LEARNING FROM EXPERIENCE TO IMPROVE CLIMATE ADAPTATION UNDER THE UNFCCC:

A CASE STUDY OF THE MEKONG DELTA

By

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ABSTRACT

Nation states that are parties to the United Nations Framework Convention on Climate Change (UNFCCC) have established organs to finance climate adaptation measures, the largest of which is the Green Climate Fund (GCF). The UNFCCC also tasked lesser developed nations seeking to receive such funding to prepare and periodically update National Adaptation Plans (NAPs). The GCF has established procedures and criteria for post-project evaluations to promote "continuous learning" from experience to inform improvements in the design and execution of NAPs and adaptation projects. These criteria call for an examination of the extent to which the results achieved can be upscaled and replicated in other locations facing similar climate risks. This thesis examines the effectiveness of these evaluations for this intended purpose through a case study of a GCF project in the Mekong Delta in Vietnam.

This case was chosen because it is emblematic of highly productive and vulnerable deltaic systems in the global south and because the adaptation measures are appropriate to climate threats experienced in those settings. These measures are the regeneration of mangroves to buffer the landscape from extreme weather events and consequent floods and salinization; and the construction of resilient housing to withstand the same risks.

The research methods consisted of qualitative review of relevant documentation produced by the project and by various experts on climate adaptation in the Mekong Delta and by a series of structured interviews with the funder (GCF), the implementing agencies (the United Nations Development Programme) and counterpart agencies of the Vietnam Government at both the national and local levels, project beneficiaries in the local communities, and non-governmental organizations. The objectives and outcomes asserted in

the funding proposal to justify the grant were compared to the results achieved. These interviewees revealed questionable efficacy of the mangrove regeneration sites and techniques and disqualification of the poorest residents from the housing benefit.

The author then examined the post-project evaluation submitted by UNDP and found it deficient in assessing how these discrepancies affect the potential for upscaling and replicating. Seven reforms in the evaluation process are proposed and explicated that incorporate but are more exacting and comprehensive than reforms recently instituted by the GCF itself to improve monitoring and evaluation by providing advisory services to project implementers. That program provided additional data that indicates that the flawed feedback process detected in the case study is representative of a widespread failure to derive lessons from the limitations or "unintended consequences" encountered in executing GCF-funded adaptation projects.

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LIST OF ACRONYMS

AF	Adaptation Fund
A/R	Afforestation and Reforestation
CBD	Convention on Biodiversity
CCD	Convention to Combat Desertification
CCWG	Climate Change Working Group
CDM	Clean Development Mechanism
CIFOR	Center for International Forestry Research
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.
CoP	Conference of the Parties
CIF	Climate Investment Funds
CPI	Climate Policy Initiative
CSO	Civil Society Organization
CVSEAS	Center for Vietnam and Southeast Asian Studies
DARD	Department of Agriculture and Rural Development
DCC	Department of Climate Change
DEPOCEN	Development and Policies Research Centre
DFI	Development Finance Institutions
DANIDA	Danish International Development Agency
DONRE	Department of Natural Resources and Environment
EPA	Environmental Protection Agency
EU ETS	EU emission trading scheme
FER	Final Evaluation Report
FSF	Fast-Start-Finance
GCF	Green Climate Fund
GCA	Global Center on Adaptation
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GoVN	Government of Vietnam
IEO	Independent Evaluation Office (UNDP)
IEU	Independent Evaluation Unit
IGES	The Institute for Global Environmental Strategies
IHA	International Hydropower Association (IHA)
IIDS	International Institute for Sustainable Development
IIED	International Insititute for Environment and Development
IIU	Independent Investigation Unit

IMHEN	Vietnam Institute of Meteorology, Hydrology and Environment
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
IRM	Independent Redress Mechanism
ITAP	Independent Technical Advisory Panel
IUCN	International Union for Conservation of Nature
KP	Kyoto Protocol
LDCF	Least-Developed Country Fund
LDCs	Least-Developed Countries
MARD	Ministry of Agriculture Rural and Development
MCRP	The Mekong Delta Climate Resilient Program
MERIT	Mekong Delta Climate Resilience and Integrated Transformation Project
MDB	Multilateral Development Bank(s)
MDK	Mekong Delta
MOC	Ministry of Construction
MONRE	Ministry of Natural Resources and Environment
NAPs	National Adaptation Plans
NDAs	Nationally Designated Authorities
NDCs	Nationally Determined Contributions
NBS	Nature-Based Solution
NGOs	Non-Governmental Organizations
NOL	No Objection Letter
ODA	Official Development Assistance
PSF	Private Sector Facility
RBF	Result-based Finance
REDD+	Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.
SDGs	Sustainable Development Goals
SIDS	Small Island and Developing States
UNCED	United Nations Conference on Environment and Development (Rio-Earth Summit-1992)
UNDP	United Nations Development Programme
UNFCCC	United Framework Convention on Climate Change
VNDMA	Vietnam Disaster Management Authority
WWF	World Wildlife Fund

CHAPTER 1

INTRODUCTION: THE THESIS PURPOSE, QUESTION, METHODS, AND DESIGN

1.1 RESEARCH RATIONALE AND OBJECTIVES

Climate change has been frequently cited as the abiding existential crisis in our time. In response, the vast majority of the nations of the world have convened in two efforts to develop coping strategies, first at the Kyoto Protocol in 1995 and thereafter at the UN Climate Change Conference of Parties (CoP 21) in Paris, France, on 12 December 2015 (UNFCCC 2024c). Both of these are part of the regime established by the United Nations Framework Convention on Climate Change (UNFCCC), which was adopted at the 1992 United Nations Conference on Environment and Development. It now has 196 national parties (UNFCCC 2024e). Subsequent CoPs have established several financial mechanisms through which assistance from the industrialized countries, which historically are disproportionately responsible for the carbon dioxide loading of the atmosphere, can be conveyed to the less developed countries, which are disproportionately suffering the consequences. This funding for achieving their pledges to reduce their greenhouse gas emissions (mitigation measures) and for adapting to the impacts (now recognized as inevitable) that climate change is inflicting on their economies, ecosystems, and food production systems, and health and safety capacities (CIFOR 2014).

The Paris Climate Agreement, recognizing that climate change is already causing massive disasters, pledged its members to ameliorate even greater ones impending in the future. But the Agreement's driving mechanisms do not inspire confidence. Each national party is required to promulgate a Nationally Determined Contribution (NDC) of emission reductions.

Recognizing that NDCs are voluntary and unenforceable, the CoPs have also established a process for the Parties to prepare National Adaptation Plans (NAPs) and established financing organs to assist the lesser-developed countries in achieving both their NDC and NAP pledges. NAPs are to be updated every 5 years, ideally in light of improved information derived from experience (UNFCCC 2021b). There is a general policy expressed at CoP 15 that the funding allocated to mitigation and adaptation be roughly equivalent. The financing organs are the Green Climate Fund (GCF), the Adaptation Fund (AF) (administered by the World Bank), and the Global Environmental Facility (GEF).

States' contributions to these funding organs are discretionary and contingent, ultimately upon the degree of satisfaction of the donor governments in the results achieved by their contributions. In addition to domestic political and geopolitical factors that may be at play, the continuation of funding depends on a rough cost-effectiveness calculus by the donors. These countries are basically concerned about whether the return is worth the investment. In the case of contributions for adaptation assistance, they want to see tangible and durable improvements in the capabilities of vulnerable populations to reduce or withstand the threats to lives, livelihoods, food security, ecosystems, economic prospects, health, and safety in the face of rising seas, extreme weather events, floods, droughts, more infectious disease vectors, habitat displacements, and the resulting international tensions and conflicts. All of these impacts pose significant challenges in their scale and intensity.

Climate mitigation aid to developing countries may redound to the benefit of the industrialized donor nation rather directly either in the form of a reduction in carbon loading at less-cost than strategies that could be pursued at home, or in the form of investment opportunities in renewable energy projects in the recipient country. Often, the aid flows to domestic contractors or vendors who provide the adaptation benefits to the recipient country.

Mitigation projects, in particular, may provide investment opportunities in infrastructure such as renewable energy projects. This may account in large measure to the historically disproportionate allocation of assistance to mitigation projects. It also explains why a donor country might prefer to direct its contributions for adaptation through its own bilateral aid mechanisms rather than a third-party actor. It can then select projects and target beneficiaries in ways that conform to its geopolitical interests. For example, on projects in neighboring countries that may ameliorate flows of displaced migrants.

For these reasons, International climate adaptation funders such as the GCF have a continuing burden of persuading the national governments that contributions to its projects present a superior investment opportunity (Bermeo 2018, 126-143). Whether the donors see ongoing improvements in the results achieved depends on the extent to which adaptation efforts are learning from experience and becoming increasingly effective over time. The premise of this thesis is that efforts to cope with climate change are necessarily experimental, and this researcher has characterized the Mekong Delta as a "learning laboratory" in which the efficacy of climate adaptation efforts can be assessed, and conclusions can be drawn as to their scalability and replicability in other highly vulnerable and productive delta systems around the world.

Adaptation projects often resemble more conventional development assistance programs but are also both qualitatively and quantitatively different as they deal with physical changes in the natural resources that underpin economies, livelihoods, public safety, and community well-being. Climate adaptation is about coping with rising and increasingly turbulent seas, increased frequency and severity in hydrologic variation, making floods more severe and frequent and drought more profound and enduring, increases in ambient

temperatures that are direct threats to human and animal health and vitality, and ominous changes in habitats and biodiversity.

The nature of the threats calls for novel measures to cope with them, and effective measures must necessarily be a product of global learning from experience, as each climate adaptation effort is and must be, more or less treated as a learning laboratory for the community of nations grappling with a common challenge. It is most crucial that learning takes place at the level of the organs that finance the climate adaptation intervention if they are to progressively improve in effectiveness.

1.2 The Research Question and Analytic Framework

The question addressed in this thesis is: ***How effective are the feedback mechanisms for climate adaptation projects in informing progressive improvements as indicated by a case study in the Mekong Delta of Vietnam?*** Distilled to its essence, this thesis is an evaluation of an evaluation. It examines the post-project evaluation mechanisms of the GCF, the largest of the climate adaptation financing organs established by the UNFCCC, to ascertain how robust and effective they are in addressing a question that has not been asked or answered with sufficient prominence or urgency. By "feedback mechanism", this researcher refers to at least 3 components of the GCF that may be mirrored by counterparts at the Adaptation Fund and the GEF. These are:

1) The post-project evaluations required of the entities that implement GCF-financed projects, such as the UNDP in our case study and, somewhat obliquely, their government agency "partners", referred to as National Designated Authorities (NDAs) in the GCF parlance;

2) The criteria and guidelines governing the process and content of the evaluations, promulgated by the governance institutions of the GCF (the secretariat and ultimately the board);

3) The internal organs created by GCF to review, process and digest the final evaluations and extract their implications for progressive improvements in adaptation efforts.

The conventional inquiry of a post-project evaluation is “What was accomplished”. The more important inquiry that is the subject of this thesis is, “what was learned” that can inform progressive improvement in the selection, design, and execution of climate adaptation strategies in the future. The answer we find in the case study is that while all of the quantitative goals established in the project proposal and then some were achieved, measured against the goals set for the project. The answer to the more important question “What did we learn” is “not much”. Yet the latter is the professed purpose of the evaluation mechanisms. The final evaluation mechanically follows the criteria and guidelines set out by the GCF; however, in the case study, the evaluation process failed to acknowledge, explain or report the limitations, complications and qualifications that were encountered in accomplishing the key qualitative goals. Thus, there is a notable failure to provide the board or the other internal organs with meaningful information regarding limitations for upscaling or replicating the measures implemented in the project. This thesis concludes that the post project evaluation in the Coastal Resilience Project was of limited value in contribution to the culture of continuous learning and project improvement to which the GCF says it is committed.

The thesis concludes with recommendations for reforming the process of learning from experience at the GCF. Admittedly, whether this failure is emblematic of GCF adaptation projects in general or of the other UNFCCC adaptation financing agencies cannot be inferred from this sole example. Thus, the results of this research should be taken as suggestive rather

than definitive. But the evidence from this case should raise alarm bells for both the climate assistance community and the scholars that track it. If current adaption experiments more generally are not yielding lessons that can inform a process of continual improvements in the execution and design of climate adaptation, then the success of the climate adaptation regime established by the UNFCCC is in doubt.

Most fundamentally, the success or failure of coping mechanisms cannot be tested by ticking boxes on quantitative goals, such as the number of climate-resilient houses constructed or the number of hectares of mangroves planted. Rather, the ultimate test will be how well these houses hold up against the next climate-intensified typhoon to hit the coast or the extent to which the new mangrove plantations actually attenuate protect fields, farms and structures. This we will not be able to measure until the events occur.

1.3 Methodology and Research Design

The premise of this thesis is that each adaptation project is effectively an experiment on measures and processes for adapting to particular impacts of climate change. Each can produce insights into the extent to which attempted measures have worked or have not why, and the implications for upscaling and replicating. Each experiment provides a global learning opportunity that can illuminate how the selection, design, and execution of future adaptation efforts should evolve and improve.

1.3.1 Data Sources

This thesis utilizes qualitative research methodology, incorporating both secondary and primary data sources. The primary data has been gathered through live structured field interviews with officials and individuals involved in the Coastal Resilience Project and exchanges of written correspondence. Interlocutors included staff of the funder (Green Climate Fund), the implementing agencies United National Development Program (UNDP) and

units of the Government of Vietnam at the national, provincial, and district levels, individual project beneficiaries, academic experts, bi-lateral aid agencies, international non-governmental organizations actively working on climate adaptation in the Mekong Delta, and other knowledgeable observers and experts. As the research isolates the factors bearing on project performance, it will evaluate how each of these stakeholders exercised discretion. If the feedback mechanisms are working well, the adaptation projects should become more and more effective over time. If, on the other hand, the feedback mechanisms are flawed, disenchantment with adaptation investments is likely to be the result. That is a real worry in a world where aid flows are inherently unpredictable and unstable.

This constellation of actors effectively forms a series of principal-agent relationships, establishing a hierarchy of derivative responsibilities aimed at achieving adaptation goals and monitoring, evaluating, and reporting results. In the Coastal Resilience Project. There is a cascade of authority, financial flows, and consequent control over project selection, formulation, design, execution, and evaluation. These “Principal-Agent” relationships are explored in some detail in Section 3.3 in the context of the framework for the Green Climate Fund.

The secondary sources of formation included relevant published literature, such as journal articles and books, and information accessible on the Internet. They also included unpublished (“gray”) literature, consisting primarily of government reports and documents produced by the participants in the Coastal Resilience Project, including post-project evaluation reports and materials produced by NGO sources.

1.3.2 Fieldwork Data Collection's Process

The field data collection was carried out in two of the seven sites selected by the GCF's Coastal Resilience Project to compare results and test hypotheses. The first phase occurred in Ca Mau Province from 27-31 October 2024. Ca Mau province is the only project site within the delta and is one of the most vulnerable to climate impacts. The second fieldwork data collection was conducted in Thừa Thiên Huế Province from 16-20 February 2025. This site was selected because it received a major share of the project resources and is a coastal area that is not experiencing the sediment deprivation that exacerbates climate impacts in the delta. This provides a basis for comparison.

Conducting the fieldwork was fraught with challenges and limitations that bear on the results obtained. These are described in Section 5.4. The hypersensitivity of the Vietnam security forces to environmental issues has significant ramifications for the interviews conducted for this thesis. In many cases, the interviewees have asked to remain anonymous, a condition that this researcher strictly observes. The concern is that their candor may result in reprisals if it is taken as critical of the government or at least complicate vital working relationships with government officials. As a result, much of the primary data is reported here without attribution.

1.3.3 Data Analysis and Interpretation

During the fieldwork, the interviews were conducted with the assistance of an interpreter for translations between Vietnamese and English. The interviews were recorded using a digital recorder. After collecting the relevant data from both fieldworks for this thesis, the primary data were transcribed into English. This transcribed data was then categorized and organized into groups based on the research objectives. For example, the data were

organized around themes such as mangrove regeneration, climate-resilient housing, groundwater pumping, sediment issues, land subsidence, and vulnerability. Subsequently, content analysis was employed to systematically analyze and examine the data in relation to the research questions, theoretical framework, and existing literature. This process ultimately led to the formulation of research findings, conclusions, and recommendations for the thesis.

Following the fieldwork, the researcher conducted follow-up inquiries with the interviewees by making phone calls and sending emails and messages to local officials and households. This was done to gather additional information, delve deeper into the interview responses, and seek clarification on the data and answers provided during the initial interviews.

To validate the data, after each interview, this researcher summarized the results of the interview and sent them back to those interviewees and requested their review and confirmation of the results of the interviews. Sometimes the findings are presented in a narrative format that illustrates the insights derived. This may include direct quotes from interviewees to conserve the richness and authenticity.

1.4 Scope and Limitations of the Thesis

This thesis focuses on the efficacy of the learning processes employed by the financing organs in their efforts to progressively improve the performance of their investments on the premise that the learning curve substantially depends on the effectiveness of the monitoring and evaluation mechanisms in informing the design and execution of future projects. But the thesis does not attempt to evaluate the effectiveness of the adaptation measures undertaken in the Coastal Resilience Project for several reasons. For one thing, the types of adaptation measures assessed in this thesis—housing upgrades and afforestation of mangroves—are measures that would be pursued to attain the Sustainable Development Goals and Agenda

2030, quite apart from their utility for counteracting climate change. That phenomenon and its universal and existential risks really only lend urgency and scale to an already established set of development assistance goals.

Secondly, there are two types of coping responses to climate change. One category is efforts to counteract the effects, such as creating barriers to rising seas and larger storm events; the other is strategies to accommodate these changes in the physical environment through changes in land uses, food production systems, etc. The efficacy of adaptation measures really depends on which coping strategy they relate to.

Third, climate adaptation is a relatively new endeavor in the development assistance space, and the efficacy of these recent efforts in countering the types of physical impacts encountered in the Mekong Delta usually cannot be evaluated until a significant time has passed. It may take many years before the effectiveness of measures intended to counteract phenomena such as extreme weather or hydrologic events can be measured empirically. For example, we cannot know for sure how effective mangrove regeneration at a particular site will be until a large storm surge occurs. Similarly, we cannot know whether the design of supposedly climate-resilient housing designs will actually withstand typhoon-scale events until they occur. This time horizon precludes conducting a comparative analysis of outcomes between communities that received adaptation assistance and similar communities that did not. In other words, it is not really possible to establish a baseline for evaluating the efficacy of particular measures. The empirical record just takes too long to yield that type of data.

Finally, evaluating the technical merits of such adaptation measures requires a range of specialized technical skills (e.g., geomorphology, civil engineering, agronomy, etc.) that this researcher does not possess. Additionally, causal relationships may be ambiguous. For

instance, it may not be clear whether a shift from one type of crop to another is the result of a climate adaptation effort or market dynamics.

Under these circumstances, this research focuses on the "operational effectiveness" of attempted adaptation interventions. The matter to be evaluated is the effectiveness of the feedback mechanisms on adaptation aid flows, focusing on one particular case example that may be emblematic of adaptation efforts in vulnerable delta systems generally and, therefore, suggestive of the need to upgrade these feedback mechanisms in the interest of improving project selection, design, and execution in the future. Yet, the limitations of this research must be acknowledged: The research focused on just one climate adaptation project in just one country under funding from just one of the climate finance organs. A broader inquiry into the questions raised by this research would require time and resources far beyond those available for this thesis. This inquiry suggests that there is ample scope for reform of the feedback mechanisms. Yet, the conclusions that can be inferred from such a limited empirical base are suggestive of further and broader research that is warranted rather than definitive. However, while the small sample of a single project can yield only anecdotal evidence and is not sufficient to support broader inferences, it does suggest that a broader and deeper inquiry is warranted into the robustness and effectiveness of the project evaluation mechanisms. As concluded in this thesis, such inquiry has not yet been pursued with the vigor it warrants. These matters are discussed further in Chapter 8 on findings and conclusions.

1.5 Case Selection: Geographic focus on the Mekong Delta in Vietnam

Given the limitations of time and resources for this thesis research, an early task was to identify a case that would be particularly "lesson-rich" and, therefore, fruitful to examine. Climate resilience in the Mekong Delta was selected for three reasons. First, the delta is

exceptional for its food production and biodiversity, which is described in Section 1.5.1. Second, this productivity is severely threatened by the delta's extreme vulnerability to the impacts of climate change, which is discussed in Chapter 2. Third, this vulnerability is greatly exacerbated by anthropogenic alterations in the morphology of the delta, also discussed in Chapter 2. These characteristics make it emblematic of vulnerable delta systems worldwide where large-scale upstream and *in situ* development combine with climate change to pose an existential threat. These deltas also tend to have large populations that are susceptible to being displaced by these impacts. The relevance of the thesis research to highly productive and highly vulnerable delta systems globally is discussed in Appendix I.

1.5.1 The Rich Biophysical Setting

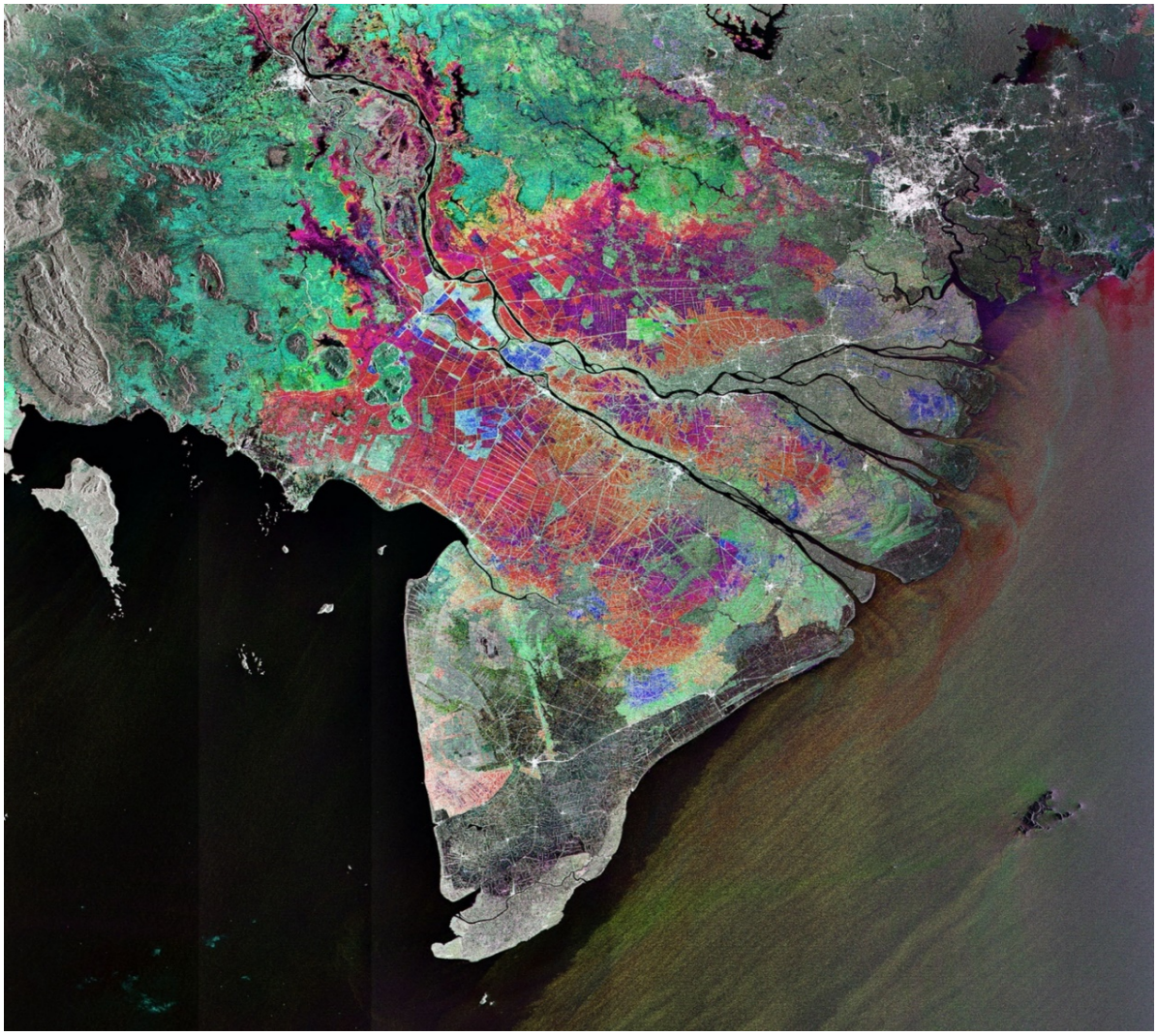


Figure 1: Mekong Delta observed from the satellite.
Source: Vietnam's Mekong Delta by EnviSat, an earth-observing satellite (European Space Agency (ESA) 2009).

Vietnam is classified as a lower-middle-income country (The World Bank Group 2024). with a particularly productive delta and a 3200-kilometer-long coastline along which live some 70% of Vietnam's population of 104 million people (Prakash 2018). The delta is the coastal area most vulnerable to climate change. It supports the livelihoods of approximately 18 million Vietnamese and Cambodians who call it home and contributes 18% to Vietnam's GDP, primarily from agriculture, fisheries, and forestry. The Delta has highly productive food-growing systems that produce:

1) 50% of Vietnam's total rice production and 95% of its rice exports
2) 65% of aquaculture and 60% of fish exports
3) 70% of fruit production. (Vietnam+ 2024).

However, rice production in the coastal zone has become increasingly unsustainable, as evidenced by a 2016 drought that resulted in a one-million-ton decrease in harvests. Droughts, as well as floods, are endemic to agricultural systems such as those in the delta that are wholly dependent upon a highly variable river system. There is no irrigation water storage in the delta to buffer the variable annual rainfall patterns (which are becoming more erratic with climate change) or to regulate the flood waters. The flow of the Mekong River system also varies significantly throughout the year. It is a monsoon-driven system that produces extensive seasonal flooding in the delta, alternating with an extensive dry season. The flood season, which lasts from July to November, constitutes 85- 90% of the total annual flow, while the low flow season from December to May accounts for just 10-15%. The flooded area covers approximately half of the entire Mekong Delta. Flood levels can range from 1 to 4 meters, with inundation lasting between 1 to 6 months (Binh et al. 2020).

As a result, the delta's populations have a long-standing tradition of living alongside floods and brackish waters, adjusting to the yearly and seasonal changes in flood levels and salinity. However, this flat, low-lying delta system is especially susceptible to issues like rising sea levels, land subsidence, and the impacts of upstream dams and water consumption. While the communities and their agricultural economy manage to flourish, they face serious risks from these effects, which have become more pronounced in recent decades (GIZ 2020, 7).

The total forested land area in the Mekong Delta is approximately 300,000 hectares. The entire shoreline of the delta was previously dominated by mangrove forests, which

provided crucial protection against strong tides and other coastal processes. Now, that number is less than 5% (GIZ 2020,17-32).

The wetlands of the Mekong Delta offer distinct habitats for aquatic and global flora and fauna. They serve as breeding grounds for numerous aquatic species and provide resting and feeding areas for migratory birds during the winter months. Despite significant losses of natural landscapes, the remaining rivers and associated wetlands encompass approximately 0.7 to 0.8 million hectares, sustaining a rich biodiversity, including fish species, many of which are migratory.

Although fish catches remain substantial, they are clearly declining due to overfishing. The future of inland fisheries appears quite grim. The construction of high dykes has led to the loss of spawning and breeding habitats. The offshore fishing zones surrounding the Mekong Delta are considered highly productive breeding and fishing grounds (GIZ 2020, 21). The outflow from the Mekong River nourishes these zones, which are characterized by a plume containing sediments, nutrients, and brackish waters that extends up to 500 km into the sea. These offshore fisheries rely on the nutrients carried by the sediments deposited annually by the Mekong River. The marine fisheries in this plume-affected region are substantial, accounting for approximately 50% of Vietnam's offshore fishing fleet and sea fish catch. More than 1.25 million individuals rely on marine fisheries for their livelihoods, whether for subsistence or income (GIZ 2020, 21).[1]

As we shall see in the next chapter, both the outflow of fresh water and sediment are diminishing due to the construction of dams and reservoirs, as well as increasing water diversion for agricultural purposes. These changes affect the coastal zone in several ways,

[1] This is a report made by GIZ on the Mekong Delta Integrated Regional Plan for the period 2021-2030 with a vision to 2050. It was adopted by the Prime Minister of Vietnam on February 28, 2022 (No. 287/QD-TTg).

including coastal protection, the ecology of the delta front and estuaries, and nearshore fisheries.

1.5.2 Selection of the Coastal Resilience Project for the Delta Case Study

Another factor in the choice of the Mekong Delta for this research is that it is also one of the most studied by a wide variety of researchers. This makes it a particularly good "learning laboratory" for deriving lessons on climate adaptation measures and how to replicate them elsewhere in the world. This is important because the development pressures that have imperiled the Mekong Delta are looming everywhere. Namely, a likely boom in hydropower development, ironically to address the other side of the climate imperative, the need to accelerate the pathway to carbon neutrality for the power sectors of national economies, particularly in the developing nations.

It was not feasible to document adaptation projects funded by all of the organs established under the UNFCCC. Therefore, the Green Climate Fund (GCF) was selected since it is the largest fund with the most extensive track record. All of the projects financed by the GCF within Southeast Asia were run through three selection criteria to select (1) projects that have been completed, (2) projects that are driven specifically by climate threats as contrasted with projects that are motivated by conventionally development goals, and (3) projects that implement physical solutions to climate change as contrasted with those that feature institutional responses such as early warning systems, credit facilities, capacity building, or knowledge sharing. These selection criteria were applied to 42 GCF-funded projects in Southeast Asia with a total funding of $2.59 billion USD (GCF 2024). Out of these, a single large project on coastal resilience in Vietnam emerged from the screening process as the focus of this research. This is a $46 million USD project funded by GCF, UNDP and the Vietnamese Government, and implemented by UNDP in combination with the Vietnam Ministry of

Agriculture and Rural Development (MARD) and Ministry of Construction (MoC) to build climate resilience for vulnerable coastal communities in one province in the Mekong Delta and six other coastal provinces (UNDP-Vietnam 2016). The details of this adaptation project are described in Section 4.3.

CHAPTER 2

STATE OF KNOWLEDGE CONCERNING VULNERABILITY OF THE MEKONG DELTA TO CLIMATE CHANGE

The delta is by far the most productive agricultural and aquacultural area in the entire country. Yet, the delta exhibits all of the physical manifestations of climate change, including sea level rise, storm surges from extreme weather events, salinity intrusion, floods, droughts, wildfires, stressful ambient temperatures, and increasingly infectious disease vectors.

The Intergovernmental Panel on Climate Change (IPCC) has classified the Mekong Delta as one of the most endangered in the world due to its flat topography (Krittasudthacheewa et al. 2019). The average altitude of the delta is only 0.8 meters above sea level, and the projected rise by the end of this century is much above that. A sea level rise of a meter or more is expected by the end of this century. That prediction was previously thought to be at the extreme end of the spectrum—it is now regarded as a conservative estimate. By the year 2100, sea level rise is projected to inundate 40%-45% of the landmass (USAID 2024; UNDP 2021a, 21), as shown by the blue area in the display below.

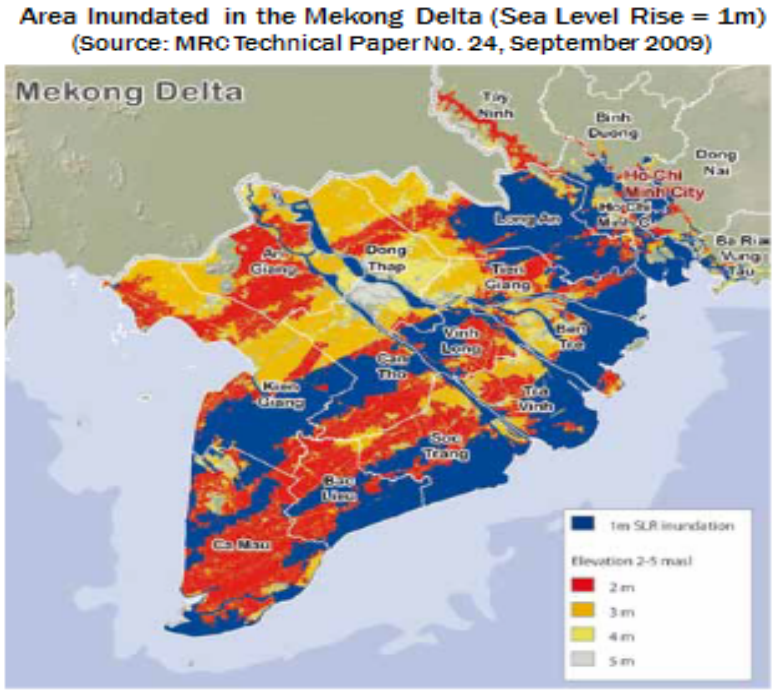


Figure 2: The area expected to be inundated in the Mekong Delta by 2100.
Source: Vietnam Institute of Meteorology, Hydrology and Environment, Vietnam MONRE, 2008.

2.1 Tidal Influence and Salinity Intrusion

The region's minimal topographic gradients mean that much of it is impacted by the sea. During the dry season, low river flows allow saline water to penetrate deep inland, affecting a broad coastal area because the local canal systems are directly linked to the rivers. The combination of tidal movements, the flat low-lying landscape, and the extensive network of canals makes the Mekong Delta particularly vulnerable to salinity intrusion, impacting up to $1.7 million USD hectares annually. In the absence of immediate adaptation measures, about 45 percent of the Mekong Delta area will be affected by saltwater intrusion, resulting in an estimated total economic loss of some $17 billion USD by 2030. Some provinces would be at risk of being entirely submerged by seawater. Areas affected by this change would face significant drainage issues during extreme rainfall, river flooding, or storm surges, as there may not be enough gradient for effective drainage, particularly in more inland regions.

Salinity intrusion due to sea level rise is a serious problem in the low-lying terrain of Ca Mau. Many sluice gates have been built in the canals to prevent saltwater intrusion and protect freshwater availability. Unlike other areas in the Mekong Delta, the irrigation system in Ca Mau is also tailored to flood prevention and drainage rather than conventional agricultural irrigation (Wyatt 2024; Đặng Quốc et al. 2024).

By 2030 and likely by 2050, substantial flood protection and drainage pumping will be necessary in cities, towns, and rural areas, depending on land use and changes in production practices. As a result of sea-level rise and other factors, the region is projected to become a major climate out-migration hotspot by the middle of this century (The World Bank 2022, 1-15).

It is also suffering from coastal erosion and loss of historic mangrove forests faster than any other region. The eastern region of Ca Mau, particularly towards Nam Can, faces severe erosion problems, raising concerns about the viability of mangrove restoration efforts. In the last five years, the coastline has receded about 100-200 meters (Karlsrud, Vangelsten, and Frauenfelder 2017), resulting in annual mangrove losses of about 30-50 hectares, with some areas experiencing even greater depletion. It is the part of Vietnam where:

> The mangrove forest, vital for coastal protection, has been most heavily depleted . . . This loss exacerbates the impacts of storms and rising sea levels, particularly for the 500,000 people living within 200 meters of the coast. (UNDP 2024, 19).

Some observations are quite obvious. While sea levels are rising by centimeters per year, the inundation of the coastal landscapes actually occurs in storm surges caused by extreme weather events, which can temporarily propel sea water over broad areas of the landscape. While the water may recede, the risk to lives, livelihoods, land uses, and human habitations may not. The same is true of threats to human health from temperature rise. While the average

increase in ambient temperatures measured over the course of a year may seem small, the risks to health come from exposure to just a few hours of extreme temperatures on occasions that are no longer rare. Hydrologic extremes are of the same type. A historic flood event destroys all in its path in a matter of hours, and now it comes more frequently than residents are prepared for and more severely than floodplains can contain. Coasts erode a little at a time but sometimes in massive morphological resets. Droughts tend to persist long enough now to cause permanent desertification where pastures used to flourish. Adaptations, too, can no longer be thought of as small adjustments over time. In Vietnam's coastal areas, the vast mangrove areas at the land-sea interface that used to serve as a barrier that diminishes the impacts of an increasingly turbulent ocean have been largely lost. With them, the coasts have also lost one of the most productive ecosystems on the planet. Mangrove functions as a nursery and habitats for aquatic species, driving the oceanic food chain. The progressive loss is happening not by small increments but by large meteorological events (Danish International Development Agency (DANIDA) & IMHEN (Vietnam Institute of Meteorology, Hydrology and Environment 2010). Preparing for the worst is now just preparing for the norm.

2.2 Sediment Depletion Exacerbates Climate Vulnerability in the Delta

Like all river deltas, the Mekong is a sediment deposition feature, formed by the discharge of suspended sediments as the moving water of the river meets the still water of the sea. This land was formed and is maintained by the annual replenishment of sediments flowing from the upstream catchment. Sediment is essential to maintain the complex channel and floodplain morphology that provides the diversity of habitats needed by different species and life stages of fish and other aquatic biota. Fine sediment deposited from overbank flows provides soil fertility for natural riparian forests and for floodplain agriculture. These

sediments are essential for maintaining and replenishing the delta landform through annual deposition during the peak inflow season, driven by the monsoon rains. River sediment in the lower Mekong enables the high productivity of both the perennial aquatic habitats and the ephemeral terrestrial floodplains (Kondolf 1997). When these sediments and nutrients are captured by reservoirs, the foundation of the ecosystem is undermined, and the delta is facing an existential threat like few other landscapes on the planet.

The greatest threat to the delta landform, its food production system, and the mangrove protective belt is the reduction in sediments and their associated nutrients reaching the delta due to capture in the upstream hydropower dams in Laos, Cambodia, Thailand and most of all, in China. Before 2000, the Mekong Delta received approximately 150 million tons (Mt) of alluvium each year. However, due to the capture of the sediment in the upstream reservoirs, this amount has now diminished to around 60 Mt, and is expected to continue declining in the future. Eleven dams have already been built in the headwaters of the Mekong in China and some 48 are now either in place, under construction, or inevitable in the Lower Mekong River, just upstream of the delta. Another 100 or so are in prospect if the full hydropower potential is developed. If all dams are constructed as planned, without modifications to allow sediments to pass, the Delta will receive only about 4% of its pre-dam sediment load. Under a full-buildout scenario, the very existence of the Delta as a physical feature is doubtful. Land erosion and subsidence will be essentially uncontrolled and, combined with sea-level rise, would leave few options available to mitigate coastal retreat (Rubin, Kondolf, and Carling 2014).

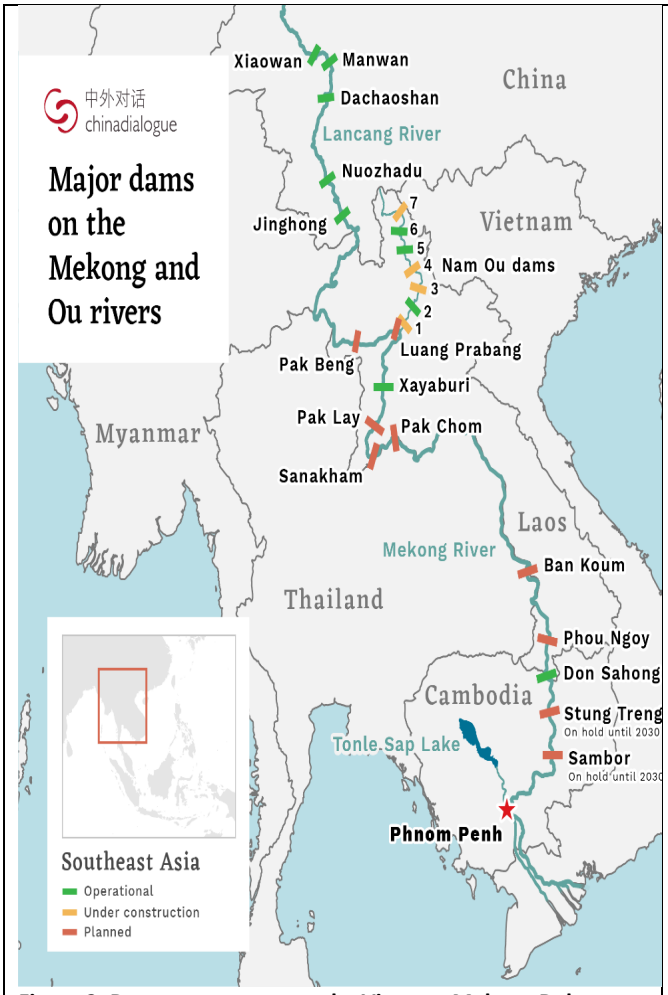


Figure 3: Dams upstream over the Vietnam Mekong Delta.
Source: (Tyler 2020).

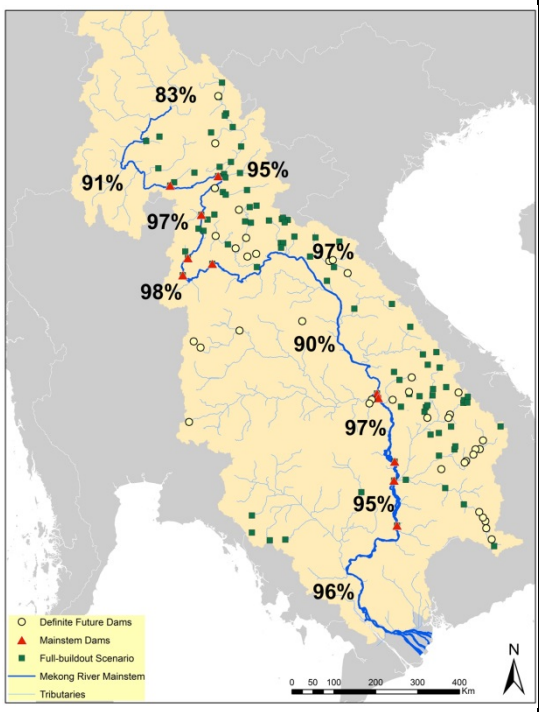


Figure 4: Under the 'Full-Buildout' Scenario, 60-96% of the sediment would be trapped by reservoirs.
Source: (Natural Heritage Institute 2015)**.**20/06/2025 13:56:00

Sediment and nutrient depletion are occurring not only due to capture in the upstream dams, but also due to broad-scale mining of the sand and gravel of the river channel for construction aggregate, particularly in Cambodia, but also in Vietnam. These threats have been intensively cataloged and documented. In the delta, sand mining activities are estimated to extract about 50 Mt of sand annually (Park 2024). It is extensive, highly destructive, and eminently preventable through national regulation.

The diminishing sediment load of the Mekong River is contributing to increased net erosion of riverbanks, estuary shorelines, and coastal areas. These erosive flows commonly

induce incision, coarsen the bed, and fundamentally alter aquatic food webs (Kondolf, Rubin, and Minear 2014).

Most relevant for the case study that will be examined in this thesis, the sediments provide the substrate required for the regeneration of the mangrove forests that are the chief buffer protecting the landscape from the ravages of a rising and increasingly tempestuous sea. Large areas of mangrove forests have been lost as a result, along with their associated ecological benefits. The potential area for reforestation of the mangroves is very limited, as land suitable for this purpose is constrained by intensive land use for aquaculture on one side and the threat of coastal erosion on the other. The area of mangrove forest, in terms of both width and density, has been declining due to the expansion of shrimp farming aquaculture and land subsidence, which has exacerbated coastal erosion. Coastal mangrove squeeze is a significant concern for the delta coastline because dykes have been constructed very close to the shore, often within the 500 meters needed to support the mangrove belt (Prime Minister Office, Government of Vietnam 2009).

Accompanying the loss of sediments is the loss of their associated nutrients. The loss of nutrients reduces the productivity of the aquaculture industry in the Mekong Delta (Vu, Hortle, and Nguyen 2021). The outflow of nutrients also fuels the food chain for the nearshore marine fishery, which is among the most productive in the world. The figure below shows a satellite image of the plume of sediments and nutrients discharged into the coastal environment at the mouth of the Mekong River in the South China Sea.

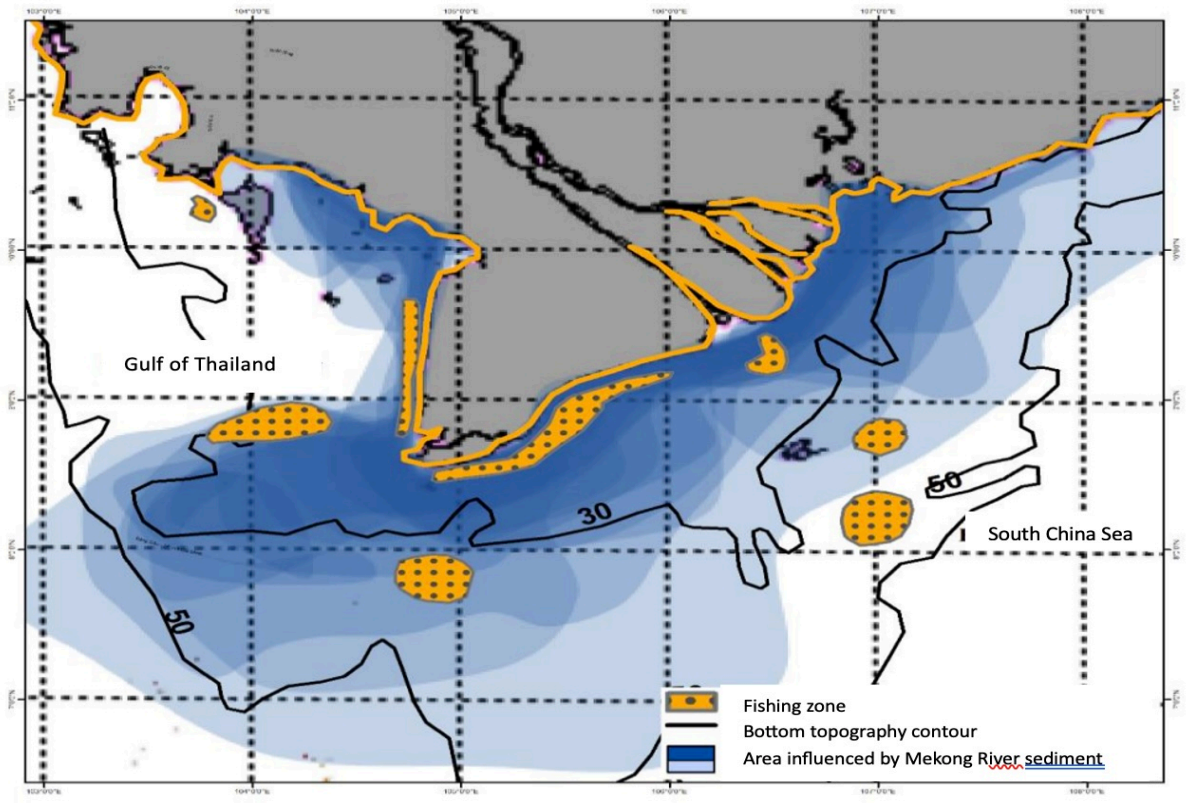


Figure 5: Sediments and nutrients are discharged into the near-shore environment at the mouth of the Mekong River in the South China Sea.
Source: The Integrated Master Plan for the Mekong Delta Area, (GoVN 2021).

2.3 SUBSIDENCE DUE TO GROUNDWATER EXTRACTIONS

Subsidence of the landform of the delta is occurring in the areas where groundwater is being extracted. This is particularly the case in Ca Mau Province. Many farmers in this coastal zone rely on groundwater to dilute the salinity that is intruding on their irrigation system as the sea rises. This, however, produces a positive feedback loop where greater salinity induces more groundwater extraction to dilute it, which causes greater land subsidence, which results in more seawater intrusion. Recent observations indicate that land subsidence rates are 5 to 10 times greater than the average rate of sea level rise, leading to drainage problems and putting agricultural land at greater risk of being inundated by brackish water. In Ca Mau province, the region experiencing the highest subsidence rate, the ground is subsiding by over

3 cm per year due to groundwater extraction in an area of nearly 40,000 hectares (Karlsrud, Vangelsten, and Frauenfelder 2017; GIZ 2020).

At present, groundwater in the Mekong Delta is extracted through numerous registered and unregistered private tube wells, which can reach depths of 80 to 120 meters or more, as well as through regulated water supply facilities that draw from deeper aquifers between 100 and over 300 meters deep. This high-quality groundwater is widely utilized for domestic water supply, irrigation, aquaculture, and industrial activities, making it a crucial source of fresh and clean water, particularly in coastal regions (GIZ 2020).

If these trends persist for 50 years, subsidence will reach half to one meter, enough to submerge large areas of the delta. This is even without considering climate-change-induced sea-level rise, which makes the situation much worse.

Figure 6: House in Ca Ma, Mekong Delta undermined by erosion.
Source: (Natural Heritage Institute 2015).

The effects of sediment deprivation combined with sea level rise are already starkly apparent. But the picture is actually more ominous. At present, much larger eventual impacts are being masked by the inventory of sediments that have been stored in the Mekong

floodplain over several millennia. Slowly this inventory is being eroded away by water hungry for sediment that is being released from the dams. Once this inventory is depleted, the full effects of sediment capture will become apparent as all of the processes cataloged above will become much more pronounced (Kondolf, Rubin, and Minear 2014).

It is worth reflecting at this point in the discussion on the extent to which the factors affecting flows into the delta that are necessary for its survival are or are not within the power of man-made institutions—such as national governments—to control. Sea level rise is, at this point, inevitable (Trinh and Neefjes 2022). The remaining issues—vitally important—are how much and when. But all of the other factors are amenable to smart development and management choices. Sand mining and groundwater pumping can be curtailed quite readily by national regulations (although enforcement, as usual, is an open question). The reduction in trapping of sediments in reservoirs is a much greater challenge as the dams are in upstream countries and removing sediment from reservoirs is expensive and often impractical.

2.4 Socio-Economic Effects of The Morphological Changes

These impacts in the Delta are having severe consequences for the local economy and food security throughout Vietnam. According to the 2018 Asian Development Bank and World Bank 'Climate Risk Country Profile', specific examples of potential economic losses due to climate change include: (i) an estimated annual loss of $3.6 billion USD (at 2018 prices) due to increased flood damage, with at least a third of this occurring in the Mekong Delta; (ii) a projected 9% reduction in GDP without any adaptations due to the heightened risk of a 1-in-100 year storm surge in the Mekong Delta; (iii) a potential 50% decrease in rice yields in the Mekong Delta, impacting a crop valued at approximately $10 billion USD (Tang Thê and Conan 2022).

The delta produces half of the rice crop for Vietnam, the world's third-largest exporter. Salinity intrusion into the delta is displacing rice cultivation and the aquaculture industry. Simulations show a loss of rice production in 10 provinces in the Mekong Delta, hypothesized as the most affected areas (Open Development of Vietnam 2022). Results show that these areas will lose 7.6 million tons of rice per year, which is almost a third of the total Mekong Delta rice production.

Expected losses of food production from the disruption of sediment and nutrient flows are not confined to the delta lands. The Mekong River is also uniquely productive in fisheries; the delta's extraordinary productivity is directly dependent on the inflows of sediment and nutrients that are delivered by the Mekong River's annual monsoonal flood pulse. If nutrient loads were to be reduced by 80%, a 36% reduction in fish productivity is expected (NHI, USAID, The World Bank, IMHEN, SIWRP 2017, 4). Additionally, the enormous fish production that occurs in the terrestrial part of the delta is more than matched by the off-shore marine with production in the order of 500,000 – 726,000 tons per year. It is also dependent upon the flow of nutrients to nourish the food web. Coastal fisheries will decrease significantly due to reduced sediment and nutrient input to the sea (Koponen et al. 2010).

The anticipated loss of food production and associated livelihoods and food nutritional security is likely to combine with other factors to displace a large fraction of the Delta population and eliminate entire communities (Renaud and Kuenzer 2012). The internal migration of Vietnamese from rural to urban areas is already occurring, and climate change is likely to exacerbate it as people are displaced from rice cultivation and aquaculture to seek substitute livelihoods (Thuan 2022; Giving Compass 2024). Some 1.7 million people, accounting for 14.5% of the total population of the Delta, have migrated out of this region since 2009 (Chapman and Van 2018). Delta inhabitants have little resilience to disruptions in

their livelihoods because their monthly income is the lowest in the entire country. Workers in Ho Chi Minh and Hanoi earn between 60% to 82% more than those in the Vietnam Mekong Delta (Le, Hoang, and Vu 2022). These processes are anticipated to accelerate in the future, with the prospect of environmental migrants increasing exponentially (some 18 million people live in the Mekong Delta) and eventually overwhelming the domestic capacity to absorb them (World Wildlife Fund (WWF) 2024).

CHAPTER 3

THE FRAMEWORK FOR FOREIGN ASSISTANCE FOR CLIMATE ADAPTATION

3.1 THE FUNDING ORGANS CREATED BY THE CLIMATE CHANGE FRAMEWORK AGREEMENT

The recent series of Conferences of the Parties (CoPs) of the UNFCCC have voiced alarm that the pace of global heating from anthropogenic causes is not being matched by sufficient investments in either mitigation or adaptation solutions (UNFCCC 2024d, 29). As noted in Sections 1.1 and 1.2, the UNFCCC regime has created two mechanisms for Parties to prepare action plans for climate mitigation and climate adaptation, respectively. The main driver of mitigation actions at the national level is the obligation for the Parties to adopt Nationally Determined Contributions (NDC) toward reductions in greenhouse gas emissions. Less well-known is the counterpart obligation of Parties to also adopt National Adaptation Plans (NAPs) for coping with the inevitable impacts of climate change (Article 4.1 (b) of the Paris Climate Agreement) (UNFCCC 2024b). Both the NDCs and NAPs are to be escalated in intensity through regular updates, currently anticipated every five years (UNFCCC-LDC Expert Group 2024, 16). However, the updated NDCs collectively are not sufficient to achieve the Paris Agreement's target to maintain global temperature at no higher than 1.5 °C above pre-industrial levels (UNFCCCb, 2021), which was surpassed in 2025. While some governments have strengthened their pledges, most have only made only superficial adjustments (UNEP 2023).

The NAPs may contain either (or both) "conditional" and "unconditional" commitments. "Conditional" commitments are ones that hinge on securing international climate finance to implement their adaptation measures (UNFCCC 2012). Many NAPs indicate specific financial requirements.

To facilitate implementation of the NAPs, the accord negotiated at the Copenhagen CoP in 2009 commits the richer countries—that became so by disproportionately loading the atmosphere with greenhouse gases--to mobilize at least US$100 billion USD per year in climate finance for the poorer countries—which are disproportionately suffering the consequences (Bhattacharya, Kharas, and McArthur 2023) The underlying presumption is that these climate aid flows will be shaped by the NAPs, as they are formulated and updated periodically (UNEP 2021).

The total funding requested in the initial NDCs amounted to around $300 billion USD, much surpassing the $100 billion USD offered by the developed countries (United Nations 2024). Article 9 of the Paris Agreement addresses climate finance but merely reaffirms the initial $100 billion USD target until 2015, after which a new target was to be established. CoP 26 expressed “deep regret” regarding the shortfall, with only $79.6 billion USD reported in 2019 (Hallowes and Munnik 2022, 102), CoP 29 in November of 2024 did reset the target at $300 billion USD, in which the $100 billion USD goal set for 2020 was achieved (OECD 2024).

Obtaining a reliable and useful estimate of the donor contributions to adaptation projects is elusive for a number of reasons: various donors use various practices for reporting; it is often difficult to separate adaptation funding from mitigation funding from development assistance in pursuit of the Sustainable Development Goals in general (i.e., how much of the putative donations to climate adaptation are actually “additive”?). Some projects arguably fall into several categories. For instance, reforestation projects adapt to climate change by providing shade and buffers against storm events, but also sequester carbon (temporarily) and restore habitats. Investments in water supply not only ameliorate droughts but also meet basic human needs for potable water supplies. Blended finance (public-private funding partnerships) also complicates the reporting. Some donors count the private contributions as

part of their support for the UNFCCC goals, some do not. As a consequence, the reported numbers range widely from $32.4 billion USD to $54.6 billion USD in 2022 (UNFCCC 2024a; Climate Policy Initiative and Global Center on Adaptation 2024). What is more, they quickly obsolesce. What, for instance, will be the picture now that the United States has (temporarily?) withdrawn from the UNFCCC and dismantled its foreign aid apparatus?

What may be more important to track are the trends, and they are not pretty. Donations have not increased at a rate that can achieve the 2025 goal of $100 billion USD for climate change projects, or the overall goal of $40 billion USD for adaptation annually. Following a general increase in 2019 driven by a short-lived momentum, adaptation funding has remained flat. There are also growing concerns about whether these resources truly benefit those who need them the most. Loans instead of grants have become more prevalent over the past five years, which may further exacerbate current debt crises and fiscal challenges in countries already in high distress.

Some of the best analysis comes from an organization called SEEK Development, which styles itself as a strategic and organizational consultancy. It points to the mounting doubts about the veracity and credibility of self-reporting by the donor agencies, citing analysis by OXFAM, which stated that:

> Oxfam criticizes . . . in particular, the lack of transparency, gaps, and veracity of reported figures. It assesses that donor reports continue to overstate climate finance by a large margin and that methods for measuring adaptation finance are not transparent, which prevents accountability and independent scrutiny. This also applies to the reporting of multilateral development banks (MDBs), which is usually seen as being less coherent and transparent. In its 2023 Climate Finance Shadow Report, Oxfam identified that of the $31.7 billion USD that MDBs invested annually in the period 2019- 2020, only around $6.0 billion USD was invested in climate-specific net assistance. A recent study examining World Bank climate projects reveals that hundreds of projects have little climate change mitigation or adaptation relevance (SEEK Development 2023, 3).

During 2021-2022, the annual adaptation finance flows reached $63 billion USD, which represents a modest year-on-year growth of 28% compared to the figures from 2019-2021. It's estimated that the required adaptation finance flows for developing countries by 2021-2035 will be around $840 billion USD, based on the 2021-2022 level (Climate Policy Initiative (CPI) and Global Center on Adaptation (GCA) 2024, 1-10).

According to Figure 7, the total adaptation finance spending in the bilateral, multilateral climate funds and private funding was around $286 billion USD between 2010 and 2022.

Figure 7: The total adaptation finance spending in the bilateral and multilateral climate funds , as well as private.

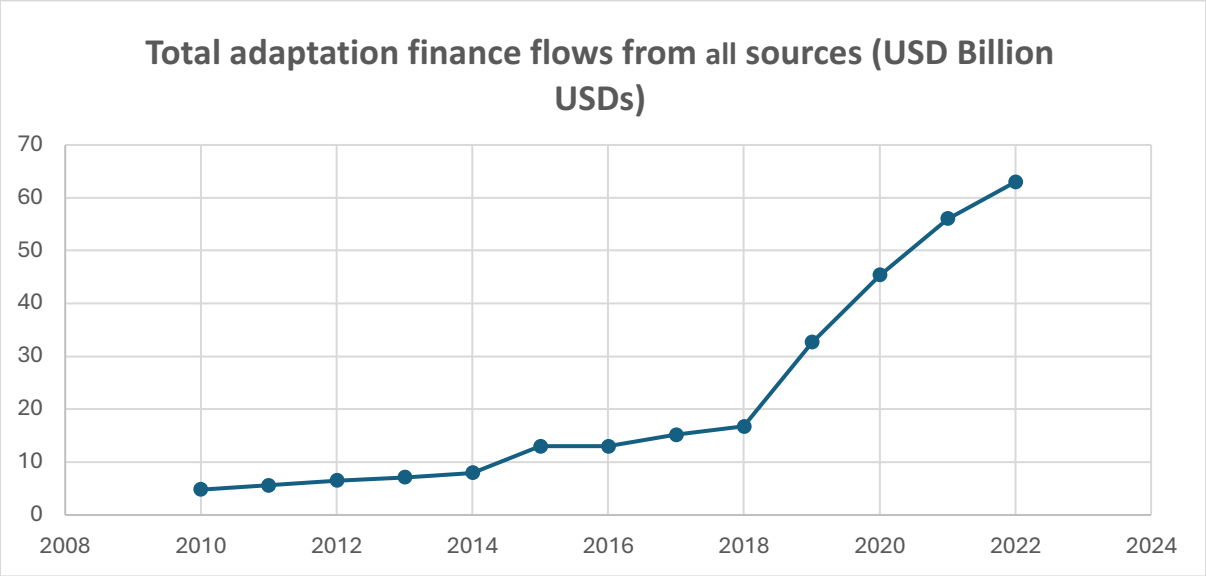


Figure 7: The total adaptation finance spending in the bilateral and multilateral climate funds.
Source: CPI Landscape report (multiple years) and CPI, GCA 2024 (Naran et al. 2022; Barrett 2022; Climate Policy Initiative and Global Center on Adaptation 2024).

These funds are administered by the established multilateral development assistance agencies, including the World Bank and the Global Environmental Facility (GEF), by the specialized UN agencies (such as UNDP, UNEP, FAO, UN-Habitat, and others) (Hall and Persson 2018), and by the UNFCCC financing organs, such as GCF and the Adaptation Fund. In addition,

the figure includes adaptation aid flows from the bilateral development assistance agencies and also by private sectors and by the national governments themselves.

The financing instruments utilized by these international donor agencies include grants, concessional agreements, equity contributions, and loan repayment guarantees. Grants are gifts of funds without a repayment obligation. Concessional loans are provided at less than market interest rates. Equity contributions are ownership interests in climate mitigation (most likely) or adaptation enterprises. Guarantees provide surety that a loan will be paid back to the financing mechanism if the debtor defaults, resulting in lower risk and, therefore, lower interest rates.

The Mekong Delta in Vietnam has been a focus of major donors from various international organizations and bilateral funds from several countries over the years. For instance, the major donors include Japan, Singapore, the European Union, the United States, and organizations like the World Bank and Asian Development Bank, focusing on projects related to building infrastructure, agriculture, climate resilience, and poverty alleviation. For example, from 2000 to 2020, Vietnam received significant Official Development Assistance (ODA) ranging from $1 to $4 billion USD annually. Of this ODA, approximately 10% - around $350 - $400 million USD per year – was allocated to Environmental Protection and Climate Change, which includes projects supported by GCF and the World Bank that specifically target flood resilience in the Mekong Delta (Mekong Plus 2024). Moreover, aid assistance to the Mekong Delta from 2011 to 2030 totals about $201 billion USD in loans and approximately $3,3 billion USD in grants. This funding supports 197 ongoing projects implemented by 28 Development Partners during this period (GIZ/MCRP and Mekong Delta Working Group 2022).

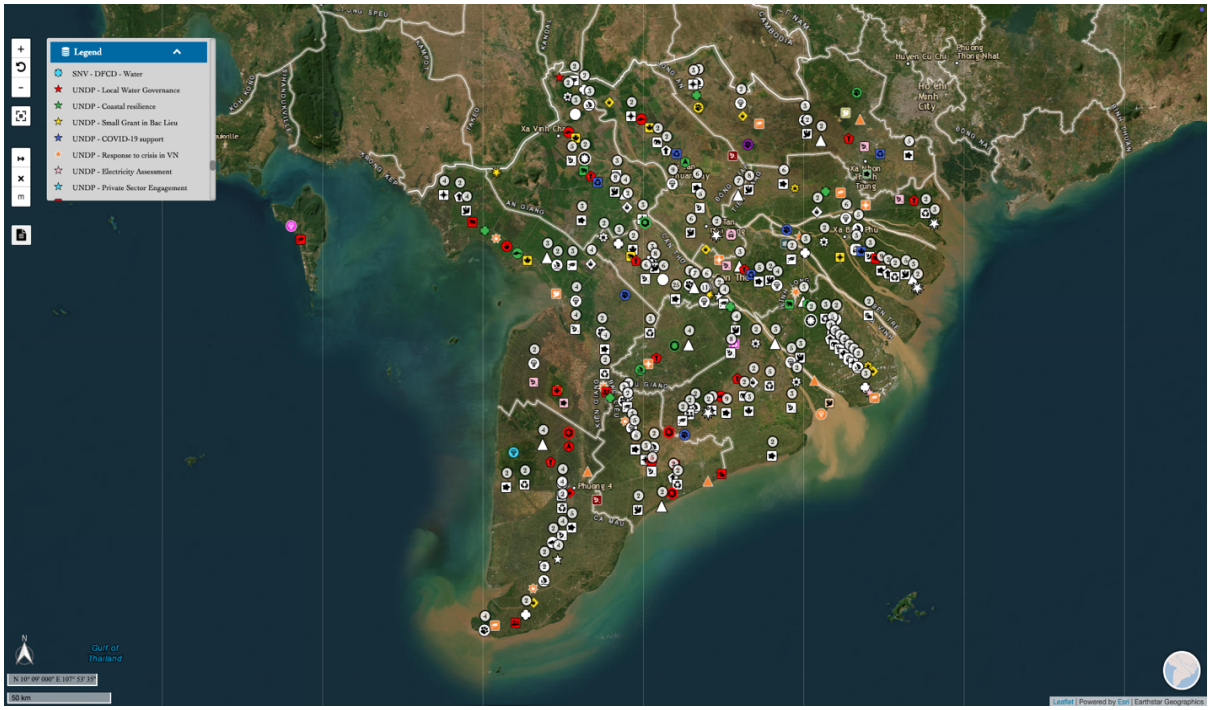


Figure 8: Catalogue of 28 Development Partners in the Mekong Delta.

Source: (GIZ/MCRP and Mekong Delta Working Group 2024) https://coastal-protection-mekongdelta.com/DP/Catalogue/WebGIS/index.html, accessed: 14 April 2025.

3.2 The Green Climate Fund

Dedicated climate grants originated at the Global Environmental Facility (GEF) when it was established independently of the World Bank to serve as the UNFCCC's financial arm during the 1992 United Nations Conference on Environment and Development. Since its formation, GEF has mobilized USD 24.75 billion USD in contributions from 40 donor countries over seven replenishment cycles. Of this, GEF had committed $4.9 billion USD by 2020 for initiatives related to climate change (Global Environment Facility, 2020). In 2001, the GEF was assigned by the CoP to manage three additional funds: the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF), and the Adaptation Fund (AF) (UNFCCC 2021a). The AF was specifically established to finance tangible adaptation efforts in vulnerable developing countries that are Parties to the Kyoto Protocol, with part of its budget derived

from a 2% share of the proceeds from Clean Development Mechanism project-certified emissions reduction sales (Adaptation Fund Board 2019).

Disenchantment with this arrangement led to the Green Climate Fund (GCF) being conceived at the Copenhagen CoP15 in 2009 with promises of an initial $100 billion USD and a charter to pursue innovative approaches to affect a "paradigm shift towards low-carbon and climate-resilient development pathways" (GCF 2022, 2), and a decided focus on helping the poorest nations. It was initiated as a mechanism designed to provide grants or loans to both public and private sector recipients while also generating funds through a "Private Sector Facility" (Bracking 2015).

The GCF is the largest multilateral climate finance organ, with total disbursements of just over $20 billion USD since inception, spread across its two tranches. It wasn't until 2015 that the GCF reached the required threshold of $5.5 billion USD in pledges necessary to start funding projects and programs in developing countries (Basak and Vinkhuyzen 2022, 140-141). As of September 2021, total pledges reached $10.3 billion USD, with over 70% of participant countries increasing their contributions. This replenishment constitutes a small fraction of the $100 billion USD annual climate finance commitment that was promised for 2020 and beyond and shows only a modest increase from the initial round of GCF resource mobilization in 2014. Notably, the United States, under President Trump, and Russia did not pledge any funding, despite previous commitments. That US boycott was partially reversed by President Biden but has been reinstated during a second Trump term. The GCF approved its first set of projects in November 2015. Since then, as of October 2021, the GCF Board has approved $10 billion for 190 projects aimed at benefiting countries across the Global South (McCarthy 2021).

The GCF is commanded by its charter to invest 50% of its resources in adaptation. By November 2020, the GCF portfolio had finally reached the goal of 50% allocation to adaptation

projects. Furthermore, half of the adaptation funding must be directed at especially vulnerable countries such as least-developed countries, small island developing states, and African nations (GCF 2022).

The GCF Board has implemented what it regards as a “rigorous” accreditation process to screen entities that are eligible to receive funds and implement projects and established fiduciary standards for them. As of November 2021, 113 entities had received accreditation from the GCF Board, with national and regional entities making up the majority of accredited entities (AEs) (GCF 2022). This marks a substantial shift, as the initial years of the GCF predominantly saw accreditation granted to UN agencies and regional development banks. The GCF focuses on the built environment, the energy and industry sectors, human livelihoods and health, land use, forests, and ecosystems. It operates through partnership arrangements with international and national commercial banks, multilateral, regional, and national development finance institutions, equity funds, United Nations agencies, and civil society organizations. The GCF can structure its financial support through a flexible combination of grants and concessional debt (Green Climate Fund 2024).

3.2.1 GCF’S FUNDING POLICIES AND PROCEDURES

The Green Climate Fund (GCF) distinguishes itself from other funding organizations by providing a combination of loans, grants, and equity financing. Unlike the Adaptation Fund, which primarily offers grants, GCF manages larger funding volumes, with approximately 40% of its resources coming from grants and loans, while about 10-15% is allocated to equity, mainly for private sector initiatives (Vickers 2024).

GCF's loans are offered at concessional rates lower than market interest rates but are expected to be repaid after project implementation. Equity financing is treated as an

investment where GCF takes stakes in innovative businesses tackling climate challenges, expecting potential profits akin to dividends for shareholders.

Additionally, GCF deploys innovative financial instruments such as guarantees, allowing for risk management in funding new business ventures, thus allowing startups to access essential capital for climate adaptation and mitigation projects. This financial approach was established at GCF's founding, as detailed in its governing instrument, and underlines a commitment to working with the private sector. While the 40% allocation for grants and loans is not fixed, GCF maintains a balanced funding strategy to avoid scrutiny or pushback, particularly from developing nations that may require more grants, especially in contexts where loans may not be feasible because of the low likelihood of repayment. Further insights into the internal logic of the GCF funding approvals were provided by the interview with Dr. Ben Vickers, the GCF official who oversaw the Coastal Resilience grant to Vietnam. Vicker's views are summarized below. Further details of that interview are in Section 5.1.

The connection between human activities and rising greenhouse gas levels, along with the consequent climate effects, is well established in the scientific community, despite the misinformation campaigns. While measuring the success of mitigation projects is straightforward, adaptation projects lack clear global metrics for effectiveness. At the GCF, success is gauged primarily by the number of beneficiaries, though this approach is not wholly satisfactory. For example, while one person might be saved from flooding, another might merely receive a brief educational benefit, yet both are counted equally.

It is vital for the GCF to ensure that its funding does not simply replace existing development aid but complements it. Projects seeking adaptation funding must demonstrate that GCF involvement is necessary; if they could also qualify for regular development

assistance, funding should come from entities like the World Bank or Asian Development Bank instead.

To evaluate adaptation projects, GCF's priority is first to verify a clear climate risk, such as increasing coastal flooding in a specific area. This data may not always be available, particularly in countries like Vietnam. In such instances, GCF makes its decisions using the best available resources, like local knowledge or government records, to gauge how climate phenomena, like changes in rainfall, affect productivity over the years. Impacts on ecosystems or communities must also be assessed; for example, areas like the Mekong Delta, facing rising flood risks and salinity that threaten livelihoods and habitats, require action. It is critical to identify any barriers that hinder adequate responses to these climate impacts.

If a government has sufficient resources to address issues, like saline intrusion in rice fields, GCF support may not be justified. Thus, the evaluation of adaptation projects centers on recognizing true climate risks, understanding their consequences, and identifying barriers that only GCF financing can address. The case for GCF funding of Vietnam's Coastal Resilience project is considered strong because it supplements local capacities that are insufficient to combat challenges such as saline intrusion and mangrove degradation.

GCF funding is not intended to cover all financial needs; rather, it aims to tackle specific barriers while expecting contributions from the Vietnamese government during project implementation. In poorer countries like Laos, GCF still seeks co-financing but anticipates a smaller contribution due to financial limitations. Ultimately, the effectiveness of GCF funding, along with any co-financing, depends on the scale of the problem being addressed (Vickers 2024).

3.3 Principal- Agent Interactions in the GCF Framework

The relationships between the GCF and the actors involved in its governance are crucial to its overall effectiveness and accountability. These relationships can be understood as a hierarchy of principal-agent interactions, with roles and responsibilities defined in various instruments. Basically, to understand the hierarchy of principal-agent relationships, one only needs to follow the flow of money, with the accompanying delegation or retention of discretion over various decisions as provided in those instruments.

At the top of the hierarchy are the sovereign parties to the convention, which serve as the sources of financing for the adaptation interventions. The UNFCCC Conference of the Parties serves as the ultimate "principal". The parties to the convention, through their periodic conferences, act as "principals," delegating specific responsibilities to the financing entities (e. g., GCF, AF, GEF), acting as "agents". These responsibilities include the monitoring and evaluation of project results (Lloyd and Oppenheimer 2014). These funding agencies have internal governance boards that have adopted decision-making mechanisms and processes.

In the case at hand, the CoP authorizes resources and provides direction to the GCF Board and oversees its operations to ensure that GCF policies and funding distributions align with the priorities and positions of the UNFCCC Parties. Thus, the GCF's governing Board is accountable to the CoP. The developing country board members, along with CSO representatives and officials from the UNFCCC Secretariat, have stressed the CoP's role as the "account holder" of the GCF Board. The GCF is required to report annually to the CoP and receives formal directives from it, which are documented in CoP reports (UNFCCC 2015). A comprehensive review of the UNFCCC's Financial Mechanism occurs every four years, designed to ensure compliance with CoP directives.

The GCF Board consists of 12 members from developing countries and 12 from developed countries participating in the UNFCCC, with one co-chair elected from each group. Board members serve three-year terms. Additionally, the Board's decision-making relies on a consensus approach. This composition was designed to address criticisms from developing nations and civil society organizations (CSOs) regarding donor influence over decision-making and fund allocation in other international climate funding mechanisms (Michaelowa and Sacherer 2022; GCF 2025). CSOs also contribute as official observers at GCF Board meetings and exert informal pressure to influence decisions that address the needs of the communities they represent. Each GCF Board meeting includes a representative from a developing country CSO and another from a developed country, alongside two observers from the private sector, one from a developing and one from a developed country. CSO representatives believe that they are answerable to other CSOs within their network and the constituencies they represent, including the direct beneficiaries of the GCF projects. They rely on informal channels, such as public criticism, to hold the GCF accountable.

The GCF Secretariat manages the GCF's daily operations and implements the policy decisions endorsed by the GCF Board. (In this respect, the Secretariat acts as the agent of the GCF Board). The Board also created sub-organizations supervised by the Secretariat. The GCF Board has established three distinct accountability units: the Independent Evaluation Unit (IEU), the Independent Investigation Unit IIU), and the Independent Redress Mechanism (IRM). These units aim to ensure accountability, manage risks, and evaluate the effectiveness of GCF activities. Additionally, an Independent Technical Advisory Panel was created to conduct impartial technical evaluations of funding proposals in relation to the GCF's investment criteria, and the GCF Accreditation Panel was implemented to review accreditation applications and assess the applicant's ability to meet the Board's standards. The Independent

Redress Mechanism evaluates adherence to policies and procedures, investigates GCF-funded projects and programs, and provides recommendations to the GCF Board to ensure compliance and address grievances. As of November 2021, this unit had received thirteen complaints and successfully resolved nine brought by Parties who felt adversely impacted by GCF activities or projects (Basak and Vinkhuyzen 2022, 148; Independent Redress Mechanism (Independent Redress Mechanism 2025).

Adaptation (and mitigation) projects are proposed by the Accredited Entities (AEs), which may include national governments, UN agencies, non-governmental agencies, etc. The financing agency acts as "principals," assigning responsibilities to "accredited entities" (AEs) as the implementing "agents" (Hall 2016). The GCF has established a "fit-for-purpose" accreditation system, which subjects entities perceived as higher risk (e.g., due to project complexity or size) to more scrutiny than lower-risk entities. Feedback indicates that the accreditation process remains burdensome for many smaller local implementing agents. This situation could potentially impact sustainability and national ownership if it results in a systematic tilt away from indigenous applicants from small island nations or lower-capacity nations in favor of larger foreign entities. The AEs often hire contractors and consultants who provide services, advice, assistance, and technical support, creating another "principal-agent" relationship.

At a somewhat co-equal level with the AEs in the hierarchy are the "Nationally Designated Authorities" (NDAs) appointed by the recipient governments. NDAs play a crucial role in ensuring that project proposals submitted to the GCF Board are aligned with national priorities. As agents for their respective governments, NDAs are not explicitly accountable to the GCF itself. Instead, they are accountable to the governments they represent, typically

operating within government ministries and reporting hierarchically to a minister or agency head.

In the early days of the GCF, numerous GCF Board members held dual roles as their country's National Designated Authority (NDA) or as part of their national delegation to UNFCCC CoP meetings (or both). This duality often stemmed from the limited capacity and resources available in developing nations. Individuals with experience in climate change are frequently recruited for multiple roles simultaneously. However, a Board member who also acts as an NDA may lack objectivity when evaluating project proposals for funding, given that NDAs often develop these proposals and thus have a vested interest (in relation to the GCF Board) (GCF 2025).

The AE and NDA form something of a partnership in both project formulation and execution. While the boards of the financing organs ultimately approve or disapprove the requests for adaptation funding, the actual selection, design, and execution of projects rest with the NDAs and AEs acting in concert. Together, they formulate project proposals and submit them for approval by the GCF board. Both the AEs and the boards of the financing bodies tend to defer to the desires of the governments that host the adaptation projects. Donors are concerned that their "investments" be "demand-driven" and that the host country possesses a sense of "ownership" of the projects to ensure durable results (Thwaites, Larsen, and Ronquillo-Ballesteros 2022, 380-402).

The role of the NDA is really quite indispensable, as the funding agencies uniformly are concerned that the projects they fund have the full endorsement of the recipient government. In the case of GCF, projects cannot be approved by the board without a "no objection" letter from the recipient government (Ben Vickers, Pers. Comm.). Thus, the adaptation projects they

propose are typically limited to those included in the NAPs that the parties are required to prepare under the UNFCCC.

The potential flaw in this approach is that national governments may not be well informed about the full range of strategy choices to include in their NAPs. The NAP of the Government of Vietnam, relevant to the case study for this thesis research (described in Section 4.1, below), functions as an uncritical compendium without providing a basis for selecting priorities or preferences. (We will see in Section 4.2, however, that other policy documents from the GoVN are strikingly progressive and innovative.) Ideally, the projects proposed for funding should be shaped by lessons learned through the evaluation of previous climate adaptation efforts, both domestic and foreign. In the view of this researcher, they should be informed by an understanding of what has worked in the past, what has not, and why.

If the proposal is approved by the board, a funding agreement is signed by the GCF and the AE. That instrument defines the extent of delegated authority from the GCF (the principal) to the AE (the agent). For instance, in the case at hand, GCF allowed UNDP in consultation with the Government of Vietnam to select the project sites for the Coastal Resilience Project. The AEs are responsible for actual project deployment based on the funding decisions made by the GCF Board. Although they can delegate project implementation to third parties, they must put in place measures to ensure adequate performance of sub-grantees, as AEs remain ultimately accountable to the GCF for the success of projects (GCF 2015). Developed country board members emphasize the necessity of holding AEs accountable. On the other hand, AEs may identify recipient countries as account holders, as AEs typically collaborate with recipient country government entities to develop projects and serve as implementation partners.

Several development assistance programs employ a concept of "results-based financing" (RBF), where the disbursement of funding depends on achieving pre-determined performance targets (Oxman and Fretheim 2009, 70). RBF alters the dynamics between the "principal" (the donor agency, such as GCF) and the "agent" (the AE), transferring the financial risk of non-delivery from the former to the latter (Sacherer et al. 2022, 296). This addresses the classical principal-agent dilemma, which arises when the principal delegates responsibilities to the agents but lacks complete information about the agents' actions and how those actions align with the principal's interests. We shall have occasion in later chapters to explore whether this is what we see in the relationship between GCF, UNDP, and the Vietnamese Ministry of Agriculture and Rural Development in the coastal resilience project in the Mekong Delta.

At the lowest level of the principal-agent delegation chain are the actors at the project site level who actually deliver the adaptation assistance. These include the local units of government who take instructions from the national agencies (the NDA or its affiliated departments), the contractors hired by the AE's, and, very importantly, the beneficiaries themselves, which may include households, farmers, enterprise owners and operators, and the local community as a whole. Views on how these actors are interrelated in the Coastal Resilience project can be found in the summaries of the field interviews in Section 5.5 and Appendix II.

These principal-agent relationships in the context of the case study are diagrammed below:

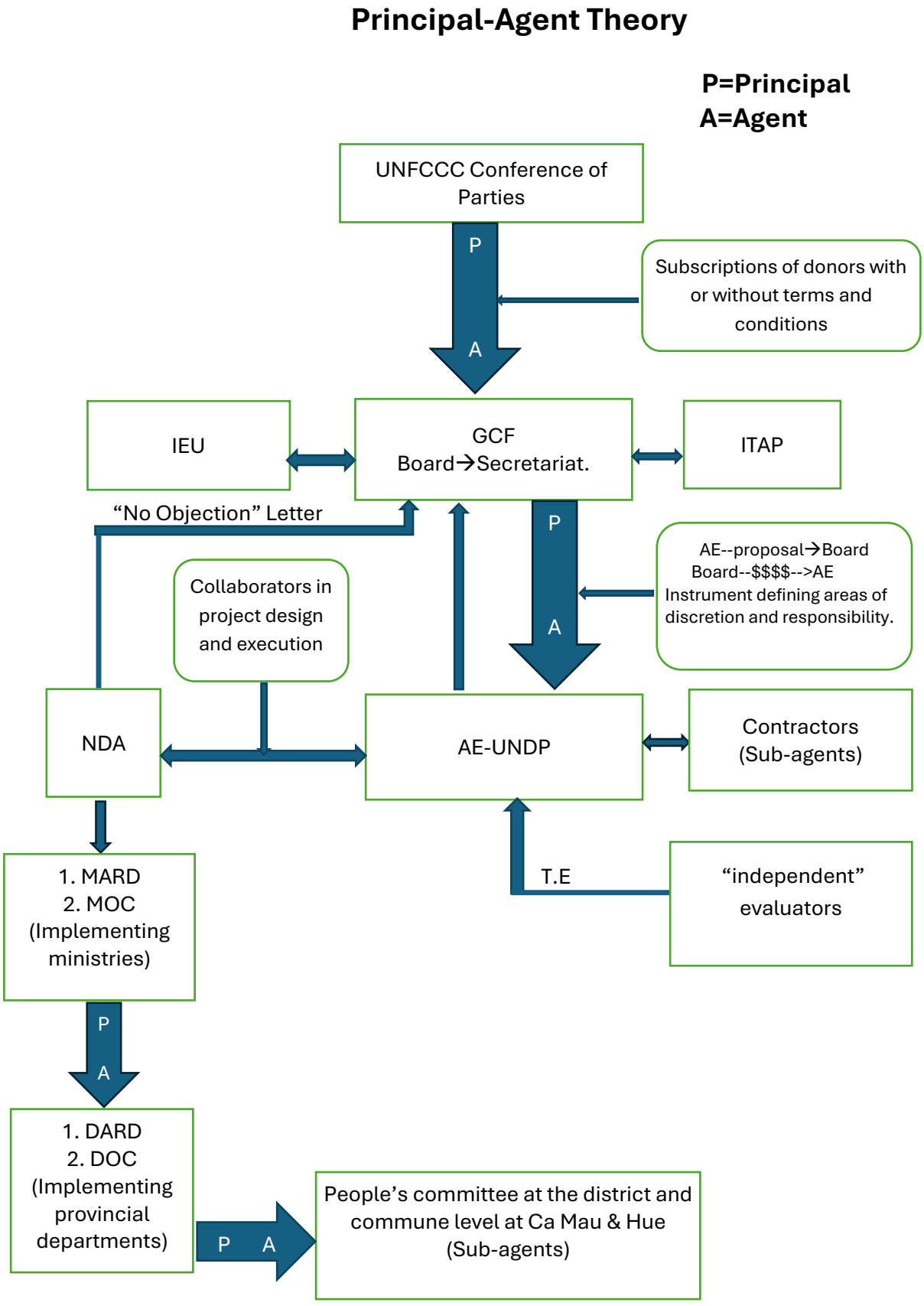


Figure 9: A diagram of the Principal Agent of the case study.

3.4 Observations on How GCF Processes Actually Work from Attendance at the 40th Board Meeting

During the week of October 18-24, 2024, this researcher was able to observe the functioning of the GCF institutionally at its 40th annual board meeting in Songdo, South Korea. This researcher was credentialed to attend and observe by an accredited civil society organization that advocates for gender-responsive policies in climate finance. This provided an opportunity to witness the interactions among the board, the GCF agencies, the accredited entities, and the civil society observers. Here are some of the observations:

1) A fair amount of tension was evident between the civil society organizations (CSOs) and the GCF board. This was apparent in how they interacted over a request the CSOs submitted to the board, urging the board to grant the CSOs an opportunity for prior consultations on pending funding proposals before giving them formal consideration or approval. This request was made in the context of the board's review of a proposal from GIZ (acting as the AE) for a huge ($105.1 million USD in GCF funds plus co-financing) reforestation project in West Kalimantan, located in the Indonesian part of Borneo (FP248). The CSOs opposed the project because they believed that the indigenous peoples were not adequately consulted on the project design. The CSOs argued that prior consultations would help prevent misunderstandings and avoid potential misrepresentations about the extent of the benefits of such projects. This assertion was disputed by a person who claimed to be a representative of the local community, who testified in favor of the project. The GCF's Independent Technical Advisory Panel (ITAP) also provided a favorable evaluation. The board then approved the project, notwithstanding the CSO opposition. The undercurrent this researcher discerned was that the board has more confidence in the opinion of ODA sponsors such as GIZ and in its ITAP than in the self-appointed CSOs.

2) It was apparent that some of the funds provided by the donor countries are returned to them through awards to their bilateral aid agencies, who are Accredited Agencies (or Entities), authorized to sponsor applications for funding for their projects. The GCF grants are also a major source of funds for inter-governmental organizations such as UNDP, UNEP, FAO, IFAD, the World Bank, and the Regional Development Banks, which would otherwise be reliant upon funds contributed by their donors (which are often the same national agencies that support the GCF, creating something of a zero-sum game). This raises the classic question as to how much of the GCF funding, or more generally, the other funding mobilized by the Paris Agreement, is truly additive to aid flows that would otherwise be provided by the official donor agencies to advance the Sustainable Development Goals (SDGs).

3) In a session on GEF financing of projects in Latin American countries, the Independent Evaluation Unit reported that a number of concerns were raised, which may (or may not) be symptomatic of more generic dysfunctions in the GCF approval process:

- Concerns about Access and Efficiency: Stakeholders have voiced worries regarding the accessibility of GCF financing and the efficiency of the processes in place, suggesting that existing frameworks may hinder participation.
- Prolonged Accreditation Processes: The lengthy accreditation times, averaging around four years, are a significant barrier for many entities trying to access climate financing, leading to disincentives for engagement.
- Under-Utilization of Resources: The evaluation indicates that there is a lack of a clear approach for the LAC region, resulting in under-utilization of the GCF's potential.
- Limited Co-Financing: The region receives less co-financing per dollar invested by the fund compared to other regions, raising concerns about the overall funding landscape.

- Involvement of National Designated Authorities (NDAs): Many readiness proposals are initiated by development partners with limited involvement from NDAs, highlighting a disconnect in local participation.
- High Indebtedness: The reliance on financial instruments like senior loans, which represent a significant portion of approvals in the region, raises concerns given the high levels of indebtedness among countries in the region.
- Complex Programming Process: The application and programming processes for accessing funds are described as complex, with issues such as language barriers, lack of contextual information, and inconsistencies in fund review processes.
- Gender and Indigenous Engagement: The portfolio needs to move from a gender-sensitive to a gender-responsive approach, and better engagement with Indigenous communities is required to address their needs effectively.

4) This observer witnessed essentially zero attention at the board meeting to the central question examined in this thesis: namely, what has the GCF learned from its post-project evaluation process that bears on how to improve the structure and effectiveness of climate adaptation initiatives under consideration by the board. There was essentially no discussion of the findings from the post-project feedback mechanism regarding the results of previous investments in climate adaptation measures and what these results can tell the board about where and how to invest in resilience in the future. This may be because there have been few completed projects, and therefore, the empirical record is currently too sparse. Climate adaptation *per se* is a new endeavor in the international development assistance arena, although, in actuality, much of what qualifies as adaptation resembles traditional economic development pathways such as reforestation, water conservation, and capacity building for

livelihood transitions. Or, it may be that the board is simply not making use of the feedback mechanisms it has established.

The lack of attention to what has been learned from experience may be about to change. At the board meeting, this researcher had the chance to interact with staff from the Independent Evaluation Unit about the thesis research and to explore how IEU envisions their role in the evaluations that the AE's are tasked to provide on GCF-funded projects. In response, IEU staff provided documentation not otherwise publicly available that was quite revelatory. These consisted of a "Synthesis Report 2023", which contains analysis and findings from a new IEU program called "Learning Oriented Real-Time Impact Assessment (LORTA)", which has been established to assist AEs in upgrading their monitoring and evaluation reports. It shows that GCF has become concerned about the failure of the evaluation process to provide sufficient value to the culture of continuous learning that GCF is committed to embodying. The LORTA Synthesis Report deems "the results of the evaluability assessment are alarming". Details of the LORTA program and its findings are discussed at length in Sections 6.3 and 6.4 of this thesis.

CHAPTER 4

HOW DOES THE COASTAL RESILIENCE PROJECT RELATE TO VIETNAM'S PLANS AND POLICIES FOR CLIMATE ADAPTATION IN THE MEKONG DELTA?

4.1 VIETNAM'S NATIONAL ADAPTATION PLAN FOR 2021-2030

Vietnam signed and ratified the Paris Agreement in 2016 and revised its Nationally Determined Contribution in 2020 and 2022. Endowed with a coastline of about 3,260 km and a maritime area of around 1 million km² (which includes more than 3,000 predominantly small and mostly uninhabited islands), Vietnam acknowledges its significant vulnerability to climate change. The country is home to two major alluvial deltas: the Mekong Delta, which encompasses Ho Chi Minh City, and the Red River Delta, which includes Hanoi; both of which are heavily populated and particularly at risk from rising sea levels (MONRE-GoVN 2022, 2).

As may be typical of such plans, this ~300-page NAP is an uncritical compendium of initiatives, perhaps intended to assure that nothing is left off the table rather than comparing alternatives or establishing priorities. Some of the concrete tasks that are proposed are particularly relevant to the initiatives in the Coastal Resilience Project. These include tasks relevant to mangrove protection, including pledges to "Protect 14.9 million ha of existing forest area, prioritizing the protection of mangrove forests" (MONRE-GoVN 2022, 75), including "Seaside land for mangrove regeneration" (Ibid., 101); and to "Improve resilience to natural disasters and the impacts of climate change in coastal areas" (Ibid., XXVII) with "Nature-based and ecosystem-based climate change adaptation (CCA) models" (Ibid., 149).

Other initiatives relevant to this thesis include: "Manage underground water extraction in areas affected by climate change and saltwater intrusion" (Ibid., XIV). This

would put the province of Ca Mau at the center of such initiatives, whatever they may be. "Encourage (by means not specified) the application of advanced science and technology to manage water resources sustainably" (Ibid., XIV), including (interestingly) "artificial recharge of groundwater basins"; "Strengthen transboundary cooperation to protect and prevent the depletion and degradation of water resources" (Ibid., 101), (hopefully including some unspecified efforts to reduce sediment trapping in reservoirs in Laos and China and curtailment of sand mining in the Mekong floodplains in Cambodia). Accomplishing these transboundary goals would require a degree of transboundary cooperation that is rare in the Mekong basin; Minimize erosion, drought, and saltwater intrusion, including "prevention of landslides, subsidence, and sea encroachment" (Ibid., XV). This may mean limiting sediment depletion from sand mining, which bears a causal relationship to erosion, subsidence, and saltwater intrusion; "Upgrade flood control, erosion prevention, and ocean protection infrastructure" (Ibid., 68-119); and "Build climate resilient housing for vulnerable communities in coastal areas which is nested rather incidentally in much more elaborate and extensive initiatives for urban infrastructure" (Ibid., XVI), none of which are very concrete or location-specific.

Notably, the NAP includes at least a nod in the direction of planning for the relocation of residential areas that are "frequently affected by extreme climate events", especially in places at high risk of "storms, floods, and storm surges, erosion of coastlines and riverbanks, or at risk of flash floods, land subsidence, landslides, and geological hazards". This text seems to signal an openness to "managed retreat" strategies in places where engineered solutions or "nature-based" solutions may not be efficacious. This allusion may be relevant to the concept of adaptive zoning of land uses discussed in Chapter 7 of this thesis. Construction of emergency evacuation centers and housing is also

mentioned as is implementing “post-disaster recovery and reconstruction programs, prioritizing areas with more damage and vulnerable groups”(MONRE-GoVN 2022:106).

The NAP estimates the financial cost for these (and other less relevant) climate change adaptation activities at 3%–5% of GDP, totaling USD 55–92 billion USD for the decade 2021-2030. Vietnam proposes to provide financing equivalent to 1.5% of its GDP, supplemented by about USD 2.75–6.42 billion USD per year from “the non-state budget”, that is, in contingent financing from international donors or the private sector, which aggregates to about $27.5–64.16 billion USD (Ibid., XXVI).

The NAP provides justification for these enumerated activities by reference to the natural and human resources that are at risk (MONRE-GoVN 2022). The NAP also contains interesting commentary on outmigration from the delta:

> The Mekong Delta region has the highest migration rate in the country, recorded at 8.3% in 2019, with nearly all migrants relocating to the Southeast region. * * * Climate change and environmental issues primarily affect migration patterns in agriculture. In discussions with local authorities and households in [the delta], it was noted that adverse climatic conditions have worsened over the past five years, particularly due to saline intrusion, droughts, coastal erosion, and heavy rainfall. This extreme weather has negatively impacted local economies and livelihoods, leading to increased migration as a response. (MONRE-GoVN 2022, 57).

4.2 The Climate Adaptation Vision in Vietnam’s Resolution 120

On November 17, 2017, Vietnam issued Resolution 120. In Vietnamese law, a "resolution" (Nghi quyet) refers to a formal decision to take action by the National Assembly or its Standing Committee. A resolution in Vietnam has legal status. It is essentially a mode of providing instruction to line agencies in a communist political system. Resolution 120 opens with a recognition that the Mekong Delta “is the largest agricultural hub in Vietnam, accounting for 50% of the rice crop, 65% of aquaculture, 70% of fruit, 95% of exported rice

and 60% of exported fish". It then acknowledges that economic development in the delta faces a great challenge because it is vulnerable to climate change and sea level rise, which "are occurring much faster than expected, causing extreme weather events and affecting people's livelihood and life". Significantly, the resolution recognizes that the problem is exacerbated by the construction of hydroelectric power plants in the upper riparian countries, which is causing changes in flows of water and reductions in sediments entering the delta with deleterious effects on fisheries resources, and salinity intrusion, which exerts negative impacts on the region's socio-economic development. It also acknowledges the serious "land subsidence, groundwater level decline, coastal encroachment and reduction in the area of natural forests, especially mangrove forests", and the "over-extraction of silt" resulting in an increased risk of erosion of the river banks, canals, and ditches which is undermining the housing in the delta (Vietnamese Government 2017, 1-2).

There is a sense of urgency in the Resolution. It finds that the government has been too slow in dealing with these problems and therefore calls for a "new vision" to be implemented in stages.

It envisions a doubling of forest canopy from 4.3% at the time of adoption to 9% by 2050. "Agricultural development will shift from a dominance by rice cultivation to a more diversified pattern determined by economic factors" (meaning, perhaps, market forces), and from quantity of production to quality". Cultivation practices will shift from the current reliance on "chemical-based agricultural production to organic and hi-tech practice[s]. This sector will move up the value chain by developing agricultural processing industries" (Ibid., 3).

Like the NAP, the Resolution contains several references to the concept of salinity zoning, as discussed in Chapter 7 of this thesis:

> The development models will adapt "to natural conditions" and be environmentally sustainable under the motto "living with floods, brackish water, and saltwater . . ." (Vietnamese Government 2017, 3).
>
> Besides freshwater resources, [the development pathway will] "regard brackish water and saltwater as natural resources for economic development. . . ." (Ibid., 4).
>
> Vietnam will "[e]stablish ecological sub-zones to orient the development of economy, agriculture and infrastructure (floodplain, freshwater ecosystem, brackish water, and saltwater ecological area, etc.)" (Ibid., 5).
>
> It will "[a]ttach importance to and mainly apply non-structural measures while structural measures are also well taken" (Ibid., 4-5).
>
> "The irrigation infrastructure will be developed in line with the climate-resilient agriculture" (Ibid., 3).
>
> Vietnam will formulate a new master plan for sustainable and climate-resilient development of the Mekong delta, which shall replace the phrase "sống chung với lũ" ("living with floods") with "chủ động sống chung với lũ, ngập, nước lợ, nước mặn" ("living with floods, brackish water, and saltwater"). (Vietnamese Government 2017, 3).
>
> Agricultural production will be structured "according to three focuses: aquatic products, fruit trees, and rice, in association with ecological sub-zones. Aquatic products (freshwater, brackish water, and saltwater) shall be regarded as key ones." (Vietnamese Government 2017, 2-14).
> To deal with the erosion problem in the delta, the Resolution would limit construction in high erosion zones adjacent to rivers, canals, and ditches and in the basins that drain floodwaters. (Vietnamese Government 2017, 5).

It is also interesting that the Resolution seems to give primacy to climate adaptation initiatives while also calling for climate mitigation through "the development of a low-carbon economy and green economy, and protection of natural ecosystems" (Vietnamese Government 2017, 4). Moreover, like the NAP, the Resolution foresees implementing the envisioned measures through transboundary cooperation and integration (Ibid., 5). This is significant because the sediment depletion problem that limits the potential for mangrove regeneration and causes massive erosion in the delta has its source in the upstream dams,

and the flow patterns that reach the delta are determined by upstream dam operations. These matters cannot be addressed without transboundary cooperation.

4.3 The GCF-UNDP Coastal Resiliency Project in the Mekong Delta

On June 8, 2016, the United Nations Development Programme (UNDP), an "Accredited Entity" to the GCF submitted a funding proposal to the Green Climate Fund denominated "FP013: Improving the resilience of vulnerable coastal communities to climate change related impacts in Vietnam" (UNDP-Vietnam 2016, 1-68). It is referred throughout this thesis as the "Coastal Resiliency Project". All of the information in this section has been extracted from that funding proposal:

The National Designated Authority was the Ministry of Planning and Investment, although the executing entities at the national level were the Ministry of Agriculture and Rural Development (MARD), together with the Ministry of Construction (MoC) and the Provincial People's Committees of the participating Provinces. The project concluded in July 2024.

The Coastal Resiliency Project consists of three components, two of which are relevant to this thesis: (1) regeneration of 4,000 hectares of coastal mangrove to provide storm surge buffer zones, and (2) storm and flood resilient upgrades for 4,000 new houses "benefitting 20,000 poor and highly disaster-exposed people" (UNDP-Vietnam 2016; Independent Evaluation Office (IEO), UNDP 2024). These components were implemented in seven coastal provinces of Vietnam, only one of which is located in the hyper-vulnerable Mekong Delta, the focus of this research, namely the Ca Mau Province at the southern tip of the delta. For contrast and comparison, field interviews were also conducted with project implementers and beneficiaries in Thừa Thiên Huế Province, which is located in the central coastal area of Vietnam. That site province was chosen because it provides a contrast to Ca Mau province

with respect to several physical characteristics, including sediment availability, groundwater extraction, and flood incidence. It was also selected because the local officials proved amenable to the conduct of field interviews by this researcher.

Figure 10: Figure 9: A diagram of the Principal Agent of the case study.
Source: Google Earth Map (Google Data SIO, NOAA, U.S. Navy, NGA, GEBCOLandsat / CopernicusIBCAOU.S. Geological Survey, TMap Mobility, Imagery from the dates:12/14/2015–1/1/2021 (Google Earth et al. 2021).

The maps above show the situation of the field work in the country of Vietnam (left panel). The sites for the mangrove and housing upgrades in Ca Mau Province are shown in the panel on the bottom right, one in Khanh Lam Commune in U Minh District to the north (resilient housing) and one in Vien An Dong Commune in Ngoc Hien District in the south (mangrove regeneration). Note the distance of the mangrove regeneration site from the shoreline. This is highly relevant to the analysis in Chapter 6. The site in Thừa Thiên Huế Province is shown in the upper right panel (both housing and mangrove regeneration).

As stated earlier, the delta is the most vulnerable area in Vietnam to the combination of sea level rise, extreme storm events, salinity intrusion, and flooding, and is therefore the region most in need of mangrove regeneration to serve as a buffer against the impacts of climate change. It is the part of Vietnam where "the mangrove forest, vital for coastal protection, [has] been [most] heavily depleted" (UNDP 2024, 19). The delta is also by far the most productive agricultural and aquacultural area in the entire country, as has been noted previously. It is somewhat curious in this regard that the only province in the delta that was included among the seven featured in the Coastal Resilience project was Ca Mau. While the funding proposal was not transparent about it, the likely reason that Ca Mau was selected is that it contains the only shoreline areas that continue to receive sediment deposition provided by the outflow of the Mekong River and transported by the ocean currents. As we shall discuss, mangrove regeneration along the shoreline requires a substrate of sediment (mud) which is not available to the shoreline of the other delta provinces due to the capture of such materials in upstream dams and the mining of the riverbanks for construction materials. Thus, the Ca Mau shoreline is the only good candidate for mangrove regeneration. And yet, ironically, the sites selected for mangrove regeneration in Ca Mau are actually well inland of the shoreline, as the map shows!

The total financing for the two relevant components amounted to $33 million USD, of which $23.6 million USD was provided by GCF in the form of non-repayable grants, and the remaining $9.4 million USD came from the Government of Vietnam (UNDP-Vietnam 2016, 3), also in the form of non-repayable grants (although a significant co-financing contribution was required of recipients of these grant funds for the housing upgrades, as noted in the summary of the field interviews in Section 5.5.1 below).

In justifying the project, the proposal to GCF pointed out that:

More than 500,000 residents of Vietnam live within 200 meters of the coast. Their homes are most often directly impacted by typhoons and other sever weather event as they make landfall as storm surges.

Extreme storm events linked to climate change have caused annual average disaster losses of 1.3% of GDP including the total destruction or severe damage of nearly 200,000 homes.

Climate projections also point to an increase in the probability of intense typhoons, or superstorms, accompanied by storm surges.

A recurrent and dominant theme of the funding proposal is the emphasis on poverty

alleviation for the most vulnerable populations:

At 23%, the poverty rate in coastal areas is more than twice the national average, in part due to the increasing losses incurred annually from climate-related disaster impacts.

The rural poor are at especially high risk, given their reliance on natural resources for their livelihoods, particularly in agriculture and fisheries.

Increasing numbers of predominantly poor and vulnerable people in coastal areas live in unsafe housing due to increased flooding and storms (UNDP-Vietnam 2016).

That is an important consideration in the evaluation of the effectiveness of the project in Section 6.2 of this thesis.

4.3.1 Mangrove Regeneration Component

Coastal mangrove forests play a critical role in coastal protection, acting as a natural buffer between the sea and communities, absorbing some of the impacts of typhoons and storm surges. Mangroves also play an important role in preventing coastal erosion. Therefore, where it is feasible, preserving and restoring mangroves is a “nature-based” option for enhancing community resilience to climate change. It is preferred over conventional hard infrastructure such as sea walls and dykes because it is less costly to construct and maintain, less likely to fail, and provides ancillary ecosystem benefits. However, in Vietnam, mangrove forests have been dangerously degraded, from 408,500ha in 1943 to only 59,760 ha in 2008,

due to unsustainable land uses like shrimp farming, urbanization, infrastructure development, and the growth of aquaculture plantations operated by local farming cooperatives and households (UNDP-Vietnam 2016, 5).

In the words of the Coastal Resilience Project funding proposal:

> In recent years, businesses and governments are seeing the enormous potential for natural infrastructure in the form of wetlands and forests, watersheds and coastal habitats to perform many of the same tasks as grey infrastructure, sometimes better and more cheaply. For example, investing in the protection of coral reefs and mangroves can provide a stronger barrier to protect coastal operations against flooding and storm surge during extreme weather, while inland flooding can be reduced by strategic investments in catchment forests, vegetation and marshes. Evidence from coastal adaptation practices in Vietnam and in the region further suggests that integrated solutions based on ecosystem services such as mangrove stands can serve as more effective means to protect communities from the increased incidence of storms. Although the government and partners have recently invested in mangrove rehabilitation efforts (and as such these are tried and tested pilot solutions), these still remain nascent in scope and require larger geographic coverage to reinforce and protect poor and marginalized communities living along the coastline. (UNDP-Vietnam 2016, 15).

The national government has made strides in halting the decline in mangrove forests and it aims to reforest 46,000 hectares of coastal forests—including mangroves, protect over 310,000 hectares of existing coastal forests, and rehabilitate poorly maintained forests. However, issues like monoculture planting and poor seedling quality have led to survival rates of only around 50% for newly planted mangrove forests. Regeneration costs are estimated at $800 to $1,000 per hectare (UNDP-Vietnam 2016, 62). This differs from fieldwork data indicating that the cost of replanting new mangroves is $2077 per hectare. and data collection as of $2100/ha). Recent pilot projects have introduced better techniques for mangrove restoration, such as diversifying species and increasing community involvement, resulting in survival rates exceeding 80%. These improved strategies aim to incorporate local livelihoods

into restoration efforts and will inform future government initiatives for sustainable coastal management (UNDP-Vietnam 2016).

Although some progress has been made in mangrove restoration, these efforts need to be expanded to adequately safeguard vulnerable coastal areas. Accordingly, this component of the GCF-funded coastal resilience project aims to restore 4,000 hectares of mangroves to provide natural barriers against storm surges while supporting local livelihoods (UNDP-Vietnam 2016; Independent Evaluation Office (IEO), UNDP 2024).

It is notable that the mangrove restoration projects in the Coastal Resilience Project in Ca Mau Province were integrated into shrimp farms, a choice that has implications for the assessment of efficacy in Section 6.2 of this thesis. See photo 4 in Section 5.6.

4.3.2 Climate Resilient Housing Component

Poor coastal communities in Vietnam face significant threats from recurring flooding, with approximately 60,000 homes damaged or destroyed each year due to storms (UNDP-Vietnam 2016, 2). Climate change is anticipated to exacerbate these conditions, pushing vulnerable families further into poverty. Current government housing programs are insufficient as they lack adequate standards to protect against storms. Many local authorities do not enforce proper construction regulations, and there is a shortage of training for flood-resistant building techniques. Consequently, impoverished families often live in inadequate conditions, increasing their risk during disasters. There is also an urgent need for informed site selection for new homes, as current risk assessments fail to integrate the latest data on sea-level rise and storm surges. Enhanced financial support, better site selection criteria, and utilization of local resources are vital to effectively address the vulnerabilities faced by coastal communities in Vietnam.

To address these issues, the Vietnamese government has launched a national program to help at-risk households build storm-resistant homes, led by the Ministry of Construction. Insights from an initial pilot program revealed that earlier housing designs featuring raised floors and flat roofs did not adequately address the increasing flood risks posed by climate change. Consequently, the Ministry of Construction has developed improved housing models with two-story structures and pitched roofs. Additional safety enhancements, such as concrete roofs and reinforced windows, are necessary but would raise the costs of the climate-resilient houses. The GCF-funded Coastal Resilience Project initiative aims to advance the Government of Vietnam program by providing co-funding for incorporating storm- and flood-resistant designs into housing upgrades for 20,000 individuals in disaster-prone areas, jointly by the GCF grant and the Government of Vietnam.

Figure 11: Flood Resistant Housing image in Thua Thien Hue.
Source: (People'sCommittee of Thừa Thiên Huế Province Project Management Board for GCF Against Climate Change 2019)

According to the funding proposal, the combined funding is intended to help families categorized as 'extremely poor' and 'poor' according to government criteria. It states that the selection process is designed to be transparent and to ensure support reaches the most vulnerable groups, which include: 1) Households of ethnic minorities; 2) Households with difficult living circumstances, such as those headed by senior citizens, single parents, or persons with disabilities; 3) Households that are living in remote and highly disadvantaged zones; and 4) Households located in the poorest districts (UNDP-Vietnam 2016, 7).

The selection of grant recipients is decided through consultations with village residents, assessment at the commune level, and then final approval at the provincial and national levels. Once selected, the beneficiaries are reviewed by a committee of stakeholders, and the results are publicly posted. Should concerns arise, community members are able to direct concerns to the commune for response.

Though flood history is considered, the current risk assessment process does not systematically include recently developed data on key risks such as sea level rise and extreme typhoon-related storm surges.

The funding proposal reflected that the mangrove and housing components are contemplated to work synergistically.

> Each output is critical to meeting the project objective. Implemented separately, the outputs would have a limited impact on building the resilience of coastal communities. For instance, mangrove rehabilitation will absorb some of the impacts of sea surges and typhoons . . . but the poor in sub-standard houses would remain vulnerable. Construction of flood and storm-resilient houses built on high-risk sites (without the integration of risk assessments) would inadvertently put already vulnerable people at continued risk. * * * Thus, the proposed GCF project will promote a transformational impact by enabling the GoVN to comprehensively tackle the issues at hand, resulting in an adaptation solution that will have significant long-term benefits for poor and marginalized communities. (UNDP-Vietnam 2016, 16).

While these grants are nominally available for extremely poor households, the grant amount is not sufficient to cover the total cost of the house. The additional financial burden places vulnerable households, particularly 'extremely poor' households, in a difficult position. Therefore, a concessional loan is also made available with a 3% interest rate per year from the Social Policy Bank, payable over 10 years, with a 5-year concession period. Recipients are not permitted to sell the property during the 10-year loan period. The loan repayment by recipients is further used as a revolving fund overseen by the government to enable replication of the approach to additional families.

Another consideration in accessing the grant funds is that recipients must have ownership rights to the land on which the climate-resilient house will be constructed. This requirement also has implications for participation in the program by the poorest members of the community, as became apparent in the field interviews. See Sections 5.5.1 in this thesis.

CHAPTER 5

EVALUATION OF THE COASTAL RESILIENCY PROJECT

The preceding section 4.3 summarized the representations regarding the Coastal Resilience Project that the applicants made to the Green Climate Fund in its Funding Proposal. These representations and the project's performance, in general, were subjected to "ground-truthing" through a series of interviews with entities that were involved in the implementation of the project, the local officials at the project sites, the project beneficiaries, and knowledgeable sources of expertise on climate adaptation in the Mekong Delta. The findings from these interviews are presented in this Chapter and in Appendix II.

The Coastal Resilience project was implemented in seven provinces along Vietnam's extensive coastline. How these were selected is illuminated to some extent by the responses in the interviews. It may appear curious that only one of these provinces is in the Mekong Delta region, even though there is broad agreement that the delta is the area of Vietnam most vulnerable to climate change. That is Ca Mau Province, which was the focus of the first set of interviews. As discussed in Section 5.3, the reason this province was chosen as a site for the implementation of the project, and the six other coastal provinces in the delta were not simply because it is the only delta province in which the necessary physical conditions exist for successful mangrove regeneration in the coastal area. This fact is quite central to the findings and conclusions in this thesis, as the following chapters shall reveal.

The second province that was selected for the field interviews was Thừa Thiên Huế. The results of this fieldwork in Thừa Thiên Huế contrast with those found in Ca Mau in significant ways that reflect the differences in the physical settings and in the aqua-cultural

conditions. Two of these are most important: First, as we have seen, Ca Mau Province (and the rest of the delta provinces) are substantially deprived of sediment outflows to the shoreline environments due to capture in upstream dams and sand mining in the Mekong River, which greatly limits opportunities for mangrove regeneration. In Thừa Thiên Huế Province, three rivers flow into the lagoon area seaward of the ancient capital of Thừa Thiên Huế, where the mangrove restoration took place. While there are dams on the tributaries to these rivers, which do capture sediment, apparently, there is still enough flowing into the lagoon to maintain the mudflats needed for mangrove cultivation. This is probably because these drainage basins receive the highest rainfall of any area in Vietnam, which causes high-levels of erosion. Second, Ca Mau is a large shrimp farming area. This also affects the potential for mangrove regeneration in interesting ways that are discussed in this chapter. Finally, and related to shrimp cultivation, Ca Mau is suffering from significant areas of land subsidence due to groundwater pumping, which is not evident in Thừa Thiên Huế Province.

Summaries of the field interviews are rather lengthy and somewhat repetitive. These are compiled in Appendix II for those readers interested in the details. Section 5.5 summarizes the interviews with the intergovernmental organizations (GCF and UNDP), the NGOs, and the bilateral aid agencies. The findings distilled from all of the interviews are presented in Section 5.7, below.

All interviewees were presented with consent forms. Those signed by the interviewees who agreed to attribution of their responses are compiled in Appendix II. It is important to state, however, that some asked to remain anonymous to speak openly and candidly regarding a project that has official standing with the Government of Vietnam. Individual sources of information are revealed in these summaries to the extent of permission granted.

5.1 Interview of the Green Climate Fund

According to the analysis of fieldwork interviews conducted with the leading GCF official overseeing the Coastal Resilience Project, Ben Vickers (signature of consent form verified in Appendix III), the salient outputs and the key findings are as follows:

The process and criteria for site selection

This thesis raises questions about the efficacy of the sites selected for mangrove regeneration in the Coastal Resilience Project. Vickers indicated GCF does not involve itself directly in project site selection as it leaves this to the Accredited Entities, such as UNDP in this case, which often consults with local authorities in the selection process. The justifications, including the criteria and explanation for site selection, are supposed to be included in the funding proposal so that GCF can evaluate them. The proposal for funding should constitute a complete feasibility analysis. The GCF requirements for such methodologies are becoming more demanding over time. GCF's role is primarily to review the work done by the grantees to ensure quality; it allows the grantees and their local government partners to handle project execution.

The host government's consent to the project is crucial. As noted in Section 3.2, a "No Objection Letter" (NOL) from the National Designated Authority (NDA) is required, as it signifies governmental support for the project. The NOL is issued only after the NDA conducts thorough due diligence on the project documentation. Without this letter, GCF cannot finance initiatives in the country. The NDA is assumed to operate at a senior level and collaborate closely with various ministries and the Prime Minister on climate change matters. It thereby plays a significant role in shaping the country's climate change strategy and securing external funding. Once the NDA approves a project, its involvement is usually concluded, with the AE (in this case, the UNDP) managing the project implementation.

In the case of the Coastal Resilience Project, the NDA was the Ministry of Planning and Investment, but the executing agencies were the Ministry of Agriculture and Rural Development (MARD) and the Ministry of Construction (MoC). Their provincial and district-level sub-agencies, in particular, remained active in implementing the project. The interview with MARD is presented below.

THE RATIONALE FOR APPROVING THE COASTAL RESILIENCE PROJECT IN VIETNAM

Vietnam is considered a middle-income country which has shown significant progress over the past 30 years. Funding for projects in Vietnam must take into account that the government has both the resources and capacity to address various issues. If the government is not taking action, it raises questions about potential technical, institutional, or capacity-related barriers rather than financial constraints. The expectation is that the Vietnamese government will provide co-financing, especially since any existing barriers are likely related to these non-financial factors.

In Vietnam, specific coastal regions are being prioritized for funding due to their financial constraints, with the realization that the GCF does not have sufficient resources to address the issues at the national scale despite widespread coastal challenges. The GCF aims for projects, like mangrove ecosystem restoration, to achieve tangible results that can be recognized and replicated by the national government rather than trying to upscale the project itself.

THE RELATIONSHIP BETWEEN MINISTRIES AND THE LOCAL AGENCIES INVOLVED IN THE COASTAL RESILIENCE PROJECT

Vietnam's government structure is highly centralized, with authority concentrated at the national level and decision-making primarily controlled by the Communist Party of

Vietnam. The planning system operates through five-year plans, similar to China, which can hinder flexibility and responsiveness to local priorities. Changes in local development plans often require higher-level approval, making it difficult for communes to deviate significantly from district-level strategies.

Consequently, many development projects face challenges in implementation due to a lack of bottom-up engagement, favoring a predominantly top-down approach. This governance structure may promote stability but can also stifle change and project progress. Vickers recounts his experience working for the Dutch Development Agency (SNV) nearly two decades ago in the City of Hue, Vietnam, where they encountered significant delays in a forestry development project due to national government disagreement with the proposed implementation strategy, resulting in two years without expenditure. In another instance, Vietnam lost approximately $2 billion USD by not approving memorandums of understanding with international organizations, prioritizing their governance approach over financial assistance (Guarascio and Vu 2024).

GCF Concludes that the Coastal Resilience Project in Vietnam was very satisfactory and effective in terms of the value achieved for the money spent

GCF monitors financial expenditures for the projects in its portfolio to ensure that they align with the terms of the contracts. For the monitoring, GCF relies on dedicated portfolio managers to track fund utilization and compliance. Their primary focus is on assessing the results of mitigation and adaptation initiatives. They do this by trying to quantify the benefits and beneficiaries while acknowledging challenges in verifying the benefits. Vickers was satisfied with the results of the Coastal Resilience project, finding that the restoration efforts played a crucial role in reducing risks from coastal erosion, saline intrusion, and natural disasters while benefiting local populations through improved crop productivity.

GCF regards mangrove restoration as both an adaptation and a mitigation project. Thus, GCF evaluates its carbon reduction impacts. Vickers believes that UNDP demonstrated transparency in its reports to the GCF, despite some delays in data reporting as UNDP refined its methodology. A trusted scientist was hired to improve reliability in reporting (Vickers 2024).

Observations of thesis researcher: It is notable that this interviewee from GCF made no mention of the limitations in achieving the project objectives that are apparent from other interviews (as itemized in Section 5.7), presumably because the post-project evaluation process failed to acknowledge them. The only constraint in upscaling the adaptation measures that Vickers notes is merely the financial limitations.

5.2 Interview of the UNDP as the Project Implementer

The interview with UNDP was conducted in Hanoi on September 23, 2024, with the project manager, Mr. Vu Thai Truong (signature of consent form verified in Appendix III), and members of his staff who were responsible for budgeting, site selection, and funding allocation across all seven coastal provinces.

UNDP selected the sites and determined the funding allocation based on government requests and assessments of community needs, with consideration of vulnerable communities, including poor households and ethnic minorities. Seven provinces were chosen, but not all the project elements could be completed satisfactorily in all seven without additional funding. In making siting and allocation decisions, UNDP had the benefit of expertise and strategic support provided by other entities, including the Japan International Cooperation Agency (JICA), the German GIZ, intergovernmental organizations (unspecified), and the government of Vietnam. The focus of the project emphasized assistance primarily

directed to “poor and near-poor” households, households headed by women, and ethnic minorities. UNDP registered its satisfaction with the project’s outcomes, as it exceeded some of its targets, notably in housing support and disaster management systems.

However, the UNDP mentioned some challenges and areas of the project needing improvement, including recommendations for streamlining administrative processes to avoid delays in project approvals, extensions, and implementation. The interviewees also mentioned the need to make climate risk_insurance available to people. In sum, the interviewees expressed pride in the project’s accomplishments and acknowledged areas for procedural improvements in future initiatives (Vu Thai et al. 2024).

THE EFFECTIVENESS OF THE PROJECT

The UNDP staff applied the following effectiveness criteria and made the following findings:

1. Exceeding Targets: The project successfully exceeded some of its initially set targets, such as delivering nearly 4966 houses compared to a commitment of 4,000 and supporting 4028 ha of mangrove restoration compared to a commitment of 4000 ha. The model developed for the climate-resilient house can be replicated in other provinces facing storm surges and flooding.

2. Community Impact: By focusing on vulnerable groups, including poor households, ethnic minorities, and women-headed households, the project has made significant contributions to building resilience in coastal communities.

3. Increased local Capacity building: continued emphasis on building local capacity through training and knowledge sharing will ensure long-term sustainability and resilience.

4. Challenges acknowledged: While the project faced challenges, particularly with lengthy administrative process, ongoing adjustments and recommendations suggest a commitment to refining the process for future projects.

The disadvantages associated with the project included:

1. Lengthy administrative procedures: one significant drawback was the extended administrative process involved in the project's execution and requests for extensions, which caused delays.

2. Need for better communication: There is a need for clearer and more streamlined communication and documentation processes between involved parties to improve understanding and coordination.

3. Limited Focus Despite Achievements: while the project exceeded some targets, it could benefit from an expanded focus on additional vulnerable groups, such as people with disabilities, which was mentioned as a future consideration.

4. Resource Constraints: Although entities like JICA provide valuable expertise, the lack of direct funding from such partners limited the scope and scale of the project.

5. Reliance on Government Programs: Dependence on existing government programs that have previously underperformed created a risk in meeting certain targets.

In concluding the interview, this researcher inquired of the UNDP representative his view about what would have happened in Vietnam if the GCF funding had not been available. He responded that while the GCF support was very helpful, it may not have been indispensable. In his view, the coastal resilience work would have proceeded under Vietnam's NAP regardless, as the Vietnamese government would have sought aid from other donors or would have funded the activities independently. This implies that Vietnam possesses adequate resources to meet its development objectives (Vu Thai et al. 2024).

5.3 Interview of Vietnam Ministry of Agriculture and Rural Development (MARD)

The interview was conducted with an impressive young staff member of the Vietnamese Disaster Management Authority (VNDMA), a unit of MARD, in Hanoi, on 7 January 2025. The bulk of the interview with Ms. Thai Ming Huong is included in the compilation in Appendix II. However, her reflections on the future of climate adaptation for the Mekong Delta are worth quoting verbatim in her own excellent English. At the end of the interview, she related the following "Mekong Delta's story from long ago", as she put it:

Vietnam believed that it needed to alter the Mekong River Delta, which is well-known for its rice cultivation. To achieve this, Vietnam implemented several measures to prevent saltwater from entering the mainland, constructing irrigation infrastructure such as seawalls and floodgates.

However, Vietnam has recently realized that these efforts have not been effective; the more complex infrastructure the Vietnamese government builds along the Mekong River, the more severe the resulting disasters, like land subsidence, saltwater intrusion, and drought. People now believe the government should approach delta management cautiously, as history has shown that when the government did nothing in the past, they still achieved good harvests of rice. Yet, the more interventions we make in the Mekong River Delta today, the worse the disasters become, leading to significant suffering among the population.

As a result, Vietnam is now considering a new, nature-based approach that minimizes intervention in the Mekong River. The Vietnamese government is especially cautious with any projects involving the Mekong Delta, particularly those funded by the World Bank. Because the World Bank projects often involve significant funding tied to infrastructure construction, the GoVN is concerned that extensive alterations to the Mekong River delta could lead future generations to bear the consequences of their current decisions. Thus, while the government continues to prioritize the river for economic development, they must be very careful about any actions they take regarding the Mekong River delta. (Thai Minh 2025).

5.4 CONSTRAINTS, LIMITATIONS AND CHALLENGES ENCOUNTERED IN CONDUCTING FIELD INTERVIEWS

This researcher encountered practical difficulties common to foreigners doing fieldwork in Vietnam that condition the information gleaned in the field interviews in significant ways that are important to lay out in some detail before presenting the findings. To appreciate the difficulties, one must understand the broader political context. The Socialist Republic of Vietnam is a single-party autocracy which tightly controls political dissent or criticism. Vietnam, like its communist neighbor, the People's Republic of China, is currently increasing scrutiny and imposing repressive measures on research and reporting that these governments view as potentially fomenting criticism or expressing dissent against the government. This is particularly apparent with regard to the government's performance in the environmental and

human rights arenas, and particularly with respect to activities by foreign researchers and reporters.

In recent years, there has been a substantial increase in the repression of environmental activism, particularly as it relates to the management of its natural resources, including its response to climate change. The once-thriving environmental NGO sector in Vietnam operated under the assumption that environmental issues were non-political, which allowed for a certain degree of freedom. Nevertheless, as these organizations began to express views contrary to government positions, they faced increasing scrutiny and suppression. Today, activists face significant threats to their safety and sometimes even to their lives.

To illustrate with a case in point, on June 17, 2022, the New York Times reported on the case of Ms. Nguy Thi Khanh, one of Vietnam's most prominent environmental advocates, who was arrested and sentenced to two years in jail on trumped up tax evasion charges for advocating a reduction on coal-fired power generation. Ironically, the arrest came after the GoVN agreed to most of her reduction proposal (Sui-Lee 2022).

In the case of this researcher, the challenges, complications and limitations to conduct meaningful field in Vietnam derive from Decree 41/2016/ND-CP which stipulates that "foreign organizations and individuals conducting scientific research in the internal water and territorial waters of Vietnam must be permitted by competent State authorities of Vietnam". This researcher is a foreign national (a citizen of Lao PDR) and the topic of research is specifically related to Vietnam's management of its domestic and marine water resources in the face of climate change, so the research conducted for this thesis is arguably subject to this permit requirement. But these permits are hard to get and can take up to a year to obtain.

In practice, one way around the permit requirement is for the foreign researcher (e.g., the author of this thesis) to affiliate with a Vietnamese academic or research institution and carry out the research under its auspices, in which event that academic unit becomes responsible for supervising the researcher and reporting to the national security bureau. It was helpful in this regard that this researcher is fluent in the Vietnamese language.

The author's first such arrangement with Can Tho University in the Mekong Delta took much time and effort (and money) between May-August 2024 to put in place. However, it fell through when the international affairs office of the university decided that this researcher would have to negotiate a university-to-university formal memorandum of understanding between Can Tho University and Johns Hopkins University, something that would have been unrealistic to expect a student to be able to accomplish, and quite impossible within the timeline for this thesis.

That effort having failed, this researcher was finally able to get an arrangement in place with the Center for Vietnam and Southeast Asian Studies (CVSEAS) under the University of Social Sciences and Humanities in Ho Chi Minh City (a/k/a Saigon). This is part of the Vietnam National University. Under this arrangement, the host university had to request written invitations from the provincial and local officials in the two provinces, allowing this researcher to conduct the interviews. Like so much in an administrative state like Vietnam, such an invitation is hard to obtain without some personal connection between a university official and the local officials. This researcher was very fortunate to have had a previous professional relationship with the former director of CVSEAS, Professor Lam, a distinguished emeritus professor who was willing to serve as this researcher's mentor. Due to his position and reputation, he was able to obtain the necessary invitation letters from the proper officials in both Ca Mau and Thừa Thiên Huế Provinces. Additionally, consent forms and a set of

questionnaires were sent to the local government officials and to the interviewees beforehand. These questions had to be cleared by the local International Relations Department and the local security officials. Pre-submission (in Vietnamese) also enabled the interviewees to prepare for the interviews.

Even with the local permissions, however (or perhaps because of them), significant restraints were imposed on this researcher's conduct of the fieldwork, which have implications for the results. In Ca Mau, Professor Lam and this researcher were subjected to tight surveillance by the local police and security personnel. From the time we arrived until the time we departed, three policemen shadowed us everywhere—in the hotel, the car to the meetings, during the interviews, and even during meals. The policemen did not allow this researcher to view the mangrove restoration sites actually involved in the project (although this researcher was able to view mangrove plantations elsewhere) or areas where land subsidence was occurring. These local officials hand-picked the persons that this researcher was allowed to interview, both the government officials and the local families who were beneficiaries of the climate resilience project. Only six representatives of the local families were selected for the interviews in Ca Mau province (and they appeared to be relatively prosperous and not clearly representative). The same constraints were encountered in the Thừa Thiên Huế interviews (except the local security police did not surveil the activities). And, the provincial level officials in Thừa Thiên Huế refused to meet with this researcher, notwithstanding compliance with all the requirements for requesting permission, apparently because this researcher is a foreigner (albeit a citizen of another ASEAN country under a communist government!).

While these officials controlled the conduct of the interviews, in the main, their supervision did not interfere with this researcher's line of questioning, except for three

notable instances:

(1) When this researcher asked whether the local government officials received anything of value from the grant funds for overseeing the activities funded under the project, this researcher was told that that subject was “not important” and “unnecessary”, raising the suspicion that the security officials were nervous about the inquiry touching upon corrupt practices.

(2) Secondly, the local officials also steered the interview away from inquiry into groundwater pumping and resulting land subsidence (the relevance of which will be discussed later in this thesis). That activity is known to be widespread among farmers and is at least nominally illegal without a permit.

(3) Finally, this researcher especially wanted to see the mangrove regeneration sites to gain an idea of how successful they appeared to be, but was denied permission to go there “for your own safety”.

All these interactions were friendly and non-threatening, but also quite firm.

To assure accuracy, transcripts of the interviews were sent back to the interviewees for their review and confirmation. After completing the fieldwork, this researcher followed up with additional questions with the local government officials and contacted families involved in the project via phone.

5.5 Findings from Field Interviews in Ca Mau and Thua Thien Hue Provinces

The interviews conducted in Ca Mau and Thừa Thiên Huế are in a limited way a window on the effectiveness of two examples of climate adaptation measures as applied in the real world. The premise of this thesis is that efforts to cope with climate change are necessarily experimental, and this researcher has characterized the Mekong Delta as a “learning

laboratory" for assessing the efficacy of climate adaptation efforts in highly vulnerable and productive delta systems. From these lessons, conclusions can be drawn as to their scalability and replicability in similar settings around the world. With these objectives in mind, this section seeks to draw some conclusions from the field interviews that bear on that learning process. More complete summaries of the interviews are set forth in Appendix II. This section distills the salient findings and conclusions.

On the positive side, what was revealed in the field interviews was a high level of satisfaction with both the process and the results on the part of the entities that delivered the assistance and on the part of the beneficiaries. All of the Vietnamese governmental units registered high satisfaction from the national level (MARD) to the provincial, district, and community levels (the People's Committees at the commune level). The field interviews did not assess the level of satisfaction of those who did not benefit because they were not eligible. As noted, this researcher was not permitted to access the voices of these members of the community. The voices that were heard should not be assumed to be representative of a cross-section of residents of the project sites.

5.5.1 Climate Resilient Housing

While the accounts were not entirely consistent, basically it seems that the eligible beneficiaries received 80 million VND in grants (about $3300 USD), half from the GCF and half from the GoVN for the housing upgrades. The amount of funding provided to each household seems to depend on their poverty category. The levels officially recognized are displayed in the tables below:

Figure 12: Poverty Levels Recognized in Vietnam

Levels of Poverties in Vietnam	Explanation according to the Vietnam PM Decision No. 48, dated: 28/8/2014
Level 1	Families with difficulties such as inadequate employment or families with large numbers of children and families who live in mountainous areas with ethnic minority populations.
Level 2	families categorized as "poor" who live in coastal communities.
Level 3	families categorized as "near poor" who live in the lagoon area of Hue and families that are approximately 10 km from East Sea.

Figure 12: Poverty levels recognized in Vietnam.
Source: (Prime Minister Office, Government of Vietnam 2014).

Figure 13: The Amount of Funding Provided Per Each Level of Poverty in Vietnam

Level	Funding from GCF 2018-2022 (USD)	Funding from GoVN (2018-2022)	Funding from GoVN (2024)
1.	$1700 = 40 million VND	16 million VND	40 million VND
2.	$1700 = 40 million VND	14 million VND	40 million VND
3.	$1700 = 40 million VND	12 million VND	40 million VND

Figure 13: The amount of funding provided per each level of poverty in Vietnam.
Source: (Prime Minister Office, Government of Vietnam 2014; UNDP-Vietnam 2016).

For the housing selection, the recipients were allowed to choose between five to seven designs that best matched their family circumstances, climate conditions, cultural preferences, and, importantly, the costs they could bear. They also received technical assistance in choosing a design and procuring the necessary construction materials and services to erect the buildings. Some of the interviewees in Ca Mau indicated that the funding

was actually disbursed directly to these providers to avoid the possibility of misuse of the funds.

The households that received the financial and technical assistance for housing upgrades were quite satisfied in both project settings. One universal complaint, however, was that the actual cost of construction was often substantially higher than the assistance provided by the donors. With the rising cost of construction materials, and in some cases, the high costs of delivering them to remote locations, the costs were often closer to 120 million VND vs. the 80 million VND provided by the project. To be able to take advantage of the financial assistance, the householders had to be able to pay the difference themselves, either from their own savings or from loans from friends or family, or from the "Social Policy Bank". This institution established by the GoVN offers nearly interest-free or concessional loans at a rate of 3% per year over a 10-year period for poverty alleviation purposes. However, of course, these loans had to be repaid by the borrower.

Some interviewees suggested that the grants were purposefully set at a level that would require an investment by the householder so as to assure that it had some stake in the success of the endeavor. The other obvious reason for the conservative limits on grants was simply to make a limited fund go further. The practical effect, however, was that some otherwise eligible householders were excluded from the benefits because they could not meet the cost-share requirement.

Another barrier to participation in the program by the poorest and most vulnerable segment of the population was the requirement that, to be eligible, the householder must have a certificate documenting ownership rights to the land they occupied. Land ownership was also a requisite for obtaining a bank loan. These requirements are understandable from the perspective of the GoVN, which wanted assurance that the beneficiary would not be

evicted from the house it helped to finance. More generally, the GoVN wanted to avoid creating conflicts between the landowner and those living on the land, which the government would be unable to resolve. It is also understandable that the bank would want the lender to have collateral to secure repayment of the loan. However, the practical effect of these barriers to participation in the program was that the poorest segment of the population, the landless and most economically disadvantaged, were excluded. These also tend to be the people who occupy the lands most at risk of flooding or suffering from extreme weather events. For example, the project in Thừa Thiên Huế province left out some families living in the areas that are prone to flooding several times per year. Some of them are old and live alone as the younger people have moved to the cities.

The main point is that the poorest of the poor and the most vulnerable to the flooding that is exacerbated by climate change were excluded from the resilience benefits of the Coastal Resilience Project. This reality stands in stark contrast to the objectives stated in the funding proposal to give priority to the most vulnerable.

Dr. Wyatt at the International Union for Conservation of Nature opines, however, that the desperately poor are today quite a small fraction of the population. Vietnam has actually done a remarkable job in bringing these people out of poverty. Indeed, the land distribution that the government has made in Ca Mau province, in particular, has been to these landless people. And land tenure arrangements have been liberalized in recent years. In the past, the leasehold terms provided by the government were too short for some segments of the population to be able to obtain bank loans because the collateral value of their leasehold was not sufficient. Now, these lease terms have been extended so that loans are now possible for housing investments or shrimp pond investments for a larger fraction of households (Wyatt pers. comm. 2024).

While the government is working on other ways to assist the landless people, no program is yet in place. In certain areas, the local governments established a land fund, a portion of which can be allocated to support poor individuals, but this is not widespread across the country.

The Vietnamese government agencies involved in the project were concerned with spreading the benefits as broadly as possible. In making decisions on allocating the budget for households, the GoVN follows several steps. First, it establishes eligibility criteria and submits them to the local authorities for review. It then assesses all the households in the area to determine how many meet the established criteria. The GoVN then sets priorities, as the budget cannot accommodate all families. Criteria assign point values to establish these priorities. For example, households headed by single women be allocated a specified number of points. These criteria need to be clearly communicated to all parties involved to ensure a sense of equity and fairness. When the criteria are transparent, conflicts are less likely to arise.

In Ca Mau, the project implementation process requires a careful review of residents' eligibility and identification of available land. The household must possess land suitable for house construction and capable of supporting a residence for at least 30 years without conflicting with other uses. This land should also be situated in locations where building a home will not interfere with national projects or land set aside for future development or as part of a national forest. This process begins at the commune level, with the list of candidates subsequently presented to the district level.

In Thừa Thiên Huế, the housing benefit was targeted at poor families whose homes are located in vulnerable flood-prone areas near the Tam Giang lagoon and the seashore and less than 1.5 meters above current flooding levels. That selection criterion was based on Directive

48 from the Vietnamese Prime Minister's office (Directive 48/2014/Q Đ-TTg, dated: 28/8/2014), (Prime Minister Office, Government of Vietnam 2014). In the selection of the families to receive benefits, local People's Councils facilitated discussions to determine eligible households, culminating in a submitted list for district-level verification. After the families were approved, the funding was allocated directly to the approved families, bypassing intermediaries to streamline access. Families were tasked with hiring builders, but the project paid the builders directly to ensure that funds were not diverted and that the construction complied with standards (Le Hoai et al. 2024). However, in the case of Thừa Thiên Huế, the fund was directly handed to households, and the households were responsible for hiring a contractor to build the house by themselves soil (Ho Cong and Nguyen Dinh 2025).

In both provinces, the interviewees expressed the opinion that the vulnerable households that could not qualify for housing upgrades were placated by the expectation that future projects would be implemented to alleviate their climate risks. But in Ca Mau, one interviewee pointed out how challenging that may prove to be. Many of the residents who did not have land certificates or did not have the means to provide a cost share occupy lands that are particularly vulnerable to storms, floods, and erosion (Le Thi 2024). It does not make sense to spend money to upgrade these houses. But that leaves this researcher to wonder what a future remedy might look like. It may be difficult to relocate these residents to less vulnerable locations. As the interviewee pointed out, approximately 70% of rural populations rely on natural resources, mostly fishing, for their livelihoods (Le Thi 2024). Although some areas have been designated for resettlement, many families return to their previous homes as their livelihoods are tied to those locations.

The eastern region of Ca Mau, faces severe erosion problems raising concerns about the erosion risks for existing housing. Approximately 30% of families live near the river and coastline in Ca Mau, placing them in a vulnerable and impoverished situation. In the last five years, the coastline has receded about 100-200 meters (Karlsrud, Vangelsten, and Frauenfelder 2017). When families lose their land to erosion, government compensation is only available for losses related to government projects, not for those caused by erosion.

Whether this has implications for the decisions that have been made on the site criteria for the housing upgrades was not entirely resolved by the interviews. Apparently, in both locations, siting decisions were made to avoid building upgraded houses on riverbanks or levees due to the erosion problem. Indeed, this researcher learned in the interviews in Ca Mau that there is a local regulation that new houses cannot be built within 100 meters of levees due to the risk of levee breaches from erosion. Also, construction on the shoreline is strictly prohibited, and building on dikes or on reclaimed land is not permitted for the same reasons (Le Hong et al. 2024). Also, mangrove forests are typically protected areas where permanent housing construction is prohibited by regulation.

However, it was not clear from the interviews whether the officials factored into their consideration the probability of erosion acceleration in the future. For example, in Ca Mau, where land subsidence is progressing, building houses where land depressions are likely in the future would be unwise. Subsidence due to groundwater extractions is not a problem in Thừa Thiên Huế, however. There, freshwater from the rivers is abundant for agriculture and rural residents. In the urban areas, freshwater is reliably provided by the local water utilities. Another curious feature of the housing upgrades from the perspective of this researcher is that the new housing designs essentially involve building a two-story structure on a higher foundation than the original house in flood-prone areas. This requires a large foundation to

prevent flooding during high-water seasons. But the expense of foundations depends on their height. The expectation of the housing designers seems to be that if the floods or storm surges exceed the height of the new foundation, the flood waters would just inundate the first floor of the new house, allowing the residents to move up to the second floor for safety. The first story would nonetheless suffer significant flood damage and clean-up efforts. This is obvious from the photos of the new houses in Section 4.3.2.

Another obvious alternative would be to just put the new house on stilts or piers sunk well into the ground so that the flood waters would not enter the house at all. This approach is widely employed for housing along the Mekong River in the flood-prone areas of the Mekong River in Cambodia and Laos, for instance. The recommendation to elevate the houses on piers so that the floodwaters cannot invade the lower floor of the house was discussed in the interview with the district officials in Thừa Thiên Huế. However, the local government official said that constructing houses on piers would cause the cost to more than double compared to building a high foundation and filling the foundation with soil (Ho Cong and Nguyen Dinh 2025). But this researcher questions that assertion. In the areas of the Mekong just mentioned, entire villages are on stilts, and these are exceedingly poor villages. This matter, therefore, remains a mystery not resolved by the interviews.

5.5.2 Mangrove Restoration

GCF, UNDP, and MARD staff all reported satisfaction with the mangrove regeneration component of the Coastal Resilience Project. Yet, it is hard to gauge the satisfaction of the beneficiaries of the storm buffering effect. The basic purpose of the mangrove regeneration was to protect the landward community from the effects of coastal erosion, extreme storm events, and salinity intrusion from them. However, individualized beneficiaries are not clear.

However, the GoVN efforts go beyond just planting mangrove forests; they also worked

on developing livelihood models that teach residents how to benefit from the mangroves. This approach is deemed to be beneficial in ensuring the project's long-term sustainability. Arguably, the local laborers hired to plant the mangroves were also beneficiaries as they earned an income from the work. In Thừa Thiên Huế, at least, the project officials hired a contractor to perform the replanting, and this firm apparently did the hiring. It is not clear whether the necessary labor was sourced locally. With effort, these livelihood training beneficiaries and job beneficiaries could be identified, but these individuals were not among the beneficiaries selected by the local officials for this researcher to interview.

Indeed, there is some tension between mangrove regeneration and livelihoods in the same area. In Thừa Thiên Huế, for instance, some of the families interviewed indicated that they felt that the lagoon area where mangrove regeneration was taking place already had as much mangrove as it needed for climate protection. The mangroves actually interfered with the spreading of their fishing nets.

Figure 14: Mangrove new planting in Thua Thien Hue
Source: (People's Committee of Thừa Thiên Huế Province Project Management Board for GCF Against Climate Change 2024).
On the left panel shows the sediment augmentation in process. The right panel shows the mangrove restoration competing with an area where the fishermen want to spread their nets.

In Ca Mau, where shrimp farming is a major land use, there was some tension expressed over the percentage of land area that should be planted with mangroves and the percentage that was allowed for the shrimp ponds. The regulations specified a 60-40 ratio in favor of the mangroves, but the farmers often only provided 50-50, and the ratio was hard to enforce. The reason for the mixed cultivation approach is that the GoVN wanted to plant mangroves without displacing the shrimp farmers, which constitute the main livelihood opportunity, and also wanted farmers to act as the custodians of the mangroves to protect them from illegal exploitation. But the balance is rather unstable. The farmers are allowed to harvest the mangroves for charcoal production when they reach a certain age and size (typically around 12-15 years), which gives them a financial incentive to conserve the mangroves. But the right to harvest also includes an obligation to replant the mangroves, and that takes a large chunk out of the profits. It is also quite labor-intensive to dig the old roots out of the ground and prepare the soil for the new plantations. Also, the leaves from the mangroves falling into the shrimp ponds are a nuisance. They deplete the oxygen as they decompose and so must be dredged from the ponds. On the other hand, the trees provide shade that reduces the salinity concentration in the ponds due to evaporation, which is a benefit. But the main tension is simply that shrimp production is far more lucrative than mangrove harvesting. So, the more area devoted to shrimp, the better, from the standpoint of the farmer (Wyatt, pers. comm. 2024).

In Ca Mau, the local officials made some suggestions for improvement in future project design. One point was that, in future projects, a higher priority should first be given to livelihood support in the form of technical training to enhance shrimp farming skills and expand livelihood options beyond just shrimp and crab farming to include raising other fish and shellfish. In the view of these interviewees, offering such skills training to community

members would incentivize them to take greater interest in forest protection, promoting a balance between economic development and ecological awareness.

5.5.3 Contrasts Between the two provinces

Ca Mau and Thừa Thiên Huế (Hue) Provinces exhibit notable differences in terms of geography, environmental management, economic activities, and challenges related to their suitability for climate adaptation measures. Contrasts relevant to the case study are these:

Geography and Environment

Ca Mau: Located at the southern tip of Vietnam, Ca Mau is characterized by its coastal environment, abundant mangrove forests, and a complex delta ecosystem. The region faces significant issues with coastal erosion, especially on its eastern coastline, while the western coast benefits from sediment deposition. This unique geography influences the type of environmental management strategies adopted, including reforestation and erosion control efforts.

Hue: Situated in central Vietnam, Thừa Thiên Huế is known for its historical significance, cultural heritage, and mountainous terrain, which distinctly differs from Ca Mau's flat delta landscape. The region has a more temperate climate compared to Ca Mau, which has a tropical monsoon climate, affecting vegetation types and agricultural practices.

Sediment Availability

For the purposes of this thesis's analysis, the most important difference between the two settings is the availability of sediment to provide and maintain the mudflats required for successful mangrove plantations.

Ca Mau: Regenerating mangroves along the shoreline in Ca Mau and the rest of the delta is problematic because of the severe depletion of sediments now flushing out to sea from the Mekong River for reasons treated at length in Section 5.7.1. This greatly reduces the opportunities for mangrove regeneration. The shoreline that continues to receive sediment deposition sustains mangroves naturally and does not need climate adaptation project assistance (Wyatt 2024). The other areas are suffering from coastal erosion at such a rate that new plantations are not able to survive. Additionally, the inland coastal areas are also experiencing erosion of river and canal banks at an alarming rate, undermining structures that are built nearby.

Hue: Sediment reduction is also evident in the rivers that reach the mangrove regeneration site in the lagoon in Thừa Thiên Huế due to dam construction in the upper reaches, but it is not as severe as in Ca Mau. The Tam Giang lagoon seems to have enough silt and sediment inflow to maintain mangroves, especially during times of high rainfall. The percentage of survival is reported to be 85% by those interviewed. However, others pointed out that the sediment base for mangrove planting is supplemented through slurry pipelines from a sediment bank that has been established. The sediment layer is around 0.8-1.0 meters above the high tides. But the total cost of replenishing the sediment base is quite expensive, around $459,128/22 ha or ($20,000/ha) (People's Committee of Thừa Thiên Huế Province Project Management Board for Global Climate Fund Against Climate Change 2024). Hence, it is probably not practical to upscale this model for mangrove planting to other places.

FLOOD

***Ca Mau*:** The vulnerability to flooding is less severe in the central or northern areas of the delta. In fact, the floods in the Mekong region provide benefits by delivering nutrients to the

land. As a result, the local population has adopted a mindset of coexisting with floods and enjoying the benefits that these floods bring. But in the coastal areas of Ca Mau the floods tend to be more damaging than benign.

Hue: Floods tend to be a major hazard as Thừa Thiên Huế is the recipient of the heaviest rainfall runoff in Vietnam. As usual, it is the poorest people who occupy the lowest-ying and most vulnerable areas.

LAND SUBSIDENCE DUE TO GROUNDWATER PUMPING

Ca Mau: Land subsidence is becoming a significant problem in Ca Mau as groundwater is pumped to dilute saltwater intruding from the sea. This creates zones of depression where flood waters accumulate, making them unsuitable for building climate-resilient housing. The problem is already widespread and is increasing without an end in sight (Minderhoud et al. 2019, 202).

Hue: Thừa Thiên Huế has ample freshwater from the rivers as this is the area of Vietnam that experiences the greatest amounts of rainfall. Hence, groundwater pumping does not take place and land subsidence is not a problem.

ENVIRONMENTAL PROJECTS AND MANAGEMENT FOCUS

Ca Mau: The province emphasizes reforestation, specifically of mangrove regeneration, targeting areas with dead or harvested forests to restore carbon reserves and create carbon credits. Initiatives, such as the Green Climate Fund (GCF) project, aim to integrate eco-friendly practices with local economic activities like shrimp farming. The document outlines challenges such as significant coastal erosion, the need for infrastructure to protect against wave action, and managing local communities' livelihoods while promoting reforestation.

Hue: The Coastal Resilience Project mainly focused on funding resilient housing against flooding and storm surges to vulnerable people along the lagoon and seashore. Also, the project aims to promote sustainable agriculture involved in planting new mangroves for 22 ha to preserve ecology, prevent storm surges and flooding, provide ecosystem refuge for extinct fish species, and support ecotourism for Thừa Thiên Huế province.

Economic Activities and Livelihoods

Ca Mau: The economy heavily relies on aquaculture, particularly shrimp farming, which poses challenges due to diseases and environmental impacts. The push for balanced ecosystems is reflected in local policies that encourage a mix of forestry and shrimp farming.

Hue: Economic activities include agriculture, tourism, and handicrafts, focusing more on traditional methods and cultural preservation. However, the economic strategies are not centered as heavily on agriculture as in Ca Mau.

Challenges and Societal Impact

Ca Mau: The challenges outlined, such as severe land erosion, depletion of groundwater, and ecological risk from aquaculture practices, heavily impact local livelihoods and necessitate governmental and communal strategies to mitigate these issues. Community involvement in forest management is crucial, but financial incentives are necessary for sustaining these practices amidst economic pressures.

Hue: The challenges that Thừa Thiên Huế faces from climate change are primarily from flooding and storm surges affecting houses and agriculture-aquaculture, but these may not be as acute as in Ca Mau.

The fieldwork conducted in Ca Mau and Thua Thien Hue Provinces revealed both similarities and differences between the two provinces, as summarized in Table 03 below:

Figure 15: Summary of the similarities and differences drawn from the fieldwork in Ca Mau and Thua Thien Hue

Provinces /Aspects	**Ca Mau**	**Thua Thien Hue**
Geography & Environment	Ca Mau is located at the southern tip of Vietnam. It's characterized by its coastal environment, vastly-reduced mangrove forests, and a complex delta ecosystem. The region faces significant issues with coastal erosion, especially on its eastern coastline, while the western coast benefits from sediment deposition.	Hue is located in central Vietnam and distinctively different from Ca Mau's flat delta landscape. Hue has a tropical monsoon climate affecting vegetation types and agricultural practices.
Mangrove	80% chance of survival	80% chance of survival
	Severe reduction in sediments due to upstream dams in the Mekong basin.	Modest reduction in sediments due to dams on upstream rivers.
	GCF supported 224.19 ha of mangrove regeneration. (Price for replanting new mangrove cost $2077/ha)	GCF supported only 22 hectares of newly planted mangroves. (Price for new planting costs $20.000/ha due to necessity of building new mudflats.
		(Less mangrove areas because it obstructs the local people harvesting fish in the Tam Giang lagoon).
	Poor and vulnerable people with the lack of land title ineligible to receive the housing support.	Poor and vulnerable people with the lack of land title ineligible to receive the housing support. (But, local government tries to reduce the number of vulnerable families by providing land and housing.

Economic Activities and Livelihoods	Economy heavily reliant on aquaculture, particularly shrimp farming mixed with forest restoration.	Economy includes agriculture, tourism, traditional and cultural preservation.
Land subsidence	Yes, because of groundwater extraction.	No, because no groundwater extraction.
Coastal erosion	Yes	No

Figure 15: Summary of the similarities and differences drawn from the fieldwork in Ca Mau
Source: composed by the author.

5.6 Interviews and Reports Provided by NGOs and Bilateral Aid Experts

The most useful, credible and knowledgeable information regarding the coastal resilience challenges facing the delta and the performance of the Coastal Resilience Project was provided by experts from two large, well-known, and respected International Non-Governmental Organizations (NGOs) dedicated to natural resource conservation and from the Deutsche Gesetlschaft fur Internationale Zusammenarbeit (GIZ) GmbH (hereafter "GIZ"). GIZ is an international development service provider owned by the German Government. GIZ provided the GoVN with a "Mekong Delta Integrated Regional Plan" (the Mekong Delta Master Plan), which was formally adopted by the GoVN on June 20, 2022 (covering the period 2021-2030).[2] GIZ is one of the most technically proficient and influential aid agencies working the Southeast Asia on development assistance. This researcher also interviewed the coordinator of the Climate Change Working Group (CCWG), which is also comprised of NGOs and aid agencies.

[2] That Master Plan is not summarized in this thesis because the relevant parts were largely adopted from Resolution 120, which is summarized in Section 4.2.

The principal NGO consulted was the International Union for the Conservation of Nature [3], whose membership includes both governmental and non-governmental organizations. IUCN is regarded not as an advocacy organization but as a source of balanced and non-partisan policy and technical expertise. IUCN, for instance, hosts the scientific body that maintains and updates the "Red Book" of endangered and threatened species under the UN Convention on Trade in Endangered Species (CITES). The other prominent NGOs included the World Wildlife Fund (WWF) and the Climate Change Working Group (CCWG). The work of WWF in the Mekong Delta focuses on enhancing community livelihoods and aquaculture. CCWG is comprised of "international NGOs, academia, government bodies, and climate experts that share knowledge and advocate for the involvement of civil society organizations (CSOs) in climate policy planning and implementation".

All of these entities provided their information freely and candidly with the understanding that it would be used in this thesis, but, as of this writing, only IUCN has agreed to direct attribution in this thesis. Accordingly, the thesis makes extensive reference to the opinions and information provided by Dr. Andrew Wyatt, the Deputy Head of the Lower Mekong Sub-Region at IUCN and an encyclopedic source of expertise on climate adaptation efforts in the Mekong Delta. Dr. Wyatt proved to be the most knowledgeable, experienced, and forthcoming in the several interviews and data portals he provided. Inputs from the other interviewees is reported anonymously to avoid compromising their working relationships with the GoVN given its sensitivity to investigations regarding environmental issues or the government's performance with regard to them. Notably, the input from these other NGO interlocutors was consonant with Dr. Wyatt's input.

[3]Because it has both governmental members and non-governmental members, it is difficult to classify. It operates as both a research organization and an advocacy organization, to the extent that membership consensus allows. It is accredited to participate in fora not otherwise open to NGO advocates.

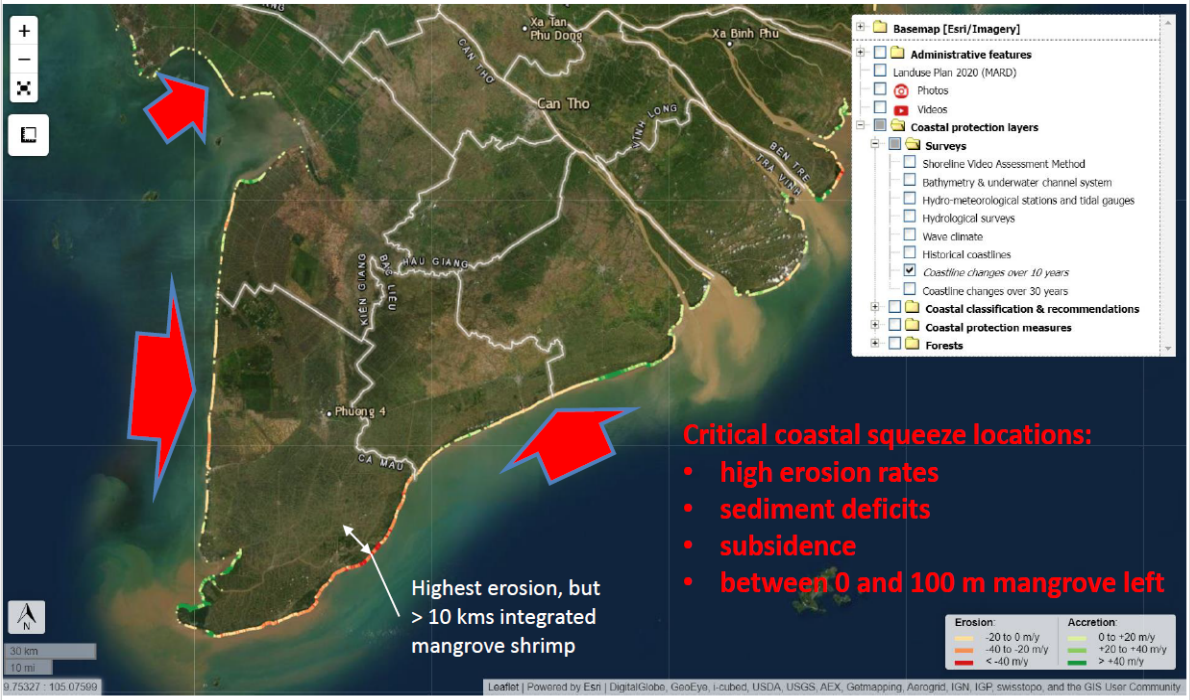
The interviews with the NGOs covered only mangrove regeneration not resilient housing. The questions posed to all these interlocutors related to how successful the mangrove regeneration activities of Coastal Resilience Project actually were in counteracting the expected impacts of climate change in the Mekong Delta. The purpose of the interviews was to compare these inputs against the official post-project evaluation conducted by UNDP (through contractors hired for this purpose). The comparison can be found in the next Chapter 6.

According to Wyatt, climate adaptation work has been going on in the delta for at least 20 years, and many millions of dollars have been "wasted" on projects that do not survive. Most fundamentally, in these previous projects as well as the Coastal Resilience Project, there is a lack of appreciation that sediment deposition is essential for mangrove survival. Now with sediment depletion occurring in the Mekong waters that discharge into the ocean, the substrate (mudflats) needed for successful mangroves are no longer being deposited. Both the dams and the sand mining are removing the coarser material from the river flow which is the heavier fraction that will settle out and provide the substrate.

The Ca Mau Province contains only 1/3 of the Mekong Delta coastline, but it may be the only part of the delta that is suitable for the regeneration of mangroves. Basically, the bathymetry and the ocean currents are causing both sediment erosion and aggradation to occur on opposite sides of the Ca Mau peninsula. Ocean currents have made the southwest Ca Mau an accretion zone for a fraction of the sediments that do continue to make their way to the South China Sea. But, in the opinion of Wyatt, these are places where mangroves are naturally regenerating anyway. These areas, while not large in extent, do not need man-made interventions. The other shoreline areas where the mud deposition is sufficient for mangrove restoration tend to have low population densities, raising the question of whether the

considerable expense of mangrove afforestation in those areas would be worth the expense, as there is not much to protect. Thus, there continue to be some mudflat areas to work with, but even in Ca Mau, the potential is limited. The easy projects have already been done by a variety of agencies. Future projects will be more challenging.

The net result is that the Ca Mau experience is not readily transferable to the rest of the delta because the rest of the delta coastline lacks mudflats due to erosion by the coastal currents. In fact, sediment depletion has allowed massive erosion of the areas where mudflats formerly existed. Where mangroves previously existed on the seaward side of sea walls, they have not survived because they have been squeezed between the rising sea levels and the physical barriers to upland retreat. IUCN refers to this as the "coastal squeeze" phenomenon, as depicted on the map below (Wyatt 2022).



http://coastal-protection-mekongdelta.com/

Figure 16: Showing the coastal squeeze areas in the Mekong Delta.
Source: Ministry of Agriculture and Rural Development, VNDMA (MARD-VNDMA 2024). (The original of the tool was created by GIZ). Accessed: March 05, 2025 (https://coastal-protection-mekongdelta.com/)

In the other shoreline areas to the east (like Bac lieu and Soc Trang Provinces), where a mangrove buffer is sorely needed, sediment deposition requires the construction of barriers from the sea that allow the smaller amounts of fine sediments that are transported by the ocean currents to settle out and create the muddy soil conditions needed for mangrove regeneration. Here, there has been experimentation with bamboo "T" fences to create these barriers. Using these materials is advantageous because they are much less expensive than concrete seawalls. However, these experiments have not proven to be successful because, due to sediment depletion in the Mekong flows into the sea, about three years of silt deposition are needed before the mangroves can be planted. But the seawalls constructed of natural materials only last a year before they have to be rebuilt. Previously, when the Mekong sediment discharge was not depleted by upstream dams, one year was sufficient for the deposition of sufficient substrate.

Where sea walls have not been or cannot feasibly be constructed, they are too expensive to build and maintain, and it is obviously not feasible to regenerate mangroves behind them. This characterizes the majority of the delta shoreline as well as the vast coastal area of the rest of Vietnam. WWF estimates that they cost $1.7 million USD per km and only have a 3-4 year lifetime before they need to be repaired or replaced. They have also proven to be largely ineffective in protecting the coast from extreme weather events and even from routine coastal erosion.

Also, the lands behind the sea walls are often privately owned (or, more accurately, subject to long-term leases from the GoVN). These are called "red book" lands. These private landholders are resistant to yielding their lands to mangrove reforestation. There are also "green book" lands behind the sea walls, which are set aside as nominal forest preserves. Here, the government retains the land use rights, but individual families are allowed to

establish residences. As a forest conservation arrangement, they are even permitted to harvest the mature mangroves and sell them for charcoal production in exchange for acting as stewards of the mangroves under terms allowed by the government. They are allowed to use 40% of the land for shrimp farming in exchange for protecting the other 60% as forest. There is continuing debate about the correct ratio. In theory, the residents who harvest the mangroves are obligated to replant substitutes, but enforcement is lax. There is a certification process for compliance with the mixed-use strictures. Certified shrimps receive a premium in the marketing arrangements.

"Owners" of red book lands and occupiers of green book lands are not induced to yield much to mangrove regeneration or protection because the economic value of these lands for other agricultural or aquacultural uses, such as shrimp farming, far exceeds the value of the mangrove harvest. According to Wyatt, shrimp farming is five times more profitable than mangrove sales. IUCN believes that it may be necessary to encourage shrimp farmers to cooperate with these hybrid approaches to mangrove regeneration by providing compensatory shrimp cultivation in artificial tanks (Wyatt 2024).

However, the problem with the Coastal Resilience Project is that the mangrove regeneration did not actually occur in the shoreline areas that are vulnerable to coastal erosion, storm surges, extreme wind events, and salinity intrusion. Rather, the regeneration took place well inland in the areas that are mainly used for shrimp cultivation. This is apparent from the map in Figure 8 in Section 4.3. Recent experience suggests that mangrove plantations further inland will provide minimal protection against typhoons. The last one to visit this part of the delta was Typhoon Linda, which occurred in 1997. It created a storm surge of 1.5 meters at the shoreline (which is substantial on a landmass that, on average, is only about 0.8 meters above sea level). However, the effects of Linda were minimal in the

area where the mangroves were planted by the Coastal Resilience Project. This again raises the question: what is being protected by the mangroves being replanted by this Project?

It is the near-shore area that is threatened by typhoons in the delta. And while they have historically been relatively infrequent, recent extreme storm events around the world signal that complacency would be misplaced. The Philippines recently experienced five typhoons in a row with devastating effects. And the examples of extreme weather events becoming more extreme are too numerous to catalog. Increasing ocean temperatures result in increasing intensity of storm events. So, all predictions are that these phenomena will become larger, more frequent, and more widespread as temperatures continue to rise (EPA 2025). Adaptations to climate change today really must be designed to protect against conditions that will only be experienced decades from now. The financing and implementing entities must adopt an appropriate long-term line in their decision-making.

The project, therefore, did not significantly contribute to rebuilding the historic mangrove forests that buffer the land from the effects of the rising sea. Wyatt believes this siting choice was deliberate by UNDP and MARD, the implementing agencies, because mangrove afforestation is more likely to be successful at such inland sites than at the shoreline, where the buffering effect would be most beneficial.

The Vickers interview suggests that the GCF staff and board were unaware that this siting choice was unlikely to accomplish the purpose advertised in the funding proposal of providing an effective buffer from a rising and increasingly turbulent sea, as the GCF (the "principal") deferred to the implementing agents on the siting decisions. (See Section 3.3 for a discussion of the principal-agent relationships in the adaptation financing process). Other than ineffective siting, the other large question that looms over the mangrove regeneration approach of the Coastal Resilience Project is whether planting mangroves together with

shrimp ponds is an effective climate adaptation. Pursuant to Resolution 120 (Vietnamese Government 2017), the concept of combining reforestation with shrimp cultivation may make sense from the standpoint of providing an incentive structure for the shrimp farmers to act as good stewards of the forest. The idea is that shrimp cultivation is much more lucrative than harvesting mangroves for charcoal. In addition, mangrove functions as a nursery and habitat for aquatic species, which, although not expressed goals of the project, would improve quality of life and environmental resilience. Thus, allowing the farmer to mix shrimp ponds with reforested lands is likely to promote good forest conservation practices.

This logic makes sense. The question is, does it actually promote climate resilience? This approach creates a landscape mosaic where about half of the area coverage is mangroves and about half is shrimp ponds. While the regulations nominally call for a 60-40 ratio of mangroves to shrimp ponds, in actual practice, mangrove coverage of more often about 50% and sometimes as low as 30%.

Figure 17: Integrated shrimp-mangrove farms in Vien An Dong Commune, Ca Mau Province.
Source: image by Thanh Nguyen in (Nguyen 2023).

The conversion of coastal areas to shrimp farming is heavily subsidized by the national government, making shrimp farming much more lucrative than mangrove harvesting, so owners are induced to minimize the mangrove fraction. Ending subsidies is a necessary part of the mangrove regeneration adaptation, but government subsidies are difficult to roll back without political blowback. Also, there are logistical complications as well. It is often necessary to clean the mangrove leaves from the shrimp ponds because the litter depletes the oxygen that the shrimp need to survive. Moreover, the pattern of tree coverage is quite dynamic from year to year, depending on the extent of mangrove harvesting that takes place. All in all, it is highly questionable whether this patchwork pattern will modulate storm damage.

One should also reflect that while the coastal resilience project may not have accomplished a lot for climate resilience, more mangroves are always better than fewer. And even if the mangrove density of coverage has dubious effectiveness for buffering storms, it does at least provide some shade on the shrimp farms. This reduces the evaporation from the strong sun, which concentrates the salt content in the shrimp ponds. Too much salinity is fatal to the shrimp, so this is a serious problem that impels the shrimp farmers to pump the fresh groundwater for dilution purposes, which contributes to the land subsidence problem. Thus, the "good enough" view of international development assistance is propounded by Professor Levy in his book "Working with the Grain" (Levy 2014). comes into play here. Yet, it is an assumption of this thesis that small benefits for large investments may erode the fragile commitment that the industrialized countries have been willing to make to contribute financial assistance to less developed countries, especially as the costs mount and become more and more daunting.

In sum, there is a serious reason for doubt that the mangrove regeneration strategy pursued by the Coastal Resilience Project will contribute to many climate adaptation benefits in the Mekong Delta for several reasons. The implications are stark. It may mean that the potential for "nature-based" solutions to sea level rise may be limited in the Mekong Delta and many other deltas around the world where upstream development has interrupted sediment processes. What it means in practice is that the toolbox for climate resilience for coastal communities is reduced to structural measures, such as sea walls, and "managed retreat" which may entail relocation of vulnerable communities and salt-intolerant land uses away from the encroaching seas. The problem with the structural measures is that they are very expensive to build and maintain and are famous for distorting natural coastal dynamics, inducing development into vulnerable areas, and failing to provide the protection they

promise. The problem with relocating populations is that the substitute communities may not want them, and that successful relocation involves finding equivalent livelihoods.

All of this raises the intriguing question of what to do next in the delta to adapt to climate change. One potential answer is explored in Chapter 7.

5.7 Finding and Conclusions Drawn from Interviews and Document Reviews

To wrap up the findings and conclusions, there are major disconnects between the objectives established in the funding proposal to GCF and the actual results revealed in the Coastal Resilience Project evaluation interviews:

5.7.1 Mangrove Regeneration

The avowed purpose of the mangrove regeneration component of the project was, as explained above, to protect the habitations and land uses from extreme storm events with their high winds, sea surges and salinization, and coastal flooding and erosion. An obvious point in this regard is that the effectiveness will depend on the severity and frequency of such events. Yet all predictions regarding climate change are that they will become more severe and more frequent. One can assume, for the sake of this evaluation, that high-intensity events such as typhoons are inevitable. It is not a question of whether they will occur, but how frequently and at what strength. The interviews brought to light four aspects of the mangrove regeneration adaptation that call into question their effectiveness in buffering the landscape when these events occur:

1) To be effective as a buffer, mangrove belts need to be approximately 0.5 kilometers in width across the entire affected shoreline. The regeneration that was actually accomplished was an almost inconsequential fraction of that target:

2) To be effective as a buffer, the mangrove belt needs to be at the shoreline itself. In the case of the Coastal Resilience Project, the regeneration was too far inland to be effective.

3) The buffering value of the mangrove forest depends on its density. In the Coastal Resilience Project, the mangroves were planted in combination with shrimp ponds, such that the density is only around 50%;

4) Mangrove regeneration requires mudflats to survive and be sustainable. In the case of the Mekong Delta, sediment deprivation due to upstream capture in reservoirs and riverbank mining makes only a small fraction of the shoreline suitable for mangrove planting. The rest is too prone to erosion. Structures that can help trap sediment, like sea walls, are too expensive to build and maintain to be a practical and sustainable solution at the scale that will be needed in the Mekong Delta.

While sediment depletion and shrimp farming may not be factors in most of the rest of the extensive shoreline in Vietnam, the other factors still apply. The reality is that Vietnam has allowed most of its historic coastal mangrove forests to be destroyed for fuelwood and to make room for agriculture, aquaculture and other land uses. To repair that damage will be so costly as to call into question its practicality, once again bringing into focus the type of sea level rise accommodation alternative discussed in Chapter 7.

5.7.2 Climate Resilient Housing

The funding proposal reiterates in several places that the aim of the resilient housing component of the Project was to protect the poorest and most vulnerable residents from the perils of flooding, which is expected to be exacerbated by climate change with its more intense rain and windstorms and rising sea levels. As the sea rises, it is more difficult for the low-lying landscapes to drain to the sea. It is disproportionately the poorest residents who

reside in these low-lying areas. How effective the designs and construction materials for the upgraded housing will be as these flood events occur, only time will tell. Yet all predictions regarding climate change are that the storms and flood events will become more severe and more frequent. The interviews revealed several factors in the execution of the resilient housing component that call into question its effectiveness in alleviating the risks to the poorest and most vulnerable:

1) To be eligible for grant funds for the housing upgrades, a resident must have tenure rights to the land on which the house would be constructed. A significant fraction of the population in the most vulnerable areas does not have the required certificates and is, therefore, ineligible. This fraction is apparently not large and is going down due to the commendable progress that Vietnam has made in poverty alleviation, and there may (or may not) be other projects in the future that will provide for their needs. This researcher asked several interviewees for an estimate of the number of landless residents living in vulnerable areas but none were forthcoming for Hue, but around 30% in Ca Mau (Le Thi 2024).

2) The grant funds available generally do not cover the entire cost of the housing upgrades. Those who wish to take advantage of the program must be able to pay the remaining costs. The poorest members of the community do not have the means. While subsidized loans are available to bridge the gap, these require land ownership for collateral. Again, this places the project benefits beyond the reach of the poorest, who are also the ones most in need. Apparently, the number of households too poor to take advantage of the housing benefit is declining due to the remarkable success of the GoVN in poverty reduction.

3) There are also several questions regarding the factors taken into account in the selection of eligible sites for climate-resilient housing. There are three issues here:

a) It is apparent from the information presented in Section 2.1 that the delta is going to experience accelerated erosion of riverbanks and irrigation canals when the full effect of the sediment capture upstream kicks in (after the inventory of sediments deposited in the Mekong flood plain has been washed away by the “hungry water” flowing downstream of the dams). This raises the concern of whether the site selection process paid attention to how close to these eventual erosion zones the new housing is being built.

b) Land subsidence is progressing in Ca Mau from the groundwater pumping. Assuming that continues, it will create depressions where flood waters and salinity intrusion will pool. Are the houses sited away from such areas?

c) In a few decades, much of Ca Mau will be permanently under the rising sea, at least at high tides. Again, where are the houses being built relative to the areas that the sea will reclaim first? Even putting the houses on stilts would not make these sites viable for housing.

This researcher was not able to find any documentation on whether and how these issues were addressed, suggesting that they probably were not.

CHAPTER 6

FLAWS IN THE GCF FEEDBACK MECHANISM AND IMPLICATIONS FOR IMPROVING ADAPTATION DESIGN

Chapter 5 concludes with findings that the mangrove regeneration and climate-resilient housing components of the GEF-UNDP Coastal Resilience Project encountered significant limitations in meeting the objectives set forth in the funding application. In this Chapter, we shall consider the extent to which these limitations were acknowledged and examined in the process set up by GCF for post-project evaluations. The process was set up by the GCF to serve the purpose of informing the future selection, design, and execution of climate adaptation initiatives, particularly in vulnerable delta systems around the world. As a first step, let us first take a look at the details of the feedback mechanism as currently constituted: the policies and criteria that govern it, the evaluation process itself, and the organs of the GCF that are in place for systems management and quality control.

6.1 GCF'S EVALUATION POLICIES AND CRITERIA

Paragraph 3 of the Governing Instrument for the Green Climate Fund calls upon "the Fund … [to be] a continuously learning institution guided by processes for monitoring and evaluation" (GCF 2021,1). It emphasizes the importance of periodic ***independent*** evaluations of the performance of the Fund and particularly the effectiveness and efficiency of its funded activities to identify and disseminate lessons that can inform decision-making. The instrument instructs that the evaluation results are to be published and submitted to the UNFCCC Conference of the Parties "for purposes of periodic reviews of the financial mechanism of the

Convention." (Ibid., 2021,1). To this end, the Board is required to establish an "operationally independent evaluation unit as part of the core structure of the Fund" (Ibid., 2021, 9).

In compliance with these directives, the GCF Board created an Independent Evaluation Unit (IEU) under the Secretariat to take responsibility for monitoring and evaluation functions. The IEU is to:

> [p]rovide evaluation reports to the UNFCCC, the CoP and the Paris Agreement for the purposes of periodic reviews of the Financial Mechanism". . . . The IEU shall, every five years . . . present a report on issues related to the implementation of this Policy, along with any recommendations for changes to it. (GCF 2021, 11).

The Board also adopted a formal Evaluation Policy in 2021 that sets forth a:

> Framework to help the Fund and its stakeholders produce and use high-quality evaluations to credibly and objectively assess the results, performance, efficiency, and effectiveness of the GCF in delivering its mandate. . . .
>
> The Policy is designed to create a culture of learning built from producing and using impartial, credible, independent and trusted evidence and evidence-informed strategies and implementation. (GCF 2021, 2).

The stated rationale is that

> Trusted, high-quality evidence produced from credible evaluations helps to inform GCF investments, policies, structure, performance, processes and strategies by informing and guiding the Fund for its day-to-day operations and providing strategic guidance to the Board, the Secretariat, independent units and AEs. This, in turn, ensures GCF investments have greater impact and that they are expected to contribute to building a healthier planet. (GCF 2021, 3).

Relevant to the discussion in this thesis, the Policy "requires all accredited entities [(AEs) such as UNDP] to submit . . independent evaluations for all projects. . ." (GCF 2021, 1).

All evaluations are to adhere to the following principles:

Impartial, objective, and unbiased: Including avoiding conflicts of interest and observing standards specific to the evaluation profession, including the United Nations Evaluation Group's (UNEG)-Code of Conduct for Evaluations (2008) (United Nations Evaluation Group 2008).

Relevance, use, and participation: Suitable for decision-making, accountability, and learning.

Credibility and robustness: Based on state-of-the-art standards of evidence, analyses, and Transparency.

Measurability: Able to measure performance, either quantitatively or qualitatively, and also provide comparability between alternative theories.

The operative provisions of the policy documents are quoted at length above to make as specific as possible three aspects of the evaluation framework that are particularly relevant to the case study and to the recommendations for improving the process:

First, it is important to emphasize that the evaluations are to serve the particular purpose of informing ongoing GCF investment decisions, including their structures and strategies, to ensure that they have a maximal climate resilience impact. In other words, the GCF commits itself to a continuing process of learning from the results produced in the projects it funds to foster continuous improvements in performance. This researcher has adopted the term “learning laboratories” for this process of learning from experience. One can then conclude that there is some dysfunction when evaluations fail to inform the GCF of where and how results have not fully achieved the qualitative or quantitative goals set forth in the funding proposals. When this is observed, the question arises as to what reforms in the feedback process and mechanisms might be effective in making them more fit to purpose.

Second, it is notable that the assignment to the Independent Evaluation Unit is to evaluate the performance of the GCF itself, and to report its findings periodically to the principals, namely the Conference of the Parties to the UNFCCC. The IEU has apparently been given the mission of evaluating the performance of the GCF-funded projects or at least engaging the evaluations produced by the project executors. This suggests that there may be scope for improvement in the charter of the IEU.

Third, apparently, the obligation to submit post-project evaluations does apply to all AEs implementing all GCF-funded projects. Whether this mandate is universally followed was not investigated in the thesis research.

The Coastal Resilience Project did prepare a Final Evaluation report. The issue probed in this thesis is how well-informed, candid, and useful the evaluation was. In that regard, Appendix II of the Policy on GCF evaluation criteria comes into play. It states that the evaluations are to include the following:

(i) Relevance, effectiveness, efficiency, impact, and sustainability of projects and programs;

(ii) Coherence in climate finance delivery with other multilateral entities.

(iii) Gender equity;

(iv) Country ownership of projects and programs;

(v) Innovativeness in result areas – the extent to which interventions may lead to a paradigm shift towards low-emission and climate-resilient development pathways (GCF 2021, 21);

(vi) ***Replication and scalability*** – the extent to which the activities can be ***scaled up in other locations within the country or replicated in other countries*** . . . ; (my emphasis) and

(vii) ***Unexpected results, both positive and negative*** (my emphasis).

Notably, the Final Evaluation for the Coastal Resilience Project did contain sections on each of these subjects. So, the authors who prepared the evaluation report can claim that they ticked all the boxes. The problem this researcher wishes to highlight is with criteria (vi) on replication and scalability and (vii) on unexpected results (GCF 2021). As the analysis in Chapter 5 shows, significant limitations and complications were encountered (if not actually anticipated) in the implementation of the measures that substantially limit their scalability or replicability and were apparently unanticipated. These should have been, but were not, forthrightly acknowledged in the Final Evaluation Report. Consequently, the document failed to serve its core purpose of informing GCF and the interested community in general about

improvements needed in future project selection, design, and implementation both in the Mekong Delta and more generally in other highly vulnerable and sediment deprived delta systems around the world.

There is also a provision that:

> The Board will foster a culture of learning by requiring that all evaluations presented to the Board have a management response, and all evaluations, reviews, and assessments of the IEU will be followed up by a management action report, a year or more later, after consideration by the Board. (GCF 2021, 16).

It is not clear whether, when, or how the final evaluation for the Coastal Resilience Project will be presented to the Board to initiate this follow-up process.

6.2 Evaluation of FINAL EVALUATION REPORT for the Coastal Resilience Project

The Final Evaluation Report (FER), dated 15 November 2024, was prepared by private consultants commissioned by UNDP. The team consisted of one international consultant and one national consultant. Their background, qualifications, contractual history, and previous relationship to UNDP or MARD, if any, are not disclosed other than to state that the international consultants have "experience and exposure to projects and evaluations in other regions globally." The FER contains a claim that the consultants "adhered to the UN Evaluation Group's principles of independence, impartiality, transparency, ethics, and credibility" (UNDP 2024, 12; Independent Evaluation Office (IEO), UNDP 2024), and it includes a certification that the evaluators have abided by the UN Code of Conduct for Evaluation, which provides, among other criteria, that the evaluators:

> Must ensure that independence of judgment is maintained and that evaluation findings and recommendations are independently presented…..

> Must confirm that they have not been involved in designing, executing, or advising on the project being evaluated and did not carry out the project's Interim Evaluation. (UNDP 2024, 99).

Notably, the code does not require disclosure of qualifications, prior experience, or whether the evaluator has a pattern of contracting with UNDP to evaluate the performance of its projects.

The deficiency in the FER was not in failing to track results against promises. The FER essentially tracks the quantitative goals established for the project in the Funding Proposal and indicates that the number of acres planted, and the number of houses built actually exceed those goals. It also reflects the substantial satisfaction with the outcomes of the project reported by the beneficiaries, the Vietnamese government agencies at the national and local levels, and the staff of UNDP involved in delivering the benefits. This confirms the impressions gleaned by the field interviews with these stakeholders as reported in Section 5.2 and Appendix II.

The FER report is rife with superlatives in its valuation of the results achieved in the Project, rating them as "remarkable," "highly satisfactory," and "impressive" in the section on effectiveness (UNDP 2024, 35). The sustainability of the project outcomes is judged to be "particularly strong" (Ibid., 39). The FER alleges that the project was "strongly aligned with Vietnam's national climate adaptation strategies" (Ibid., 8). It also states that the "project showed strong potential for sustainability," "high scalability," and potential for "replication in similar climate contexts" (Ibid., 8), a claim that this thesis examines below.

This researcher finds only a single reference to "areas requiring improvement to facilitate a successful evaluation," allegedly in Annex 12, Table 2 in this 109-page document (UNDP 2024, 18). However, there is no Table 2. The FER does contain recommendations for

future projects (UNDP 2024, 9-10), which seem largely irrelevant to the actual issues confronted. “Lessons learned” are catalogued on pages 48-49. But notably, no lessons were learned regarding the factors that limited the effectiveness, sustainability, and replicability of the results achieved in the project. Indeed, nowhere in the document are limitations even acknowledged, casting doubt on the value of the evaluation for informing progressive improvement in climate adaptation interventions.

However, it is important to observe that the FER was based exclusively on a desktop review of documents produced by the project and interviews with project stakeholders (UNDP 2024, 71-76). Apparently, some but not all of the interviews were conducted in person. But the FER betrays no understanding of the broader literature and sources of independent expertise consulted by this researcher that bear on the efficacy of the types of project activities undertaken. These sources tend to cast doubt on the value of the FER, as explained below.

In sum, the major flaw in the FER is its failure to acknowledge or evaluate the complications, qualifications, and limitations encountered in actually accomplishing the professed objectives. Those objectives included providing resilience from storm surges and extreme weather events and addressing the need for resilient housing for the poor and most vulnerable residents. These limitations in the efficacy of the measures as implemented are directly relevant to criteria (vi) in the GF evaluation policies or scalability and replicability (GCF 2021). As a result, the FER is of little value for gleaning useful lessons on future improvements in the selection, design, and execution of projects in the future in a setting such as Vietnam or, indeed, other tropical countries with vast coastlines and vulnerable deltas. This calls into question the scalability and replicability of mangrove regeneration in other deltas around the world that are also sediment-deprived due to upstream dams. Many deltas fall into that

category today and probably many more in the future as hydropower development accelerates.

Section 5.5 of this thesis reports the findings and conclusions from the field interviews and catalogs the several important respects in which the implementation of the Coastal Resilience Project produced questionable results in terms of the ultimate objectives of creating a “nature-based” mangrove buffer to protect the land from a rising and increasingly turbulent ocean and in providing flood-proof housing for the poorest and most vulnerable of the coastal inhabitants. If the FER report had dealt candidly with the mangrove regeneration issues and in a manner calculated to inform future project selection, design, and execution at GCF, it would have reported that:

1. Regeneration of mangroves to provide an effective buffer against sea level rise, coastal erosion, and storm surges needs to take place at the shoreline and provide a 0.5-meter-wide barrier.

2. The Mekong Delta shoreline is not actually a very good candidate for mangrove regeneration because the necessary mudflats are not available except in a limited portion of the Ca Mau coastline due to sediment depletion as a result of capture in upstream dams and aggregate mining in the Mekong River banks.

3. The only portion of the shoreline where the sediment deposition continues to create favorable conditions for mangroves is in a portion of Cau Mau Province. But in those areas, mangrove regeneration occurs naturally without the need for afforestation initiatives.

4. Regenerating mangroves in inland areas where there is adequate sediment substrate is of limited effectiveness in buffering the effects of climate change. This is particularly the case when mangrove plantations are interspersed with shrimp ponds, which creates a mosaic

of forest lands that may not dense enough to be very effective in buffering the effects of more severe storm events.

5. Creating artificial barriers along the shoreline to accumulate sediment and protect against erosion are expensive to build and maintain and, in any event, are not part of the GCF-UNDP project.

The FER claims in many places that the project results satisfy the announced objective of targeting benefits for the poorest and most vulnerable members of the population. For instance, on page 41 the FER proclaims that:

> [t]he project effectively embodied the "Leaving No One Behind" approach by embedding inclusive, rights-based strategies that prioritized marginalized groups. . . . These efforts ensured that the most vulnerable populations were at the forefront of initiatives to enhance climate resilience and adaptive capacity (UNDP 2024, 41).

Yet, in fact, the Coastal Resilience project excludes the segment of the vulnerable population that (1) are landless or do not have tenure rights to the land they are occupying and (2) do not have the financial means to share in the costs. The segment of the population that has been left behind are the landless, essentially the "squatters," who are also the poorest and most vulnerable to climate change. It is understandable that the project would not want to build houses on lands where the occupants are subject to eviction. However, the FER is silent on this limitation in achieving the announced objectives of the project.

Another question that is not treated at all in the FER is whether the housing construction was placed in durable locations or even whether UNDP/MARD made its siting determinations based on what is known about the future of the delta. Sea level rise and climate change are going to massively transform the delta landscape, as shown in Chapter 2. The FER is silent as to whether any of this was considered as UNDP and the Vietnamese NDA formulated the

project or as GCF evaluated it for funding, or as it was executed on the ground. Certainly, no mention of these sustainability issues is to be found anywhere in the FER.

Again, the key question is whether the GCF received the kind of feedback it needs to decide whether and, most importantly, how and where to fund climate-resilient housing upgrades elsewhere in the delta? Elsewhere in Vietnam? Or elsewhere in the world? At a minimum, GCF should learn from the Coastal Resilience Project that in the future, siting criteria and determinations should be an explicit aspect of the project and should consider the sustainability of the site over relevant timeframes given what is known or can be anticipated about how the landscape is going to change as a result of climate change and other factors. The FER provides no basis for such considerations by the GCF.

The experience in the case study also raises the question how can climate resilient housing be provided for the most vulnerable residents of deltas that lack the means—money and/or land entitlements—to be able to participate in cost-sharing arrangements? This is a classic issue in development assistance programs more generally. Ignoring their plight just causes them to migrate where they are not wanted and cannot sustain themselves is not an acceptable answer and it is way beyond the scope of this thesis and this researcher's training to suggest a better one. What is disquieting is that the institutions whose business it is to find a better answer do not seem to be engaged.

What inferences can we draw from the case study? If the efficacy of restoring historic natural buffers between delta landforms and an increasingly restless sea is as limited for the Mekong Delta as this case study suggests, what are the implications for the many other deltas systems around the world, especially those at morphological risk due to existing and anticipated upstream dams intercepting sediment flows. And if the most vulnerable residents of disappearing delta's are being left behind by expensive efforts like the Coastal Resilience

Project, what would a more effective program look like? And cost? What signal should this appraisal send to the funding agencies set up under the UNFCCC? Climate-resilient housing and mangrove regeneration are expensive. One would think the GCF, and other climate financiers would be keenly interested in learning from experience to get it right. The feasibility of mobilizing the necessary resources must be squarely faced, or else the promises will greatly outrun the performance.

This raises the larger issue of how these interventions can practically fit within a comprehensive and technically sound master plan for coastal climate resilience in a country such as Vietnam. Climate-resilient housing and mangrove regeneration should be regarded as *elements* in a comprehensive toolbox of strategies, not as stand-alone solutions. The implications are rather profound. It means that mangrove regeneration must be nested within a more comprehensive mix of adaptation strategies. As is apparent by even a casual glance at the sea level inundation map shown in section 2.1 and the summary of estimates, much of the delta landmass will be progressively and permanently overtaken by the sea in just a few decades. By the end of this century, some 45% of the delta will be inundated. The implications for climate adaptation are profound. One alternative is discussed in Chapter 7 of this thesis.

The conclusion is that in the case examined in this thesis, the feedback mechanisms developed by GCF have failed to produce the learning from experience is the intended purpose. That raises two subsidiary questions: (1) How can the GCF feedback mechanisms be upgraded to produce more useful guidance. That issue is addressed in Section 6.4. (2) How widespread is the dysfunction in feedback mechanisms in the climate adaptation field, and what should be done about that? That issue is discussed more fully in Section 6.3, below, and in Chapter 8, which suggests a further research agenda. If the problem is indeed chronic rather than merely

episodic, one might conclude that job one for the UNFCCC is to require more effective evaluation systems to be established by the funding organs.

6.3 Reforms in Monitoring and Evaluation by the IEU's LORTA

The deficiencies detected in the post-project evaluation for the Coastal Resilience Project are just one case sample. This prompts the question of whether this case is unique or typical of projects carried out by the GCF. Is there additional data on the quality and effectiveness of evaluations of GCF-funded adaptation projects that permit broader inferences to be drawn?

As noted in Section 3.4, this researcher obtained documentation from the GCF's 40th Board Meeting on a program recently instituted by the GCF's Independent Evaluation Unit (IEU) called "Learning-Oriented Real-Time Impact Assessment" (LORTA). It recently evaluated a sample of projects funded by GCF to ascertain how well they contribute to the professed purpose of fostering a culture of continuous learning from experience to inform the selection, design, and execution of GCF adaptation investments (see Section 6.1). In a 2023 "Synthesis Report, the IEU presents its findings from this new program and the learning that emerged from its review of four project examples.

Its Synthesis Report finds that:

> "Only 34 per cent of proposals (to GCF for funding of climate adaptation projects) satisfactorily accounted for any unintended consequences of their GCF funding, and 28 percent ignored the issue. * * * Thus, the results of the evaluability assessment are alarming". (IEU 2024, 3).

The Report goes on to describe the active engagement of the IEU to upgrade the quality of the monitoring and evaluations, including such interventions as:

1) Capacity strengthening of the accredited entities for impact assessments.
2) providing technical advisory services,
3) measuring impact through causal analysis of "what works and to what extent", and
4) wider dissemination of learning.

As of the issuance of the report, LORTA has engaged with about 50 projects to improve the performance of the Accredited Entities in conducting evaluations. In some cases, LORTA appears to have essentially taken over the process. The report does not indicate how many of the 50 projects are climate mitigation projects and how many are climate adaptation projects. However, it appears that relatively few of the projects actually mentioned in the report have progressed to the post-completion stage (only one is actually mentioned). The rest are still in progress. Interestingly, in discussing the learning process and how it should be conducted, the report does make passing reference to including an evaluation of the scalability and replicability of results achieved and to including counterfactual analysis (i.e., comparison of alternatives).

The report illustrates the learning potential from existing projects with four examples. However, only one of these seems relevant to the case study in this thesis. This is a project in Bangladesh entitled "*Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity*". Yet, the only lesson it points to relates to the objective to empower women by giving them control over the income they generate. The report finds:

> "However, despite the ability of women to diversify their income-generating activities, the project did not result in women gaining more power or control over the expenditure of their generated income. This limitation can be attributed to the

> predominantly male and patriarchal culture in the southwestern provinces of Bangladesh. Changing deeply engrained perceptions, lifestyles, and decision-making processes may require more time and sustained effort." (IEU 2024, 12).

We can conclude from the findings in the synthesis report that deficiencies in the quality of GCF projects for contributing to the purpose of learning from experience are endemic. How effective the LORTA interventions will prove to be can only be ascertained when the projects have concluded and the final evaluations are submitted. Yet, as we shall discuss in Section 6.4, it appears that the remedies applied by LORTA may not be as comprehensive as is warranted.

To further explore the extent to which meaningful learning is occurring in climate adaptation projects funded by organizations other than GCF, this found the literature on the adequacy or effectiveness of evaluations performed by agencies implementing projects funded by the UNFCCC organs is surprisingly sparse. There is, however, an abundant body of studies on the effectiveness of efforts to adapt to climate change. These studies were systematically compiled and analyzed by Owen. She conducted a literature review to identify adaptation initiatives that show some degree of effectiveness using five indicators, including reducing risk and vulnerability. A total of 110 case studies were reviewed, including a category for "physical or structural actions that shape infrastructure and ecosystems" (Owen 2020, 4-5). However, of the studies surveyed, only five were focused on coastal resilience.

Owen points out the difficulty of attributing effective outcomes to specific adaptation activities. Adaptation to climate change is often conflated with adaptation to environmental disasters. While the field of climate adaptation is relatively new, it stems from decades of research about responses to environmental change in the latter part of the 20th century. (Owen 2020, 2; Bassett and Fogelman 2013) "These factors make it difficult to disentangle a simple understanding of adaptation in practice" (Owen 2020, 1). The UNDP, for example, frequently conducts outcome and project evaluations to assess contributions towards

achieving specific objectives but finds that “in most cases, it is unrealistic to isolate the effect of one development initiative from other influencing factors.” (Owen 2020, 3; (UNDP-IEO 2021). However, she found that “evidence that climate change adaptation activities frequently do not work as intended.” (Owen 2020, 1).

An additional challenge for evaluating adaptation is that climate change operates on longer timescales than many other projects. Outcomes may not be revealed for years or decades, if at all. Moser (2013) notes that “publicly perceived success is achieved when an anticipated problem or impact does not occur—deaths prevented, damages avoided—yet proving this is the result of a policy or management intervention is often difficult.” She reminds us that “In determining adaptation outcomes, it is important to remember that correlation does not imply causation” (Owen 2020, 3; (Moser and Boykoff 2013). One cited study draws the same conclusion as this thesis, that “Mangrove rehabilitation can become ineffective if the processes that cause erosion are not also addressed” (Owen 2020, 10; Schmitt et al. 2013).

6.4 Recommendations for Improving the GCF Feedback Mechanisms

It appears that the feedback mechanism employed in the Coastal Resilience case study did not work well for the intended purpose of providing GCF with the information it needs to truly be a “continuously learning institution”. What are the bases for this dysfunction? The fault does not lie with the project beneficiaries. They uniformly reported happiness with the results. It does not lie with the evaluation team. They were just hired to check boxes and did so. It does not lie with UNDP. It followed the process and criteria required by the GCF policy. It does not lie with the Designated National Authorities or the GoVN implementing agencies (the Ministries of Agriculture and Rural Development and the Ministry of Construction). Their fingerprints are not on the FER as far as this researcher can tell, but UNDP claimed that they

were involved in reviewing the TER. It does not lie with the Independent Evaluation Unit. It does seem to have very little engagement (which may be part of the problem).

One could point out that the design of the project, as set forth in the Funding Proposal, displayed little understanding of the on-the-ground realities in the delta. But really, it is the GCF itself (meaning the Secretariat and Board) to which meaningful recommendations for reform must be directed. While these organs delegated the role and responsibility for conducting post-project evaluations to the AE (UNDP in this case), the delegation came with instructions governing both the required process and content for the reports, which this case study shows to be deficient. Viewed through the lens of Principal-Agent Theory, we could say that the Principal (GCF) delegated the evaluation role to the Agent (UNDP) under instructions. The task was fulfilled, and the instructions were followed. Yet the intended results—feedback from experience useful for improving the next crop of adaptation inventions—were not achieved. The problem, it seems, is with the Principal's instructions.

GCF itself seems to have recognized the need for reforming the process for learning from experience by instituting the LOTRA role for its IEU. If LORTA is extended and made permanent, it may substantially improve the effectiveness of the project evaluations. Nevertheless, in the view of this researcher, further reforms may be warranted. Here are the recommendations:

FIRST, MAKE POST-PROJECT EVALUATIONS UNIVERSAL: As noted in Section 6.1, the GCF policy guidance on project evaluations does seem to require that all GCF-funded projects prepare a post-project evaluation, and the GEF project lead for the Coastal Resilience Project did state in an interview that that is indeed the practice. This researcher was not able to ascertain whether that practice is uniformly observed. However, it seems obvious that learning from

experience would be accelerated if post-project evaluations were a routine requirement for all funding awards from the GCF and the other UNFCC financing organs.

SECOND, MAKE EVALUATIONS PUBLICLY AVAILABLE: it is also obvious for the same reason that such appraisals should be published and widely accessible for all to learn from. The GCF policy provides that "all evaluations will be made public through the GCF or IEU website" (GCF 2021, 13) but this appears to apply to evaluations carried out by the IEU itself. AEs are instructed to "share their evaluations and data on GCF projects . . . with the GCF" . . . and "the Secretariat will. . . create a mechanism to systematically share them on a publicly available database" (Ibid., 13-14). That mechanism apparently has not yet been set up.

THIRD, PROVIDE AN INSTRUCTION MANUAL: it is apparent that the process and criteria imposed by the GCF and employed by the evaluators were not sufficient to elicit a meaningful discussion of the limitations, complications, and qualifications encountered in achieving the advertised goals of the Coastal Resilience Project. Apparently, the criteria for the evaluations need further elaboration if the process is to consist of more than just checking boxes or tallying how close to the quantitative goals the results came. GCF needs to know more than just how many houses were built or how many hectares of mangroves were planted in each province. What would be far more enlightening is the disclosure of the limitations and complications that would be encountered in upscaling and replicating the chosen strategies and tools, and ideally, the analysis of how future projects could be designed and executed to avoid those barriers. Instructions that require more objective and insightful investigation of the factors that bear on the sustainability, replicability, and upscaling of the climate adaptation strategies would produce more meaningful and credible reports. The appraisal of scalability and replicability, in particular, needs to be augmented with an instruction manual that addresses

how to conduct counterfactual analysis of practical alternative measures, designs, sites, etc., that could produce more effective (and cost-effective) benefits.

Conducting a counterfactual analysis of project effectiveness is a sophisticated enterprise. It requires going beyond making a judgment as to whether an adaptation measure was effective by asking, "Compared to what else could have been done with an equivalent investment?" It requires knowledge of what has been tried elsewhere and how well it worked (and why). In other words, it requires drawing on the lessons from experience. That's why the learning that may come out of the MERIT project on managed retreat, described in Chapter 7, is so important. If the innovations are successful, they may transform the way we adapt to the sea, not just in the Mekong Delta, but also globally.

FOURTH, UPGRADE THE EVALUATOR QUALIFICATIONS: Credible evaluations require a high level of technical expertise and relevant field experience. The qualifications for evaluators may need to be upgraded. The evaluators in the case study probably met the minimum qualifications as currently required by GCF policies. However, the bar may be set too low. In the current case example, it is not apparent that the evaluators possess the technical capabilities or experience to scrutinize the causal assumptions behind the "theory of change" embodied in the design of the adaptation project (UNDP 2024; GCF 2021). Certainly, the evaluation in the case study shows no evidence of competence in agroforestry or fluvial morphology, or land tenure policies of the government of Vietnam.

The evaluators also need to have a system-wide perspective. In the current context, the fate of the delta is a regional matter, not localized within Vietnam. This is characteristic of transboundary water systems around the planet. A sustainable future for the Mekong Delta in the face of climate change implicates the entire river basin system. The fate of the delta is to a large extent dependent on decisions made by the upstream governments, all the way to

the headwaters in China. The evaluation seems oblivious to the regional dynamics and their implications for effective climate adaptation in Vietnam. Hiring evaluators with a broader scale of reference and knowledge of regional and global processes is needed. In sum, a transboundary perspective is indispensable and noticeably lacking in the design and evaluation of this case study project.

FIFTH, INCLUDE KNOWLEDGEABLE EXTERNAL EXPERTS AND OBSERVERS IN THE EVALUATION PROCESS. The methodology pursued by the evaluations pre-determined the results to some extent. The only interviews conducted were with project participants and agency personnel who enjoyed the benefits and, therefore, registered a high degree of satisfaction with the results of the project. A broader scope of inquiry would have readily disclosed the types of limitations and complications in the effectiveness of the adaptation measures that were reported to this researcher. In fact, there are many technically sophisticated and experienced research institutions that have been keen observers of adaptation efforts in the Mekong Delta. Some of these are NGOs, some are bilateral aid agencies with a depth of experience, and some are governmental or intergovernmental agencies.

Many are members of the Mekong Delta Development Partners Working Group, which is reported to be a robust forum for the sharing of lessons learned and data that has been accumulated and can illuminate the relevant issues. It is comprised of donor and implementing agencies focused on the Mekong Delta that engage in candid exchange of information, expertise, creative thinking and collegiality on adaptation and development strategies without the routine auditing by government officials. This allows free expression without fear of adverse impacts on working relationships with Vietnamese government officials. This researcher has been impressed by the opinion of several of the interviewees with their high opinion of this informal working group. Allegedly, the recommendations from

this process led to the promulgation of the Mekong Delta Regional Master Plan by the GoVN and Resolution 120, which have subsequently guided adaptation planning in the delta.

It is striking how the realities revealed by interviews conducted by this researcher with sources of technical expertise on climate dynamics and adaptive strategies contrast with the post-project evaluation that occurred in the coastal resilience project which is of limited value in informing future adaptation choices. This strongly suggests that GCF and its IEU, if they are serious about a process of constant learning and improving, need to take steps to assure that the perspectives, experiences, and technical expertise that are external to the community of project stakeholders are consulted in the evaluation process.

The LORTA program does not explicitly provide instructions or assistance to the AEs in expanding the range of expertise consulted in the evaluation process. The examples provided in the Synthesis Report still confine the scope of the evaluation interviews to the project implementing stakeholders and the beneficiaries. Like the case study, there does not seem to be an effort to interrogate the wider sources of expertise from the knowledgeable academic and non-governmental research institutions. This should change.

SIXTH, INSTITUTIONALIZE THE EVALUATIONS WITHIN GCF: Credible evaluation requires that the evaluators by not such well-qualified professionals but also truly independent of the implementing organs that engage them. This is particularly important given the incentives of the project executors to position themselves for future awards by providing glowing reports on their accomplishments to create a record of successful performance. Repeat business for the evaluators is more likely if their appraisal of the outcomes achieved by the implementing agency is favorable than if it is critical. This researcher speculates that a reason for the lack of candor or perspective by the evaluators in the case study may be that they have become, in

effect, captive of the process. Such reports should always be viewed with a degree of skepticism. But the principal-agent dysfunction is more broad-scale: The UNFCCC and GCF want to keep the donor countries happy enough with the announced results to continue with their funding commitments. UNDP and its counterpart national agencies are heavily dependent on the funding that comes from the GCF, and its applications are more likely to succeed if they can point to a record of successes.

The way to break through this perverse incentive structure is for the GCF itself to conduct the post-project appraisals with a critical eye through contractors that are paid for by and answer only to it. The new role for the IEU in providing "advisory services" to AEs in conducting monitoring and evaluation is a significant step in this direction. But the responsibility remains with the AEs. A more meaningful reform might be to give the IEU the plenary role in evaluating the performance of the projects that GCF funds. Particularly, it would be ideal if the IEU conducted the outreach to the external sources of expertise described in the Fifth Reform, above. It probably does not make sense to task the AEs or NDAs to perform this outreach. They have no incentive to solicit expert criticism of their work. But the GCF could and should use its IEU to engage in and, importantly, pay for this type of consultation. It will require resources. These outside centers of expertise are to be found among the NGOs, academic centers of technical excellence, and, importantly, among the other donor agencies with a depth of experience. These entities' budgets do not include funds to conduct these types of evaluations. However, the funding required would be very small compared to the funds expended in project execution and would probably be the best investment GCF and others could make in improved efficiency and effectiveness.

The LORTA program may constitute a transition for GCF from a simple "financial pass-through entity that sits back and waits for a project proposal to come to it for consideration

and approval" (Basak and Vinkhuyzen 2022, 144-145) to a more engaged "service delivery model" (Ibid., 144) that would serve as a 'convener, capacity-builder, and advisor" through effective partnerships. For instance, highly productive deltas that are eroding, subsiding, and suffering salinity intrusion may need a climate adaptation master plan that includes an appropriate and cost-efficient mix of structural measures, nature-based measures, and land use relocation strategies. Financing the development of such a prototype might be the single most cost-effective investment a funding organ such as GCF (or the Climate Adaptation Fund, or the GEF) could make to get climate adaptation onto a more sustainable track. This is much more likely to happen if the learning on what has worked, what has not, and why is documented in the post-project evaluations. That is at least an interesting hypothesis worthy of further investigation.

Principal-Agent Relationships with Recommended Reforms

P=Principal, A=Agent

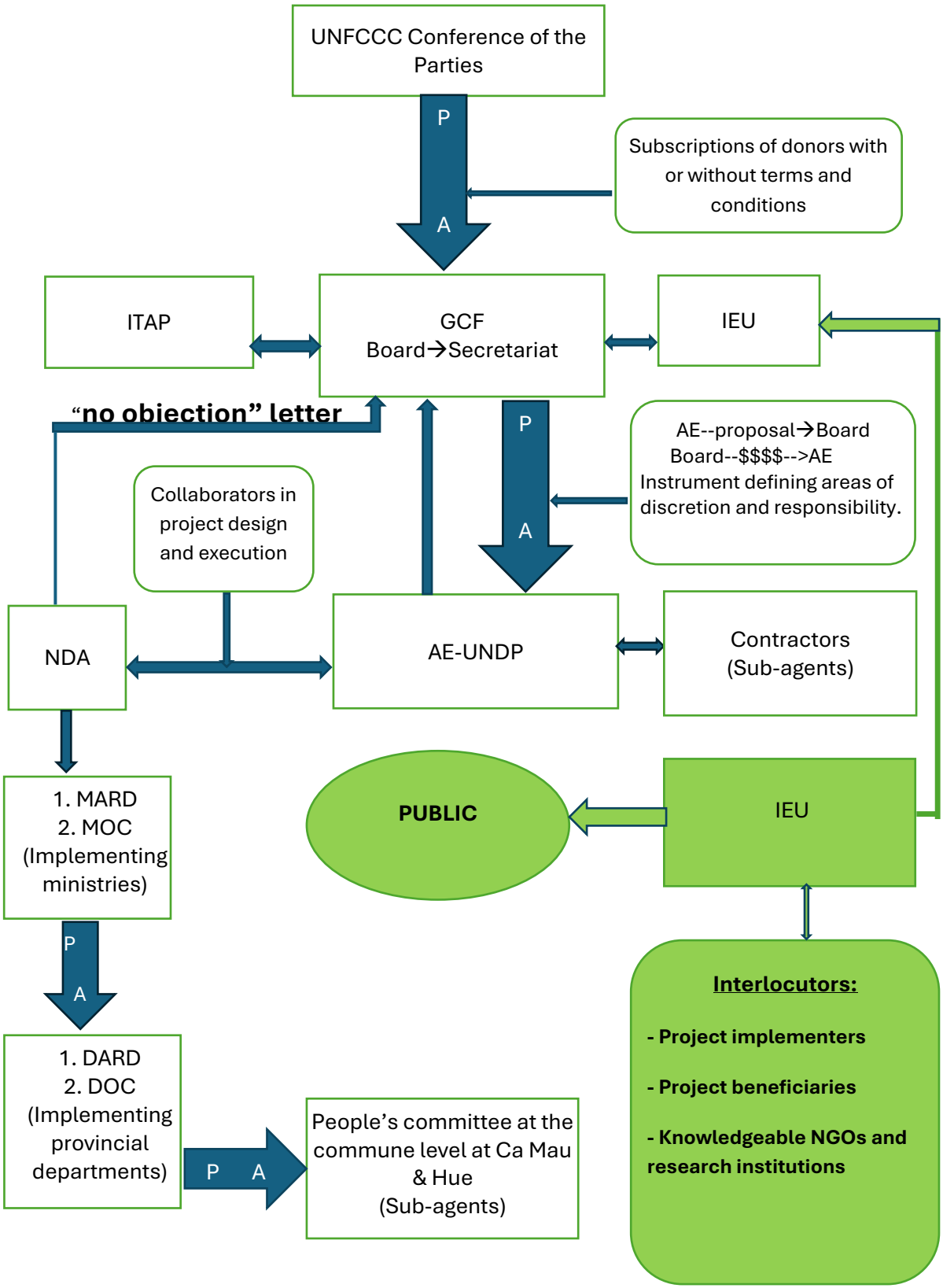


Figure 18: Principal-Agent Relationships with Recommended Reforms

Chapter 7

The Concept Of “Managed Retreat” Through Salinity Zoning of Land Uses

The findings and conclusions from the field interviews, as reported in Section 5.5, indicate that the efficacy of “nature-based” solutions to climate change, such as the regeneration of coastal mangroves, is limited in the Mekong Delta due to the depletion of sediment flows into the shoreline areas. The underlying reasons strongly suggest that these same limitations would apply in other delta systems around the world that are located at the terminus of other major river systems that have been dammed for power, water, supply, flood control, navigation, and other purposes. As there are more than 50,000 such dams now operating around the world (Randell 2022), this sediment starvation phenomenon is very widespread around the world and should be a matter of concern to the global institutions that deliver climate adaptation assistance, and to the intergovernmental organs that fund such assistance.

Yet, as we can see from the Coastal Resilience Project of the UNDP, the post-evaluation feedback mechanism is oblivious to this problem. This raises the interesting question: if the feedback mechanism was functioning properly, what would it have told the GCF about alternative approaches to at least consider in the future, the efficacy of which are not necessarily limited by the disruption of sediment management regimes? The evaluation would have been of greater value had it compared the mangrove regeneration measures undertaken in the Coastal Resilience Project to other strategies for buffering the effects of extreme storm events. To assure the reader that that is not a null set, this Chapter briefly reviews the alternative of managed retreat as illustrated by a project that is being formulated for

implementation in the Mekong Delta, which it calls the MERIT project, and its transformative "theory of change".

One could ask the same questions regarding the limitations that the Climate Resilient Project encountered in providing climate-resilient housing for the poorest and landless segment of the population. It suggests that land entitlement and cost-sharing approaches will leave the most vulnerable residents with dwellings (if any at all) that cannot withstand the more extreme episodes of storm events. This, too, is likely a generic problem in the less developed countries around the world, arguably even in the rich countries like the United States with its large, unhoused population. Ultimately, this may only be correctible with a much larger investment in adaptation responses for these people.

In any event, this researcher will focus only on the first example, alternatives to mangrove regeneration in deltas that are too sediment deprived to support reforestation, to illustrate the main point, namely that funders like GCF need to be thinking about what kind of projects to invest in where the conventional tools in the box prove ***by more effective post-project evaluation processes*** to be too limited for upscaling and replicating, particularly in exceptionally vulnerable landscapes such as river deltas.

7.1 The MERIT Project's Land Use "Zoning" Approach

This researcher has noted in section 4.2 the creative thinking of the Government of Vietnam in Resolution 120, encapsulated in the phrase: "living with floods, brackish water, and saltwater." (Vietnamese Government 2017, 2-14). Another way to express this adaptive strategy is "let the ocean have its way" (my term). In other words, in addition to trying to keep the ocean from invading the landscape with structural barriers or forest regeneration along entire coastlines, instead also adapt the landscape—its people and their land uses—to the

inevitability of sea level rise and the progressive increase in saltwater intrusion. As we have seen from Section 2.1, carried to its probable extreme, the extent of saltwater inundation expected in the Mekong Delta within this century calls for radical and dynamic changes in land uses for something like 40-45% of the delta landmass. The MERIT project's managed retreat strategy illustrates an interesting approach.

MERIT is the acronym for the "Mekong Delta Climate Resilience and Integrated Transformation Project." MERIT is still at a conceptual stage, and yet the World Bank has already drafted a Project Information Document (PID) dated November 22, 2022 (The World Bank 2022b) which has been authorized for public disclosure and which provides some interesting details. The PID suggests that the project is motivated by economic development objectives, which it recognizes can only be attained over the long run by adapting to climate change. It points out that while Vietnam's poverty rate has dropped from ~80% in 1992 to ~5% by 2020, the delta itself has lagged the rest of the country (The World Bank 2022b, 3). As a consequence, there is a dearth of employment opportunities for young adults, which has resulted in an outmigration of 39% of the population over the past decade. This is in spite of the extraordinary food production that takes place in the delta, where "just over half of Vietnam's rice and fish production and more than two-thirds of its fruit production takes place". However, the future is very bleak without major adjustments as "saltwater intrusion, [will result] in an estimated total economic loss of some US$17 billion USD by 2030" (The World Bank 2022, 4). The project is built on the 2017 Prime Minister's Resolution 120 on Sustainable and Climate-Resilient Development of the Mekong Delta (Vietnamese Government 2017), and the Mekong Delta Regional Master Plan 2021-2030 with a vision to 2050 approved in 2022 (MONRE-GoVN 2022):

> The resolution 120's vision for transforming the region's economy represents a set of fundamental paradigm shifts from engineered solutions in support of land and water use for intensified rice and the orthodox climate defense approach, to a "living with nature" philosophy (Vietnamese Government 2017, 4-5).

It adopts a:

> Landscape approach where the region is divided into three hydro-ecological zones (freshwater, intermittent fresh-brackish water, and saline water) to promote different agricultural production systems suited to each zone. . . (Vietnamese Government 2017, 5).

Resolution 120 contains several other references to the concept of salinity zoning:

> The development models will adapt "to natural conditions" and be environmentally sustainable under the motto "living with floods, brackish water, and saltwater . . ." (Vietnamese Government 2017, 3).

> Besides freshwater resources, [the development pathway will] "regard brackish water and saltwater as natural resources for economic development. . . ." (Ibid., 4).

> Vietnam will "[e]stablish ecological sub-zones to orient the development of economy, agriculture and infrastructure (floodplain, freshwater ecosystem, brackish water, and saltwater ecological area, etc.)" (Ibid., 5).

> It will "[a]ttach importance to and mainly apply non-structural measures while structural measures are also well taken" (Ibid., 4-5).

> "The irrigation infrastructure will be developed in line with the climate-resilient agricultural switching model in ecological sub-regions" (Ibid., 3).

These shifts in land uses are already happening to some extent due to economic pressures: e.g., the shift to saline-tolerant shrimp farming is more lucrative already than rice cultivation, which requires freshwater.

The MERIT project is going to be a ~ $500 million USD project to adapt the landscape to the sea, rather than the old engineering paradigm of trying to adapt the sea to the landscape. It will have four components, the largest and most relevant is Component 2: Investing in climate-resilient infrastructure to:

> Reduce the vulnerability of natural assets that are most at risk to climate hazards, such as those located on the coasts and riverbanks that are subject to high rates of erosion."

> * * * This will entail a combination of green (e.g., mangroves, coastal forests, and use of natural materials for riverbank and coastal stabilization) and gray infrastructure (e.g., waver breakers, coastal dikes, and river enforcement structures). (The World Bank 2022, 11).

The intended capital expenditures on infrastructure will include upgrading and modernizing the "the vast . . . irrigation and drainage infrastructure network (e.g., canals, sluices, pumps, weirs, and diversion structures)". The idea is to create a system that brings freshwater into the freshwater and brackish water zones as needed to repel or dilute salinity intrusion and that facilitates the drainage of floodwaters and agricultural effluent to the sea. These infrastructure projects would absorb most of the loan portion of the funding, which can only be spent on capital improvements (that will generate a revenue stream in the form of taxes to the provinces to pay off the debt). Most of this would be used to repair, replace, and automate the operations of sluice gates to control salinity and drainage (Wyatt, pers. comm., 2024).

Wyatt summarized the major infrastructural transformation as moving from the use of sluice gates as flood control devices to the use of sluice gates as salinity control devices. Currently, the gates are used to prevent inundation of the farmland by the annual monsoon runoff and had to be closed for several months, segmenting the ecological system and preventing sediment inflows from depositing and then opening during the many months of the dry season. This has created water pollution and stagnation problems. Another problem with the current floodgates (and manually operated salinity gates) is that they were constructed within compacted dirt barriers, which are subject to rapid erosion from the tides unless there are mangroves to protect them. These mangroves are now mostly gone, so the gates have deteriorated and are no longer operative.

The new approach would involve the automatic opening and closing of the sluice gates during the tidal cycle to keep the seawater from intruding into the canal system during high tides and closing it to allow the canals to drain during the low tides. The gates will allow the floodwaters to drain through the system in a more natural pattern. Many more of these gates will be installed, and all will be automated so that the need for a manual option twice a day can be avoided.

There is also a grant component for non-infrastructural improvements. A major activity in this "soft money" component is facilitating land use changes in response to the increasing salinity levels due to sea level rise and episodic ocean storm events. A notable example is the plan to move fruit tree orchards into the upper part of the delta and replace them with more salt-tolerant enterprises. The logic is compelling: seasonal crops that are lost to salinity intrusion episodes cost the farmer a year's worth of production, but the loss of permanent crops—trees—due to mortality from saline conditions sacrifices years—often decades-- of investment. The government has therefore published a new master plan for the delta that shows maps of how the land uses need to change by 2050.

7.2 "Managed Retreat" in a Comprehensive and Durable Adaptation Plan

The intriguing question is how the land use zoning and associated water infrastructure improvements might fit into a longer-term and more comprehensive climate adaptation strategy for the Mekong Delta (and perhaps universalized to similarly-situated deltas around the world).

The first observation is that the MERIT vision, transformational though it may be in the short term, does not really extend far enough in the future to constitute a truly sustainable plan. It is apparent that the zones created and the land uses they foster cannot be static in the

face of a progressively rising sea, increasing extreme weather events, and variable hydrologic patterns. A more dynamic approach will be necessary.

Moreover, it is not yet clear how the MERIT project would fit into a more comprehensive adaptation plan for the delta. It seems intuitive that such a plan should include three basic strategies:

(1) For coastal population centers where the existing land uses are valuable enough to warrant it, a classic engineering approach will continue to be needed. Ring levees will surely be needed to protect large urban areas such as Ho Chi Minh City, where high tides already create islands within the city that are cut off by flooded areas impassible by car. Seawalls or ring levees will also be needed for other coastal towns where the land use values warrant the expense, which will be high, and the long-term maintenance costs even higher. It is inconceivable that more than a small fraction of the 730 km shoreline of the delta, not to mention the coastline of the entire country of Vietnam, would be able to justify this cost. Moreover, these areas will remain at perpetual risk of failure of the infrastructure and consequent high levels of damage. Engineered barriers must be 100% effective against the sea to be effective at all. When levees are overtopped by storm surges, the barrier actually works to hold the seawater in rather than holding it out. Even a small breach during a major storm event will allow the sea to penetrate into and behind the barrier such that the barrier will actually be counterproductive as it will keep the intruded sea water from draining back out. Those who hope for one hundred percent integrity of infrastructure in perpetuity may be living a fantasy.

(2) In areas where “nature-based” solutions, such as mangrove buffers, are practical, this may be a preferred strategy. In those limited shoreline areas where a sufficient mangrove belt can be maintained or regenerated (i.e., an uninterrupted 500-metre buffer zone right at the

shoreline (Prime Minister Office, Government of Vietnam 2009), mangrove regeneration or other "Nature-based solutions" should be pursued. However, as the preceding Chapters reveal, the potential for this remedy has already been mostly exhausted in the Mekong Delta. Looking at the major delta systems of the world, the only ones that do not have sediment-capturing dams upstream are the ones where the populations are sparse (see Appendix I). This is not an unsolvable problem in principle—there are methods for periodically and perpetually flushing sediment from reservoirs into the downstream river system, and there is some precedent for dismantling dams. But the practicalities and costs are daunting. Perhaps more to the point, it is hard to envision a pathway for climate adaptation financiers, such as the GCF, to be funding projects to flush hydropower reservoirs or tear them down.

(3) In areas where neither of these approaches are practical, it may be wisest to allow the sea to have its way. To bring this home to this thesis, the Mekong Delta is probably in this category. In these areas, land uses would adjust to not only the incremental rise in the sea level but also to episodic surges in salinity intrusion—storm events. Habitations would be upgraded and relocated upgradient and new buildings might have to be restricted. As noted, the sea does not retake the land by centimeters but by meters to kilometers at a time when storms occur. Agricultural and aquacultural uses of the land could continue in a manner, to an extent, and at locations where temporary disruptions due to storm events would be expected and could be tolerated and adjusted to. Repairing fish ponds or rice paddies would be far less expensive than constructing barriers, which will inevitably fail at some point anyway. The problem here is that permanent crops (tree orchards) would not be a sensible investment in areas at high risk of sediment intrusion (or droughts or floods, for that matter). Land uses of this type that cannot be allowed to fail when the sea comes knocking must be relocated.

The MERIT project seems a modest nod in the direction of such a policy called “managed retreat”. Progressively, the sea will permanently inundate as much as 45% of the delta landmass by the end of this century, as noted repeatedly in this thesis. The managed retreat approach would accommodate rather than resist this inevitability by adapting economic activities to conform to the resulting conditions. To reiterate, the concept is to allow rising seas to progressively intrude into the low-lying landscapes where it is not practical to erect barriers—either conventional engineering structures such as sea walls or nature-based barriers such as mangroves—and to conform land uses to the resulting salinity conditions. Crops and fish farms that are saline tolerant would be allowed in the zone(s) near to the sea, land uses that can tolerate brackish conditions would be allowed further upgradient, and uses that require freshwater would be designated further inland. The water management and delivery infrastructure would also be re-engineered to serve these same conditions. For instance, salinity gates would be reconstructed to operate on a diurnal cycle to keep the high tides from intruding upward in the canals and rivers, and then opened to allow the freshwater to flow to the sea. Freshwater delivery systems would be re-engineered to maintain brackish conditions where needed and to irrigate the crops—particularly the permanent crops—that cannot tolerate salinity. The boundaries of these zones will need to migrate landward as seas continue to rise. Habitations and other physical infrastructure would be sited only in the higher ground where flooding is not an appreciable risk.

It is important to add that neither the MERIT project documentation, nor Resolution 120, much less the NAP for Vietnam, uses the term “managed retreat” or even states explicitly that radical land use changes will be needed to cope with a rising sea in the flat but highly productive terrain that is the Mekong Delta. To acknowledge this proposition explicitly,

obvious though it may be on reflection, is untenable politically in Vietnam (and in many other coastal countries). At least for now.

We can see from this discussion that the MERIT experiment will be rich in lessons relevant to delta systems worldwide and vital for the other financing institutions to learn from and may provide a wedge for a more realistic policy dialog on the efficacy of strategies for coastal resilience at the global scale. This is just another example of how and why a systematic, forthright, and broadly-scoped feedback mechanism on climate adaptation efforts is needed.

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CHAPTER 8

THE FINDINGS AND CONCLUSIONS AND THEIR IMPLICATIONS FOR A FUTURE RESEARCH AGENDA

8.1 FINDINGS AND CONCLUSIONS

The analytic framework for this thesis is presented in Section 1.2, and each Chapter reports its findings and conclusions. These do not need to be repeated here. Suffice it to say that the thesis examines the post-project evaluation mechanisms of the largest of the climate adaptation financing organs established by the UNFCCC and concludes that it fails its intended purpose of providing the Green Climate Fund with lessons useful for its commitment to "continuous learning" from experience to inform improvements in the design and execution of adaptation projects. In fact, the evaluation process failed to acknowledge, explain or report the limitations, complications and qualifications that were encountered in accomplishing the key qualitative goals of (1) protecting the poorest and most vulnerable delta residents from the ravages of climate-induced floods and (2) buffering the landscape from climate-induced extreme storm events in a sediment-deprived environment. More specifically, the evaluation in the case study failed to analyze how these limitations bear on the scalability and replicability of these measures in future investments by the GCF. The concern expressed in the thesis is that unless the donor countries are seeing that investments are resulting in progressive improvements in adaptation outcomes, the future of the entire enterprise is at risk.

This researcher concludes that meaningful recommendations for reform must be directed at the GCF itself. Seven proposals are made for improvements in the policies, criteria and process for post-project evaluations to make them more useful for progressive

improvement in adaptation project selection, design and execution. In essence, the core suggestion is that the Independent Evaluation Unit that has already been established at the GCF undertake the evaluations itself, rather than GCF delegating this function to its project implementers, with a staff with a level of technical and economic training and experience fit for the purpose, and with a perspective that transcends the specific geographic and socio-political setting involved in the project. It is also deemed essential that the evaluators be cognizant of emergent and innovative alternatives that may serve as a model and inspiration for wider application.

To provide an example of such innovations in adaptation paradigms the thesis describes an approach that is being formulated for the Mekong Delta that includes the concept of "managed retreat" in the tool kit of measures for coping with rising seas consequent salinity intrusion in delta landscapes, which tend to be highly productive economically, densely populated, and exceptionally vulnerable. This vision allows for adapting land uses to increasingly saline conditions in conjunction with engineered and natural barriers, where feasible and cost-justified. The Government of Vietnam itself introduced this vision, which is now being formulated into a large and ambitious adaptation intervention by the World Bank.

This thesis makes no predictions or recommendations on managed retreat. It is explicated briefly only to illustrate that a process of learning from experience what works and what doesn't and why and where can lead the world to more innovative and potentially effective adaptation responses. Yet learning by doing depends crucially upon robust feedback processes.

8.2 What Further Research is Indicated

The scope of this research was constrained by limitations of time and resources. In light of these practical constraints, this researcher chose one specific adaptation and evaluation case to study for the lessons it might provide that transcend the specific features of the Mekong Delta setting. This case was chosen because it is believed to be emblematic of the low-lying, tropical, and sediment deprived delta systems around the world, because it featured "nature-based" solutions that have come into vogue, and because it illuminated post-project feedback mechanisms instituted by the largest of the climate adaptation funding organs established under the UNFCCC.

Necessarily, the findings and conclusions that can be drawn are anecdotal and therefore more suggestive than definitive. Yet it is the hope and belief of this researcher that the utility of the work has transcendent value in highlighting future research needs in a field where scholarship has been surprisingly sparse. Therefore, this researcher wishes to conclude with a proposed charter of fruitful areas for future exploration:

First, how representative of delta systems around the world is the Mekong Delta, really, with respect to attributes relevant to climate adaptation strategies? It would be interesting to construct a vulnerability index. Appendix I sets forth some basic information on the attributes of many deltas that resemble those found in the Mekong Delta. Of these, the aspect that may be most relevant to the suitability of nature-based solutions is the sediment regimes. Sediment capture in dams is pervasive in these systems. There are more than 50,000 large dams now operating around the world, and the resulting sediment disruption is well-documented for most of them. And the location of these dams relative to international boundaries is easily discernible. What is not yet predictable is how much worse this condition is likely to become as national governments move to decarbonize their power sectors with

renewable alternatives to thermal power systems. Credible institutions such as the International Hydropower Association and the International Energy Agency are predicting a doubling of installed hydropower within the next couple of decades (IHA 2023, 1; IRENA 2023). How this will affect climate adaptation strategies for the afflicted deltas has not been studied, and yet bears crucially on the choice of adaptation strategies to finance by institutions such as the GCF.

Subsidiary to this question are two others: If there is a pattern of sediment capture by upstream and transboundary dams, what if anything can adaptation institutions like GCF, or, indeed, the UNFCCC itself, do to induce the upstream riparian to undertake measures to remobilize the captured sediment for the benefit of the downstream riparian nations? And, if nature-based solutions are limited for these deltas, what is the next best alternative? How far can the managed retreat alternative actually be pursued, with its potential for relocating large populations? Hopefully, the learning that will come out of the MERIT project will illuminate alternatives at the global scale. It warrants further evaluation as it unfolds.

Second, it would also be interesting to evaluate the evaluations conducted for other climate adaptation projects that have been completed in other highly vulnerable delta systems, especially those that are sediment-deprived. The thesis examined only two types of adaptation measures, mangrove regeneration and the construction of climate-resilient houses, and the limitations encountered in implementing both. The climate adaptation toolkit is much wider than that.

Third, it would be interesting to look at a broader range of evaluations of adaptation projects to see whether the failure to deal forthrightly with limitations, complications and qualifications is exceptional or routine. We could start with evaluations conducted on GCF-funded projects. More broadly, we could compare the evaluation processes at the Global

Environmental Facility and the Adaptation Fund, not to mention the processes at the many bilateral aid agencies, United Nations specialized agencies, the multilateral development banks, and so on. A more definitive study of the efficacy of post-project evaluation reports is needed.

8.3 A Final Observation

What is insidious about climate change is its tendency to lull us into complacency. It may seem that the seas rise by centimeters; flood and droughts are just temporary deviations from the norm; coastal and inland erosion is measured in fractions of meters from year to year; the hottest days are only marginally so; extreme storm events are just a local tragedy; habitats, settlements and food production systems can gradually migrate northward or upland. These perceptions are really a dangerous mirage. Average conditions may change incrementally. But the extremes tend to occur cataclysmically and without warning. A serious climate adaptation regime prepares for the worst tomorrow. And while adapting to a changing climate may look a lot like conventional disaster relief, the difference is more qualitative than quantitative. For one thing, climate change is unidirectional. Sea level rise, ambient temperatures, morphological transformations, and hydrologic changes are only going to become more frequent and extreme. And adaptive strategies may take a long time to implement. That means they need to start urgently and improve continuously.

Whether the impacts of climate change come gradually and predictably or suddenly and without warning, adaptation measures generally require a long timeline to implement, and implementation after the damage is a quintessential malfunction. It takes 15-20 years for mangroves to mature. Building enough storm and flood-proof houses to protect entire at-risk communities is not accomplished as the storm clouds gather. Reconfiguring land uses and

associated livelihoods to accommodate restless and capricious seas may take decades. And the learning curve on all of these responses is embryonic. And the richer and less vulnerable nations of the world are not yet highly motivated to get adaptation underway. All of these points point to the importance of tuning up the learning process so that it is equal to the challenges ahead.

Learning from experience takes place as ameliorative measures are tried and succeed and fail in whole or in part, and under diverse circumstances. According to the OECD, the $100 billion USD annual target for adaptation aid has recently been reached (OECD 2024). It would be a lost opportunity if that investment fails to produce learning together with targeted results. But learning requires a willingness to drill down on the façades that aid providers present to aid financiers, which is what this thesis endeavored to do with its field interviews. Like this thesis, the recommendations for future research are to enhance tools and techniques in addition to advancing the academic frontiers. Climate adaptation is like swimming: it is quintessentially a practice rather than a theory, and learning how to do it successfully is a matter of survival on a fragile planet.

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APPENDIX I: HOW THE MEKONG DELTA "LEARNING LABORATORY" CAN INFORM CLIMATE ADAPTATION AROUND THE WORLD

It is the premise of this thesis that the experiences in the Mekong Delta with climate adaptation experiments, with the Coastal Resilience Project as a case example, can yield lessons pertinent to the design and execution of climate adaptations in other highly-vulnerable delta systems around the world. This researcher believes this is particularly the case for other deltas that are experiencing similar development stresses such as sediment deprivation in the river inflows due to upstream dam development causing massive erosional and geomorphic changes and land subsidence due to groundwater extractions, and those deltas that have ecosystems and food production systems typical of tropical climates like the Mekong Delta. For instance, lessons regarding mangrove regeneration are more pertinent to other deltas in which mangroves grow and lessons regarding the adapting shrimp farms to climate change are more relevant to other deltas in which shrimp cultivation currently exists. Yet the extent to which this premise obtains depends critically on how effective the feedback mechanisms that glean the salient lessons from experience prove to be.

This Annex lists some of the earth's deltas where the lessons from the Mekong may have the greatest relevance. The list may be over-inclusive in that time and resources did not permit a detailed comparison of similarities and dissimilarities with the Mekong Delta biophysical setting, and there is not much published literature to draw upon.

The phenomenon of sediment depletion due to capture in dams is likely to increase substantially with the expected boom in hydropower development. To a considerable extent, this will occur at sites above major deltas that are among the most important remaining food production and aquatic biodiversity assets. It is, therefore, somewhat curious that so little analysis has taken place on the juxtaposition of these two phenomena: sites of high hydropower potential and deltas of exceptional vulnerability to the disruption of the flows of sediments and nutrients.

COMMON FEATURES OF DELTA SYSTEMS AROUND THE WORLD

Deltas are important places for food security because of their highly productive agricultural lands and access to resources via waterways (Syvitski et al. 2009). At the same time, the low elevation of deltas means that they are highly exposed to risks from relative sea-level rise, flooding, and salinization. "At the drainage basin scale, dams for hydropower development and water consumption lead to a disconnection of the delta from its upstream area, depriving it of river sediment (Scown et al. 2023). Within deltas, human activities cause local effects such as subsidence due to the extraction of groundwater and hydrocarbons, land

drainage, and construction (Syvitski et al. 2009). Socio-economic systems in many deltas have become disconnected from the ecosystems upon which they fundamentally rely.

Cornell University Professor Daniel Pete Loucks provides an overview of the world's largest deltas, their value as the home to megacities and agricultural production zones, and their vulnerabilities to climate change, which would be exacerbated by (further) upstream dam development (Loucks 2019a). His article also surveys the literature Some of his less obvious but interesting findings, gleaned from the relevant literature, are these:

- Over 5 % of the world's population lives within deltas, which comprise less than 0.5 % of the Earth's land (Scown et al. 2023, 1). Today, coastal river deltas are among the Earth's more densely populated areas (Syvitski et al. 2009; Angamuthu, Darby, and Nicholls 2018; Darby et al. 2013; Rahman et al. 2018; Szabo et al. 2016). Average population density is already almost 12 times higher (around 639–648 persons per km in 2020) than other ice-free land areas. Population densities rise well over 10,000 people per square kilometer in urban parts of some African and Asian deltas (Ericson et al. 2006) and other deltas are undergoing rapid urbanization. For example, the **Ganges-Brahmaputra-Meghna** delta is home to more than 100 million people. Others are home to the largest cities in the world, such as Cairo, Dhaka, Kolkata, and Shanghai. The **Magdalena** in Columbia and the **Rhine** in the Netherlands also stand out. The highest delta-average population densities are consistently seen in the **Nile Delta** (Egypt), rising over 5,000 persons per square kilometer by 2100 . The population density in the **Niger Delta** (Nigeria) more than doubled by 2100. The **Pearl Delta** (China) is currently the most urbanized, followed by the **Rhine, Yangtze** (China), and **Chao Phraya** (Thailand) (Loucks 2019, 5).

- Several deltas are already saturated (or close to) with cropland upon which large populations are dependent for food, including the **Krishna**, **Godavari**, and **Mahanadi/Brahmani** deltas in India and the **Red River** delta in Vietnam. The **Red** and **Yangtze** deltas are almost entirely used for irrigated agriculture. Cropland limits the physical space for other land use types (e.g., the land required for urbanization or for mitigation or adaptation activities (Szabo et al. 2016), and creates tensions and trade-offs with the ecological functioning of deltas.

- Those delta countries with consistently the lowest scores for government effectiveness in adapting their deltas to climate change and development impacts are in Africa or South and Southeast Asia, with the addition of the **Fly** (Papua New Guinea) and the **Orinoco** (Venezuela) deltas. The **Tigris-Euphrates** (Iran, Iraq, Kuwait) and

Vietnamese deltas (**Mekong** and **Red**) also appear among the lowest scores. No data on government effectiveness or adaptation readiness was available for the **Irrawaddy** delta in Myanmar, which may, in fact, be the lowest overall for these indicators as it is for GDP.

The Inland Deltas at Risk

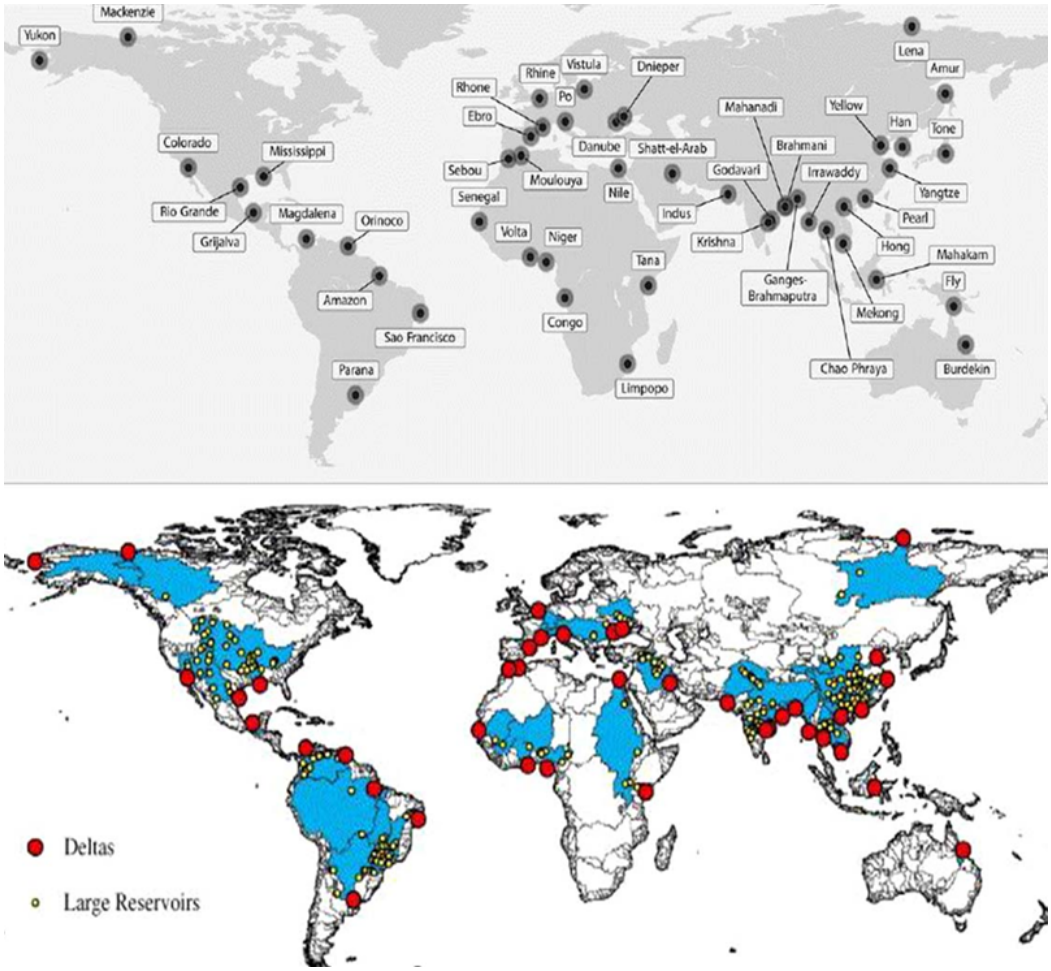
In most cases, the deltas at risk are in estuaries at the coast, but some of the most biologically productive are also inland systems, that is, freshwater deltas. Among the most notable examples of inland deltas are:

- The **Pantanal** on the **Paraguay and Parana Rivers** in Brazil, Ecuador, and Bolivia, is threatened by proposals to dredge sediment from the rivers for navigation.
- The **Okavango Delta** in Botswana is threatened by hydropower development schemes in Angola.
- The **Inland Niger Delta** in Mali, which is threatened by the upstream Selingue Hydropower dam and planned irrigation diversions.
- The **Khor Abu Habil Inner Delta** in Sudan.
- The **Sudd** wetland complex in South Sudan both of which are at risk from upstream dam development on the **White Nile** in Ruanda, the Congo, and Uganda.
- The **Shatt-al-Arab Delta** at the confluence of the **Tigris and Euphrates** Rivers in Iraq.

COMMON CLIMATE-RELATED THREATS

Many of the world's deltas are threatened by the same stressors as the Mekong Delta. These include those caused by upstream dam development, such as sediment and nutrient depletion and flow distortion, combined with the aggravating impacts of sea level rise, coastal erosion, and subsidence due to groundwater extraction. The majority of the deltas (28) are projected to see a decrease in sediment over the 21st century, with 22 deltas experiencing a decrease of over 50% (Zhu et al. 2024). Recent research suggests that 85% of the river deltas around the world have shrunk during the first decade of this century due to sediment capture in the upstream reaches of their river basins (Sok et al. 2020; Snedden et al. 2007; Syvitski et al. 2009; Fan et al. 2017). With much of their lands just above or below sea level, many developed river deltas along coasts are vulnerable to floods and saltwater intrusion. With rising sea levels, their vulnerability to flooding will likely increase both in terms of extent and duration (Leinenkugel, Esch, and Kuenzer 2011; Anthony et al. 2015; Renaud and Kuenzer 2012; Syvitski et al. 2009; Makaske et al. 2013; Loucks 2019). The decreases are caused by reservoir construction and increases in wealth, which correlate with other water engineering and influence land use.

Sediment deprivation is projected to be the most extreme in the **Indus** (India and Pakistan), which is projected to lose 93 % relative to 2010 loads (Loucks 2019, 5-6).



Maps showing locations of some of the world's major reservoirs and deltas impacted by changes in their inflow regimes (Tessler et al. 2015). The blue areas are the watersheds whose runoff flows into their deltas.

Among the deltas most vulnerable to these stressors, in addition to the Mekong, are these:

Sediment trapping by dams:

- Many deltas, including the **Ebro, Mississippi, Nile, and Yangtze** River deltas, suffer from a lack of sediment due to upstream dams.
- In Pakistan, one-fifth of the **Indus** Delta plain has been eroded since the river was first dammed in 1932.
- In China, the northern shore of the **Yellow River** delta has retreated several hundred meters each year for the past several years.
- Similar impacts occurred to the **Zambezi River** delta distributaries after an upstream

dam and flood protection embankments were built.

- Reduced sediment supply is the main cause of the subsidence taking place in portions of the **Mekong** and **Nile** deltas.
- Because of river damming and river sand mining, the rate of land accretion in the **Pearl River** delta has declined to 40% of what it was over the previous 145 years in response to less fluvial input.
- Even the dams in the **Amazon River** basin have and are resulting in adverse ecological and environmental impacts.

Flow alteration due to upstream dams

- In the **Tana** and **Zambezi** deltas, more extreme river flows caused by upstream dams have caused local damage and even some loss of life for those living on the flood-plains. Reduced natural flow and sediment regimes resulting from upstream dam operation tempt people to move closer to the fertile delta riverbanks. Yet when high precipitation events occur, these delta communities are caught by surprise by the erosion and river course changes that occur (Brown and Nicholls 2015).

Changes in hydrology

River discharge increases due to climate change are a key driver of high-water levels in deltas fed by the **Indus** (India and Pakistan), **Limpopo** (Mozambique), **Volta** (Ghana) the **Fly** (Papua New Guinea), and **Yellow** (China). While floods can be a destructive hazard, they are also essential for functioning delta systems, delivering water, sediments, and nutrients that support ecosystems and agriculture in the delta plains. Thus, a reduction in flood extent will have consequences for delta functioning. Reductions in maximum daily flows of more than 50 % are seen in the model results for **Sebou** (Morocco) and **São Francisco** (Brazil).

Groundwater extractions

- The **Chao Phraya** Delta in Thailand is sinking each year because of groundwater use.
- In the **Ciliwung** delta, subsidence is threatening the north of Jakarta, caused in part by groundwater extraction.
- The **Irrawaddy** and **Parana** deltas are witnessing higher rates of subsidence than replenishment, and thus, together with sea-level rise, are increasing the risks of flooding (Higgins 2016).

Coastal erosion:

- In addition to the Mekong, other deltas continually experiencing shoreline erosion include the **Chao Phraya**, **Ebro, Yellow**, **Nile, Rhone, Song Hong** (aka Red River in Vietnam), and **Volga** (Russia) deltas. For example, the **Chao Phraya** River flowing through Bangkok, Thailand, has experienced substantial delta loss. Parts have subsided to more than a meter below sea level (Saito 2008).

Sea level rise:

- In addition to the Mekong, other major river deltas that are being impacted by local sea level rise include the **Rio Grande** (USA/ Mexico), **Magdalena** (Colombia), **Parana** (Argentina), **Niger** (Nigeria), **Mahanadi** (India), **Brahmani** (India), **Ganges–Brahmaputra** (India/Bangladesh), **Irrawaddy** (Myanmar), **Chao Phraya** (Thailand), **Pearl** (China), and **Yangtze** (China).

- By 2100, land losses from rising sea levels alone could reach 5% even for higher deltas such as the **Ganges–Brahmaputra** and the **Krishna–Godavari;** 30% for the **Mekong**, **Nile,** and **Yellow;** and more than 80% for the lower **Danube** delta.

- By mid-century, the **Godavari**, **Mississippi**, **Orinoco** (Venezuela), and **Sao Francisco** (Brazil) deltas could experience greater than 10% land loss from flooding.

- In the **Krishna** Delta, widespread seawater intrusion is transforming the fresh groundwater into brackish/saline water. With more dams across the Krishna and the Godavari rivers under construction and/or being contemplated, together with increasing groundwater and hydrocarbon extraction within the delta region, the health of the ecosystem and the well-being of the millions of people inhabiting these deltas are at risk.

- Even better-preserved deltas such as the **Danube**, the most extensive wetland in the European Union and a global biodiversity treasure, will lose its network of channels, lakes, marshes, and dunes that is the habitat for thousands of plant and animal species, some of which are threatened (Loucks 2019b; Maan et al. 2018; Stanley 1996; Liu et al. 2018).

Extreme weather events:

- Besides subsidence and sea level rise, more extreme weather events on deltas are resulting in more severe floods, longer-duration droughts, and higher temperatures. The frequency, duration, and strength of cyclones causing floods seem to be increasing, especially in the Asian deltas (e.g., **Irrawaddy** and **Ganges–Brahmaputra–Meghna**), and in the **Mississippi** River delta.

Climate Adaptive Responses

At these coasts, hard barriers such as levees, dikes, and locks are the conventional engineered solutions to erosion, flooding, or seawater intrusion. However, such projects are expensive, require perpetual maintenance, and are likely to eventually fail as storms become more intense. Where retreat is an option, reshaping the coast's sandy beaches, barriers, and mudflats may allow the overall delta landscape to adapt to higher sea levels. But intensely developed delta landscapes cannot realistically retreat. Urbanized deltas will create the most acute pressures for infrastructure solutions. But in cities such as Shanghai, Bangkok, and Dhaka, infrastructure and buildings will have to adapt to recurrent floods and consider evacuation plans. In sum, it is fanciful to hope that infrastructural solutions will be able to fully mitigate these impacts on delta systems.

Nature-based delta restoration measures can help ameliorate the risks to deltas, but they generally come with too little too late. They consist of actions such as planting protection belts consisting of coastal forests (mangroves, melaleuca); creation and designation of nature areas and national parks, natural wetlands; planting of salt-tolerant/drought-resistant/deep-rooting species; avoidance of practices leading to land subsidence, and minimizing wind speed and evaporation. However, these measures can do little to protect cities. And even in rural areas, nature-based solutions are sorely pressed to keep up with the rate of impacts. Mangroves are being destroyed much faster than they are being regenerated in the tropical cyclone belt. Examples include the **Ganges–Brahmaputra** in India and Bangladesh and the **Irrawaddy** in Myanmar. This may reverse in time as the climate adaptation funding conduits created by the UN Framework Convention on Climate Change mature, increase, and become more effective, but this will take time and resources that are in short supply (Loucks 2019, 5-6).

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APPENDIX II: SUMMARY OF INTERVIEWS WITH VIETNAMESE OFFICIALS AND BENEFICIARIES

Interview of a staff member of the Vietnamese Disaster Management Authority, a unit of the Ministry of Agriculture and Rural Development, in Hanoi on January 7, 2025:

In her view, the project has been implemented efficiently and economically and under budget, saving about $1 million USD, which can be used to implement further climate adaptation activities. She provided feedback on several issues:

- **Selection Process and Criteria**

MARD was pleased with the site selection process and criteria, as well as the outcomes. Notably, Ca Mau Province was selected as a project site due to its high vulnerability to climate change, with significant risks related to rising sea levels, drought, flooding, saltwater intrusion, and land subsidence. However, Ca Mau is less vulnerable to typhoons compared to the other provinces.

In the Mekong River Delta, flooding is not as severe in the central or northern areas. In fact, the floods in the Mekong region provide benefits by delivering nutrients to the land. As a result, the local population has adopted a mindset of coexisting with floods and enjoying the benefits that these floods bring.

- **Climate resilient housing**

Building resilient houses is quite challenging for low-income individuals in Vietnam due to financial constraints. The project addresses this issue by providing financial support to poor and vulnerable populations, giving them an opportunity to access grants from GCF funds. The total funding required to construct a resilient house is approximately 50-70 million VND (Between the years 2018-2022). The GCF provided about 40 million VND. The resident also received a counterpart grant from the national government of approximately 14 million to 16 million VND, which depends on the level of a family's poverty. Additionally, they can obtain small loans from the "Social Policy Bank", which can range from 10 to 15 million VND with little to no interest. Since these amounts are relatively small, they have the option to repay the Social Policy Bank over a longer period, such as 10 years. However, if local residents wish to construct larger houses, they need to contribute additional funds by borrowing from relatives or asking for free assistance from a private cement company.

For some extremely vulnerable individuals, affording to build a house is challenging, as they may struggle to gather the minimum required contribution. However, according to the fieldwork interview in Ca Mau, a local resident said that building a house takes at least 120 million VND. "There are some poor households that could have received the support of 80 million VND (=$3500). from the P013 project; however, building a house requires at least 120

million VND (=$5000). They are completely unable to borrow money from relatives or from the bank, so they give up on receiving this support and do not dare to accept the project's assistance. They remain poor and vulnerable. For households in great difficulty, no one dares to lend them money.

Families who received funding from the project said: “Without this support from P013, my family would not have been able to build this house. If we had built the house entirely with our own money, we would not have been able to afford it or borrow the full amount, as we could not pay it back. With this support, we dared to borrow the rest and built a house like this to stabilize and protect our children from the sun and rain, as living with small children in a temporary house was very difficult when the house was not safe. We are very happy to receive this support.” (Ms. Lien, U Minh District, Ca Mau province, interviewed on 29 October, 2024 and Nov. 21, 2024)

- **Land issues:**

To build a house under Vietnam’s regulations, one must have a tenancy certificate and a land certificate. Many poor individuals do not possess a land certificate, so they are not eligible to access the funding support from the project for climate resilient upgrades because the land may actually belong to someone else. This situation could lead to conflicts between the landowner and those living on the land, which the government would be unable to resolve. Consequently, any investment in such cases would be considered a waste. The government is working on a way to assist the landless people, but no program is yet in place. In certain areas, the local governments established a land fund, a portion of which can be allocated to support poor individuals, but this is not widespread across the country.

In Vietnam, there are three different types of land tenure: the red book, the green book, and the pink book. The green book refers to land that the government issues to farmers or poor people for a certain number of years. This might be 50 years, for example. These might be families involved in mangrove planting and shrimp farming. The red book pertains to land ownership by private individuals. The pink book is for land occupied by structures that are more or less permanent, such department-stores, or apartment buildings, or high-rise buildings.

- **Design selection**

The GCF has hired consultants to design resilient houses tailored to each province. It is essential to consider the specific conditions of each province, such as climate and cultural factors. The Departments of Construction (DOC) in each province create a detailed design profile for houses and submit it to the Ministry of Construction (MOC) for review. By the end of the project, they managed to get approval for seven resilient house designs adapted to meet the needs of specific provinces. The local residents are allowed to choose among these

options. For example, if some individuals cannot afford the 70 million VND option, they can choose a design that costs 50 million VND, provided it meets the resilient housing criteria.

The project doesn't just provide funding but also technical assistance. Project technical staff visits each household to ensure that the construction aligns with the approved designs and meets the necessary construction standards. This technical advice is needed because many local residents, particularly those from poorer backgrounds, lack the necessary knowledge about construction techniques and the correct materials.

At the end of the project, over 4966 climate-resilient houses had been constructed, surpassing the initial plan of 4,000 houses. The project has benefited more than 20,000 individuals.

- **Budget for housing allocation:**

To reach a final decision on allocating the budget for households, the GoVN must follow several steps. First, it establishes eligibility criteria and submits them to the local authorities for review. They will then assess all the households in the area to determine how many meet the established criteria. They will then set priorities, as the budget cannot accommodate all families. Criteria assign point values to prioritize individuals. For example, people with disabilities are allocated specific points. These criteria need to be clearly communicated to all parties involved to ensure comprehension. When the criteria are transparent, conflicts are less likely to arise. Furthermore, even if some individuals may not receive high scores, resulting in not receiving funding from P013, there are still alternative support options available from other projects.

- **Mangrove regeneration:**

It is essential to select appropriate areas for mangrove planting. The GoVN efforts go beyond just planting mangrove forests; they also work on developing livelihood models that teach residents how to benefit from the mangroves. This approach is beneficial in ensuring the project's long-term sustainability. The approach is to plant mangroves together with the shrimp ponds with a 60% of mangrove forest and 40% of shrimp pond (60-40 allocation), however, in many cases, it is actually a 50-50 allocation. This raises the question of whether that coverage by the mangroves is sufficient to provide a buffer against storm surges. Before proposing this approach, the Government of Vietnam analyzed potential natural disaster scenarios in relation to the project budget and chose this model.

- **Overall project's satisfaction**

At the conclusion of the project, the GoVN held numerous meetings, chaired by the Minister of MARD, who has been involved from the start. Most beneficiaries, particularly families, expressed satisfaction with the project because they received free money that allowed them to build resilient houses. Without it, many of them were unable to afford the construction resilient housing and would have to continue to live in slums or substandard conditions.

Consequently, the Minister expressed high appreciation for the project's outcomes and emphasized the importance of scaling them up to other provinces.

Last year, a UN assessment was carried out by national consultants in collaboration with the Ministry of Construction and VNDMA to identify opportunities for extending the replication of resilient houses nationwide. The project has also detected strong interest from international organizations seeking to fund resilient housing for low-income families. This interest was motivated by the effects of Typhoon Yagi in September 2024, which had a devastating impact on housing in Vietnam. It persuaded the Vietnamese government to concentrate its efforts on promoting resilient housing solutions.

The government has now partnered with UNDP to establish a fund for resilient housing that includes contributions from enterprises, the private sector, and international organizations (GCF is not a contributor). This arrangement enables the GoVN to complement its own budget for the hiring of consultants to manage the construction process. Vietnam is concentrating on a vision that will make resilient housing a key priority for the administration.

- **Project sustainability**

The GoVN believes the project has a strong sustainability aspect, not just in terms of securing funding but also in terms of community maintenance of the project after its completion. That is because where the project regenerated mangroves, it also provided training for local people to care for the mangroves and to establish livelihoods based on them.

Interview of Ca Mau Provincial Officials on February 18-19 in Ca Mau City

Ca Mau Province aims to attract additional reforestation support projects. Areas with dead forests, as well as those that have been harvested, require replanting. Numerous international organizations are focusing on Ca Mau, particularly its forests, to generate carbon credits. However, the current mechanism for these credits is unclear and not fully developed, prompting the provincial People's Committee to do more research. They are in the process of assessing the region's carbon reserves to determine the amount of carbon credits available for sale.

I) Mangrove

Due to its fertile soil, Ca Mau is conducive to successful reforestation efforts. Specifically, under the GCF project P013, 3,168.18 hectares were planted, comprising 224.19 hectares of newly planted forests and 2,943.99 hectares of restored forests located in various districts. The project supported nearly 1,000 households involved in forest planting in protected areas. The cost of planting new mangroves after reforestation is approximately $2,090 per hectare.

Successful silt trapping is essential for regenerating mangrove forests, which can be facilitated by structures such as embedded poles and bamboo piles. Some projects have successfully utilized cajuput and bamboo stakes to promote natural regeneration over time. While pile

barriers are a key component of the overall strategy, fully supporting these barriers requires significant funding.

Past afforestation programs, including the GCF project, have been successful in protected forests, particularly in three communes: Dat Mui, Vien An, and Vien An Dong. Annually, the provincial People's Committee assigns quotas for new plantings and for harvesting to ensure sustainable forest management. The goal is to restore 100% of the forests, balancing exploitation with reforestation. However, coastal erosion, especially on the eastern coast, poses challenges, with significant forest loss due to erosion.

Currently there is a project to plant mangroves in bags, undertaken by two supporting companies. But the cost of planting in bags is a bit high. The capital source comes from businesses and investors, as the government has not yet implemented this technique. Only 4,000 trees per hectare are planted compared to the traditional rate of 10,000 trees per hectare. According to the research, almost all of the trees planted in bags survive, so there is no need to check and patch like the traditional way.

In Ngoc Hien district, Ca Mau province, planting in protected forests is challenging due to erosion along the 98 km eastern coastline, where up to 75 inches of shoreline forest is lost annually. Of this coastline, only 9 km of anti-erosion embankment has been constructed so far, with 2-3 km being added each year at a significant cost of about 40-50 billion USD VND (approximately $40,000 USD) per kilometer. These embankments are made of concrete for durability and are primarily designed to reduce erosion rather than to retain sediments. Ngoc Hien district spans around 73,000 hectares, with approximately 35,000 hectares designated as forest land, featuring three types of forests: protected forests, special-use forests, and production forests. Most forest planting occurs in protected areas, where residents can plant trees, harvest select species, and share in the revenue. While communities significantly influence forest management in production and protected forests, Mui Ca Mau National Forest allows only tree planting and limits human intervention, resulting in minimal aquaculture activity. Special-use forests, such as those managed by Mui Ca Mau National Forest, are not eligible for harvesting due to their military bases.

The provincial government also allocates production forests to forestry companies like Ngoc Hien Forestry Company, while certain areas are designated for local management where individual households are contracted for timber harvesting, although local authorities retain ownership of the land.

1.1 Mangrove cultivation and shrimp farming:

The interviewees reported minimal legal or policy barriers but highlighted significant challenges in livelihood development due to shrimp diseases. For some years, the intensive shrimp farming model has faced a low survival rate of approximately 23%, leading to decreased productivity of 180-200 kg per hectare.

In Ca Mau, integrated projects linking reforestation with shrimp farming aim for a balanced ecosystem, targeting a 50-50 distribution for local communities within a 60,000-hectare area, of which 20,000 hectares are certified for clean shrimp farming. The ideal balance is 60% forest and 40% shrimp farming, yet locals prefer a 50-50 ratio due to quicker economic returns from shrimp farming compared to the long-term investment in charcoal-producing mangroves. This request has been accommodated by the government, allowing poor families to earn an income through a combination of both practices.

Additionally, shrimp farming is restricted in special-use forests but permitted in protected forests at a 70-30 ratio. In protective forests, a maximum of 20% of forest resources can be harvested, whereas production forests allow for unrestricted harvesting. Trees in these areas take 10 to 18 years to mature before they can be harvested. Harvesting requires permits for exploitation, which may yield minimal profits due to high labor and replanting costs. Local authorities have successfully rallied public support for the project's economic benefits, and farmers who comply with the mangrove shrimp pond mix can receive certification for adhering to ecological standards, which gives them a premium price for their shrimp.

Industrial shrimp farming in Ca Mau is heavily regulated, with compliance required by various government departments. Households are expected to incorporate waste treatment systems to mitigate pollution risks. However, forest mangrove planting may negatively impact local livelihoods, as fallen leaves can introduce microorganisms harmful to shrimp and crabs. Environmental factors, such as prolonged heat followed by heavy rains, have also contributed to shrimp and crab mortality, a phenomenon observed annually.

1.2 How the GCF project can be improved in extending or upscaling it?

In future projects, priority should first be given to reforestation, followed by training, and then to livelihood support. The initiative should provide technical training to enhance shrimp farming skills and expand livelihood options beyond just shrimp and crab farming to include raising other fish and shellfish. By offering financial incentives, community members are likely to take a greater interest in forest protection, promoting a balance between economic development and ecological awareness.

Additionally, the project trial on a "two-stage shrimp farming" model aims to increase survival rates among shrimp. This approach involves incubating shrimp fry for 15 days before releasing them, which helps ensure they are healthy and disease-free, ultimately leading to higher survival and productivity rates. The expected harvest time for shrimp raised under this model is 3.5 to 4 months. However, the current project has only included training and lacks sufficient funding to fully implement the two-stage shrimp farming method. However, according to a farmer, the two-stage shrimp farming approach is not effective in large pond areas. He explained that it was because the shrimp were accustomed to being fed at specific times during the two-week incubation period. As a result, once the shrimp larvae are released into the larger pond after two weeks, they must search for food on their own, leading to some

larvae dying due to a lack of food availability. Furthermore, to foster self-sufficiency among local communities, the local government should encourage and incentivize experimentation and investment in business innovations beyond traditional shrimp farming.

II). Land erosion:

The eastern region of Ca Mau, particularly towards Nam Can, faces severe erosion issues, raising concerns about the viability of reforestation efforts. In the last five years, the coastline has receded about 100-200 meters, resulting in annual mangrove losses of about 30-50 hectares, with some areas experiencing even greater depletion. Seasonal sand movement causes deposition during the flood season, followed by periods of erosion. In the Ngoc Hien area, approximately 6,000 hectares of flat land, including 1,000 hectares of alluvial land near the national forest, are eroding, leading to significant shifts in the boundary of the protected forest as submerged areas increase.

While the eastern coast suffers from erosion, the western coast benefits from sediment deposition, with ongoing monitoring of these changes. As a result, Ca Mau has become a focal point for offshore wind energy projects, which help create barriers against waves, reducing their energy and mitigating erosion. The local government suggests that trapping silt using embedding poles or bamboo piles could aid in regenerating mangrove forests, with some projects already employing cajuput and bamboo stakes for natural regeneration. However, constructing temporary dykes and barriers requires significant funding.

To combat erosion, homes must be built at a safe distance from riverbanks and dykes, although specific setback distances are not defined. The GCF project lacks clear regulations regarding the required inland distances for construction, and inspections have indicated that substandard construction will lead to enforced relocations. Houses in buffer zones should be safely distanced from eroding banks, but again, no precise measurements are provided. Erosion levels are alarmingly high, even during dry weather, indicating the necessity for a comprehensive approach to climate change. Ca Mau's geographical features, including its proximity to the sea, an extensive network of rivers and canals, and fragile soil, make it particularly vulnerable to erosion, exacerbated by climatic factors and high salinity during droughts. Thus, erosion remains a critical concern in Ca Mau.

- **Groundwater extraction and subsidence**

Two points of view were expressed. Some local government officials expressed uncertainty about subsidence, citing a lack of concrete research or groundwater monitoring. Scientists attribute subsidence to groundwater extraction, but the interviewee/local government staff is uncertain about this claim, suggesting that if subsidence facilitates seawater intrusion, it would take many years to develop. Most observations rely on scientific predictions rather than definitive studies, although international experts have conducted valuable surveys that show subsidence and flooding to be affecting the entire Mekong Delta. Others in the local

government of Ca Mau highlight the critical need to protect groundwater layers, which have significantly declined due to over-extraction and a lack of replenishment due to an abbreviated rainy season. Groundwater extraction has led to subsidence across Ngoc Hien, affecting the entire area rather than localized points.

In response, the government is sealing wells and emphasizing groundwater conservation since Ca Mau relies heavily on this resource, unlike neighboring provinces with surface water access. They advocate for the shared use of existing shared wells rather than drilling new ones to expand urban water supply networks. They prescribe the use of one well for multiple households to limit new drilling in areas with established systems. Recently, restrictions on drilling new wells have been imposed by the provincial committee, particularly in Ngoc Hien, although families with long-established wells can continue using them, even in areas with salty water. Most households already have wells, and new drilling is uncommon due to the high costs and the increasing depth required to access water, which has shifted from around 70-80 meters in the past to over 300 meters now.

However, Ca Mau is also investing in both urban and rural systems, including increasing nearby well capacities during droughts and using trucked water in emergencies. The province currently lacks groundwater pumps and primarily depends on well water and rainwater for its water supply. Public water supply exists in residential neighborhoods, but in remote areas, residents usually drill their own wells. Few groundwater pumps are evident, and their limited quantity makes them hard to pinpoint.

Groundwater usage is regulated through a permit system with quotas, particularly for industrial facilities like seafood processing plants that have strict water usage limits. Groundwater extraction is only allowed for small family farms but is prohibited for use on large tracts of land. For instance, using groundwater for extensive pond areas, such as hundreds of hectares, is not allowed. While illegal and clandestine extraction may occur, it is strictly forbidden if detected. If government investment falls short, there are plans to shift towards privatization.

Agriculture and aquaculture rely mostly on natural water resources, with groundwater being used mainly for domestic purposes. Rice farming depends on stored freshwater and natural rainfall. Any crops are typically cultivated during the rainy season. In aquaculture, groundwater is mostly reserved for seafood processing, while shrimp farming predominantly relies on saltwater. In cases of high salinity, intensive shrimp farms may need to pump fresh water to reduce salt levels, although this is infrequent. Shrimp farming is managed to minimize groundwater use, with careful planning for seasonal cycles to maintain necessary salinity levels. Farmers construct water reservoirs to manage saline intrusion and seasonal drought, and the government provides guidance on optimal water management practices.

- **Salinity intrusion:**

It mainly happens in the irrigation canals. In Ca Mau, over 30 sluice gates have been built in U Minh district to address saltwater intrusion and protect freshwater availability. Unlike other areas in the Mekong Delta, the irrigation system in Ca Mau is tailored to block saltwater and preserve freshwater, prioritizing flood prevention and drainage rather than conventional agricultural irrigation. An extensive network of rivers and canals exceeding 10,000 km requires more than 200 billion USD VND annually for dredging due to silt buildup. Every year, they have an irrigation team dredging, mainly to prevent saline intrusion during high tides, funded by irrigation fees.

II. Housing:

2.1 The process and criteria for the site selection

The project focuses on constructing 130 houses in areas adjacent to the sea or within 5 to 10 kilometers of the coast, following specific site selection criteria. These criteria emphasize assisting low-income households located along the coast that have been directly affected by storms and floods. The government plans to expand resilient housing further inland, away from mangrove forests, adhering strictly to residential zoning regulations.

Forest land cannot be indiscriminately used for housing; any land use change requires approval from the Provincial People's Committee and the Provincial People's Council. As such, forest clearing for housing is heavily regulated to protect those areas, and housing must be constructed within designated zones.

The project implementation process requires a careful review of residents' eligibility and identification of available land. The household must possess land suitable for house construction, capable of supporting a residence for at least 30 years without conflicting with other uses. This land should also be situated in locations where building a home will not interfere with national projects or land set aside for future development. Selected households must also have suitable land for construction, ensuring it is not part of a national forest or earmarked for future development.

The total project cost is 10,658 billion USD VND, with half (5,329 billion USD VND) funded by the provincial budget and the remaining amount sourced from the project fund. The provincial project management board will be responsible for engaging with and selecting eligible beneficiaries.

The selection process involves the district working closely with the commune to identify suitable candidates, who will then be reviewed and approved by the project. This process begins at the commune level, with the list of candidates subsequently presented to the district level, prioritizing economically disadvantaged families that have been adversely impacted by natural disasters. After the project was approved, the local government assisted the households in receiving money from the bank by signing their names, and then they took the money to the construction man immediately.

The implementation process involves local authorities surveying, reviewing, and making decisions about potential projects, which are then approved by the Provincial People's Committee. Initially, many households were proposed for support, but criteria needed to be established due to limited resources.

The financial support remains consistent at 40 million VND from GCF. Beneficiaries report satisfaction with the selection process and have even supplemented aid with their own funds for house construction.

2.2 Determining the design of climate-resilient housing

The Construction Department is responsible for all house designs in consultation with the provincial and local People's Committee steering committee. The house design is exemplary in terms of structural integrity and functionality. For any future projects, the local government would recommend utilizing this design, as it has proven to be effective and adaptable going forward. Throughout the design phase, the Construction Department offered three design options for public selection and discussion, ensuring that the final choice was aligned with the community's economic conditions.

Ca Mau's Department of Natural Resources and Environment (DONRE) reports that the GCF project has financed the construction of 425 houses for families across five districts and 23 communes and towns, primarily benefiting families located in coastal and near-coastal areas characterized by forest land. The provincial government has reclassified certain barren and undeveloped forest areas for residential construction to meet the project's needs; however, housing construction is prohibited on agricultural land.

2.3 Land tenure requirements

To qualify for construction support, land must be designated for residential use and either possess a title or be certified by local authorities as long-term residential land. Households must own the land to receive assistance, as concerns exist about potential disputes. Many families lack identification or certificates of tenure rights, which hinders their access to aid. The project does tenure rights that are inherited and free of ownership disputes. In certain coastal areas, many residents live on agricultural land they cultivate; however, the project does not extend support to them due to failure to meet the criteria. Many face significant hardships and live in temporary housing, with some elderly residents lacking the means to access aid, further complicated by issues like not possessing ID cards.

Approximately 70% of rural populations rely on natural resources for their livelihoods, and many lack fishing tools, rendering housing assistance insufficient without additional resources. Though some areas have been designated for resettlement, many families return to their previous homes, as their livelihoods are tied to those locations. There remains a significant unmet need for support, particularly for low-income households in Ca Mau.

The district People's Committee believes the current processes and mechanisms are effective, receiving considerable attention and directives from provincial authorities to ensure proper funding and implementation. They work closely with communes to pre-emptively address issues when distributing financial assistance, sometimes acting as guarantors to help residents purchase materials and labor. While the processes are deemed adequate, further improvements could include additional supervision from authorities to ensure correct fund usage.

2.4 Story of local government helping households to build the houses.

In coastal areas, the house construction must be at least 100 meters from the levee, to be safe. There are regulations on this. The people are poor, without cash to buy materials or hire labor. Local authorities are directed to act as guarantors if needed. For families with someone at home who can help with construction but lack the full resources, the local administration will direct the youth union, women's union, self-defense forces, etc., to assist in building the house without needing to hire labor.

The local government stated that this was the first time implementing a housing project for typhoon-resistant structures, so there was a lack of experience. Initially, there was no specific policy or mechanism in place, which led to slow disbursement.

Currently, there is still high demand for housing assistance among low-income and near-poor households in the province. However, many do not meet eligibility requirements, primarily due to the inability to raise matching funds for construction. Some poor households lack land or do not have land-use certificates, or they live on others' land by agreement, making them ineligible for project support.

There are many other challenges:

- Many previously supported households now have degraded homes, and must rebuild according to the approved area and design standards, which poses challenges for low-income families.

- The accelerated disbursement timeline adds pressure, while the support amount is too low.

- Ca Mau has weak soil, requiring costly foundation work, and lacks local construction materials, necessitating transport from other areas.

- Those eligible for support mostly live in remote areas with disrupted traffic routes due to drought, subsidence, and erosion, making the transport of construction materials challenging.

➢ Funding from donor sources is hard to identify, and residents must mainly rely on contributions from family members and local organizations. Government support levels for typhoon and flood-resistant housing for low-income households remain low. ODA funding procedures for localities are slower than the project's schedule, causing implementation difficulties.

2.5 Lessons learned from the project:

Provincial officials emphasized that the key factor in the success of the project was their active leadership, along with guidance from diverse government departments. They noted that without such support, progress would be minimal. Internationally funded initiatives in Ca Mau have proven to be highly effective, and international donors are enthusiastic about supporting the province due to its robust governance practices that guarantee foreign aid directly benefits residents in their efforts to adapt to climate change. This support is expected to persist into the future. The local government seeks sustainable, substantial, and foundational assistance rather than just temporary help.

2.6 The strength of the project.

The project is marked by its swift, timely, and efficient execution, leading to many advantages for the community. while there are no fundamental weaknesses, some challenges have emerged during implementation.

2.7 Challenges of the project

The primary challenge of this project that the local government faces is insufficient funding, compounded by the fact that many low-income families do not own land. Although some households were selected for project support, they were later found ineligible for various reasons, such as non-compliance with location requirements or land situated in unsuitable areas like riverbanks.

Many disadvantaged households lack land ownership and often depend on relatives for housing. In some cases, their land is inadequate for residential purposes, forcing them to live in particularly vulnerable areas. If these families do not meet the selection criteria, local government should provide alternative solutions, such as long-term land leases.

The 130 houses being built will not completely resolve broader social welfare issues in the community, and some households impacted by the project do not fully qualify for support. At the onset of construction, the district made significant efforts to rally resources, with strong backing from neighboring families and various benefactors contributing to the housing fund. Each house is allocated 80 million VND, split evenly between donors and the state, but actual construction costs may exceed this, necessitating that households cover any additional expenses.

2.8 Legal or regulatory hurdles

The main concern is the availability of land for housing construction. For example, construction in coastal areas is strictly prohibited, and building on dikes or reclaimed land is not permitted. Mangrove forests are typically protected areas where permanent housing construction is prohibited by regulation.

Many low-income individuals live and farm in these restricted areas, posing significant planning challenges. Therefore, the local government must rely on other support programs for these residents while ensuring adherence to the specific criteria of this program.

2.9 Some families received funding from the Coastal Resilience program, while others did not.

Some families were able to access climate-resilient houses, while others were not, yet there has been no conflict or dissatisfaction among residents. Those without support remain positive and understanding of each other's situations, expressing hope for future programs with less strict eligibility criteria. Priority is given to poor households that meet the existing criteria, with approximately 425 households receiving assistance so far.

The province is encouraged to enhance processes for future projects and funding initiatives and to mobilize both domestic and international donors to assist families across various regions, not just those along the coast. Future projects should focus on better coordination, streamlined processes, and the pursuit of additional support programs for the poor households in Ca Mau province.

2.10 Recommendation

Key lessons learned highlight the need for better coordination between donors and local government during project implementation. The program should also be executed in a more organized manner, especially since this project involves specific designs, contrasting with previous initiatives that allowed local craftsmen more flexibility. Lastly, increased government oversight and guidance are needed at both the provincial and district levels.

INTERVIEW WITH RESILIENT HOUSING BENEFICIARY FAMILIES IN U MINH

I) Housing:

Some poor families in Ca Mau earn a living through fishing. For example, the husband working on a fishing boat and the wife cutting fish for a local fishery. The wife earns 4,000 VND ($0.16) per kilogram for cutting tuna and about 9,000 VND ($0.35) for cutting smaller fish. She works from 3 to 6 PM and makes around 100,000 to 200,000 VND (= $4-$8) daily. Previously living on the riverbank, they experienced flooding, but their new location is only affected by rising tides rather than flooding. High tides occur unpredictably from October to December, causing severe erosion and instability, which leads to annual repairs on the banks for safety.

This family received housing support from the project to build a house 10 km from the west coastal seashore, costing 200 million VND, with 80 million VND coming from the project. Although the housing program isn't fully effective, she feels much safer in her new home, which is free from flooding, strong winds, and landslides, unlike her old, cracked house. The construction followed government design, and while her family couldn't contribute significantly financially, they received some interest-free loans from relatives. She is uncertain about repaying these loans due to their current financial situation.

Many families in the region are struggling with housing support. Some have land but lack the necessary funds (up to 40 million VND) to contribute to the total costs beyond the 80 million VND for house construction provided by the project, resulting in their inability to benefit from the project funding. Others own land only by the river and coastal seashore, which disqualifies them from receiving project funds. Approximately 30% of families live near the river and coastline in Ca Mau, placing them in a vulnerable and impoverished situation. While some families retain their land unless lost to erosion, compensation is only available for losses related to government projects, not for those caused by erosion.

In another case of a family who received funding from the project, the situation is like this: The family is comprised of five members, with the husband and wife born in 1992. The husband operates a durian granary in Dak Lak province, while the wife stays home to care for their three children. Their lives are significantly affected by natural disasters and weather changes, which often prevent him from working due to rain or storms. He engages in activities like drilling land and renovating shrimp farms, but adverse weather can make these tasks dangerous. His daily earnings range from 200,000 VND to 250,000 VND (=$8-$10)/day. In heavy rains, their home's foundation often floods. This situation also makes it challenging for the children to attend school, which is located 4-5 km away. Despite these challenges, he expresses satisfaction with their house, noting, "It's good to have a house like this." He believes that other poor families might also have the opportunity to obtain housing, depending on project eligibility criteria.

This family received approximately VND 80 million from the government and the GCF; after receiving the funding, the family promptly handed the money over to a builder to start constructing their house.

The families who received housing support from GCF and the GoVN are very satisfied with the project However, the amount of 80 million VND is not enough to complete the house construction. Families have to contribute more money around 100-200 million VND more from their own funds.

The housing support project under project P013 has proven effective for low-income families. Poor families view the government's assistance as invaluable. They acknowledge that the funding of 80 million VND per household is substantial, particularly for a low-income family like, where daily living expenses leave little room for savings. They found that the house design

was pleasing. They feel much safer in the new house, as having a stable home provides shelter, his living conditions have improved with a more spacious, cleaner, and airier house, enhancing the family's quality of life.

II) Families involved in mangrove planting and shrimp farming:

Most families in Ca Mau have been engaged in ecological shrimp farming- planting mangroves 60% and mixed shrimp farming 40%, although a balanced 50-50 division is preferred. They received financial assistance of 2 million VND annually for shrimp seeds from the GCF project. The more areas devoted to shrimp farming, the more lucrative the income for the local farmers.

Most families planted many hectares of mangrove forest, allowing the trees to mature for 15 to 18 years before harvesting them for charcoal. The harvesting process is methodical, involving staggered cutting based on tree age. The interviewee received financial returns of 100 million VND in 2012 from 1.5 hectares and 120 million VND in 2023 from 1,5 hectares, although the cost for replanting mangroves cost around is 35.5 million VND/ha in Ca Mau. The tree harvesting requires advance approval from the State Forest Board.

Farmers engaging in organic shrimp farming utilize tidal patterns for seasonal harvesting, mainly from mid-January to early February, while wild shrimp are available year-round. Climate change poses significant challenges, such as extreme weather and declining water quality, leading to increased disease in shrimp. Farmers often rely on a stagnant water method for trapping shrimp, which necessitates careful water level monitoring.

To combat climate change, the government encourages mangrove planting, although many farmers lack an understanding of its benefits. Traditional farming practices complicate disease management, typically necessitating scientific help only after losses occur. A local cooperative faced pricing disagreements among its members, leading to inconsistent shrimp prices.

Earnings from shrimp farming can range from 300 to 400 million VND per 7 hectares in good years but may drop to tens of millions during poor years. The farmer supports the Coastal Resilience project, which allows for better breeding stock selection, and advocates for limiting cash handouts from the project to farmers to prevent misuse.

The GCF project, which promotes mangrove planting, has slightly improved conditions by reducing harmful snails and providing a better habitat for shrimp, although ongoing maintenance is necessary to prevent interference with shrimp farming. Recommendations include planting trees more sparsely after 4-6 years for optimal growth.

Climate change is also affecting the farmer's infrastructure, necessitating the elevation of stilt houses and reinforcement of embankments against unpredictable weather, rising water levels, and stronger winds. While water pollution and climate change challenge shrimp farming due to disease, mangrove forestry remains stable. Storms are a major concern, but

rising tides are manageable, although ongoing road construction raises fears of future landslides. Construction of embankments is done by hired workers at reasonable costs, but fluctuating weather complicates shrimp farming and adaptation to climate change, often resulting in lower sale prices.

The State Forest Enterprises has entrusted the land to local families, but they do not own the land outright. They possess a "Green Book" (Sổ Xanh), which serves as a Land Use Right Certificate issued by the Forestry Department. This certificate allows for the management, exploitation, and planting of forests for a limited duration, essentially functioning as a lease. Once the contract term expires, the Forestry Department can reclaim the land unless local policies allow for continued use.

In previous years, local officials advocated for mud pumping to preserve land for road construction and to combat rising tides. However, now they have to conduct the mud pumping themselves as needed. If they own drilling machines, they only need to cover fuel costs; otherwise, hiring workers for renovations can cost about 13-14 million VND per project, carried out biannually. Renovations occur around July, with the State Forest Enterprises allowing two months for the process.

Local farmers rely on water from a drilled well for daily activities, while rainwater is used for drinking and cooking. They hire workers to drill a new well, and no permission is required for installation. Although land subsidence occurs annually due to falling water levels, groundwater levels do not affect shrimp farming or residence. Some households lack piped water access, leading to careful and judicious use of available groundwater.

Irrigation in the area is stable, and the recent deepening of the river benefits shrimp farming. However, ongoing land subsidence poses risks, and uncertainty regarding groundwater and soil management raises concerns about potential structural collapses in the area due to the weak, alluvial land. According to Mr. Hoang, many people lack knowledge about strategies for adapting to climate change.

INTERVIEWS IN THỪA THIÊN HUẾ PROVINCE

On February 18, 2025, this researcher interviewed Quang Hien District officials, Quang Cong commune officials, Quang Loi commune officials, and 4 families from those two communes, all within the City of Hue. Interviews with the District Department of Agriculture and Rural Development(DARD) of Hue Capital were denied because the Department of International Relations (DIRs) and the Police Department (PD) overlooked or neglected to include DARD in the official communication letter regarding the researcher's collaboration with the National University of Social Sciences and Humanities. The absence of guidance from DIR and PD led DARD to assert that they have a policy prohibiting interviews with foreign researchers, illustrating once again the difficulty in conducting field research in Vietnam.

The interviews that were conducted affirmed that the Coastal Resilience Project has made significant contributions to the socio-economic development of the locality in the view of both the local community and the government of Thừa Thiên Huế Province.

The housing benefit was targeted at poor families whose homes are located in vulnerable flood-prone areas near Tam Giang lagoon and the seashore and less than 1.5 meters above current flooding levels. That selection criterion was based on Directive 48 from the Vietnamese Prime Minister's office. (Directive 48/2014/Q Đ -TTg, dated 28/8/2014) (Prime Minister Office, Government of Vietnam 2014). In the selection of the families to receive benefits, local People's Councils facilitated discussions to determine eligible households, culminating in a submitted list for district-level verification. After the families were approved, the funding was transferred directly to the approved families, bypassing intermediaries to streamline access. Each family received financial assistance of around 80 million VND (approximately $3400 USD) for building flood-resistant homes. Families were tasked with hiring constructors, with payments made directly to the builders to ensure compliance with city standards. The duration for house construction was 6 months in the year 2018-2020 and 3 months in 2024.

The successful execution of the project was due in part to the approval received from various governmental agencies for the budget allocations, operational plans, and contractor selections. Strong coordination among local authorities and agencies has also played a key role in ensuring that project activities are carried out in a timely manner. Additionally, loans of supplement funds from the Social Policy Bank have been crucial. The government subsidizes such loans with very low interest rates. A loan of 15 million VND can be taken from the Social Policy Bank with a loan duration of 10 years and an interest rate of 3% per year. Repayment starts in the 6th year and is to be completed by the 10th year, covering both principal and interest). This is also based on Prime Minister Decision No. 48, dated 28/8/2014.

Support from organizations such as the Vietnam Fatherland Front Committee, the Women's Union, the Red Cross Society, and businesses like Luks Vietnam have also greatly benefited the impoverished families involved in the project.

According to the People's Committee of Quang Dien District, between 2018 and 2021, the number of families classified as poor decreased significantly from 167 to 6, indicating the project's contribution to poverty alleviation.

- **Strengths:**

The initiative has successfully built 731 storm and flood-resistant homes and is making progress on planting 22 hectares of mangroves in Hương Phong city, Thừa Thiên Huế Province. Community satisfaction is high, with residents noting a reduced need for evacuation during floods and improved housing safety. About 50% of households now have two-story homes for flood protection, while around 20% built single-story homes for storm safety.

Families that did not receive assistance from the P013 project felt disappointed, but they understood that the project prioritized the most vulnerable, such as the elderly and those living alone. Those denied assistance often had nearby family support. Families not yet funded remain hopeful for future assistance.

Interviewees affirmed that the GCF project was highly beneficial for the poor and vulnerable families in Thừa Thiên Huế by providing protection against floods. Local communities appreciate that the project helped prevent the displacement of residents previously affected by flooding. The local government views it as a great success. Families who received funding expressed happiness and security, although some still carry debts of up to 15 million VND at a 3% interest rate over ten years to the Social Policy Bank.

The project faced no regulatory barriers, facilitating its implementation.

- **Weakness:**

The project still leaves many families living close to or right in the areas that are prone to flooding, sometimes multiple times a year. Most of them are old and live alone. The younger people have moved to cities and go abroad for work. Many of these families are quite poor, making the 69 million VND allocated from the P013 project for building a house insufficient. As a result, they must seek additional funding through sponsorships, support from relatives, and their personal savings. The amount the family can contribute varies greatly; while some may only be able to add around 30 million VND to complete the construction, others might need to invest an extra 100-200 million VND.

The land and topography are characterized by low-lying areas, requiring the construction of a large foundation to prevent flooding during high-water seasons. It is recommended to elevate the houses on piers so that the floodwaters cannot invade the lower floor of the house. However, the local government said that constructing houses on piers would cause the cost to more than double due to building a high foundation and filling the foundation with soil, compared to the newly built two-story houses that were designed by the project.

This results in costs exceeding 100 million VND. However, this fee only covers the house itself, meaning additional funds must be sourced to build a bathroom and kitchen appliances. These extra expenses significantly increase the overall cost of construction, making the total outlay for building a house quite high. The families feel that the assistance from the project is insufficient. Some families in highland areas prefer single-story houses, while some in lowland areas desire two-story homes. However, the project is only offering a standardized two-story house design for all locations.

I) Mangrove:

The benefit of mangroves is that they support the ecosystem in the Tam Giang lagoon and the local economy and ecotourism. The promotion of a sustainable tourism economy alongside

aquaculture is essential for sustainable growth and climate adaptation. Activities related to mangrove planting and protection have heightened local awareness of the importance of these ecosystems, reducing threats to their conservation. Moreover, they withstand waves, wind, and storm surges and keep the dykes from eroding. Among their other climate and environmental benefits, mangrove forests are essential for supporting livelihoods in Hương Phong Commune through aquaculture. The Coastal Resilience Projects aimed to plant 22 hectares of mangroves in this area, to enhance the quality and coverage of these ecosystems, thereby protecting coastal communities, aiding carbon sequestration, and increasing biodiversity, ultimately benefiting around 2,783 households by promoting sustainable livelihoods, job creation, and improved living standards.

In the Thừa Thiên Huế area, families plant mangroves separately from shrimp farming. They don't mix together like in Ca Mau. They grow mangrove forests and catch fish and shrimp naturally. They tend to plant mangroves around the banks of the shrimp ponds on the levees rather than interspersing them.

Tam Giang Lagoon in Thừa Thiên Huế has a mix of salty water and fresh water. In the dry season, the water in the lagoon is quite salty. In the rainy season, the lagoon has more fresh water coming from the rivers. The lagoon covers an area of about 52 square kilometers and extends for roughly 24 Kilometers in length. The total area of mangrove forest in the lagoon is 3700 ha in Quang Dien district. That is regarded as full capacity for mangrove planting as the lagoon does not need further mangrove plantations. The rest of the area of the lagoon is needed for fishing.

Mangrove forests play a vital role in environmental protection, particularly in mitigating climate change, promoting eco-tourism, and supporting aquaculture, which boosts livelihoods in Hương Phong Commune. An initiative to plant an additional 22 hectares of mangrove under the GCF project aims. The development of new mangrove plantations has restored many rare fish species that were previously almost extinct due to overexploitation and now have a chance to revive (CVSEAS 2025).

2) Sediment:

Three rivers flow into the lagoon: The Huong or Perfume river, the Bo river and the Ou Lau river. These bring sediments into the lagoon, which is dredged periodically to provide material for the dykes and levees along its fringe.

3) Climate change impact:

Climate change impacts are manifest in Thừa Thiên Huế province in the form of floods, storm surges, and typhoons at typhoon for 100-200km/hour. These effects seem to be becoming larger. For instance, a drought occurred in 2020, and then large floods in 2022. Normally, the rainy season lasts from September to December. 2022 had big rain that lasted until late March 2023. It caused big flooding and much damage to agriculture. Almost all of the districts were

completely under the water, and the dykes and levees were breached. It's very hard for local government to predict and solve these problems. The GoVN has invested a lot in the irrigation and drainage system and in embankments and dykes. But that has not been sufficient due to unpredictable and severe climate change.

Every year Quang Dien district faces at least two flood events. These have displaced households who lived along the rivers and caused severe land erosion along the rivers. The same happens every year in many districts in Hue. Last time, around seven communes were displaced, each containing around 6000 families. Now, there are only around 30 vulnerable families left along the riverbank, and the government has plans to relocate them. They loved to live along the riverbanks due to their convenience for transportation and their lives attached to the rivers. The government assisted and evacuated people for the relocation 2005-2007. They put them in a house inland where it is safe from flooding and land erosion.

4) Groundwater pumping

In most districts in Thừa Thiên Huế, the local people get all their water from pipes from the local water company for domestic purposes, not using any groundwater. Agricultural uses fresh water from the river, which is not impacted by salinity. However, there are two communes that are not near a river. They pump groundwater into a pond, and then they use that water for irrigation. But there is no land subsidence in Thừa Thiên Huế.

5) Challenges of the project:

Increasing material costs driven by inflation have created a need for more funding than the original 80 million VND allocated. Families often have to depend on their own savings, bank loans, or support from local organizations for additional financial help. At times, they seek assistance with labor from youth unions, women's unions, private cement companies, and international organizations like the Red Cross.

Depletion of natural sediment from rivers to support mangrove planting in the Tam Giang lagoon. However, the lagoon seems to have enough silt and sediment from the river, especially where there is lots of rain, to sustain the mangrove planting. And the percentage of survival is 85%. However, the sediment base for mangrove planting is supplemented through slurry pipelines from a sediment bank that has been established. The sediment layer is around 0.8-1.0-meter-deep when the high tide comes. But the total cost of building the base is quite expensive, around $459,128/22 ha or ($20,000/ha) (People's Committee of Thừa Thiên Huế Province Project Management Board for Green Climate Fund Against Climate Change 2024). Hence, this model for mangrove planting in Lagoon cannot be scaled up to other places.

6) Conclusion:

The mangrove afforestation component only took place in 2024, achieving the planting of 22 hectares in Huong Phong commune, Huong Tra district. Many of the poor people were not employed in the mangrove planning even though they were classified as poor because they were elderly or disabled. Many young people who would have been good workers for the mangrove regeneration have left the area to seek work in big cities or abroad, often sending remittances back home. Instead, a company was hired to do the planting and then handed the plantations over to the district government to manage them.

While local residents are pleased with the housing construction, there are mixed feelings about promoting mangrove planting versus prioritizing fishing farming, as many local fishermen and farmers prefer to use Tam Giang Lagoon space for income generation by farming fish. Support for fishing farming from local government may complicate mangrove conservation efforts, as the mangrove forests can limit access for fishing boats. Nonetheless, long-term mangrove regeneration is essential for biodiversity conservation and for protecting communities from storm surges, flooding, wind, and soil erosion.

Families that benefited from the GCF project for housing improvements were highly vulnerable and classified as poor, earning roughly 2.5 million VND (around $100)/month. Elderly individuals living alone and those in poverty typically relied solely on financial support from family members and relatives and received a social allowance of about 1 million VND/month if they were 80 years or older. In 2022, elderly individuals aged 80 received 360,000 VND($15)per month in 2022, which is expected to increase to 500,000 VND per month by 2025 (ASL Law Firm 2022). They obtained funding of 80 million VND ($3400) from the GCF- P013 project to build resilient houses against flooding and storm surges, but this amount was insufficient. As a result, they had to borrow from relatives and banks, deplete their savings, and receive free support from a private cement company to finish building their houses, with total costs averaging between 200 to 250 million VND (approximately 8,000 to 10,000 USD). After receiving the P013 funding through the local government, they were responsible for finding their own construction contractor and making direct payments to them.

Before the housing upgrades, some of the beneficiaries faced severe flooding inside their homes of 1-1.5 meters and destructive storms, which forced them to climb onto their roofs to await rescue by boat or to flee to higher areas or to their relatives' homes for safety. During these floods, they often lost livestock and household items. The government assisted with evacuations, particularly for the elderly. During the flooding time, they used boats for transportation. However, since the completion of the project, residents no longer require evacuation, as they can safely stay on the second floor of their new homes.

The resilient housing project to prevent storms and flooding in Thừa Thiên Huế has proven to be highly effective, particularly evident during the severe storms and flooding of 2023. The sturdy houses with a second floor provided families with a safe escape from rising waters.

APPENDIX III: POSITION OF THE INTERVIEWEES, QUESTIONNAIRES AND LETTER OF ACCEPTANCE

1) LIST OF INTERVIEWEES

List of interviewees during the fieldwork in Ca Mau 28-30 October 2024 and in Thua Thien Hue (16-20 February 2025)

1). Meeting with the Department of Environment and Resources (DONRE) of Ca Mau Province (Oct. 28, 2024, at 2:00 PM).

No.	Position of the Interviewees	Consent Form Yes/No
1.	Department of Natural Resources and Environment	Yes
2.	Finance and Planning Office at Department of Agriculture and Rural Development	Yes
3.	Construction Department-A specialist in Housing management and Real Estate Market at Department of Construction	Yes
4.	Provincial Police (Economic Department)	Yes
5.	Provincial Police (Political Department)	(No)
6.	Board Mannagenement of GCF Project	Yes
7.	Sciences and Technology Department	Yes

2) Meeting with U Minh District, Ca Mau province (Oct. 29, 2024 at 9:30 AM)

No.	Position of the Interviewees	Consent Form Yes/No
8.	Vice President of the People Committee U Minh Dítrict	Yes
9.	Vice President of People Committee of Khánh Lâm Commune	Yes
10.	Vice Head of Agricultural and Rural Development Department	Yes
11.	Vice Head of Natural Resources and Environment	Yes

12.	Vice-Head of Finance and Planing Office	Yes
13.	Vice Head of Criminal Police Office	Yes
14.	Staff of People's Committee and People's Council	(No)
15.	Vice Head of Economic and Society Office	Yes
16.	Farmer 1, at Ấp 6, Xã Khánh Lâm, Huyện U Minh, Tỉnh Cà Mâu.	Yes
17.	Farmer 2, at Xã Khánh Lâm, Huyện U Minh, Tỉnh Cà Mâu.	Yes
18.	Farmer 3, at Xã Khánh Lâm, Huyện U Minh, Tỉnh Cà Mâu.	Yes

3). Meeting at Vien An Dong District, Ca Mau Province (Oct. 30, 2024 at 10:00 AM)

No.	Position of the Interviewees	Consent Form Yes/No
19.	Head of Agriculture and Rural Development Department at U Minh District	Yes
20.	Vice President of People Committee Vien An Dong Commune	Yes
21.	Staff at the Department of Agriculture and Rural Development	Yes
22.	Vice Head of Natural Resources and Environment	Yes
23.	Vice Head of Economic and Development	Yes
24.	Vice Head of Forestry Police of Khanh Lam Commune	Yes
25.	A staff at Office of People's Council and People's Committee	Yes
26.	Farmer 1 at Vien An Dong Commune	Yes
27.	Farmer 2 at Vien An Dong Commune	Yes
28.	Farmer 3 at Vien An Dong Commune	Yes

List of Interviewees of the fieldwork in Thua Thien Hue (16-20 February 2025)

4). Quảng Hiền District, Date : 18 Feb. 2025

No.	Position of the Interviewees	Consent Form Yes/No
29.	Vice president of People Comittee of Quang Dien District.	(No)
30.	Head of the Department of Agriculture and Rural Development of Quang Dien District.	Yes
31.	Deputy Chief of the Office of the People's Committee of Quang Dien District.	Yes
32.	Deputy Head of Department National Resources and Environment	Yes
33.	Deputy Head of Department of Economic and Construction	Yes
34.	Expert of Office of People Committee and People Community of Quang Dien District.	Yes

5). Quang Cong Commune, Date: 19 Feb. 2025

No.	Position of the Interviewees	Consent Form Yes/No
35.	Vice Chairman of the People's Committee of Quang Cong Commune, (Responsible for Cultural and Social Officer, in charge of labor, invalids, and social affairs of Quang Cong Commune)	Yes
36.	Department of Economics and Infrastructure of Quang Dien District, Hue City	Yes

6). Quảng Lợi Commune, Date : 19 Feb. 2025

No.	Position of the Interviewees	Consent Form Yes/No
37.	Vice Chairman of the People's Committee of Quang Loi Commune	Yes
38.	Land registration officer of Quang Loi Commune, Quang Dien District, Hue City.	Yes

7). Families in Quảng Công Commune and Quảng Lợi Commune, Date : 19 Feb. 2025

No.	Places	Consent Form Yes/No
39.	Family 1 at Quảng Công Commune	Yes
40.	Family 2 at Quảng Công Commune	Yes
41.	Family 3 at Quảng Lợi Commune	Yes
42.	Family 4 at Quảng Lợi Commune	Yes

8) Interview UNDP – in Hanoi, GOUNH (September 23, 2024 at 3:00PM)

No.	Name and Sure Name	Position of the Interviewees	Consent Form Yes/No
43.	Vũ Thái Trường	Project Manager	Yes
44.	Ngo Hong Hoa	Financial Officer	(No)
45.	Dung Le Ngoc	Monitoring and Evaluation	Yes
46.	Nguyen Mai Nhi	Project Assistant	Yes

9). Interview GCF- in Songdo, South Korea (October 21, 2024 at 9:30 AM)

No.	Position of the Interviewees	Consent Form Yes/No
47.	Land Use, Forests and Ecosystems Sector Senior Specialist Green Climate Fund	Yes

10) Interview IUCN- in Ho Chi Minh City on October 04, 2024, at 12:00 PM, Nov. 18, 2024, at 3:00PM, January 17, 2025, at 12:00 PM, and February 24, 2025, at 2:00PM.

No.	Position of the Interviewees	Consent Form Yes/No
48.	Deputy Head of Lower Mekong Subregion at IUCN, Mekong Delta Program Manager at IUCN	Yes

11) Interview Vietnam Disaster Management Authority (VNDMA), MARD (January 07, 2025 at AM)

No.	Position of the Interviewees	Consent Form Yes/No
49.	Department of International Cooperation and Science & Technology, Vietnam Disaster and Dyke Management Authority, Ministry of Agriculture and Rural Development	Yes

12) Consultation with a scholar from IIED-Online zoom meeting (January 07, 2025 at 3:30 PM)

No.	Position/Organization	Consent Form Yes/No
50.	International Institute for Environment and Development (IIED)	No

13) Consultation with an SCO- in Songdo, South Korea (October 24, 2024 at 2:00 PM)-Wish to be anonymous

No.	Position/Organization	Consent Form Yes/No
51.	Secretary General of Climate Watch Thailand	No

14) Interview WWF and Climate Change Working Group (CCWG)- in Ha Noi (January 6, at 3:00 PM)- Wish to be anonymous

No.	Position/Organization	Consent Form Yes/No
52.	Project Manager from the Climate and Energy Practice, WWF-Vietnam.	No
53.	Coordinator of the Vietnam NGO's Climate Change Working Group (CCWG), Vietnam's largest NGO network on climate change responses.	No

15) Interview GIZ- in Ha Noi (January 7, at 11:00-12:20 PM)- Wish to be anonymous

No.	Position/Organization	Consent Form Yes/No
54.	Programme Director Mekong Delta Climate Resilience Programme (MCRP) Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Room E3-E5, No.14 Thuy Khue, Tay Ho Hanoi, Viet Nam	No
55.	Team Leader Water Management and Coastal Protection	No

16) Consolation of experts and researchers related to climate change contacted by email on the topic: “Post-Project Evaluation Reports related to Climate Adaptation Projects” 13 Jan. 2025. (No Consent Form)

No.	Position
1.	Head Interdependent Redness Mechanism GREEN CLIMATE FUND
2.	Director Department of Monitoring, Evaluation and Learning GREEN CLIMATE FUND
3.	Chief Investment Officer Office of the Chief Investment Officer GREEN CLIMATE FUND *(No return email)
4.	Senior Planning Officer Green Climate Fund Sectoral Department Climate Change GIZ *(No return email)
5.	Climate Project Coordinator Financial Institution Group Advisory Services IFC-World Bank Group *(No return email)
6.	Land Use, Forests and Ecosystems Sector Senior Specialist Green Climate Fund
7.	Senior Manager, Policy Women’s Environment and Development Organization *(No return email)
8.	Senior Climate Policy Analyst, Institute for Climate and Sustainable Cities in the Philippines *(No return email)

No.	Position/Organization
9.	Climate Policy Analyst, Institute for Climate and Sustainable Cities in the Philippines *(No return email)
10.	Team Leader: International Climate Risk and Adaptation Research Fellow Stockholm Environment Institute
11.	Professor at Johns Hopkins University
12.	Professor at Johns Hopkins University
13.	University of Amsterdam, Netherlands
14.	Deputy Head of Lower Mekong Subregion at IUCN
15.	Director General ICEM-International Centre for Environmental Management, Hanoi, Vietnam
16.	Director Office of Climate Change, Energy and Environment USAID/Vietnam *(No return email)
17.	Programme Director Mekong Delta Climate Resilience Programme (MCRP) GIZ
18.	*Senior evaluator and lead analyst*. International Institute for Environment and Development (IIED)
19.	Research Fellow in Climate Change Adaptation Institute for Risk and Disaster Reduction University College London
20.	World bank officials work in Vietnam.

21	GCF-Intern GREEN CLIMATE FUND
22.	PhD Researcher at University of Amsterdam

QUESTIONNAIRES FOR FIELDWORK

Sample Questions/Topics for Interviews to People's Committee of Ca Mau, DARD, MOC Project Management Board of Ca Mau:

"By participating in this survey or questionnaire, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time."

Name:…… Date:……Time: ……

1) What involvement did you have in the selection of the sites for the climate adaptation projects in Vietnam (FP013)?

2) What was the process and criteria for that site selection?

- In the selection of sites, what assumptions were used as to the width of the mangrove belt that is necessary to be effective in buffering ocean storm surges?
- What was the source of that assumption?
- What is the magnitude of typhoon and frequency data that was used in planning the mangrove buffer?
- How does the regeneration that occurred under the project compare to these assumptions?

- What is the location of the regeneration site relative to the shoreline?

- Did you find that there was sufficient mudflats at that site for successful mangrove regeneration?

- How do you know that it will be successful?

- Where does the sediment come from to replenish the mudflat from the erosion caused by the sea?

- What rivers contribute that sediment?

- Do any of these rivers have upstream dams that are capturing some fraction of the sediment?

- Are shrimp also cultivated in the site where the mangrove is being regenerated?

- If so, what is the fraction of the land coverage devoted to shrimp ponds compared to the coveraged by mangroves?
- Where is the basis for that fraction (what policy or regulation).
- What is the basis for the assumption that that ratio will create a buffer that is effective against storm surges.

- What is the expected survival rate of the mangroves regenerated by the adaptation projects?
- What is the basis for that prediction?

3) In retrospect, how satisfied were you in the results of that selection process? If you could do it over again, what changes would you make in the process and/or criteria?

4) How satisfied are you regarding the adequacy of the funding allocated?

5) Were there any legal or regulatory hurdles that had to be resolved at provincial and district level?

6) With regard to the particular measures implemented:

a. What role did you have in determining the design of climate resilient housing?

b. How satisfied are you with the resulting design? Are there ways in which you think it could have been improved?

c. What was the success rate achieved in the mangrove regeneration? Do you think that could have improved by employing difference species, techniques, site selection?

7) Of the climate resilient housing target of 20,000 households, how many of these were carried out in Ca Mau province? Where in the province were these houses built?

8) Some households received resilient housing and some did not; some areas received mangrove regeneration, and some did not. How were these decisions made and did it result in friction and/or dissatisfaction among the residents?

9) Why were some families selected to received funding/help from this project and other families who have the same condition were not selected?

10) Do you think families who received funding/help from this project are satisfied with the outcomes of this project? Why or Why not?

11) A key question How can resilient housing and mangrove regeneration can be scaled up to provide an adequate level of resilience for coastal communities in Vietnam. What are your views on this? Are there ways in which the cost-benefit ratio can be improved for future projects?

12) The mangrove regeneration activity about 21 hectares in Western part of Ca Mau, U Minh district (supported by KfW-Germany) (Please show me on the map) and how much of that mangrove still survive? If they didn't survive, what are the reasons for not surviving?

13) Are you aware of any other mangrove going on in Ca Mau province? What were the successful rate of mangrove regeneration?

14) In the future, do you want this kind of project to happen again?

15) Could you explain about the suitability of the project (FP013-by UNDP) with the needs and development priorities of the province?

16) What is your opinion on the project sustainability?

17) Could you tell us about the Provincial evaluation of project implementation and results (Mangrove plantation, livelihood models, and Community -based Disaster Risk Management (CBDRM))?

18) Could you tell us about the links between this project and projects of the state and other organizations in the province

19) What are the strengths and limitations of the project?

20) What are the lessons learnt and recommendations of the province for after the project

***** Thank you very much for your time and cooperation*****

Questions/Topics for Interviews with Affected Stakeholders (Beneficiaries and Dis-Beneficiaries):

For Climate Resilience Housing:

1) Have you been experienced house flooding? Tell me about it?
How often, how severe, what have you done to cope with it?
Have you lost livestock due to flooding, how long the flooding last?
Did the flood water come from the sea?

2) How was your household affected by the climate adaptation measures that were implemented in your community?
3) Did you receive a climate resilient house, or not? If you did, how satisfied are you with the design and location of the house? How do you think it could have been improved?

4) Do you think the benefit of the project is worth the cost?

a. Yes, very much.
b. Yes, somewhat
c. No, I don't think the benefit worth the cost.
d. I am not sure.

5) Do you think the level of funding is sufficient for the size of the problems?

e. It's less.
f. It's enough.

g. It needs more.

6) Over the past 7 years of the projects implementation, do you see any improvements in coping with climate change? Why?

7) Are you satisfied with the project so far? Why?

8) What are your suggestions/recommendation to make the project better in terms of adaptation to climate change issues that you are facing now?

For Mangrove Regeneration Families:

1) Were you involved in the mangrove regeneration activities? In what way?

2) Was your livelihood affected by the mangrove regeneration? How was it affected?

If so, what compensation did you receive or were you promised? How satisfied are you with that result?

3) Do you think the benefit of the project is worth the cost?

a. Yes, very much.
b. Yes, somewhat
c. No, I don't think the benefit worth the cost.
d. I am not sure.

4) Do you think the level of funding is sufficient for the size of the problems?

e. It's less.
f. It's enough.
g. It needs more.

5) Over the past 7 years of the projects implementation, do you see any improvements in coping with climate change? Why?

6) Are you satisfied with the project so far? Why?

7) What are your suggestions/recommendation to make the project better in terms of adaptation to climate change issues that you are facing now?

***** Thank you very much for your time and cooperation*****

Interview Questions on Groundwater Pumping

Q: Are you aware of groundwater pumps anywhere in Ca Mau province?

Q: Can you please draw circles on this map where you have seen groundwater pumping?

Q: What months of the year do they seem to be operating?

Q: Who owns and operates these pumps? Government officials or private landowners?

Q: Most important question of all: How and where is this groundwater being used?

For the shrimp ponds? Why?

For the rice fields? Why

Q: Have you noticed an increase in groundwater pumping in recent years? Why would that be?

Q: Have you noticed any changes in the lands around the pumping areas in recent years? For instance, does the land seem to be sinking? When it rains, are the puddles around the pumping areas larger than they used to be?

Q: Where the land is sinking, does ocean water come in to fill these areas? Do you see salt deposits in these areas?

Q: What actions are the government officials taking to limit groundwater pumping?

<u>Interview Questions on Mud Flats and Irrigation Diversions</u>

Q: Have you noticed any changes in the amount of mud flats at the edge of the ocean over the past several years? What have you noticed?

Q: Can you please show me on this map where you have seen these changes?

Q: Have you seen any changes in the mangroves in these areas?

Q: Do you have any photographs of these changes?

Q: Have you noticed changes in the irrigation system in Ca Mau? Are the irrigated areas expanding?

Q: Can you show me on this map the areas where you have seen this expansion occurring?

***** Thank you very much for your time and cooperation*****

LETTER OF ACCEPTANCE FROM CVSEAS

Vietnam National University Ho Chi Minh City – University of Social Sciences and Humanities
CENTER FOR VIETNAM AND SOUTHEAST ASIAN STUDIES
Address: Room A211, 10-12 Dinh Tien Hoang, District 1, Ho Chi Minh City
Telephone: (8428) 3910 0692 – Fax: (8428) 3911 0297 – Website: www.cvseas.edu.vn
Email: info@cvseas.edu.vn

Ref: 124/TTNCVNĐNA

September 04th, 2024

LETTER OF ACCEPTANCE

Mrs. SYMONEKEO SENSATHITH
Johns Hopkins University
School of Advanced International Studies (SAIS)
Washington, D.C., USA

Dear Mrs. SYMONEKEO SENSATHITH,

Warm greetings and best regards from the Center for Vietnam and Southeast Asian Studies (CVSEAS) at the University of Social Sciences and Humanities, Vietnam National University Ho Chi Minh City.

Following the suggestion for research support from Dr. Tran Dinh Lam, on behalf of the Center for Vietnam and Southeast Asian Studies, we have approved your application to conduct research on ***"Evaluation of the Effectiveness of Climate Adaptation Projects in the Mekong Delta: Harvesting the Lessons that Can Inform the Design and Execution of National Adaptation Plans under the UNFCCC"*** under the supervision of Dr. Tran Dinh Lam at the Center for Vietnam and Southeast Asian Studies **from September 21st 2024 to December 31st 2024**. We will provide favorable conditions for you during your study time at our center.

Should you have any inquiries or need assistance, please do not hesitate to contact us.

TRUNG TÂM NGHIÊN CỨU VIỆT NAM VÀ ĐÔNG NAM Á

Phan Thi Hong Xuan
Director
Center for Vietnam and Southeast Asian Studies
University of Social Sciences and Humanities
Vietnam National University Ho Chi Minh City

Vietnam National University Ho Chi Minh City – University of Social Sciences and Humanities
CENTER FOR VIETNAM AND SOUTHEAST ASIAN STUDIES
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Email: info@cvseas.edu.vn

Ref: 51/TTNCVNĐNA

December 16th, 2024

LETTER OF ACCEPTANCE

Mrs. SYMONEKEO SENSATHITH
Johns Hopkins University
School of Advanced International Studies (SAIS)
Washington, D.C., USA

Dear Mrs. SYMONEKEO SENSATHITH,

Warm greetings and best regards from the Center for Vietnam and Southeast Asian Studies (CVSEAS) at the University of Social Sciences and Humanities, Vietnam National University Ho Chi Minh City.

Following the suggestion for research support from Dr. Tran Dinh Lam, on behalf of the Center for Vietnam and Southeast Asian Studies, we have approved your application to conduct research on ***"Evaluation of the Effectiveness of Climate Adaptation Projects in the Mekong Delta: Harvesting the Lessons that Can Inform the Design and Execution of National Adaptation Plans under the UNFCCC"*** under the supervision of Dr. Tran Dinh Lam at the Center for Vietnam and Southeast Asian Studies **from December 25th 2024 to February 25th 2024**. We will provide favorable conditions for you during your study time at our center.

Should you have any inquiries or need assistance, please do not hesitate to contact us.

TRUNG TÂM NGHIÊN CỨU VIỆT NAM VÀ ĐÔNG NAM Á

Phan Thi Hong Xuan
Director
Center for Vietnam and Southeast Asian Studies
University of Social Sciences and Humanities
Vietnam National University Ho Chi Minh City

APPENDIX IV: CONSENT FORM

Date: July 16, 2024
Principal Investigator: Nina Hall
Application No.: HIRB00019473

JOHNS HOPKINS UNIVERSITY
HOMEWOOD INSTITUTIONAL REVIEW BOARD (HIRB)
RESEARCH PARTICIPANT INFORMED CONSENT FORM

Study Title: Critical Review of the Efficacy of Climate Adaptation Assistance to Vietnam by the Global Foreign Aid Agencies: A Case Study of the Mekong Delta

Application No.: HIRB00019473

Sponsor/Supporter/Funded By: Self-funded project by student investigator.

Principal Investigator: Nina Hall, Ph.D.
Assistant Professor of International Relations,
Email: nhall@jhu.edu, Phone: +39 051 2917811

You are being asked to join a research study. Participation in this study is voluntary. Even if you decide to join now, you can change your mind later.

The person being asked to be in this research study may not be able to give consent to be in this study. You are therefore being asked to give permission for this person to be in the study as his/her decision maker.

1. Research Summary (Key Information):

The information in this section is intended to be an introduction to the study only. Complete details of the study are listed in the sections below. If you are considering participation in the study, the entire document should be discussed with you before you make your final decision. You can ask questions about the study now and at any time in the future.

The objective of this research is to draw lessons derived from the experience to date in adapting food production systems and biodiversity in

Vietnam to the impacts of climate change. The student researcher is looking for lessons that can be applied to the development of National Adaptation Plans (NAPs) in other developing countries with characteristic similar to those found in Vietnam, such as an extensive coastline and an exceptionally productive deltaic system.

The purpose of this study is to gather the opinions of climate adaption aid providers, recipients and knowledgeable observers on how effective the adaptation project have been and how the design and execution could be improved. The value to participants is that the findings may inform and shape future adaptation efforts so that they are more effective. This is important because successful climate adaptions are indispensable for sustainable economic development.

The primary data for this research will come from interviews with various stakeholders involved in relevant climate adaptation projects. The field interviews will be conducted with knowledgeable staff of the donor, executing, and sponsoring agencies (including the Green Climate Fund, UNDP, and Global Environment Facility); government officials at the national, provincial and local levels; community leaders; aid recipients; NGOs; and academic experts. The interviews will be scheduled with the help of an administrative assistant and conducted with a qualified translator. The researcher will use questionnaires to guide the interviews and will respect interviewees' consent and wishes for anonymity. The secondary data will be collected through review of both published and unpublished documents.

There will be no risks or costs for participants in this study. Any requests for anonymity will be fully respected. Interview sessions will last for approximately 1 hour.

2. Why is this research being done?

This research is necessary because climate change is a pressing issue that is already impacting food production systems and biodiversity in many regions, including Vietnam. Developing countries are particularly vulnerable to the impacts of climate change, and its crucial to understand how adaption measures can be effectively implemented to mitigate these impacts. By studying Vietnam's experiences in adapting to climate change, valuable lessons can be leaned and applied to other developing counties facing similar challenges. Additionally, with many countries still in the process of developing or updating their National Adaption Plans, there is a need for research that can provide insights on effective project design and implementation. Conducting this research can help improve the resilience of food production systems and biodiversity in the face of climate change, ultimately benefitting both local communities and the environment.

3. What will happen if you join this study?

If you agree to be in this study, we will ask you to do the following things:

1) Provide your insights and perspectives in response to the questions that will be posed by the researcher. To help you prepare the questions have been provided to you in advance. However, we do not need to follow the questionnaire precisely. Please feel free to indicate other questions or subjects that you think would be most fruitful.
2) The questions and your responses will be transcribed and sent back to you for your review and corrections.

Photographs / Audio recording:
As part of this research, we are requesting your permission to create and use [photographs of research sights' images and voice recordings]. Any [photographs of research sights' images and voice recordings] will not be used for advertising or non-study related purposes.

You should know that:

- You may request that the (photographs/ **audio recording**) be stopped at any time.
- If you agree to allow the ((photographs/ **audio recording**) and then change your mind, you may ask us to destroy that imaging/recording. If the imaging/recording has had all identifiers removed, we may not be able to do this.

- We will only use these (photographs/ **audio recording**) for the purposes of this research.

Please indicate your decision below by checking the appropriate statement:

_____I **agree** to allow the study to make and use photographs /audio recordings of me (or the participant I represent) for the purpose of this study.

_____I **do not agree** to allow the study team to make and use photographs/video recordings/audio recordings of me (or the participant I represent) for the purpose of this study.

_____ _____
Participant Signature Date
(or Legally Authorized Representative Signature, if applicable)

4. What are the risks or discomforts of the study?

Interviewees of this project may face some risks, including:

1. The interviewees may feel hesitant or unwilling to share sensitive information about their experience and perspectives on climate change adaptation, especially if they fear repercussion or breaches of confidentiality.

2. The interviewees' responses may be misunderstood or misrepresented by the researchers, leading to inaccurate or biased conclusion in the study.
3. Discussing topics related to climate change, adaption and vulnerability may evoke strong emotions or distress in the interviewees, especially if they have experienced significant challenges or losses as a result of climate change impacts.

Therefore, to avoid those risks, researchers need to seek their consent from interviewees, ensuring confidentiality and anonymity, providing adequate support and debriefing mechanism, maintaining transparency and openness in the research process, and engaging in ethical communication and data handling practice.

5. Are there benefits to being in the study?

There are several potential benefits for interviewees in joining this project/or study, including:

1. Opportunities to share perspectives: Interviewees have the chance to share their experiences, insights, and perspectives on climate change adaptation efforts in their community or region. This can help amplify their voices and contribute to a broader understanding of the challenges and opportunities faced by vulnerable populations.
2. Influence Policy and Action: Interviewees can directly contribute to the development of national adaption plans and strategies. Your input and feedback can help shape future polices, programs and projects aimed at building resilience to climate change.
3. Capacity building: Interviewees will have opportunities for learning, capacity building, and skill development through involving in this project. They may gain new knowledge about climate change adaption, project design, and how to effectively communicate their needs and priorities to decision-makers.
4. Empowerment: by sharing their stories and experiences, interviewees may f eel empowered and validated in their efforts to adapt to climate change. This recognition can promote a sense of agency, resilience, and pride in their contributions to their communities and the broader field of climate change adaption.

Overall, participating in this project can provide interviewees with a platform to showcase their knowledge and lived experiences, advocate for their needs, and contribute to positive change in their communities and beyond.

6. What are your options if you do not want to be in the study?

Your participation in this study is entirely voluntary. You choose whether to participate. You have the option of participating anonymously, which means that your responses will be used but not attributed to you. If you wish to participate in that fashion, you need only state that decision and I commit to honor your wishes.

7. Will it cost you anything to be in this study?

"No".

8. Will you be paid if you join this study?

"No".

9. Can you leave the study early?

- Yes, interviewees have the right to leave interview at any time, even if it is in progress.
- Interviewees are free to withdraw from the study/project/interview at any point without penalty or consequence.
- Participants should not feel pressured or obligated to continue with the interview if they are not comfortable or wish to discontinue their participation.

10. Why might we take you out of the study early?

Not applicable

11. How will the confidentiality of your biospecimens and/or data be protected?

The confidentiality of interviewee's information will be protected through these following methods:

1. Keeping all information such as audio recording, documentation, and notes from the interview in a secure computer.
2. Using pseudonyms or anonymizing information during any writing thesis that may reference the interviewee's input.
3. Obtaining informed consent from the interviewee before beginning the interview process.
4. Following any relevant laws and regulations related to confidentiality such as data protection and privacy laws.
5. Taking care to securely dispose or any documentation or recordings related to the interview once they are no longer needed.

12. What is a Certificate of Confidentiality?

Not applicable.

13. What does a conflict of interest mean to you as a participant in this study?

Not applicable.

14. What other things should you know about this research study?

Not applicable.

What is the Institutional Review Board (IRB) and how does it protect you?

This study has been reviewed by an Institutional Review Board (IRB), a group of people that reviews human research studies. The IRB can help you if you have questions about your rights as a research participant or if you have other questions, concerns or complaints about this research study. You may contact the IRB at 410-516-6580 or hirb@jhu.edu.

What should you do if you have questions about the study?

Call the principal investigator, Nina Hall (Principle investigator) at +39 051 2917811, or
Symonekeo Thomas (student investigator) at (+1) 415 342 4225. If you wish, you may contact the
principal investigator by letter. The address is on page one of this consent form. If you cannot reach the
principal investigator or wish to talk to someone else, call the IRB office at 410-516-5680.

You can ask questions about this research study now or at any time during the study, by talking to the researcher(s) working with you or by calling [Ms. Symonekeo Thomas, student investigator] at (+1) 415 342 4225.
If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

What should you do if you are harmed by taking part in this study?

If you feel that you have been harmed in any way by participating in this study, please call **[Nina Hall, Principal Investigation, at +39 051 2917811] or [Ms. Symonekeo Thomas, student investigator, at (+1) 415 342 4225].** Please also notify the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

This study does not have any program for compensating or treating you for harm you may suffer as a result of your participation.

15. Optional Study Components:

Not applicable

Future Contact

We would like your permission for our research team to contact you in the future. Please note that your decision below does not prevent other researchers at Johns Hopkins University from contacting you about other research.

Please sign and date your choice below:

YES _____ _____
Signature of Participant Date

NO _____ _____
Signature of Participant Date

16. What does your signature on this consent form mean?

Your signature on this form means that: You understand the information given to you in this form, you accept the provisions in the form, and you agree to join the study. You will not give up any legal rights by signing this consent form.

WE WILL GIVE YOU A COPY OF THIS SIGNED AND DATED CONSENT FORM

_____

Signature of Participant (Print Name)
Date/Time

_____

Signature of Person Obtaining Consent (Print Name)
Date/Time

NOTE: A COPY OF THE SIGNED, DATED CONSENT FORM MUST BE KEPT BY THE PRINCIPAL INVESTIGATOR; A COPY MUST BE GIVEN TO THE PARTICIPANT.