHG production. As a result, anthropogenic climate change poses a global political challenge that is inherently and fundamentally focused on justice and fairness. As a matter of fact, one group's exploitation of the planet's atmosphere causes unjust harm to vulnerable nations [661] . Climate change can thereby worsen even more the current social disparities and vulnerabilities since it creates and exacerbates inequalities at the same time [662].

As a result, climate change has the greatest impact on vulnerable communities that are the least responsible for producing it and that frequently marginalized from the decision-making processes [663]. Since the 1990s, the concept of climate justice has emerged both in academia and civil society, with the purpose of achieving justice for disadvantaged people that have been severely impacted by climate change and yet have contributed the least to it [664] [665]. This phenomenon seeks to find solutions to the climate crisis that not only decrease emissions, but also measures that generate a more equal society. Just climate change adaptation can be defined as the process of 'adaptation planning and

[658] IPCC AR6 WGII (2022)
[659] IPCC (2014)
[660] Peter Newell. 'Climate justice' (2022). The Journal of Peasant Studies, Volume 49, Issue 5. Pages 915-923. P. 916
[661] Vanderheiden, Steve. (2008). Atmospheric Justice: A Political Theory of Climate Change. 10.1093/acprof:oso/9780195334609.001.0001. P. 45
[662] Peter Newell (2022) p. 916
[663] Ibid, pp.915-916
[664] Coolsaet Brendan. 'Environmental Justice: Key Issues'. (2021) Routledge. P. 149 https://www.taylorfrancis.com/books/9780429029585.
[665] Peter Newell (2022) p. 915

implementation, which recognises past and current disadvantages in society, identifies the potential unequal way in which climate impacts and costs and benefits of adaptation measures are distributed, is based on inclusive processes throughout planning, implementation, monitoring, and evaluation, and restores past inequalities through adaptation' [666].

An important progress towards the recognition of climate justice at the international level, has been made by the latest report of the IPCC. Indeed, according to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Climate justice is characterized by three principles [667]: distributive justice that is related to the 'allocation of burdens and benefits among individuals, nations and generations', procedural justice that entails 'who decides and participates in decision-making' and recognition that concerns the 'fair consideration of diverse values, cultures, worldviews, and perspectives' [668]. Recognition is inextricably related to distributive and procedural justice since it is 'both a normative principle as well as an underlying cause of unjust distribution and lack of democratic participation' [669].

According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, the first principle of climate justice is the distributive justice that take into consideration the 'allocation of burdens and benefits among individuals, nations and generations' that aims to achieve a fair allocation of the costs of climate change [670]. Considering the adaptation strategy, distributive justice has three principles that are extremely relevant in order to achieve such measures: 'fairness between individuals, hence a reasoned allocation of costs, fairness between states, so that taken onto consideration the county's condition, and fairness between generations' that guarantee adequate life conditions to future generations [671]. The claim of Fairness between individuals is based on the fact that the allocation of 'goods, vulnerabilities, and risks of climate change' should not be arbitrary. Indeed, the main idea behind the fair allocation

[666] Juhola, Sirkku & Heikkinen, Milja & Pietilä, Taru & Groundstroem, Fanny & Käyhkö, Janina. (2022). 'Connecting climate justice and adaptation planning: An adaptation justice index'. Environmental Science & Policy. 136. 609-619. 10.1016/j.envsci.2022.07.024. P. 1
[667] IPCC AR6 WGII (2022), p.5
[668] Ibid
[669] Ibid, p. 50
[670] Vanderheiden, Steve. (2008), p. 143
[671] Ibid, p.70

of the costs concerns the fact that those actors that have been the most responsible for causing the problem, should be the ones that pay.

From this report, it immediately emerge the dual perception of climate justice. It is in fact address both from an ethical point of view and also from a political position [672]. Concerning the ethical view of climate change, Edith Brown Weiss is the first author that address this issue starting from the concept of intergenerational justice setting the path for crucial climate ethics research. She contributed to raising many fundamental questions such as 'who has responsibility to pay for adaptation and mitigation', 'how procedural fairness and participation can be ensured' and 'to whom should ongoing emissions rights be allocated' [673]. It is important to highlight that the majority of climate ethics literature is rooted in the liberal philosophical tradition, therefore not addressing the 'structure of society, the status of humans, or the broader socio-economic system' [674]. Along these lines, John Rawls formulate an egalitarian theory of justice called 'justice as fairness', which establishes the principles of a just society, namely 'equality in the assignment of basic rights and duties' and the belief that 'social and economic inequalities are just' when they 'compensate benefits to society's least advantaged members' [675].

These principles are the main guideposts for liberal philosophers, and they address two ethics principles concerning the allocating the costs of climate change. These issues are considered in the theory of distributive justice defined by the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [676]. The first principle is the 'polluter pays principle', which states that whoever caused the problem should be held accountable [677] [678] [679]. The second principle is concerned with the 'ability to pay', and claims that, considered the situation of vulnerable individual, it is fair to state that the most privilege people should be those who endure the responsibilities of climate change [680] [681]. In order to efficiently apply the latter principles, a 'hybrid' approach that combine them must be implemented. This approach is the 'common but differentiated responsibility' principle

[672] Coolsaet Brendan (2021) p.149
[673] Ibid
[674] Ibid, p.150
[675] Ibid
[676] Ibid
[677] Caney, S. 'Cosmopolitan Justice, Responsibility, and Global Climate Change'. (2005) Leiden Journal of International Law, 18(4), 747-775. doi:10.1017/S0922156505002992, p. 752
[678] Vanderheiden, Steve. (2008), p. 72
[679] Coolsaet Brendan (2021), p. 150
[680] Caney, S.(2005), p.769
[681] Coolsaet Brendan (2021) p.150

established in 1992 during the Rio Declaration. This declaration represented a major progress in the climate justice field since it established that, in addition to developing preventive measures to avoid anthropogenic impacts on the climate, it also incorporated for the first time some moral standards. As the UNFCCC states in its 1992 convention, it recognizes that: 'the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs' [682] [683].

As a result, according to this principle, each nation should address the climate issue and take appropriate measures on the basis of the county's condition. The Rio Declaration recites as follow:

'In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command [684].

Therefore, the Rio Declaration states 'climate justice is a matter of establishing responsibilities and rights, and then allocating the burdens of climate change mitigation and adaptation accordingly'. Indeed, n the context of mitigation, everyone should be responsible of carry the burden, however, 'developed countries should bear the greater portion of this burden because they benefited most from the causes of climate change and they are most able to pay by virtue of their wealth'. From this analysis, it immediately emerge the complex nature of the assignment of responsibility. Indeed, it is true that the developed world is historically the most responsible for polluting , however at the same time 'much of this was done in ignorance of the effects'. Consequently, from an ethic point of view, the burden caused is different from the emissions produced after 'the effects of climate change have been more widely understood'. Additionally, developing

[682] Davidson, Marc. 'How Fairness Principles in the Climate Debate Relate to Theories of Distributive Justice'. (2021) Sustainability. 13. 7302. 10.3390/su13137302. P. 11
[683] UNFCCC (1992)
[684] United Nations. 'Rio Declaration on Environment And Development' (1992) Principle 7, Article 3(1)

countries also produced a growing proportion of GHG emissions that is ‘directly related to their attempts to escape the cycle of poverty that colonialism bequeathed them’ [685].

Regarding the adaptation context, the debate complicate even more since it does not only affect the ‘fairly sharing the burden’, but it also ‘involves the creation of both burdens and benefits’. Indeed, such measures should help vulnerable communities since they are the most in need. However, another ethic issue raises also in this situation since ‘adaptation measures will also end up benefiting people other than these beneficiaries’. Hence, issues such as ‘who a valid beneficiary of adaptation is, and who should pay for these benefits’ emerge. In addition, considering that climate change is a global issue, as a consequence the ‘state cannot be the arbiter of justice’ relying ‘on the creation and effective operation of institutions’ such as the UNFCCC [686].

8.2 Climate justice as a political issue: Procedural justice and recognition

From the sixth Assessment Report of the Intergovernmental Panel on Climate Change, it has emerged the dual perception of climate justice, namely the ethical and the political one. The political perspective is intrinsically interconnected to the ethics of climate change, and both of them are needed in order to achieve climate justice. Since the ‘Greenhouse Gangsters vs. Climate Justice’ report by the San Francisco-based organisation Corporate Watch of 1999, the term climate justice has emerged in the political action paving the way to the formation of many climates justice movement. One of the most significant, was the 2002 ‘Bali Principles of Climate Justice’, which entailed a number of principles concerned with the 'recognition and representation' of marginalized communities in the international debate, particularly 'Indigenous peoples, women, and children’, advocating for the foundation of public policy on 'mutual respect and justice for all peoples' [687].

Along this line, the sixth Assessment Report of the Intergovernmental Panel on Climate Change has established two more principles in order to achieve climate justice, namely procedural justice and recognition. Regarding the former, it entails ‘who decides and

[685] Coolsaet Brendan (2021). P. 151
[686] Ibid
[687] Ibid, p. 154

participates in decision-making'[688]. This principle focuses on the 'fairness' and justice of decision-making procedures, as well as the authority of individuals making the choices [689]. In order to assess the fairness of such procedures, different criteria are implemented, namely: 'transparency, the application of neutral principles among parties, respect for participants rights, and inclusive participation in decision-making'. Indeed, it is fundamental to implement a system based on openness, communication, and accountability as well as implementing neutral principles between parties. This criterion stems from the philosophical concern of neutrality of justification that concerns the distributive question to 'provide each individual with the goods and resources necessary to fulfil their conception of the good life' [690]. Moreover, it is crucial to guarantee the respect for participants rights since less responsible for climate repercussions individuals that disproportionately endure its damages, must be considered participants and 'primary beneficiaries of climate action' [691]

lastly, it is fundamental to guarantee an inclusive participation in decision-making process. Indeed, developing countries despite being the most vulnerable, are often marginalized from this process and it is therefore fundamental to develop a more inclusive approach to take account the needs and voices of vulnerable communities [692]. To address this issue, it is crucial to develop methods that combine 'human factor and community development practices' that consider the particular requirements of the excluded communities [693]. Both the Paris Agreement and the recent COP 26, urge public involvement through the civil society engagement in climate change measures debates and the development of 'new forums such as the Local Communities and Indigenous People's Platform of the UNFCCC work toward this goal' [694] [695]. Indeed, more varied decision-making groups can achieve better outcomes than more restricted ones [696]. Therefore, the parity in participation necessitates the inclusion of all parties in the climate

[688] IPCC AR6 WGII (2022), p.5
[689] Ibid, p. 51
[690] Fragnière, Augustin. 'Climate Change, Neutrality and the Harm Principle'. (2014). Ethical Perspectives. 21. 73-99. 10.2143/EP.21.1.3017287. P. 4
[691] OHCHR. 'Understanding Human Rights and Climate Change' (2015), p. 2
[692] Stonewall, Jacklin & Dorneich, Michael & Shenk, Linda & Krejci, Caroline & Passe, Ulrike. 'Inclusive Decision-Making' (2019) . 10.1201/9780429425905-2. P. 1
[693] Ibid, p.3
[694] UNFCCC (2021)
[695] IPCC AR6 WGII (2022), p.51
[696] Ibid

debates as well as the fair consideration of 'minority groups, vulnerable populations, indigenous peoples and subsistence-based cultures' [697]

The latter principle of climate justice determined by the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, concerns the principle of recognition that address the 'fair consideration of diverse values, cultures, worldviews and perspectives' [698]. Indeed, in the academic literature of climate change adaptation, there is a growing understanding of the significance of culture in influencing climate change adaptation processes and results [699]. The concept of recognition is inextricably tied to distributive and participatory justice. Indeed, it is not possible to achieve participatory justice without recognition since certain communities may not have the opportunity to properly voice their points of view or they may not be considered. Deficits in participatory justice, in turn, leads to challenges in distributive justice since they can indicate 'culturally biased assumptions about the value of some goods'. As a result, it is fundamental to design policies that include recognition in order to achieve procedural and distributive justice [700].

According to Kyle Powys Whyte, in order to achieve recognition justice, it is necessary to develop policies that 'meet the standard of fairly considering and representing the cultures, values, and situation of all affected parties' [701]. Indeed, recognition highlights the need of tolerance and reciprocal acceptance in developing fair methods and results, which in turn it requires awareness and respect for diversity. As a result, recognition needs 'openness rather than imposition and presupposition' [702]. As Fraser argues, 'it is unjust that some individuals and groups are denied the status of full partners in social interaction simply as a consequence of institutionalized patterns of cultural value, which disparage their distinctive characteristics, or the distinctive characteristics assigned to them' [703]. Indeed, in order to understand recognition, it is crucial to assess the 'institutionalized patterns of cultural value' in order to evaluate the social position of individuals.

[697] Christopher J. Preston. 'Climate Justice and Geoengineering Ethics and Policy in the Atmospheric Anthropocene'. (2016) Rowman & Littlefield Publishers. P. 36
[698] IPCC AR6 WGII (2022), p.5
[699] Few, Roger & Spear, Dian & Singh, Chandni & Tebboth, Mark & Davies, Julia & Thompson-Hall, Mary. (2021). 'Culture as a mediator of climate change adaptation: Neither static nor unidirectional'. WIREs Climate Change. 12. 10.1002/wcc.687. P. 2
[700] Christopher J. Preston (2016), p. 30
[701] Whyte, Kyle. (2011). 'The Recognition Dimensions of Environmental Justice in Indian Country.' Environmental Justice. 4. 10.2139/ssrn.1855591.
[702] Christopher J. Preston (2016), p. 36
[703] Fraser, Nancy & Axel Honneth (2004). 'Recognition or redistribution? A Political-Philosophical Exchange'. 10.4135/9781446215272.n24.

Recognition in fact should be interpreted as a 'social status' concern. If individuals are treated as equals that are included in social life, then there is a ‘reciprocal recognition and status equality’ [704]. On the contrary, individuals are misrecognized if they are perceived as inferior and marginalized in social life. This violation of justice results from an 'interaction of cultural norms' that obstruct involvement fairness, leading to the creation of a group of undervalued individuals that are excluded from social life engagement [705]. Therefore, in order to achieve recognition in societies, it is fundamental to 'deinstitutionalize patterns of cultural value that impede parity of participation and to replace them with patterns that foster it' [706] [707].

According to recent literature on climate change justice and ethics, it has been agreed that cultural elements and values influence climate change responses since they can often impede the successful implementation of adaptation measures. These cultural impacts are mostly visible in vulnerable communities since they tend to rely on such factors in different aspects of their lives. Indeed, cultural variables can affect individual's views of climate threats, effects, and adaptation alternatives which can contribute to resistance to change [708]. As a result, it is fundamental to shift from considering cultural aspects as obstacles to adaptation to viewing them as interrelated elements of individuals that interact in various ways to create adaptive behaviour patterns. Indeed, addressing 'culture as an enabler' can results in alterations in mindsets and cultural standards, allowing for the development of more successful adaptation strategies. Accepting that 'culture is inherently dynamic', implies that cultural transformation is not only achievable, but it may also be used to promote 'inclusive and long-term adaptation' [709]. Indeed, recognizing the dynamic nature of culture being an obstacle and a driver of adaptation, can play a fundamental role in achieving successful adaptation results especially for the most vulnerable and excluded members of society [710].

As a result, ‘adaptation is not something that can be done to a community. It is something that needs to be done by a community, determined by its own needs and values’ [711]. It is

[704] Fraser et all (2004)
[705] Ibid
[706] Ibid
[707] Coolsaet et all (2021), p. 154
[708] Few et all (2021)
[709] Ibid, p.5
[710] Ibid, p.6
[711] Barnett, Jon. ‘The Effect of Aid on Capacity to Adapt To Climate Change: Insights From Niue.’ Political Science 60. 31-45. (2008). 10.1177/003231870806000104. P. 16

therefore crucial to implement adaptation measures that address the specific needs and cultural aspects of vulnerable and marginalized communities in order to achieve environmentally suitable and culturally appropriate strategies [712]. As a result, the principles of climate justice encourage a 'socially-just pathways for change' that address increasingly interconnected methods that differentiate alternatives depending on numerous factors [713] [714].

8.3 Bottom-up theories and advocacy coalition framework approach

As previously analysed, three principles are required to achieve climate justice. The recognition theory that sees vulnerable groups marginalized in decision making processes and seek to develop more inclusive participation; the distributive theory that pursue the 'just distribution of material goods, services, or social position'; and lastly the procedural theory that seek to 'reinforce institutionalized political, economic, social, cultural, and symbolic subordination' [715]. According to Schlosberg, 'just adaptation is achieved when people have the political opportunity to determine for themselves which capabilities are needed to live flourishing lives' [716]. The analysis of the climate justice principles has therefore led to an important outcome since these justice issues are contained in capabilities theory. Indeed, a 'capabilities-based approach to climate adaptation seeks to establish the conditions for socially just climate adaptation by calling attention to the political, cultural, and social conditions that create and sustain vulnerability' [717] [718]. Climate adaptation measures are, in fact, delivered using 'top-down' governance structures that are unavailable to vulnerable communities. The capabilities approach

[712] IPCC AR6 WGII (2022), p.4
[713] Ibid, p. 61
[714] Patrick Nunn and Roselyn Kumar 'Understanding climate-human interactions in Small Island Developing States (SIDS) Implications for future livelihood sustainability' (2018) International Journal of Climate Change Strategies and Management, Vol. 10 No. 2, 2018, pp. 245-271, Emerald Publishing Limited, 1756-8692, DOI 10.1108/IJCCSM-01-2017-0012. P.16
[715] Malloy, Jeffrey & Ashcraft, Catherine. (2020). 'A framework for implementing socially just climate adaptation'. Climatic Change. 160. 1-14. 10.1007/s10584-020-02705-6. P. 5
[716] Schlosberg, David. (2012). 'Climate Justice and Capabilities: A Framework for Adaptation Policy'. Ethics & International Affairs. 26. 10.1017/S0892679412000615.
[717] Ibid
[718] Malloy et all (2020) p. 4

therefore seeks to identify vulnerable groups needs and encourage them to take appropriate adaptation decisions[719].

One method for achieving recognition through the capabilities approach, regards the strategic urbanism adaptation approach (Chu 2017). This method concerns the relations among government authorities and local members in order to raise awareness on the development of adaptation programs. In turn, procedural justice improves as a result of conceding individuals rather than elites the authority to select the capabilities required to improve climate adaptation policies. ‘Therefore, in order to accomplish 'just adaptation', it is crucial to shift from 'procedurally inclusive adaptation to procedurally just processes' with the goal of giving a voice to vulnerable communities to better shape the political adaptation decisions in their favour [720].

Another approach to achieve climate justice is to emphasize the 'underlying causes of vulnerability’. This method enables adaptation to be framed in term of different criteria, namely resilience, equity, and transformation. As illustrated in recent climate justice literature, achieving resilience is one of the main objectives of adaptation and it is defined by the Intergovernmental Panel on Climate Change as ‘the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change’[721]. The consideration of adaptation from the standpoint of resilience leads to 'technocratic solutions' that do not address political capabilities. According to some scholars, this paradigm results in a 'resilience trap' since climate adaptation initiatives favour short-term solutions encouraging 'unsustainable or socially unjust practices' rather than enhancing adaptive capacity. As a result, it is fundamental to concentrate on decision-making processes and on the 'distribution of burdens and benefits’ [722] [723].

Concerning equity, the second framing on adaptation, it concern a fundamental concept that has become increasingly central in the climate justice debate. Indeed, because of the ‘unfair intergenerational nature of climate change’ many scholars have been evaluating its nature. Considering adaptation from the perspective of equity entails an emphasis on the ‘distribution of resources, income, wealth, and social positions to favour the most

[719] Malloy et all (2020) p. 4
[720] Ibid, p. 5
[721] IPCC (2014)
[722] Schlosberg, David. (2012
[723] Malloy et all (2020) p. 6

vulnerable within society' [724]. Indeed, equal adaptation initiatives seeks to highlight vulnerable community's needs, strengthened their capacity, mitigate climate change repercussions, and encourage the 'redistribution of resources to benefit socially vulnerable populations' [725]. Many scholars, however, have criticized this conceptualization since equity programs typically depend on government practices that are unable to see the specific demands of marginalized people, leading vulnerability to endure. Recent scholarship argues that it is crucial to develop on conceptualization of adaptation that openly target inequalities [726]. Lastly, another way of framing adaptation concern transformation, which seeks to break current patterns of inequality and rather stress the 'relational aspects of adaptation' [727]. Addressing adaptation as transformation reveals causes of some of the causes of vulnerability concerning the 'political, social, or economic institutional processes' [728] and it broadens the definition of vulnerability to encompass a larger range of individuals, 'such as children, elderly, disabled, or linguistically isolated people' [729].

Policy implementation initiatives have evolved throughout the years. Initially, adaptation strategies were executed in a top-down approach, indicating a gap between the development of the policy and its establishment. Moreover, this approach also assess the policy objectives so to provide new proposals for decision-makers. Top-down policies are also developed for long period timeframes, causing vulnerable groups to be overlooked in the policy-making process. As a result, top-down approaches concentrate more on 'central policy decision-makers and hierarchical approaches to decision-making' [730]. Indeed, it does not account for all the parties involved in policy making, resulting in an inaccurate framework that set the basis for injustice impacting the most unleasable communities. Over the years, top-down approaches have been therefore considered to be incompatible with the achievement of climate justice, prompting the need to develop a different approach. As a result, bottom-up methods began to emerge concentrating on the inclusion of all actors in society, particularly the most marginalized groups. Indeed, this approach put an emphasis on the 'role of street level bureaucrats, the full range of

[724] Rawls, John. 'A Theory of Justice'. Harvard University Press, (1971) https://doi.org/10.2307/j.ctvjf9z6v.
[725] Adger et all (2005)
[726] Malloy et all (2020) p. 7
[727] Ibid
[728] Ibid
[729] Ibid, p.8
[730] Ibid, pp. 8-9

stakeholders involved in policy implementation, and the continuous formulation of policy throughout the implementation process' [731]. Therefore, this approach is more concerned with the analysis of the policy development and establishment process, as well as the relation among individuals and authority in a 'policy subsystem' [732].

As a result, in order to achieve justice for the marginalized and vulnerable communities in the climate adaptation framework, it is crucial to implement bottom-up measures rather than top-down. Indeed, bottom-up approaches have many benefits for these groups. In the first place, they do not merely assess the 'central policy decisions and outcomes against measurable stated policy goals', but instead they focus on the actors efforts and the interactions within these communities. Secondly, it is a method that is structured on 'agency-based approaches' and not on 'technocratic solutions'. Indeed, rather than focusing on 'power relations', it is based on participatory and inclusive solutions. Moreover, bottom-up measures use a 'decentralized approach' instead of 'collective evaluation of system interdependencies'. Finally, its structure is based on a timeframe where adjustments are implemented progressively rather than on a frequent basis, reactive decisions predominate over proactive ones, and it fosters 'empirical descriptions and explanations of decisions made within the policy implementation process' [733].

It is evident that bottom-up approaches seek to establish policies to achieve just adaptation. An important element to accomplish this goal concerns the implementation of the advocacy coalition framework approach (AFC) that emphasizes the importance of policy implementation based on 'process and agency'. Indeed, it seeks to consider the 'policy subsystem' at the domestic and regional level that concerns specific problems, like climate change, and it progressively develop with new concepts and actors. Moreover, it pursues the 'advocacy coalitions' formation, that are alliances between individuals with the same principles that implement such values through public policy, and the way resources are used to enhance political skills and understanding climate adaptation. The advocacy coalition framework approach is concerned with keeping the adaptation structure focused on justice and openly acknowledging the roots of injustice through the assessment of 'policy processes and coalition dynamics'. Indeed, these coalitions are built on systems based on values and principles that supported by 'policy

[731] Malloy et all (2020) pp.8-9
[732] Ibid
[733] Ibid

core beliefs' concerning the climate change origins, seriousness of the impacts, and tendency over mitigation or adaptation strategies. This method also focuses on the importance of 'shorter timeframes' in policy implementation since 'vulnerable populations require urgent actions in order to improve responses' [734] [735].

The formation of coalitions is an extremely important concern for marginalized groups that seek to have their voice heard. Small Island developing states (SIDS) have asked to have the 'decision-making power' to cope with climate change repercussions as well as assistance and skills to promote learning and ensure inclusiveness. 'Small-scale community-based processes' are therefore necessary in order to support such communities. Indeed, they develop a future path for each group while respecting local customs and providing the most recent research initiatives [736] (Kelman, 2010). Small Island developing states have managed to make their voices heard internationally thanks to the Alliance of Small Island States (AOSIS), a coalition composed by SIDS countries that have common development and environmental concerns. This alliance mostly works as an 'ad hoc lobby and negotiating voice' for SIDS in the United Nations, and it accomplished many climates change goals. Several additional projects have also been launched to engage SIDS local voices in climate change debates. For instance, 'Small Islands Voice' later known as 'Climate Frontlines' that describe local occurrences and methods of climate change, 'Climate Witness' planned by the WWF that provides knowledge on the perspectives and ideas of SIDS countries, 'Many Strong Voices' organized by UNEP/GRID-Arendal and CICERO that provides knowledge regarding 'local, national, and regional stakeholders in the Arctic and SIDS' to develop climate change solutions [737]. Therefore, the Alliance of Small Island States together along with the several other programs, demonstrate that SIDS as well as many other marginalized communities, can counteract to some extent the injustices caused by climate change by making local voices heard to international institutions that are tackling climate change issue [738].

[734] Malloy et all (2020) p. 10
[735] Gabehart, Kayla & Nam, Aerang & Weible, Christopher. (2022). 'Lessons from the Advocacy Coalition Framework for climate change policy and politics'. Climate Action. 1. 13. 10.1007/s44168-022-00014-5. Pp. 2-3
[736] Kelman, Ilan. (2010). 'Hearing Local Voices from Small Island Developing States for Climate Change'. Local Environment. 15. 605-619. 10.1080/13549839.2010.498812. P. 7
[737] Ibid, pp. 7-8
[738] Kelman, Ilan. (2010) pp. 7-8

CONCLUSION

Throughout the above dissertation, an attempt was made to explain that in the context of developing countries, it is essential to implement adaptation strategies that not only take into account the risks of climate change but also that these must be culturally appropriate to the context in which they are applied. To this purpose, the case of Fiji, a Small Island Developing State (SIDS) extremely vulnerable to climate change, was taken in consideration and an extensive analysis of its Nationally determined contributions was developed [739]. A case of maladaptation was then assessed in order to prove that the needs and values of vulnerable communities must be central in the climate change adaptation strategies.

Immediately it has emerged the disproportionate effects that climate change have on developing countries. Indeed, even if the greenhouse gas emission concentrations in the atmosphere has been primarily produced by industrialised countries, developing nations are those suffering the most. This issue arise from the fact that such countries are more susceptible to climate change threats due to their physical vulnerability and their weak adaptation potential. Developing nations are in fact more sensitive since a greater percentage of their industries are in 'climate-sensitive sectors', and their adaptation capacity is restricted because of a lack of 'human, financial, and natural resources, as well as limited institutional and technological capability'[740].

Consequently, anthropogenic climate change has been demonstrated to cause injustice and unfairness to the most vulnerable communities and there is therefore the need to 'reconceptualizing adaptation' addressing some ethical considerations of climate justice. Indeed, in order to achieve a just climate change adaptation strategy, it is paramount to ensure a fair distribution of 'burdens and benefits among individuals, nations and generations', a just decision-making process that is inclusive of all communities and give a voice to marginalized and vulnerable groups, and finally it must ensure a 'fair consideration of diverse values, cultures, worldviews, and perspectives' [741] [742].

[739] The Republic of Fiji. 'Fiji Low Emission Development Strategy 2018-2050' (2019), p. 3
[740] McCarthy et al., (2001), p. 16
[741] Steve Vanderheiden. 'Atmospheric Justice: A Political Theory of Climate Change' (2008), p. 45
[742] IPCC AR6 WGII (2022), p.5

It is evident that the development of adaptation policies must put in a central position the specific demands, values, and cultural principles of vulnerable communities recognizing the diversity of the varied situations and the different coping abilities [743]. Underestimating these elements leads to a lack of consideration of equity in adaptation, causing a strengthening of existing inequalities that can lead to the development of new disparities. As analysed in the maladaptation case study of Fiji of the seawall construction, top-down project that do not take in consideration marginalized people voices, lead to negative repercussions that worsen their vulnerability. Indeed, the top-down project adopted for the seawalls, was mainly shaped by exterior donors that resulted inadequately planned concerning the social, economic, and political contexts. Constraints in the structural processes of adaptation strategy, often leads to a maladaptive outcome causing a worsening in the vulnerability and marginalized even more the already affected communities. It is evident that the top-down measures that have been implemented until now, can cause harm in the achievement of adaptation. It is instead more efficient to implement a holistic strategy that consider the cultural, political, and economic context in adaptation policies development, pave the way to the promotion of justice and 'long-term sustainability [744],

Indeed, these circumstances that shape adaptation, are inextricably tied to the specific needs of vulnerable population, the cultural practices, and the community principles [745]. Culture, in particular, has progressively gained significance in shaping climate change adaptation processes since cultural variables can affect individual's views of climate change [746]. As a result, it is paramount to develop adaptation initiatives through the active participation and inclusion of affected communities and leave in secondary position the support of external donors in order to build more environmentally suitable and culturally appropriate policies [747] [748]. Moreover, analysing the linkages between 'social, economic, and political systems', and allocating significantly more resources to the ongoing

[743] Patrick Nunn and Roselyn Kumar 'Understanding climate-human interactions in Small Island Developing States (SIDS) Implications for future livelihood sustainability' (2018) International Journal of Climate Change Strategies and Management, Vol. 10 No. 2, 2018, pp. 245-271, Emerald Publishing Limited, 1756-8692, DOI 10.1108/IJCCSM-01-2017-0012. P.16
[744] Amanda Bertana, et all (2020). Environmental Sociology. Pp. 5-11
[745] Ibid,. P. 10
[746] IPCC AR6 WGII (2022), p.5
[747] Barnett, Jon. (2008), p. 16
[748] Nunn and Kumar (2018), p. 16

challenge of equity, lead to the empowerment of such communities preventing maladaptive outcomes [749].

As a result, in order to achieve justice for the marginalized and vulnerable communities in the climate adaptation framework, it is crucial to implement bottom-up measures. This approach has many benefits for such groups; indeed, it focuses on the actors efforts and the interactions within these communities, it is an 'agency-based approaches' that is based on participatory and inclusive solutions, it use a 'decentralized approach' where adjustments are implemented progressively and where adjustments are implemented progressively [750]. Adaptation programs must take into account the intricate linkages of social, economic, and political systems, allocating more resources to the improvement of equality. Therefore, it is paramount to pursue initiatives that prioritize addressing human needs in sustainable ways [751].

After many years of great work and commitment, justice is now recognized as an essential element of climate strategies. Indeed, in recent years an ethical imperative for adaptation has emerged in order to improve justice and alleviate the unequal consequences of climate change. There is a raising tendency to assess the proper justice implications of engagement as well as the evaluation of just adaptation measures. Yet, the road to achieve a fully climate justice adaptation is still quite far. Climate justice is a challenging topic because adaptation planning methods must adequately assess and account for inequities that may occur during planning and implementation [752]. Indeed, because of the complex intrinsic nature of adaptation, there is no ‘definable adaptation metric’ to evaluate how adaptation is occurring, making it difficult to monitor the progress and evaluate the efforts [753]. Furthermore, addressing the social, economic, and political context within an adaptation policy necessitates a dramatic shift in how it is perceived [754]. Climate change indeed is ultimately a justice dilemma, which necessitates an analysis of the ethical principles in order to address how climate justice debate frames its political demands [755].

In conclusion, the proposed research aims to analyse through the reconceptualizing of adaptation in terms of climate justice, the current situation in developing countries. It seek

[749] Amanda Bertana et all (2020). Environmental Sociology. P. 11
[750] Malloy, et all (2020), pp. 8-9
[751] Amanda Bertana et all (2020). Environmental Sociology. P. 11
[752] Juhola, et all (2022)
[753] Ford et all (2013), p. 1
[754] Amanda Bertana et all (2020). Environmental Sociology. P. 11
[755] Holifield Ryan, et all (2018), p.158

to comprehend the intrinsic cultural, social, economic, and political context in which adaptation policies are developed and implemented in vulnerable conditions with a deep focus on Fiji situation. It aims to highlight that in order to prevent the aggravation of vulnerability, it is essential to develop strategies that take into account the particular socio-cultural context of each specific community through the inclusive participation of local leaders.

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