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Bridging the Gap: An Evaluation of Determinants and Opportunities for Climate Finance Allocation into the Sanitation Sector

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Abstract: This mixed-methods study evaluates the allocation of climate finance to the sanitation sector, exploring project-specific and country-specific drivers and barriers while proposing strategies to enhance future funding flows. Analyzing data from the Green Climate Fund (GCF) and the OECD-DAC database, the study reveals that the sanitation sector receives a disproportionately low share of climate finance—3.4% of climate-related official development assistance (ODA) between 2020-2022 and only 0.36% of total GCF funds. These findings indicate a persistent underinvestment in sanitation relative to other climate-relevant sectors, despite its critical role in achieving sustainable development goals (SDGs) 6.2 and 6.3 and its contribution to climate change mitigation and adaptation. A panel data analysis highlights that climate-related funding allocation towards the sanitation sector is strongly influenced by a country's readiness to utilize funds and its relationships with donors, with higher readiness and stronger political ties correlating with greater funding. However, limitations in data quality and coding ambiguities pose challenges to the robustness of these findings. Case studies show that most GCF-funded sanitation projects are located in middle-income countries and are primarily financed by development banks rather than private actors or climate finance providers, like the GCF itself. This highlights a gap in the sector's ability to attract and manage climate finance, primarily due to limited awareness of sanitation's role in addressing climate change and its continued low prioritization. The study identifies key opportunities to increase investment in the sanitation sector, including enhancing the capacity to frame projects with clear climate mitigation or adaptation objectives, integrating climate-smart technology, and raising the sector's profile on the climate-political agenda. These findings provide actionable insights, supported by rigorous panel data analysis, to bridge the financing gap and strengthen the sector's role in global climate action.

Keywords: Climate finance; sanitation sector; mixed methods; panel data; GCF
JEL Classification: F18; F35; F50; H11; H51; I15; I30; O2; O3; Q5

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1 Introduction

Climate change threatens economic growth, development and the livelihood of many people, particularly in the developing world. A sector that is often overlooked in climate change discussions is the sanitation sector, strikingly absent in the nationally determined contributions (NDC) of countries (Dickin et al., 2020). Yet, the sanitation system and the climate cycle are intrinsically connected. In fact, it is estimated that onsite sanitation systems alone contribute to about 5 percent of anthropogenic methane emissions, which has about a 0.004 °C climate forcing effect (Cheng et al., 2022). To further put these numbers into context, providing sanitation access to 800 million people in India via pit latrines would cause increases in India's annual GHG emissions, equivalent to 7% of current levels (Kulak et al., 2017), and the climate impact of providing 2.3 billion people worldwide who lack access to basic sanitation with pit latrines could more than double the GHG emissions stemming from this source (van Eekert et al., 2019).

Moreover, climate change poses serious threats to existing sanitation systems worldwide, but especially to vulnerable infrastructure in low- to middle-income countries (LMICs), having serious implications for health, well-being, and human dignity (Hyde-Smith et al., 2022). Poor sanitation is associated with transmission of diseases, such as diarrhea, cholera, typhoid, malaria and dengue fever, particularly among vulnerable groups such as children, women and the elderly. Poor sanitation also has major social and economic implications, negatively affecting education, labor productivity, income and gender equality, and potentially reinforcing poverty levels, according to the theoretical framework of poverty traps described by Ghatak (2015). In 2012, the World Health Organization (WHO) estimated that global economic returns on investments into the sanitation sector is more than 5-fold (Hutton, 2012). To address the issue of lack of adequate sanitation services and infrastructure globally is thus paramount, both from the perspective of reaching net-zero emission targets set out in the Paris Agreement to limit global warming to 1.5°C, but also from a social and economic perspective with the aim to ensure sustainable livelihoods, well-being and human dignity.

Despite the great need and potential of sanitation sector investments to contribute to economic growth and safeguard standard of livings, the financing gap to reach safely managed sanitation for all remains huge. The global cost of achieving the SDG 6.1 and 6.2 targets for safe water and sanitation has been estimated at USD 114 billion per year, and the capital investments needed to meet the targets are approximately three times investment levels (Hutton and Varughese, 2016). The total cost comprises annual investment of USD 37.6 billion in safe water, USD 19.5 billion in basic sanitation, USD 49 billion in safe fecal waste management and USD 2 billion in hygiene.

The nature of the sanitation sector makes it eligible for several types of finance. Development aid is a common source of funding for the sector in LMICs, where the need for

investment is large. Climate finance sources, which is the focus of this study, is another type of funding available to the sector, including both mitigation and adaptation targeted funds, as well as funds from public and private sources. Looking at climate finance allocations alone, of the USD 5 billion allocated funds by the Green Climate Fund (GCF) as of 2020, only USD 1.24 million was reported to be received by the sanitation sector, accounting for less than 0.025% of the GCF approved project budgets (Dickin et al., 2020). Moreover, an examination of climate-related Official Development Assistance (ODA) data from the OECD showed a similar trend. In 2017, only 3% of climate finance was allocated to the water and sanitation sector (Dickin et al., 2020).

The inaction in including the sanitation sector in climate finance disbursements and treating it solely as a development issue could lead to significant delays in achieving climate action targets, as it fails to provide the necessary incentives for promoting sustainable practices within the sector. Given the finance gap described, climate finance also presents large unrealized potential for bridging the investment gap by complementing traditional sources of funding. This could also potentially lead to missed opportunities in generating synergies between development, climate adaptation efforts and climate mitigation efforts, e.g. via coordinated funding and knowledge sharing, leading to more optimized resource allocations.

However, to date little empirical evidence is available to explain what gives rise to this under-utilization and how to effectively unlock another potent lever towards achieving SDGs 6.2 and 6.3. Until now, research done at the intersection of the sanitation sector and climate finance have focused on assessing the sector's inclusion in climate change discussions, highlighting the neglect of the sector in climate finance regards (Bayoumi, 2019; Dickin et al., 2020). Research done with focus on how to facilitate the sanitation sectors' growth have only focused broadly on the business case of the sanitation sector and its ability to attract funding towards sustained growth and increased access (van der Hoek et al., 2010; Trémolet, 2013). However, no attention has previously been given to the sanitation sector's ability to increase access to climate finance, despite both the sector's climate mitigation and climate adaptation potential. Moreover, research that has been conducted on determinants for climate finance flows commonly have a broad approach, without any sector focus. For example Stoll et al. (2021) looked at the entire GCF portfolio and how unaddressed market imperfections may limit access to private finance, only for adaptation projects. Various country-specific determinants to climate finance flows, such as recipient countries' capacity to utilize climate funds, or their vulnerability to climate change has been investigated before (Betzold and Weiler, 2017; Chen et al., 2018; Cheng et al., 2022; Doshi and Garschagen, 2020; Mofakkarul, 2022; Mori et al., 2019; Robertsen et al., 2015; Robinson and Dornan, 2017; Weiler et al., 2018; Weiler and Sanubi, 2019; Weiler and Klöck, 2021), but without any focus on the sanitation sector. A similar study assessing countries' governing capacities was conducted by Lubinga and Mazenda (2024), who looked at the link between the World Bank governance indices and climate finance amounts received by countries increasing their climate ambitions via their NDCs. None of the research conducted previously have tried to identify which factors that influence how much climate finance is accessed are relevant to the sanitation sector.

This project aims to fill the research gap by empirically assessing what factors related the sanitation sector in a climate finance context, both from an adaptation and mitigation point of view, contributes to the investment gap. Moreover, this study will aim to present

pathways towards adapting to challenges and seizing opportunities for the sector to bridge the financing gap towards SDGs 6.2 and 6.3 by leveraging climate finance. Finally, the study will contribute to the body of literature by providing an update of the sanitation sector's prevalence in climate finance disbursements. The overall research questions of the project will be:

- What are project-specific and country-specific drivers and barriers related to the sanitation sector that prevent the sector to receive climate finance?
- What can be done to increase climate finance flows into the sector moving forward?

The scope will be limited to the GCF approved project portfolio and climate-related ODA due to limitation of time and resources. The remainder of this thesis will be organized as follows: In chapter 2, the conceptual framework of the study will be presented. In chapter 3, the methodology used to answer the research questions will be described. The results of the study are then presented in chapter 4, followed by chapter 5, which contains a discussion of the results, and chapter 6, in which the study is concluded.

2 Conceptual Framework

Research surrounding the topic of climate adaptation and mitigation finance commonly use a three dimensional framework, comprised of: recipient need, recipient merit and donor interests (Halimanjaya, 2016; Mofakkarul, 2022; Weiler et al., 2018; Weiler and Sanubi, 2019). Studies of this type concentrate on funding primarily in shape of international aid, focusing on country-specific determinants of finance flows in a donor-recipient relationship. A similar approach will be adopted in this study to investigate determinants for finance flows in the environment surrounding a sector, focusing on climate mitigation and adaptation targeted international aid towards the sanitation sector. This study will also expand this framework beyond the traditional recipient-donor country relationship and include the perspective of the individual sanitation project, utilizing the detailed project-level data available in the GCF's project portfolio. The aim of adding a bottom-up approach to the analysis is to investigate opportunities and challenges for sanitation projects that goes beyond country dimensions, exploring how funding patterns are—or can be—influenced by individual projects proponents irrespective of the over-arching funding environment.

2.1 Recipient Need

The presence of a "need" in the context of international aid is a fundamental factor driving investment. This is rooted in the objective of maximizing uptake of the intervention and the impact per dollar invested. The GCF explicitly states the recipient need as a one of their six investment criteria (GCF, nd), underlining its importance for funding decisions in the climate finance realm. Various studies have studied determinants for the uptake of sanitation interventions. Some studies highlighted the lack of demand for sanitation services or infrastructure as a main impediment to coverage in informal settlements (Parry-Jones, 1999; Peal et al., 2010), and Outlaw et al. (2007) found that unawareness of the availability of sanitation services prevents users from participating in the market in Uganda. Moreover, Joshi and Mannan (2011) found that excreta disposal systems delivered as low-cost "safe sanitation" but not matching the sanitation needs of the community may neither be appropriate nor used, and cannot therefore be sustained beyond the life cycle of the intervention.

Private sector investors with a profit motive are also concerned with the willingness to pay for an intervention, which determines the demand and in turn the profitability. Demand may be influenced by a myriad of factors. The price of a good or service that a consumer must pay to benefit it is in the end what determines the demand. Different aspects in the market may influence this price, including the technology available to the supplier, or factors dictating the taste of the consumer. Various sanitation infrastructures of different degrees of complexity and capital intensity are available, ranging from septic

tanks, to more advanced centralized sewer systems (Muzioreva et al., 2022). Moreover, cultural factors can have important influence on consumer's tastes for different types of interventions. For example van der Hoek et al. (2010) investigated the impact of norms on preferences for different sanitation interventions, and found that culture and norms plays an important role for the uptake of an intervention. Another study found that attempts to stimulate demand to address the public good nature of climate adaptation interventions leads to increased private sector engagement (Stoll et al., 2021).

In terms of proxies for recipient countries' need, a country's vulnerability to climate change is frequently considered a central factor for adaptation funding allocations. For example, the GCF, states that its aim is to provide adaptation funding to countries that are "particularly vulnerable" to the adverse effects of climate change (GCF, 2024). Its investment criteria indicators includes "vulnerability of the country" as a key component in the project proposal review (GCF, nd). In the body of literature, several definitions of vulnerability exists which contributes to complexities in interpreting this factor (Cutter et al., 2009; Nelson et al., 2010). The widely-cited IPCC definition describes vulnerability as the propensity or predisposition of an entity to be adversely affected by climatic changes, including its sensitivity or susceptibility to harm, and lack of capacity to cope and adapt (IPCC, 2007, 2014). Vulnerability (V) may be viewed as an entity's exposure (E) to climatic changes, its sensitivity (S) to those changes, and its capacity to adapt (AC) successfully; $V = E + S - AC$ (Hughes et al., 2012; Islam and Al Mamun, 2012). The ND-GAIN index is a commonly used framework to estimate national level vulnerability that draws on the three dimensions from the IPCC. Other frameworks exist as well, such as the Structural Vulnerability to Climate Change Index (SVCCI) and Climate Risk Index (Mori et al., 2019; Weiler et al., 2018; Weiler and Klöck, 2021). However, these indices do not conform with the definition outlined by the IPCC, e.g. the SVCCI accounts for the exposure component only.

Some challenges do persist when using vulnerability as a proxy for recipient needs. For example, parties in the developed world have thus far failed to agree on an operational definition of this term, mainly due to vested and competing interests (Ciplet et al., 2013; Khan et al., 2020). In the developing world, conflict of interest has emerged as well when defining the term since countries may want to frame the definition to serve their own vested interests (Ciplet et al., 2013). Moreover, no further details can be found on how vulnerability is assessed by the GCF. Such ambiguities, which may be strategic, could result in difficulties in analyzing the relationship between vulnerability and funding allocations.

Moreover, it is important to note that sometimes vulnerability can overlap and have an inverse relationship with merits (which will be described in more details in section 2.2), due to merits being highly correlated with "adaptive capacity", which is an element of vulnerability (Hughes et al., 2012). This makes it difficult to analyze vulnerability as a composite index. It is also challenging to find a proxy for need that only relates to the sanitation sector, which might explain the lack of previous mitigation or adaptation funding allocation studies focusing on this sector. For example Andersson et al. (2020) highlights that the sanitation sector is tightly linked with other sectors, e.g. solid waste management, water, and agriculture.

The remaining two elements of the vulnerability index, "sensitivity" and "exposure", are both aggregates of a subset of indicators coming from different categories including; food, water, health, ecosystem services, human habitat and infrastructure. Thus, treating

sensitivity or exposure as separate indices would not be meaningful in this study either, as it contains indicators from several unrelated factors or sectors. A solution to this overlap is to look at factors separately at the individual indicator level, being the most granular form of the index. For the composition of the vulnerability index, several sanitation sector related indicators have been used, including; projected change of deaths from climate change induced diseases such as diarrhea, dependency on external resources for health services, percentage of population living in slums, access to basic and improved sanitation facilities, projected change of flood hazard, projected water level rise impacts, and population living under 5m above water level. For example, to proxy the need for investment using access to basic or safely managed sanitation systems appears reasonable in this context, since a higher percentage of the population lacking access, the higher is the need for funding. In the context of international aid, such need would potentially drive funding via two channels; the donor looking for maximizing impact per dollar allocated, and the recipient having a stronger incentive to signal the need to donors. A similar logic could be applied for the other listed proxies.

A strong correlation might still exist between proxies for sanitation need and the capacity to adapt, leading to a correlation between sanitation need and merits. However, in this study it is meaningful to look at proxies for recipient's need of sanitation investments separately as it is central to the research questions, and is otherwise not discernible in aggregate data, such as the ND-GAIN or other indices.

Concerning climate mitigation funding, vulnerability has not been considered a recipient need factor, except in (Weiler and Sanubi, 2019). An important recipient need factor often considered in climate mitigation studies about international aid that is relevant for the sanitation sector is GHG-emissions, along with other non-sanitation related factors, such as rate of deforestation and amount of carbon sinks (Bagchi et al., 2016; Halimanjaya, 2016). The underlying reasoning of considering GHG-emissions is that donors are more inclined to allocate funding to areas where the potential to reduce emission is highest, along with the prospect of profitable carbon markets (Burnham et al., 2013).

The degree of development of a country is widely considered in both mitigation and adaptation funding allocation studies as well. GDP per capita is a frequently featured proxy for poverty levels. This variable captures a social dimension of vulnerability not already included the ND-GAIN's index for vulnerability, and has been used in several previous studies (Betzold and Weiler, 2017; Robertsen et al., 2015; Weiler et al., 2018). However, due to strong links between GDP per capita and merits, it would not be reasonable to consider this variable in the context of this study.

The regional location of recipient countries have been considered as a factor in previous studies as well. Studies show that countries in sub-Saharan Africa South Asia are usually considered to be more vulnerable to climate change and consequently in need of more of adaptation funding. Empirical evidence points to different directions, however. Weiler et al. (2018) and Weiler and Klöck (2021) found that African countries were likely to receive more adaptation funding than non-African countries, whereas Betzold and Weiler (2017) and Robinson and Dornan (2017) found no evidence of such relationship. The status of Small Island Developing States (SIDS) has garnered significant attention due to their heightened vulnerability to climate change, leading to their prioritization in various climate agreements (Khan et al., 2020; Robinson, 2018; UN, 1992). However, previous research presents mixed findings on the impact of this status. For instance, three studies (Weiler and Klöck, 2021;

Robinson and Dornan, 2017; Weiler et al., 2018) reported a significant positive effect, while two others (Betzold and Weiler, 2017; Mori et al., 2019) found the effect of SIDS status on adaptation funding to be non-significant. Since the effect of being vulnerable is mostly captured by the ND-GAIN index, the regional factor will be disregarded as it is not the main focus of this study. The sanitation sector is also mainly affected by water level raise and flooding, which is already accounted for by looking at the percentage of population living close to water surface.

Finally, population size is another factor considered in previous mitigation and adaptation funding allocation studies. The rationale behind the inclusion of this variable is that larger countries have a greater need of adaptation and mitigation funding (Halimanjaya, 2016; Robinson and Dornan, 2017; Weiler et al., 2018).

2.2 Recipient Merit

A project's "merit" is central for any investment with a profit motive, but also has implications for international donations, often driven by more than philanthropic motives (Addison et al., 2004; Canavire et al., 2006; Gilder and Rumble, 2020). Regarding the GCF, the largest multilateral provider of public climate finance globally (Kumar, 2012), the importance of a project's merit manifests through several of their investment criteria, including: impact potential, paradigm shift potential, sustainable development potential and efficiency and effectiveness (GCF, nd). These criteria underlines a desire by the GCF to maximize impact per dollar invested.

Private sources of funding towards climate mitigation and adaptation becomes especially relevant in the context of the GCF. The GCF is unique compared to other climate finance providers in their ambition to mobilize private investment via innovative finance mechanism, such as concessional loans or guarantees (Amighini et al., 2022). The co-finance ratio, including private as well as public co-financiers, is also a key indicator for the efficiency and effectiveness investment criteria. Concerning private sector investments into the sanitation sector, the business case is paramount when evaluating investment decisions. In this regard, the public good nature of adaptation project have previously been considered a major impediment to private sector engagement. For example, (Stoll et al., 2021) investigated this relationship and found that addressing the public good nature via policies such as subsidies, tariffs or fees, lead to increased engagement from the private sector.

Concerning proxies for country-specific merits, "readiness" is a commonly studied factor. Although a consistent definition of the term does not exist, it refers to social, institutional and economic qualities or capacities of a recipient country. In terms of social aspects, a country may have insufficient human resources, skills and infrastructure to access and deploy climate funds, both from public and private sources. Concerning international aid, to receive funding a country needs to motivate and prove its need to funders. Due to the lack of historical climate data, skilled human resources and IT infrastructure, this could be quite challenging (Chase et al., 2020; Fiala et al., 2019). A recent review of 93 GCF-approved project proposals showed that 80% did not present a well defined theory of change, 68% did not clearly discuss methods to measure change, and only 10-13% demonstrated measurable indicators and/or methods for evaluating change (Fiala et al., 2019). Another study found that lack of capacity to prepare projects proposals, unavailability of historical

climatological data, low number of qualified staff, and lack of technical, monitoring and evaluation capacities, as important barriers to access GCF funds (Chase et al., 2020).

Such social deficiencies may diminish both public and private funder's confidence in the ability of recipients to implement and manage mitigation or adaptation interventions, consequently reducing their chances of being funded (Doshi and Garschagen, 2020). Concerning the sanitation sector, lack of awareness of the sanitation sector's relevance for climate adaptation and mitigation was discussed by Dickin et al. (2020), who found that sanitation has been relatively underrepresented in countries' NDCs. Such blind spots may contribute to inaction in seeking funding, as lack of past experiences along with lack of established methods to quantify mitigation as well as adaptation impact may be missing. The lack of requisite skills and experiences surrounding the sector in a climate finance context could also lead to eroding funder's confidence.

Gaps in awareness is also of particular concern for accessing private sector investments. Lack of awareness is commonly referred to as a market imperfection called incomplete/asymmetric information. Information asymmetry emerges when critical information is unavailable, inaccessible, or unevenly distributed among agents (Akerlof, 1970). In the context of climate change, information asymmetry occurs when agents, e.g. investors, project proponents, contractors or governments are unaware of the risks and impacts exacerbated by climate change, and the options available to mitigate these risks (Fayolle et al., 2019). The presence of information asymmetry among relevant stakeholders dis-empowers them from making climate-related decisions and investing accordingly, in particular in developing economies (Antwi-Agyei et al., 2014; Stenek et al., 2013). It was shown by Stoll et al. (2021) that addressing the issue of climate change related information asymmetry in GCF project proposals leads to more private sector engagement. Lack of awareness from both investors and project proponents could create a vicious cycle, where neither party ingrains climate awareness of the sector in the other.

Institutional deficiencies, as well as conflict and violence often haunting developing countries are also important factors that may deter financiers due to higher perceived risk of their investment. Consistent effects of these factors on adaptation and mitigation have been provided earlier (Bagchi et al., 2016; Betzold and Weiler, 2017; Halimanjaya, 2016; Robertsen et al., 2015; Robinson and Dornan, 2017; Weiler et al., 2018; Weiler and Klöck, 2021; Weiler and Sanubi, 2019).

Economic factors related to the ability to attract climate funds are also important to consider. One such factor is the ease of doing business. Indications of a favorable business climates could be to ease in dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, or resolving insolvency.

An index that draws on the social, institutional and economic dimension of readiness is the ND-GAIN index. Other researchers (Chen et al., 2018; Mofakkarul, 2022; Mori et al., 2019) studying adaptation funding have assessed the readiness index as a single composite variable, despite its multiple dimensions. They also found significant and positive effect of readiness on funding allocation. While this study focuses on the sanitation sector, there are no reason to assume any of the indicators irrelevant to the sector, and details about sector specific capacities are not available in aggregated data.

2.3 Political Interests

As mentioned above, the decision to allocate international aid can be strategic (Addison et al., 2004; Canavire et al., 2006; Gilder and Rumble, 2020). Such strategic interest may not only come from the desire to maximize impact per dollar invested, but may also be rooted in political interests. Such interest can also come in shape of both international politics and domestic political agendas.

In terms of domestic perspectives, country ownership is an essential requisite for accessing climate finance. Country ownership is explicitly stated as one of the investment criteria of the GCF. The term entails that a country, including its government, institutions, and stakeholders, holds the main responsibility and authority for setting priorities, formulating strategies, and managing programs to address its own needs. This principle emerged from the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action, which highlighted that donor-driven projects tend to be unsustainable if they do not align with the specific needs, priorities, and realities of the recipient country (OECD, 2007).

In terms of country ownership and funding allocations, the presence or priority of the sanitation sector on the political agenda may determine how much funding is sought, but also how investors perceive the recipient country's interest in sustaining the project in the long run. As shown by Dickin et al. (2020), the sanitation sector is rarely featured in countries' NDCs, indicating a low political priority for the sector in a climate change context. Moreover, increasing climate ambitions in countries' NDCs were also proven to lead to more funding for countries that exhibited higher levels of governing capacities (Lubinga and Mazenda, 2024). This suggests that a low visibility of the sanitation sector in political agendas and particularly in NDCs may pose significant challenges for accessing climate finance for the sector.

From the perspective of international politics, donor country's interests may play a major role. In general, data on donor interest is lacking (Betzold and Weiler, 2017; Weiler et al., 2018). However, one previous study showed that geographical proximity to donor countries results in more mitigation funding received (Halimanjaya, 2016), and one study found that former donor colonies were likely to receive more adaptation funding (Weiler et al., 2018). International trade patterns have been identified as an important factor as well. For example, it was shown by Weiler et al. (2018) and Weiler and Klöck (2021) that countries that imported more from donor countries were likely to receive more climate adaptation aid as donors may be more willing to support those countries that depend on them. To investigate the impact of such factors, ODA per capita, ODA proportional to GNI and total development aid were used as proxies in previous studies and were found to lead to increased adaptation aid allocations (Robertsen et al., 2015; Robinson and Dornan, 2017; Weiler et al., 2018).

It is important to note that interests pertaining to international politics play a more significant role in shaping bilateral funding allocations. Donor countries often prefer bilateral funding as it allows them greater control and influence. In contrast, multilateral funds, such as those disbursed by the GCF, are less likely to be subject to these international political considerations. This distinction will be reflected throughout this thesis: the examination of climate-related ODA will focus on the influence of international politics, while the analysis of GCF-funded projects will put more emphasis on domestic political agendas.

3 Methodology

To answer the research questions, a mixed-method approach, including quantitative and qualitative methods, was used. The focus of the analysis revolved around climate-targeted official development aid (ODA) recorded in OECD's database between 2002 - 2022 and climate finance disbursement from the GCF's approved project portfolio, consisting of 260 approved project proposals as of 1 April 2024.

Concerning international development aid flows, a descriptive analysis was first done to outline funding patterns for the entire data set, as well as recent trends in funding, focusing on the years 2020-2022. Second, a panel data analysis was conducted to evaluate the impact that a select set of country-specific proxies for readiness and political interest have on funding allocations towards the sanitation sector, controlling for SDG 6.2 and 6.3 related investment needs.

Regarding the GCF project portfolio, quantification of the number of sanitation projects in the GCFs' project portfolio was done, including quantification of funds allocated, disaggregated by GCF funding, public co-funding and private co-funding. Next, GCF project level data was used to delve deeper into the variables of interest and look at how they manifest on a project level, considering both the public and private finance perspective. Finally, expert interviews with relevant stakeholders involved in the GCF investment process and implementation phase was conducted to to probe deeper into influencing factors that might not be detectable from publicly available approved project proposals.

By centering the study around both ODA and GCF funds, the intention is to overcome the issue of lack of sanitation related data by leveraging the strengths of respective funding source. The size and frequency of recorded ODA data makes it suitable for rigorous panel data analysis of country-specific effects pertaining to merits and interests described in section 2, whereas the GCF's project portfolio provides detailed project-specific information useful for exploring examples of how merits and political interests have been addressed by sanitation project proponents in the past.

3.1 International Development Aid Flows

3.1.1 Data Collection & Description

A combination of different datasets were used to quantitatively examine country-specific factors relating to merits and political interests impacting climate finance flows towards the sanitation sector. An overview of all variables are available in table 3.1.

The funding data used was retrieved from the OECD-DAC climate-related funding database. This database has been widely used in previous studies (Betzold and Weiler, 2017; Halimanjaya, 2016; Mofakkarul, 2022; Robinson and Dornan, 2017; Weiler et al., 2018). In

Category	Variable	Variable Code	Variable Type	Source
Funding allocation	Mitigation funding	mitfund	Million USD (2022 rate)	OECD DAC
	Adaptation funding	adafund	Million USD (2022 rate)	OECD DAC
Recipient need	Access to basic sanitation	san	% of population	UNICEF
	External health expenditure	exhexp	% of current health expenditure	WHO
	Share of population living close to water surface	close_water	Percentage of population (Elevation below 5 meters)	World Bank
	Emissions per capita	em_pc	Metric tonnes CO_2	World Bank
	Population	pop	Population (headcount)	World Bank
Recipient merit	Readiness	read	Index score (0 to 1)	ND-GAIN
Political interests	Import value index	imp_indx	USD percentage of average (2015 base)	World Bank
	ODA per capita	oda_pc	Current USD	World Bank

Table 3.1: Description of variables and data sources

normal circumstances, OECD-DAC data analyzed consist of both multilateral and bilateral climate focused development finance flows, both from public and private donors. However, due to an undergoing migration of the OECD data library, this data could not be retrieved. Instead, data for bilateral funds in support of climate mitigation and adaptation committed for disbursement was used.

The funds have been earmarked as climate finance using the Rio Markers, and/or the Climate Components methodology (Simon, 2018). A scoring system of three values is used in the Rio Marker (0, 1, 2), in which aid activities are "marked" as targeting climate mitigation or adaptation as the "principal objective" (2) or a "significant objective" (1), or as not targeting the objective (0). In the data not accessible, information about which marker has been assigned to an individual project is available, enabling the construction of a "cross-cutting" project having mitigation or adaptation as the principal objective, and one of either as the "significant" objective (see e.g. Mofakkarul (2022)). However, with the available data, such construction was not possible, hence the focus on mitigation and adaptation funding. To collect SDG 6.2 and 6.3 related funding data, three sector codes in the OECD data library were used, including; "Sanitation - large systems", "Basic sanitation", and "Waste management/disposal". Mitigation and adaptation funding going towards these sectors are the dependent variables in the panel data analysis. Overall, data for 139 countries spanning the years 2002 - 2022 was retrieved.

In this study, the components of the ND-GAIN index for readiness were analyzed both as a composite variable (overall readiness) and individually. The three components of the index relates to readiness in terms of social factors, governance factors and economic factors. At the most granular level, these component consist of individual indicators. For social factors these indicators are: social inequality, information and communication technology infrastructure, as well as education and innovation. Indicators pertaining to political factors include: political stability and non-violence, control of corruption, regulatory quality and rule of law. For economic factors, ease of doing business is used as the sole indicator.

The import value index, which is constructed as a percentage of the average value with 2015 as the base year was used to proxy for donor country interests, and the data was provided by the World Bank. ODA per capita was also used as a proxy variable for donor interests, for which data was taken from the World Bank as well. No analyzable proxies could be found for recipient countries' domestic political interests relating exclusively to the sanitation sector, hence the focus on international political interests in a donor-recipient context.

In terms of proxies for recipient countries' need, as mentioned in section 2.1 the ND-GAIN vulnerability index is commonly used as a proxy, either as a composite index, or single parts of its three elements. However, due to the difficulty of isolating relationships

between the composite index or its three sub-components to the sanitation sector, this study focused on the individual indicators comprising these composites separately.

To begin with, data from UNICEF on access to safe and basic sanitation systems from UNICEF was considered. Considerable amount of data across both countries and years were missing for access to safely managed sanitation systems, hence the exclusion of this variable. Significant amount of data was also not recorded for access to basic sanitation, although not as serious. An evaluation of within and between country variation of the access to basic sanitation variable was conducted to see if it could be reasonably used as a regressor. Results showed that the change in percentage access to basic sanitation between year 2015 and 2022 (which had the most amount of data) were about 3 percentage points (p.p.). The standard deviation of percentage access to basic sanitation between countries were about 28 p.p. It was therefore assumed that the variation in access to basic sanitation between countries is significant, whereas it is relatively stable within countries over time. Hence, data for 2015 was used to construct the variable.

Data for population living close to water variable was obtained from the World Bank, and a similar data issue as for access to basic sanitation was encountered. The assessment of the variable showed similar results as for access to basic sanitation and data for the year 2015 was used. Two countries were dropped due to absence of recorded data, including Chile and the Republic of Kosovo.

Additional variables included to proxy for recipient need were; external health expenditure as percentage of current health expenditures, population and emissions per capita.

Notably, data for population living in slum was considered as a proxy for recipient need, but a considerable amount data was missing and the variable was consequently dropped. Other variables were also considered, including; projected change of flood hazard, projected change of deaths from climate change induced diseases such as diarrhea and projected water level rise impacts. However, data for these variables were not available for use.

Among the proxies for need, considerable correlation was found within this variable category, but also between these proxies and the variables of interest (see figure A.1 in appendix A). To mitigate multicolinearity issues, avoid inflating the standard errors and hence improve statistical power in the regression framework, the individual proxies for need were consequently repurposed to constitute components of a "sanitation investment need" index, analogous to the ND-GAIN vulnerability index.

To construct the index, a 10-step framework based on OECD (2008) was followed[1]. The conceptual framework in chapter 2 and the description of the data in this section lays the foundations of the index (steps 1-4). Based on this, a normalization of the array of need proxies were conducted resulting in a set of indicators ranging from 0-1, with a higher score indicating a greater need. To compose the index, simple weighting of the variables were opted for[2].

One index was constructed for the analysis of both mitigation funding and adaptation funding. Although emissions per capita would constitute a need for mitigation funding targeting SDG 6.2 and 6.3, such need would not related to adaptation funding targeting

[1] 10-step process to construct and index: 1. Theoretical framework 2. Data selection 3. Imputation of missing data 4. Multivariate analysis 5. Normalization 6. Weighting and aggregation 7. Uncertainty and sensitivity analysis 8. Back to the data 9. Links to other indicators 10. Visualization of the results (see OECD (2008) for details)

[2] A principal component analysis (PCA) was considered, but deemed redundant due to the low complexity and ease in interpreting the indicators.

the same goals. Thus, emissions per capita was used as a control variable separate from the index only in the mitigation funding analysis.

Due to correlation between access to basic sanitation and external health expenditures, these variables shared half of the weight in the index composition to avoid double counting. Access to basic sanitation received a weight of 40% while external health expenditure was assigned a weight of 10%. This distinction was done as the former is arguably a more direct proxy for sanitation investment needs, whereas the latter would be a more indirect proxy signaling the degree to which donors or recipients acknowledge that need and consequently materialize investments. The latter could provide important information about countries' needs, but its correlation to oda per capita (see figure A.1) could exacerbate potential multicolinearity issues along with the fact that other non-sanitation health aspects could be captured in the proxy could dilute potential causal links. The remaining weight was assigned to the percentage of population living close to water surface variable. Steps 7-10 concern robustness checks of the index and are addressed in the sensitivity analysis in section 4.1.3

3.1.2 Empirical Strategy

Based on the conceptual framework presented above, the models estimated in this study consist of funding allocation as a function of the set of proxies for need, merit and political interests.

Of the proxy variables, emissions per capita, population, readiness, import value index, external health expenditures and ODA per capita were considered as time-varying, whereas access to basic sanitation and population living close to water surface were considered time invariant due to the lack of available data. Thus, the sanitation investment need index composed consist of both time-varying and time-invariant components, making it time-varying only through the time-varying sub-components.

Several data points were missing for countries across the time-varying variables. 11 of the 139 countries had no data recorded for one or more of the covariates. As these data were non-imputable, they were consequently dropped. Additionally, 9 countries which had more than 30% data missing for one or more variables were also dropped to avoid introducing bias resulting from imputing these values.

The three variables—external health expenditure, ODA per capita, and import value index—had 5-16% missing values across Belarus, India, Kazakhstan, Mongolia, and Ukraine. It was deemed plausible that these variables were of the missing at random (MAR) type[3] due to possible dependence on the readiness index[4]. An imputation technique suitable for missing values of the MAR type is multiple imputation by chained equations (MICE), as described by Azur et al. (2011), and has been used in similar studies (e.g. Mofakkarul (2022)). While MICE was initially considered for handling missing data, various attempts to achieve stable imputations were unsuccessful. Despite adjustments to imputation chains, iterations, predictor matrices, and imputation methods suggested as diagnostics by van Bu-

[3]There can be three types of missing values: missing completely at random (MCAR), missing at random (MAR) and not missing at random (NMAR). The first refers to missing values that do not depend on the variable of interest or on any other observed variable in the data set. The second refers to missing values that do not depend on the variable of interest, but are conditional on other variables in the data set. Finally, the third refers to missing values that depend on the values themselves (OECD, 2008)

[4]The readiness index captures economic, social, and governmental factors within each country, which likely influence data completeness (e.g., through the capacity and motivation to collect and report certain data) and in turn causes missing data.

uren and Groothuis-Oudshoorn (2011), convergence issues persisted, indicating that MICE might not suit the dataset's structure, missing data mechanism or the predictors available. Given these challenges, last observation carried forward (LOCF), a common imputation method for panel data analysis (Lachin, 2011), was used. Countries for which a value was only missing for one year (5.2% missing) were imputed as variables did not fluctuate significantly year-to-year. The missing import value index for Indonesia and the missing external health expenditure data for Kazakhstan, Egypt, Iraq, and Mongolia were imputed using this method. Other countries that had values for 2-3 consecutive years (10.4 - 15.7% missing values) missing were dropped since all variables were relatively unstable over longer periods of time.

Five more modifications of the data were done. First, adaptation funding was only available from 2010, thus the preceding years were dropped from the analysis of adaptation funding. Second, emissions per capita data were not available for year 2021 and 2022. Since only the analysis of mitigation funds included this variable, these years were dropped for the mitigation funding panel data. Third, proxy variables were not available for 2022, hence the exclusion of this year in the adaptation funding panel data. Fourth, Ukraine and Belarus had missing data for 2002 - 2004 and were subsequently only dropped from the mitigation funding panel data. Finally, 12 additional countries from the mitigation funding panel data were dropped since they received zero funding across all years, and 11 countries in the adaptation funding data were excluded for the same reason. In total, 1938 and 1248 data points, spanning the years 2002-2020 and 2010-2021 across 102 and 104 countries were analyzed for mitigation funding and adaptation funding, respectively.

To analyze the individual components of the readiness index (social, governmental and economic factors) separately, additionally 6 countries that had no data recorded for one or more of these variables could not be imputed, and were therefore dropped. These countries were: Cuba, Nauru, Turkmenistan, Kiribati, Solomon Islands and the Democratic Republic of the Congo.

Consistent with other studies (Betzold and Weiler, 2017; Mofakkarul, 2022; Weiler et al., 2018), one-year lags for all time-varying variables were implemented to capture the delayed effects that these variables have on funding allocation. Specifically, changes in the proxies for need, merit, and political interests in a given year would not directly influence funding decisions in the same year. Rather, funding decisions are typically made after an application process that spans time and may be influenced by previous-year conditions. Thus, lagging these variables by one year allows to model the causal link correctly, ensuring that funding allocations in year t are explained by factors that were present in year $t-1$.

Additionally, using lags helps mitigate concerns of reverse causality, as the dependent variable can simultaneously affect the independent variables. For instance, the amount of funding allocated in a given year could influence a country's readiness or political situation in the following year. By lagging the variables, it can be ensured that changes in the explanatory variables precede the funding allocation, thus avoiding the issue of endogeneity that could arise.

To estimate models based on panel data, several options available were considered, including pooled ordinary least squares (POLS), Fixed Effects (FE), and the Generalized Method of Moments (GMM). In this study, POLS was used as a baseline to estimate a simple model, mathematically expressed as:

$$F_{it} = \alpha + \beta R_{it-1} + \mu I_{it-1} + \gamma_1 N_{it-1} + \gamma_2 N_{it-1}^2 + \zeta P_{it-1} + \epsilon_{it} \tag{3.1}$$

Where F_{it} refers to the amount of approved funding for country i (i = 1,2, ... n) in year t (e.g. for mitigation funding: t = 2002, 2003 ... 2020); α is the intercept of the model; R_{it-1} represents the readiness score lagged one year; I_{it-1} stands for the lagged proxies for political interests; N_{it-1} indicates the time-varying controls for sanitation investment needs lagged one year, and N_{it-1}^2 represents the time-varying control for sanitation investment needs squared and lagged one year; P_i is the time-varying control variable for population size lagged one year; β, μ, γ_1, and ζ are the vectors for coefficients estimated; γ_2 is the vector for the coefficient capturing non-linear effects of the sanitation investment need index; and the error term ϵ represents the idiosyncratic errors.

A POLS model is a simple and intuitive approach where country and time units are treated as homogeneous. That is, it assumes no significant differences between countries or over time. In this study, using a POLS model offers certain advantages.

First, the model is straightforward to estimate and interpret, providing a clear starting point for the analysis. By pooling all the data together, it allows for the assessment of the general relationship between the dependent variable and the variables of interest. This simplicity makes it easy to observe basic patterns and get an initial understanding of the relationships in the data.

Second, a key advantage of POLS in this context is that it does not average out country-specific fixed effects, which would be the case with a FE model. This is important because one key variable in the analysis—the sanitation investment need index—includes factors that do not vary over time. By using POLS, it is possible to retain the time-invariant variation, which allows for a more meaningful interpretation of the coefficient of this index, as opposed to removing the variation by controlling for fixed effects.

However, the limitations of the POLS model arise from its assumption that there are no unobserved differences between countries or over time. If this assumption does not hold, POLS could lead to biased estimates. This is particularly relevant because there could be unobserved, time-invariant country-specific factors (e.g., geography, institutions, historical relationships) or time-varying global factors (e.g., economic shocks, policy changes) that influence the dependent variable and are correlated with the explanatory variables.

Moreover, countries may differ in their institutional setups, policy environments, or vulnerabilities, which could result in differing responses to the same explanatory variables. These differences may not be captured by the POLS model, further introducing the risk of biased results.

To address the limitations of the POLS model and further refine the analysis, a two-way FE model have been employed. The two-way model controls for unobserved heterogeneity both across countries and over time, capturing the effects of both time-invariant country-specific factors and time-varying global factors. This allows the isolation of a relationship between the dependent variable and the explanatory variables by removing the impact of unobserved factors that vary across countries or over time. In other words, by including country and time-specific fixed effects, the FE model allows for a more accurate estimate of the relationships between the dependent variable and the variables of interest. In addition to the two-way FE model, a country fixed effects model excluding the time fixed effects was also used. The FE model is specified as follows:

$$F_{it} = \alpha + \beta R_{it-1} + \mu I_{it-1} + \gamma_1 N_{it-1} + \gamma_2 N_{it-1}^2 + \zeta P_{it-1} + \eta_i + \lambda_t + \epsilon_{it} \tag{3.2}$$

Where the added term η_i refers to the unobserved country-specific effects, and λ_t the time-specific fixed effects.

As funding allocations were observed to be skewed (see figure 4.5), a log transformation was performed. Substantial amount of zero values for funding allocations (see figure 4.4) and negative values for the oda per capita variable present in the data made the natural logarithm-based Inverse Hyperbolic Sine transformation most suitable (Burbidge et al., 1988; Pence, 2006) as it enables the retention of zero values and handled negative values throughout the transformation, which was meaningful in this study. Consistent with Betzold and Weiler (2017), Mofakkarul (2022) and Weiler et al. (2018), the time-varying continuous variables except the indices were also log-transformed.

Substantial amounts of zero values present another issue concerning the distribution of the data. The right-skewed distribution seen in figure 4.4 is driven by the large number of years in which countries received no funding, resulting in a distribution that deviates from normality. This skewness and the high number of zero values introduce two main issues. First, the violation of normality and homoscedasticity assumptions in the POLS model can result in biased estimates. Second, the zeros represent censored data—countries eligible for funding but not receiving any in certain years. This means that POLS cannot fully capture the structure of the data, particularly the decision-making process behind allocating zero funding.

Two methods commonly used to handle censored data and address skewness of this kind are the Heckman two-step method and the Tobit model (Berthélemy and Tichit, 2004). The Heckman method addresses selection bias when observations are not randomly selected, which they would not be in the case there is an underlying probability of being funded. In the first step, a probit model estimates the likelihood of selection (e.g., the probability of a country receiving funds) using a set of predictors, generating the "inverse Mills ratio". This ratio is included in the second-step regression to simulate censored values and hence correct for selection bias when predicting the amount of funding received.

Conversely, the Tobit model works in a similar way but accounts for the fact that countries receiving zero funds are censored and estimates aid commitments in a single step. Unlike the Heckman method, the Tobit model assumes that the same set of exogenous variables influences both the likelihood of receiving funds and the amount allocated, treating both processes as driven by the same underlying mechanism.

McGillivray (2002) suggests that the Heckman two-step method is preferable when the factors determining fund selection differ from those influencing the amount allocated. As noted by Berthélemy and Tichit (2004), the Heckman method can also lead to less robust estimators if the same set of regressors is used in both steps. Since in this study, there is no reason to believe that the factors influencing the probability of receiving funds differ from those affecting the amount received, the Tobit model was chosen as the more appropriate approach. Equation 3.1 consequently becomes:

$$F_{it}^* = \alpha + \beta R_{it-1} + \mu I_{it-1} + \gamma_1 N_{it-1} + \gamma_2 N_{it-1}^2 + \zeta P_{it-1} + \epsilon_{it} \tag{3.3}$$

Where F_{it}^* is a latent variable representing the amount of funding a country would receive if the selection process allowed, in contrast to F_{it} from the two former models which is the *observed* amount of funding, defined as:

$$F_{it} = \begin{cases} F_{it}^*, & \text{if } F_{it}^* > 0 \\ 0, & \text{if } F_{it}^* \leq 0 \end{cases} \tag{3.4}$$

Notably, a Tobit model would be incompatible with a FE model specification due to the nature of censoring in the Tobit model. When fixed effects are included in the model, they adjust for unobserved heterogeneity by estimating individual-specific intercepts. However, this adjustment can distort the likelihood estimation for censored observations in the Tobit model, because the fixed effects alter the relationship between the observed and censored values. Consequently, the estimation of the censored part of the distribution is biased. As a result, it is problematic to combine Tobit models with fixed effects in this context. Therefore, the FE model estimation was conducted according to the standard specification in equation 3.2

In addition to the POLS and FE models, a GMM model was briefly considered as a potential solution to address other sources of bias, particularly the potential endogeneity of the lagged dependent variable F_{it-1}, which could affect the amount of funding F_{it} in the subsequent year, as noted by Mofakkarul (2022). The inclusion of the lagged dependent variable helps control for the dynamic persistence in the dependent variable over time, which could otherwise lead to biased estimates. However, due to concerns over multicollinearity and low statistical power, potentially arising from a substantial number of zero values and the extensive use of instrumental variables, GMM was discarded as an estimation approach[5].

3.2 The Green Climate Fund's Project Portfolio

3.2.1 Data Collection

To quantify the number of sanitation projects in the GCF portfolio and their associated funding, a three-step screening was conducted to identify approved projects proposals that are related to the sanitation sector. An overview of the screening process is depicted in figure 3.1.

In the first step, a keyword search was used on each of the listed approved project proposal PDFs in the GCF project portfolio. The keywords included: Sanitation, wastewater, fecal, sludge, bio-gas, toilet, and water. In the second step, a more detailed evaluation of the project proposals was conducted to identify which of the projects that featured a keyword did indeed concentrate their core project activities around the keyword. Examples of reasons for exclusion of approved project proposals from this step was when the keyword was only mentioned in the background research, or in the description of SDG 6. In the third step the remaining approved project proposals were scanned to find a specific financial component related to the keyword. On the date of search (1 April 2024), 6 project proposals were found to have a clear financial component related to SDG 6.2 or 6.3 and were included for the analysis. These findings differ slightly from those presented by Bayoumi (2019), who found 7 sanitation projects when evaluating the inclusion of SDG 6.2 and 6.3 in the GCF project portfolio. In this study, 3 projects found in the previous study were excluded since they did not feature a clear financial component associated with the SGDs of interest, and

[5] For further details about GMM and its application, see Arellano and Bond (1991), Blundell and Bond (1998), and Roodman (2009).

3 projects were added following their approval by the GCF in the time period that followed after the reported results from the previous study.

Notably, when considering the broader scope of sanitation sector related financial components of a project being nested together with other sector-specific components, 31 additional approved project proposals were identified. However, these projects were not included in the analysis due to the ambiguity of how much of the funds were actually directed towards the sanitation component. The funds received by the selected projects proposals were disaggregated by GCF funds, share of public co-finance, share of private co-finance and theme (mitigation, adaptation and cross-cutting).

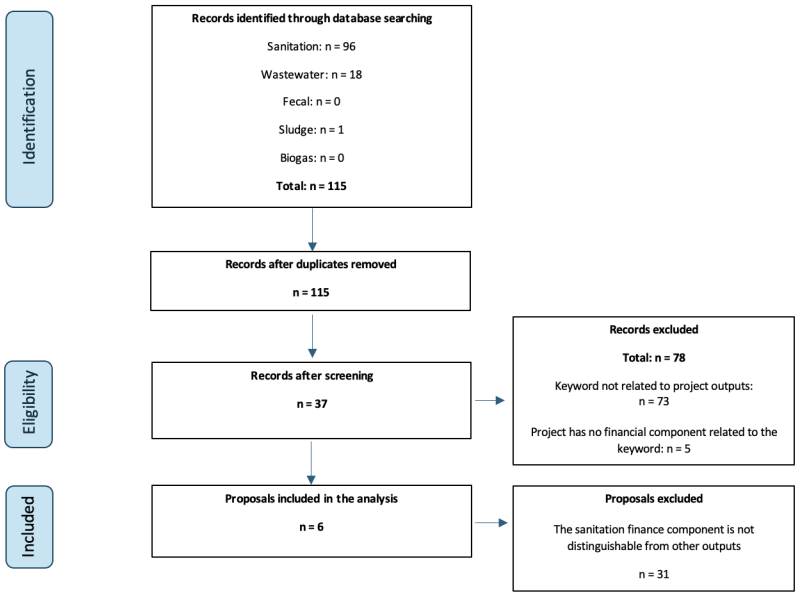


Figure 3.1: Overview of the GCF approved project proposal screening process and number of identified, included and excluded sanitation projects

3.2.2 Case Studies

In order to put quantitative findings into context and explore drivers and barriers to access climate finance in more details, a qualitative analysis was conducted. A review of the approved sanitation project proposals selected for this study was performed to examine barriers and drivers for investments into sanitation projects in light of the GCF investment criteria (GCF, nd). The coding framework used to extract data from the selected sanitation projects identified in the GCF approved project portfolio can be found in appendix B

A thematic analysis was subsequently conducted where the approved project proposals were compared to each other. The purpose was to identify common themes, categorizing how project proponents address the GCF investment criteria and to highlight best practices as well as common challenges.

3.2.3 Interviews

Complementary to the case studies, interviews with key stakeholders concerned with the investment process of GCF approved sanitation projects were conducted. Stakeholders sampled came from three main groups: GCF staff concerned with the investment process,

project proponents of approved sanitation GCF projects (accredited entities, nationally designated authorities or implementing agencies) and private sector investors that have been involved with sanitation projects or other GCF approved projects.

The aim was to interview at least one stakeholder from each of the three target groups to gain detailed insights into the factors related to the conceptual framework that underlie the GCF investment process for sanitation projects and contribute to either an increase or decrease in funding. The intention of conducting interviews is to gather additional perspectives concerning the research questions, but also to overcome the issue of non-approved project proposals (e.g. rejected projects or projects pending due to need for improvements of the design) being censored (e.g. not being available in the GCF approved project portfolio or elsewhere), as well as highlighting factors that might not be visible through the selected case studies.

GCF staff members that were sampled for the interviews come from the following GCF departments that have an explicit or implicit relation to the investment process: Division of private sector facility, division of mitigation and adaptation, division of portfolio management, division of country programming. Project proponents and private investors were sampled from the identified GCF approved sanitation projects or more broadly from the entire GCF approved project portfolio. Interview questions with GCF staff focused on assessing investment criteria prioritization, the importance of a solid business case, implications of adaptation or mitigation focuses and overall challenges and opportunities for sanitation projects. Interviews questions intended for project proponents concentrated on problems and opportunities related to the project design and submission, for example most challenging investment criteria to meet or overall perceived challenges and/or opportunities for highlighting sanitation investment needs in a climate context and increasing number of sanitation projects in the project pipeline. Interview questions with private investors intended to investigate what motivated the decision to invest, which investment criteria were used and their attitude about sanitation project investments. The interviews were planned to be semi-structured, held digitally, and revolving around the structure outlined in appendix C. By the end of the study 3 interviews were conducted, including input from GCF staff, representatives of NDAs as well as implementing agencies. No private investors were reached for an interview.

4 Results

4.1 International Development Aid Flows

4.1.1 Descriptive Analysis

In recent years, between 2020-2022, 3.4 % of total climate-related ODA was allocated towards SDG 6.2 and 6.3, which was slightly less than the 4.2 % allocated to other water, sanitation and hygiene (WASH) sectors.

Moreover, figure 4.1 illustrates the total amount of climate-related ODA (million USD) that was allocated across different WASH sectors during the same time period. Most funding went towards large water and sanitation systems, and basic sanitation received the least funds.

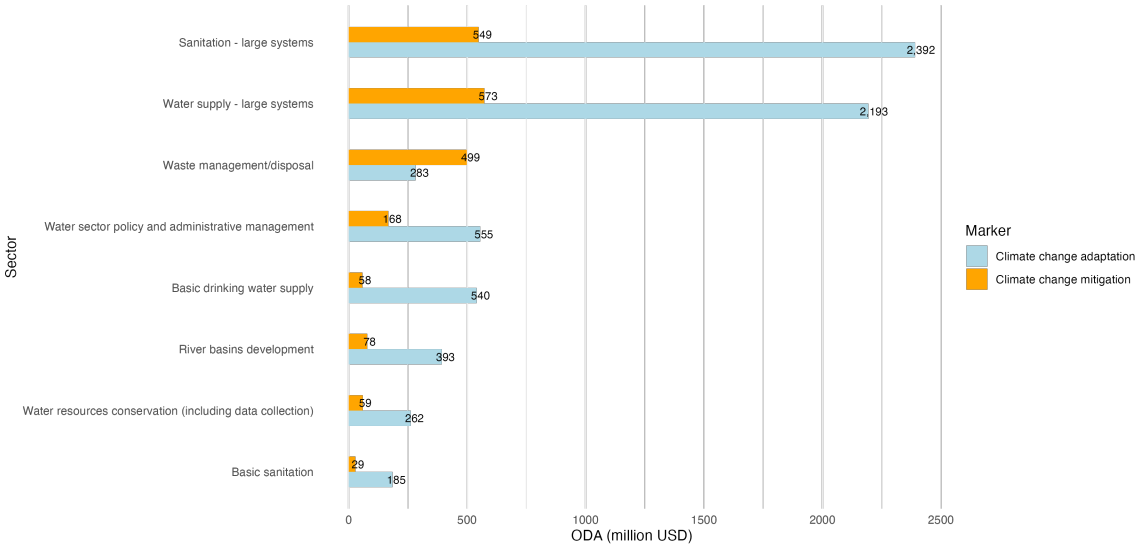


Figure 4.1: Climate-related ODA allocated by sector and funding type between 2020-2022

Figure 4.2 demonstrates the share between adaptation and mitigation funding going towards the different sanitation sub-sectors for the given time frame. At the top-left, the shares for all sub-sectors combined is illustrated, indicating that 72.7% of funds went to adaptation projects and 27.3% went to mitigation projects. At the top-right, funding patterns for large sanitation systems shows that 81.3% went to adaptation projects and 16.7% went to mitigation projects. Funding towards basic sanitation (bottom-left) saw a 86.5% share going adaptation projects and 13.5% going to mitigation projects. Finally, for waste

management and disposal (bottom-right), 36.2% went to adaptation projects and 63.8% went to mitigation projects. These numbers indicate that there is more emphasis on adaptation across all sectors, except waste management and disposal.

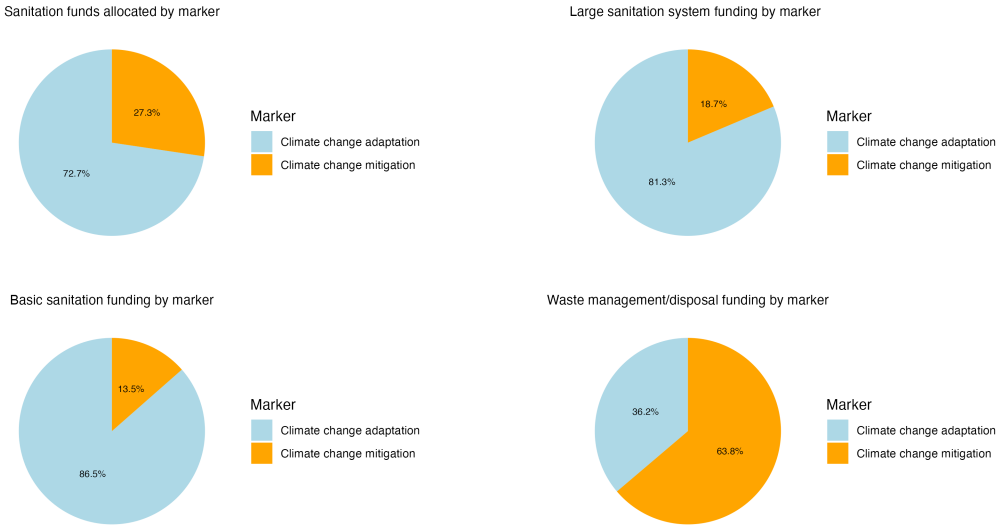


Figure 4.2: Climate-related ODA allocated between mitigation and adaptation for each sanitation related sector code

Looking at the data over a longer time period, panel A of figure 4.3 shows the distribution of total funding per year from 2002 - 2022 between mitigation and adaptation funding. As noted in section 3.1.2, from 2002 - 2010 no funding went to adaptation. In the following years, adaptation funding emerged as the predominant funding type. Panel B of the same figure shows the distribution of funding across sanitation sub-sectors. Only waste management and disposal received any climate-related funding from the years 2002 - 2010, implying that mitigation funding prior to year 2010 went entirely to waste management and disposal projects. From 2010 onward, the share of funding going towards waste management and disposal decreased significantly, mainly due to the increased funding directed toward large sanitation systems, which received the largest share. Basic sanitation received the smallest share of funds across all years. While the lack of funding for basic sanitation systems could pose a challenge for the identification of causal links in the panel data analysis—given that data for this variable was the only one available for constructing the sanitation need index—it does not render the index useless. This is because the lack of basic sanitation could also serve as a proxy for the absence of larger and more advanced systems, due to potential correlations.

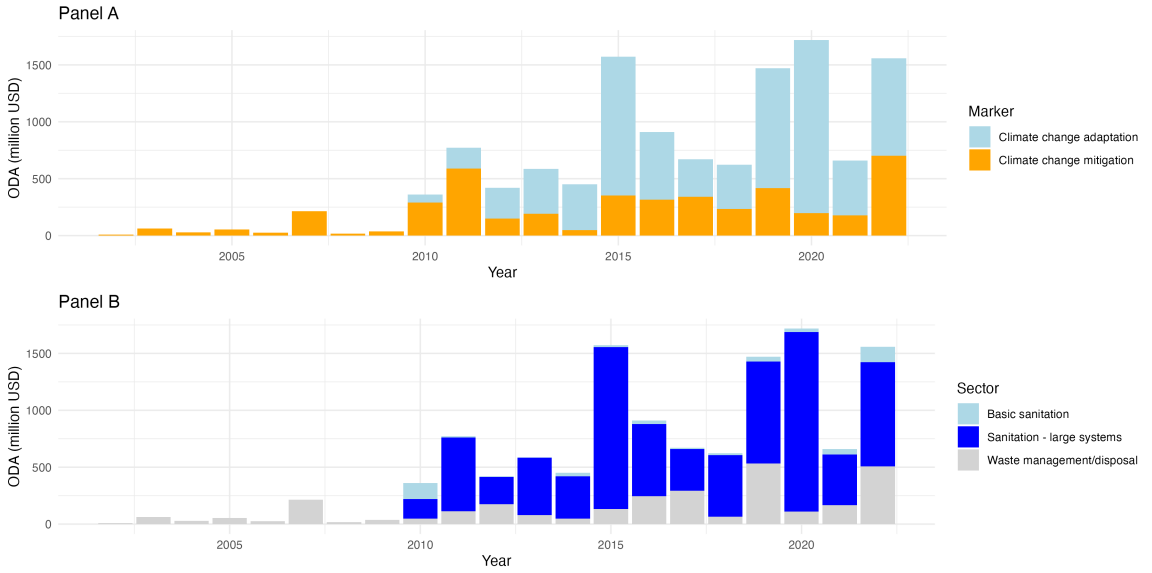


Figure 4.3: Panel A: Climate-related ODA allocated between mitigation and adaptation per year from 2002-2022. Panel B: Climate-related ODA allocated by sanitation related sector code per year from 2002-2022

Figure 4.4 sheds light on the distribution of aggregate funds received by country over the time period subject to the panel data analysis. Panel A demonstrates the binned distribution of mitigation funds received by number of countries between 2002 - 2020. Most countries received zero or very little mitigation funding over the given time period, and a very few received more than 100 million USD. A similar pattern is observed in panel B when looking at the binned distribution of adaptation funds by number of countries between 2010 - 2021, showing a clear left-skewed distribution.



Figure 4.4: Panel A: Binned distribution of total mitigation funds received by number of countries between 2002 - 2020. Panel B: Binned distribution of total adaptation funds received by number of countries between 2010 - 2021

Figure 4.5 sheds further light on the distribution of funding, providing an overview of the between and within country variation in funding received for the top 5 most funded countries. Panel A shows the mitigation funding patterns between 2005 - 2020 for Brazil, China, India, Iraq and Jordan. In panel B, the same pattern is shown but for adaptation funding for India, Indonesia, Myanmar, Tunisia and Viet Nam. As seen in both panels, amount of funding allocated varies significantly both between countries and within countries over the time period for respective funding type. This variation, combined with the fact that the graph highlights the top-funded countries, suggests that funding flows for both types of funding are driven by outliers.

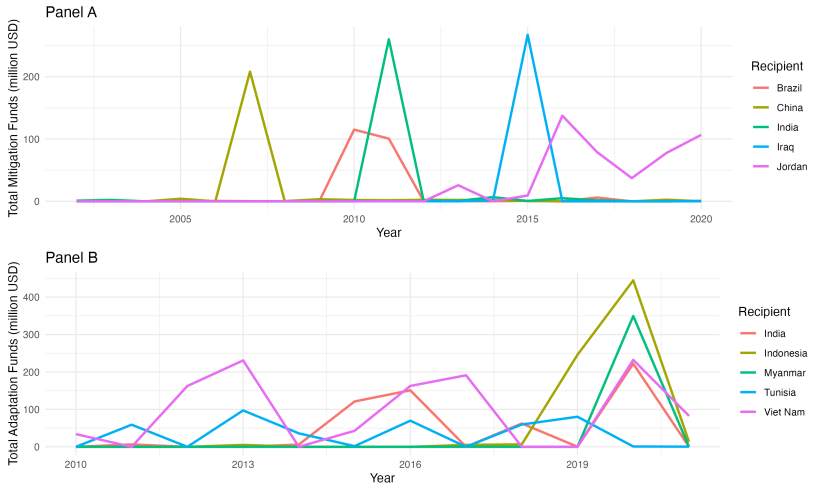


Figure 4.5: Panel A: Between and within country variation in mitigation funding received for top 5 most funded countries between 2002 - 2020. Panel B: Between and within country variation in adaptation funding received for top 5 most funded countries between 2010 - 2021

Figure 4.6 illustrates the geographical distribution of different variables. Panel A shows the sanitation investment need index score for different countries across the world. The biggest need for funds appears to be concentrated in sub-Saharan Africa, with Bolivia, Afghanistan, Pakistan, and India being a few exceptions. In panel B, looking at the access to basic sanitation (a sub-component of the sanitation investment need index) alone, a similar pattern is observed, demonstrating that correlation, although not perfect, exist between the sanitation investment need its sub-component—lack of access to basic sanitation. In panel C, the readiness score for different countries across the world is shown. Low to medium readiness is frequently found in central and South America, as well as Africa, the Middle East and South Asia. Moreover, panel D shows the amount of log funding in terms of climate-related ODA received by different countries across the world between 2002 - 2022. Gray indicates that no funding was received, being the case mainly in high income countries.

Notably, countries in sub-Saharan Africa received relatively little funding despite having low access to basic sanitation. In contrast, countries like India, China, Indonesia, and Peru received comparatively larger amounts of funding, even though their readiness scores were not significantly lower than those of their African counterparts (with the exception of China) and their basic sanitation coverage was considerably higher. These patterns provide qualitative evidence that mechanisms beyond investment needs may be at play influencing the amount of climate-related ODA received. The maps also support the suspicion discussed in section 2.1, namely that an inverse relationship between lack of access to basic

sanitation or the sanitation investment need index and the readiness score may exist, as it is evident that countries with low readiness scores are usually the ones with the higher need of climate-related investments into the sanitation sector. This is rather intuitive considering the economic and social component of the readiness index, which could plausibly be correlated with e.g. health, which in turn relates to access sanitation services and infrastructure. Nevertheless, the analysis in the following panel data section will be dedicated to probe deeper into these mechanisms with the aim of detecting potential causal links.

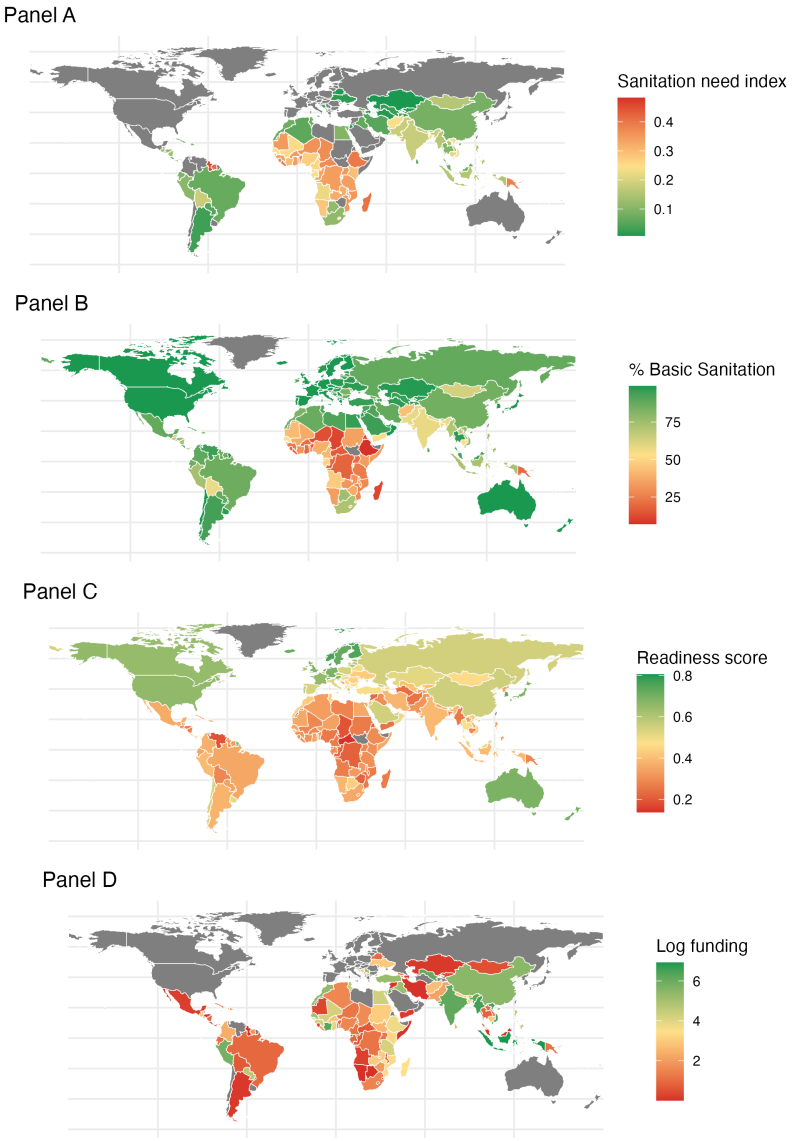


Figure 4.6: Panel A: Geographical distribution of sanitation need index score. Panel B: Geographical distribution of % of populations having access to at least basic sanitation (Source: United Nations International Children'ss Emergency Fund (UNIFEC)). Panel C: Geographical distribution of countries' readiness index score (Source: ND-GAIN index). Panel D: Geographical distribution of log funding allocations in the OECD DAC database

4.1.2 Panel Data Analysis

This section presents the results of the panel data analysis, comparing FE models and pooled Tobit models for the two dependent variables: mitigation funding and adaptation funding[1][2].

Figure 4.1 summarizes the results from the estimation of the fixed effects model as defined by equation 3.2 and the pooled Tobit model defined by equation 3.3. Column 1-4 concern the dependent variable mitigation funding, and column 5-8 concern the other dependent variable adaptation funding. Column 1 and 5 presents the pooled Tobit model estimation when the squared investment need term has been omitted, whereas column 2 and 6 includes the squared term. Column 3 and 7 contains the coefficients obtained from the FE model estimation, including time and country fixed effects, and column 4 and 8 displays the results from the FE model estimation, but when only time fixed effects have been controlled for.

For mitigation funding, the pooled Tobit model results indicate that a 1 p.p. increase in the readiness score (*read*) is associated with a 2.3 - 2.6% increase in funding on average (ceteris paribus), statistically significant at the 1% level (columns 1 and 2). This positive relationship holds across different model specifications. In the fixed effects models (columns 3 and 4), the coefficient for the readiness score appears to taper off slightly but remains robust, suggesting that countries with higher readiness scores are more likely to receive more mitigation funding, even after accounting for country and time fixed effects.

The pooled Tobit model and the FE models suggests that the readiness score is associated with increases in mitigation funding. However, as the pooled Tobit model does not account for country- or time-specific variations, and the FE models do not capture the censored nature of the data, caution is warranted when interpreting these results causally.

The relationship between readiness and funding is similarly positive for adaptation funding, though with some key differences. Specifically, a 1 p.p. increase in the readiness score leads to an approximate 3% increase in adaptation funding, statistically significant at the 1% level (columns 5 and 6). The model controlling for only time fixed effects (column 8) also supports this result. However, the relationship appears somewhat weaker compared to the pooled Tobit model, indicating that unobserved time-specific factors could be biasing the effect upward when not controlled for.

More concerning is the result observed in column 7, which shows a negative and statistically significant effect at the 10% level. This inconsistency raises concerns, but it is important to note that the deviating result in column 7 is accompanied by relatively weak statistical significance, possibly due to low statistical power, as the adaptation dataset has fewer observations. Additionally, the FE model may not fully account for the censored data structure, further exacerbating this issue. Overall, the readiness score shows signs of positively influencing adaptation funding, but caution should also be exercised when interpreting the results for adaptation funding.

Concerning ODA per capita (*oda_pc*), which is in log form, the pooled Tobit estimations show that a 1% increase in ODA per capita is associated with approximately a 0.2% increase in mitigation funding and a 0.45% increase in adaptation funding, on average, both statistically significant at the 1% level. For mitigation funding, the results suggest that

[1] Throughout this section, emissions per capita (*em_pc*) have been omitted from all regression tables to improve readability.

[2] Coefficients and standard errors for index scores presented in regression tables ("*read*", "*economic*", "*social*", "*governance*", "*need*", "*need*^{2}") have been divided by 100 to represent the effect of a 1 p.p. change in the index score.

this positive relationship holds when controlling for both country and time fixed effects, although the effect decreases slightly, and looses statistical significance when controlling for country fixed effects (column 3).

In contrast, for adaptation funding, column 7 shows that a 1% increase in ODA per capita, when controlling for both country and time fixed effects, leads to a small, statistically insignificant decrease in adaptation funding. However, when controlling only for time fixed effects (column 6), the relationship remains positive and statistically significant at the 1% level.

The consistency between the pooled Tobit model and the FE models suggests that ODA per capita is associated with increased mitigation funding, particularly in the pooled Tobit estimations. As previously mentioned, since the pooled Tobit model does not account for country-specific and time-varying factors, and the FE models do not capture the structure of censored data, these limitations may introduce some bias.

Concerning adaptation funding, the inconsistency between the specifications raises concerns. Specifically, the weak statistical significance observed when controlling for country fixed effects suggests that the relationship between ODA per capita and adaptation funding might be influenced by low statistical power and censored data, as previously noted. Nonetheless, the results indicate that ODA per capita plays a role in both mitigation and adaptation funding, but caution is warranted in interpreting these results causally, especially for adaptation funding.

Regarding the import index (*imp_indx*), which is also in log form, the pooled Tobit estimations show that a 1% increase in the import index is associated with approximately a 0.7% increase in mitigation funding and a 0.5% increase in adaptation funding, on average, both statistically significant at the 1% level.

For mitigation funding, the results suggest that the positive effect of the import index remains positive when controlling for both country and time fixed effects, although with a slightly reduced coefficient and with statistical significance absent. Similarly, for adaptation funding, the relationship remains positive and statistically significant at the 5% level when controlling for both country and time fixed effects, although the coefficient is somewhat lower (0.34%) compared to the pooled Tobit model (0.51%). On the other hand, column 8 indicates that the effect decreases and the statistical significance disappears when country fixed effect are not controlled for, suggesting that omitting unobservable country-specific characteristics introduces bias or noise.

The results from the estimations of the pooled Tobit model and the FE models indicates that the import index is associated with a positive impact on both mitigation and adaptation funding. However, the weaknesses in the data described earlier could also influence the interpretation of these results similarly.

The comparison between columns 1 and 2, as well as columns 5 and 6, suggests the presence of a non-linear relationship between sanitation investment needs and funding allocation. This is particularly evident for adaptation funding, where column 6 reveals statistically significant coefficients for both the linear and non-linear terms. While this relationship persists after controlling for time fixed effects, the coefficients lose statistical significance when both country and time fixed effects are included simultaneously. As already noted, this may be due to low statistical power and censored data.

Figure 4.7 plots the coefficients for the sanitation investment need index, derived from pooled Tobit estimations for both dependent variables. The plot illustrates a hump-shaped

effect for adaptation funding, with a statistically significant inflection point around a need index of 0.25. Beyond this point, the effect diminishes and becomes negative past a threshold of around 0.45. This pattern suggests that countries with moderate needs are more likely to attract adaptation funding, while those with very high needs experience marginally diminishing returns, which eventually even turns negative. Additionally, the effect size for mitigation funding appears increasingly negative, though not statistically significant. However, caution should be taken when interpreting these results, as the absence of statistical significance in the FE models indicate that consistency across models cannot be confirmed, given the limitations of the data available.

	mitfund				*adafund*			
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
read (L1)	0.026***	0.023***	0.020***	0.015***	0.031***	0.031***	−0.018*	0.010**
	(0.006)	(0.006)	(0.006)	(0.003)	(0.010)	(0.010)	(0.011)	(0.005)
ln oda_pc (L1)	0.221***	0.222***	0.019	0.086***	0.464***	0.455***	−0.047	0.090***
	(0.036)	(0.036)	(0.024)	(0.016)	(0.064)	(0.064)	(0.042)	(0.026)
ln imp_indx (L1)	0.678***	0.682***	0.013	0.030	0.514**	0.501**	0.338**	0.113
	(0.081)	(0.081)	(0.083)	(0.058)	(0.232)	(0.231)	(0.141)	(0.126)
need (L1)	−0.020***	−0.004	−0.014	−0.011*	0.002	0.049**	0.085	0.023**
	(0.004)	(0.014)	(0.106)	(0.006)	(0.006)	(0.022)	(0.216)	(0.010)
need^2 (L1)	–	−0.037	−0.013	0.019	–	−0.112**	−0.168	−0.052**
	–	(0.032)	(0.171)	(0.014)	–	(0.050)	(0.342)	(0.023)
ln pop (L1)	0.348***	0.347***	1.332***	0.134***	0.635***	0.620***	1.161	0.162***
	(0.029)	(0.029)	(0.312)	(0.013)	(0.052)	(0.052)	(0.733)	(0.021)
Country fixed effects	N	N	Y	N	N	N	Y	N
Time fixed effects	N	N	Y	Y	N	N	Y	Y
Tobit simulation	Y	Y	N	N	Y	Y	N	N
Observations	1,938	1,938	1,836	1,836	1,248	1,248	1,144	1,144
Censored	1,211	1,211	–	–	765	765	–	–
R^2	–	–	0.015	0.078	–	–	0.012	0.064

Note: Standard errors within brackets: *p<0.1; **p<0.05; ***p<0.01
ln stands for the natural logarithm-based inverse hyperbolic sine transformation
L1 stands for a one-year lag.
The emissions per capita variable has been omitted for readability
read = readiness, oda_pc = oda per capita, imp_indx = import index, pop = population

Table 4.1: Regression results for pooled Tobit estimations, time fixed effects, and two-way fixed effects

Table 4.2 presents model estimations where the readiness index has been decomposed into economic, social, and governmental dimensions. The most notable finding is that governmental readiness appears to be the primary driver of funding allocations, with positive coefficients for both adaptation and mitigation funding. These effects are statistically significant across all models, except when country fixed effects are included. In contrast, economic

readiness plays a relatively minor role, as the coefficients are small and only statistically significant in the fixed effects estimations for mitigation funding.

There is suggestive evidence of a potential link between social readiness and adaptation funding, as seen in columns 5 and 6 for the pooled Tobit models. However, the sign of this relationship changes when controlling for fixed effects, and statistical significance is weak or absent. This points to weak evidence for a causal link. With additional data and higher statistical power, such relationship could potentially be identified, though this remains speculative. Notably, social readiness does not appear to have any discernible effect on mitigation funding.

	mitfund				*adafund*			
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
economic (L1)	0.003	0.003	0.009***	0.005**	−0.001	−0.001	−0.007·	−0.002
	(0.003)	(0.003)	(0.002)	(0.002)	(0.006)	(0.006)	(0.004)	(0.003)
social (L1)	0.001	0.002	−0.010	−0.002	0.014	0.019*	−0.026	−0.003
	(0.007)	(0.007)	(0.009)	(0.003)	(0.010)	(0.010)	(0.026)	(0.005)
governance (L1)	0.019***	0.019***	0.001	0.007***	0.022**	0.021**	0.007	0.010**
	(0.005)	(0.005)	(0.006)	(0.002)	(0.009)	(0.009)	(0.014)	(0.004)
ln oda_pc (L1)	0.242***	0.242***	0.020	0.089***	0.481***	0.478***	−0.047	0.118***
	(0.038)	(0.038)	(0.024)	(0.017)	(0.067)	(0.067)	(0.044)	(0.029)
ln imp_indx (L1)	0.686***	0.686***	0.028	0.006	0.554**	0.532**	0.364**	0.129
	(0.088)	(0.089)	(0.092)	(0.063)	(0.244)	(0.243)	(0.167)	(0.141)
need (L1)	−0.020***	−0.004	−0.002	−0.015**	−0.001	0.047*	0.088	0.027
	(0.005)	(0.015)	(0.113)	(0.007)	(0.007)	(0.024)	(0.234)	(0.012)
needˆ2 (L1)	–	−0.039	−0.031	0.024	–	−0.107**	−0.177	−0.056**
	–	(0.034)	(0.185)	(0.015)	–	(0.054)	(0.369)	(0.026)
ln pop (L1)	0.394***	0.393***	1.229***	0.144***	0.679***	0.663***	1.510*	0.209***
	(0.033)	(0.033)	(0.336)	(0.014)	(0.057)	(0.057)	(0.803)	(0.025)
Country fixed effects	N	N	Y	N	N	N	Y	N
Time fixed effects	N	N	Y	Y	N	N	Y	Y
Tobit simulation	Y	Y	N	N	Y	Y	N	N
Observations	1,843	1,843	1,746	1,843	1,176	1,176	1,078	1,078
Censored	1145	1145	–	–	707	707	–	–
R^2	–	–	0.018	0.079	–	–	0.015	0.074

Note: Standard errors within brackets: *p<0.1; **p<0.05; ***p<0.01
ln stands for the natural logarithm-based inverse hyperbolic sine transformation
L1 stands for a one-year lag.
The emissions per capita variable has been omitted for readability
oda_pc = oda per capita, imp_indx = import index, pop = population

Table 4.2: Regression results for the readiness index decomposed for pooled Tobit estimations, time fixed effects, and two-way fixed effects

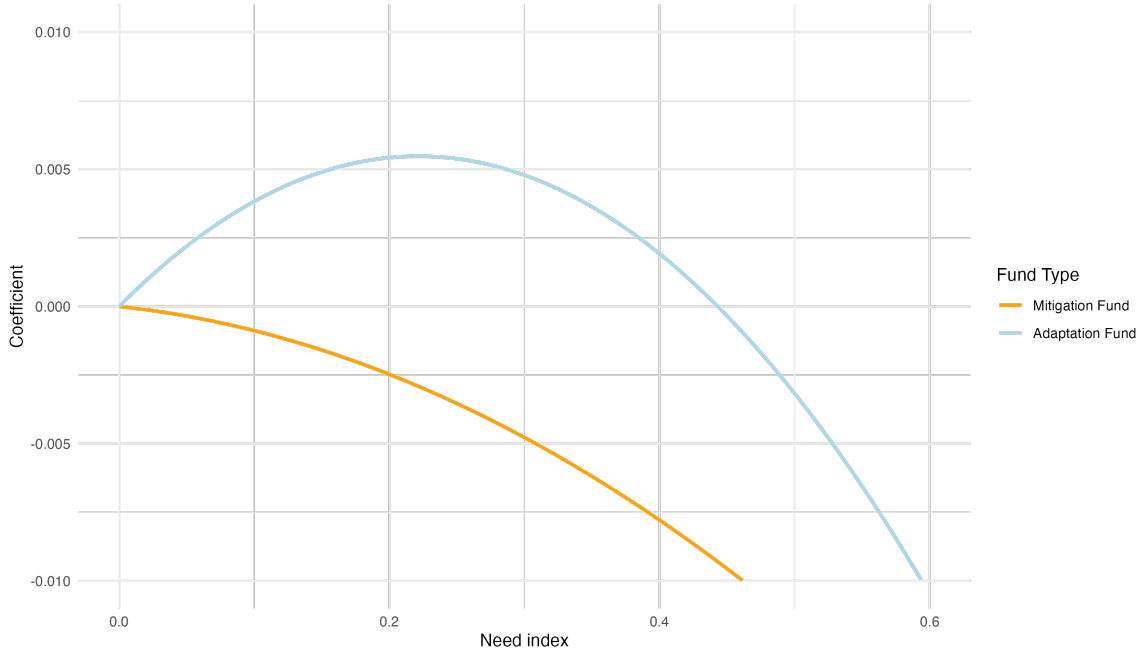


Figure 4.7: Plot of non-linear effect of sanitation need index on mitigation and adaptation funding allocations

4.1.3 Sensitivity Analysis

This section presents a sensitivity analysis of the index construction to assess the robustness of the previous results.

Table 4.3 shows the pooled Tobit model, including the squared term, with different weighting schemes and variable exclusions for the sanitation need index. In columns 1 and 4, external health expenditures (exhexp) have been excluded from the index; in columns 2 and 5, the weight of exhexp has been increased from 10% to 25%; and in columns 3 and 6, the weight of the *close_water* variable has been increased from 50% to 70%, with the remaining weight distributed between the other two components.

When comparing these results with those in Table 4.1, it appears that the findings are largely consistent across different index specifications, with the coefficients for both mitigation and adaptation funding remaining similar. The only noticeable fluctuations occur for the sanitation need index coefficient, which varies slightly across the different composition specifications. However, the sign of the coefficient remains consistent, indicating that the overall conclusions are unaffected by changes in the index construction, thereby demonstrating the robustness of the index.

	mitfund			*adafund*		
	(1) exhexp excl	*(2) exhexp 25%*	*(3) close_water 70%*	*(4) exhexp excl*	*(5) exhexp 25%*	*(6) close_water 70%*
read (L1)	0.023***	0.025***	0.028***	0.031***	0.030***	0.033***
	(0.006)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)
ln oda_pc (L1)	0.220***	0.221***	0.209***	0.454***	0.459***	0.451***
	(0.036)	(0.036)	(0.036)	(0.064)	(0.065)	(0.064)
ln imp_indx (L1)	0.683***	0.674***	0.661***	0.492**	0.518*	0.519**
	(0.081)	(0.081)	(0.081)	(0.231)	(0.232)	(0.232)
need (L1)	−0.006	−0.014	−0.003	0.044**	0.038*	0.022
	(0.012)	(0.015)	(0.013)	(0.020)	(0.022)	(0.017)
need^2 (L1)	−0.027	−0.011	−0.024	−0.086**	−0.102*	−0.037
	(0.025)	(0.037)	(0.032)	(0.040)	(0.058)	(0.038)
ln pop (L1)	0.352***	0.340***	0.337***	0.621***	0.620***	0.631***
	(0.029)	(0.029)	(0.030)	(0.052)	(0.052)	(0.053)
Tobit simulation	Y	Y	Y	Y	Y	Y
Observations	1,938	1,938	1,938	1,248	1,248	1,248
Censored	1211	1211	1211	765	765	765

Note: Standard errors within brackets: *p<0.1; **p<0.05; ***p<0.01
ln stands for the natural logarithm-based inverse hyperbolic sine transformation
L1 stands for a one-year lag.
The emissions per capita variable has been omitted for readability
oda_pc = oda per capita, imp_indx = import index, pop = population
exhexp = external health expenditures, close_water = % of population living close to water surface

Table 4.3: Pooled Tobit regression results for different weighting of the need index components

4.2 The Green Climate Fund's Project Portfolio

4.2.1 Descriptive Analysis

As mentioned in section 3.2.1, on the date of the search (1 April 2024), the GCF project portfolio included 6 approved project proposals where there was a clear sanitation component, including associated funding data, separable from other sector focuses.

Table 4.4 gives an overview of the project specific data of the identified sanitation projects. The projects have been approved by the GCF board between 2015 and 2021. 4 out of 6 projects have an international accredited entity involved (e.g. development bank), and only 2 projects had a direct access to funds via national or regional accredited entities. The projects are either small or medium sized, and one project was designed as a "program". There are two measures for impact potential associated with a project or program: number of beneficiaries for adaptation focused projects, and tonnes of CO_2 equivalent (tCO_2-eq) emission reductions achieved for mitigation projects, and both for cross-cutting projects. While FP119 is the only case of a cross-cutting project or program, it is worth to mentioned that FP008 did describe tCO2-eq emission reductions achieved from installation of septic tanks, although not quantified. Apart from this, this sanitation project portfolio selected for analysis is entirely adaptation focused.

Project Code	Accredited Entity Type	Country	Project Title	Type	Size	Theme	Project Approval Date	Beneficiaries	tCO2-eq Emission Reductions	Economic Rate of Return
FP008	Direct	Fiji	Fiji Urban Water Supply and Wastewater Management Project	Project	Medium	Adaptation	05/11/2015	290,854	NA	13.8 percent
FP021	International	Senegal	Senegal Integrated Urban Flood Management Project	Project	Medium	Adaptation	14/10/2016	2,200,000	NA	28 percent
FP041	International	Tanzania	Simiyu Climate Resilient Project	Project	Medium	Adaptation	06/04/2017	495,000	NA	10.9 percent
FP119	International	Palestine	Water Banking and Adaptation of Agriculture to Climate Change in Northern Gaza	Project	Small	Cross-cutting	14/11/2019	223,553	166,858	NA
FP155	International	Jordan	Building resilience to cope with climate change in Jordan through improving water use efficiency in the agriculture sector (BRCCJ)	Project	Small	Adaptation	19/03/2021	212,416	NA	24.1 percent
SAP008	Direct	Bangladesh	Extended Community Climate Change Project-Flood (ECCCP-Flood)	Program	Small	Adaptation	14/11/2019	90,000	NA	NA

Table 4.4: Project details and key performance metrics for projects selected for analysis

Table 4.5 provides more details of the financial data associated with the 6 identified GCF approved projects with a finance component related to SDG 6.2 or 6.3. Looking at total funds including all sub-sector components, FP008 is by far the project that received the most funds with about 400 million USD, followed by FP041 with 184 million USD received. The smallest project is SAP008, with 13 million USD received, followed by FP155 with about 33 million USD received. The project with the largest sanitation related component is FP008, amassing 84 million USD received funds, constituting 20.7% of the total project funding. FP041 on the other hand has a rather small sanitation component (3.5 million USD) compared to its overall size, which makes up to 1.9% of the total funds received. The project for which the sanitation funding share was the largest was FP021, with a share of 73.4% going towards its sanitation component. FP119 received the smallest amount for its sanitation component, which constitutes 1.1% of total funds. Very limited amount of GCF funding went towards the sanitation component of these projects, where only FP119 and FP155 received funds from the GCF for their respective sanitation components.

Most of the funding going towards the sanitation sector comes from public co-financiers, including development banks, national governments and other organizations providing international aid, such as Irish Aid. This suggests that the sanitation sector can more easily attract development aid, while the access to climate finance is limited. This could cause problems moving forward, for various reasons. First, if the sector continues to have limited access to climate finance, sustainable and climate-smart developments within the sector could lag behind. Second, in light of important climate treaties, such as the Paris Agreement, traditional development sectors, like the sanitation sector, could risk lagging behind even further as political attention and funding turns to sectors with high climate change mitigation potential (e.g. energy sector), or sector with a clear rational behind obtaining climate change adaptation funding.

Project Code	Total Project Financing	Sanitation Financing	Sanitation Financing Share	GCF Financing for Sanitation	Co-financing for Sanitation	Co-financiers
FP008	405,140,000	84,050,000	20.7%	0	84,050,000	Asian Development Bank, European Investment Bank
FP021	76,319,602	56,000,000	73.4%	0	56,000,000	Agence Française de Développement, Republic of Senegal
FP041	184,430,447	3,500,000	1.9%	0	3,500,000	Government of Tanzania, Kreditanstalt für Wiederaufbau, local user groups
FP119	48,192,125	550,784	1.1%	150,784	400,000	Agence Française de Développement, Irish Aid
FP155	33,250,000	3,585,700	10.8%	2,151,700	1,434,000	Food and Agriculture Organization, UNDP, The Government of Jordan
SAP008	13,325,740	1,535,600	11.5%	0	1,535,600	Palli Karma-Sahayak Foundation
Total	**760,982,939**	**149,221,084**	**19.6%**	**2,302,484**	**146,919,600**	–

Table 4.5: Description of financial data for each of the sanitation projects selected for analysis

Moreover, table 4.6 below gives an overview of country specific factors for each of the countries hosting one of the identified sanitation projects. These countries were Fiji, Senegal,

Tanzania, Palestine, Jordan and Bangladesh. All of these countries belong to either lower-middle income or upper-middle income groups, according the World Banks' classification framework for 2021.

Regarding the sanitation investment need index, Tanzania, Bangladesh, and Senegal demonstrate a substantial need for sanitation investment, with scores ranging from 0.24 to 0.34. In contrast, Fiji and Jordan show a smaller need, with scores of 0.12 and 0.04, respectively. Data for the index construction process was missing for Palestine, therefore no index score has been assigned.

The highest access to basic sanitation among these countries is found in Fiji, Jordan and Palestine, where almost everyone are having access. In Senegal and Bangladesh about half of the population have access to basic sanitation, and in Tanzania the share drops to about a quarter of the population. As expected, there is a clear negative correlation between access to basic sanitation and the sanitation investment need index score, given that access contributes 40% to the overall score. However, this correlation appears to be less pronounced for Fiji. As a small island developing state, Fiji's sanitation sector is likely more vulnerable to floods due to the high proportion of its population living near water surfaces.

The readiness scores of these countries range from 0.27 to 0.44, with Fiji and Jordan scoring relatively high at 0.44 and 0.41, respectively. However, these values are moderate on a global scale. In contrast, Senegal, Tanzania, and Bangladesh scored 0.35 or below[3]. These findings align with the discussion in Section 3.1.1, which highlights an inverse correlation between readiness scores and the sanitation investment need index (Figure 4.6). Countries with approved sanitation projects and higher readiness scores, such as Fiji and Jordan, tend to have better access to basic sanitation and score lower on the sanitation investment need index.

Notably, Jordan's FP155 project received the highest amount of GCF funding, consistent with the hump-shaped investment need curve discussed in section 4.1.2, adding further indications that countries with moderate investment needs but relatively high readiness scores may be better positioned to access climate finance.

Project Code	Country	Continent	Income Group	Sanitation Need Index	% of Population with Access to Basic Sanitation	Readiness Score
FP008	Fiji	Oceania	Upper-Middle Income	0.12	93%	0.44
FP021	Senegal	Africa	Lower-Middle Income	0.24	53%	0.32
FP041	Tanzania	Africa	Lower-Middle Income	0.34	24%	0.31
FP119	Palestine	Asia	Upper-Middle Income	NA	96%	NA
FP155	Jordan	Asia	Upper-Middle Income	0.04	98%	0.41
SAP008	Bangladesh	Asia	Upper-Middle Income	0.25	49%	0.27

Table 4.6: Project data overview: The sanitation need index, readiness score, and percentage access to basic sanitation are lagged one year with respect to the project approval date reported in table 4.4. Income groups are defined according to the GNI per capita classification by income groups (current USD) described in the World Bank's classification framework for 2021.

Figure 4.8 summarizes different statistics related to the overall GCF portfolio, as well as the GCF's sanitation project portfolio. Panel A shows the shares of funding allocations between GCF finance, public co-finance and private co-finance. The biggest share of funding comes from public co-financiers, which amounts to slightly more than half of all the funding (55.5%), with private co-finance and GCF finance constituting about one fourth each (22.8% and 21.7%, respectively). These numbers suggests that the GCF is rather successful in using their funds to mobilize both private sector and public sector funding for their overall project portfolio.

[3]Palestine was not included in the ND-GAIN index and has therefore not been assigned a readiness score.

In panel B of the same figure the allocation of funding flowing into sanitation projects from the GCF (including all sectors included in these projects), public co-financiers and private co-financiers is illustrated. Notably, no funding come from private sources, whereas the largest amount comes from public co-financiers (71.2%), with GCF funding constituting the remainder of the total funds (28.8%) going to the sanitation project proposals identified and selected for analysis.

This indicates that the GCF does not use much of their own funds to contribute to the total funding received by these projects, as most funding come from other public sources. However, the share seems to be considerably larger than the share of GCF funds targeting the sanitation related component as discussed above in relation to table 4.5, suggesting that other sectors embedded (e.g. water or agriculture) in the project receive more funds. Additionally, the tendency or ability to mobilize private finance for these types of projects appears weak. Overall, about 542 million USD came from public co-financiers, and about 219 million USD came from the GCF itself, which amounts to a total of 761 million USD going towards these projects.

As described in chapter 2, the use of innovative financing mechanisms is a distinctive strength of the GCF, enabling it to mobilize additional co-financiers, particularly private sector actors (Amighini et al., 2022). However, the sanitation sector appears to be largely excluded from these efficient financing mechanisms, whereas related sectors, such as water, have achieved significantly greater success in accessing these resources. Strengthening the sanitation sector's ability to leverage such funds is critical to ensuring that financing flows efficiently into the sector, supporting the achievement of SDG 6.2 and 6.3.

Moreover, Panel C shows that only 0.36% of total GCF funds disbursed—excluding mobilized co-finance—are allocated to identified sanitation projects. Although this figure includes contributions to other sectors (e.g., water and agriculture), it underscores the strikingly small share of GCF funding directed toward the sanitation sector. Excluding other sectors from this aggregate would result in an even more negligible figure. On the other hand, there seems to have been a slight increase compared to the numbers previously reported by Dickin et al. (2020), which could be explained by the addition of recently approved projects with a sanitation component having associated financial data.

Concerning funds allocated by the GCF between mitigation and adaptation, panel D quantifies the shares going to these different types of projects. A previously mentioned, almost all funding goes to climate change adaptation. Adaptation focused projects having a sanitation related component received about 193 million USD. None of the GCF funds went to mitigation projects alone, whereas a small fraction went to one cross-cutting project, which managed to amass an amount of around 26 million USD.

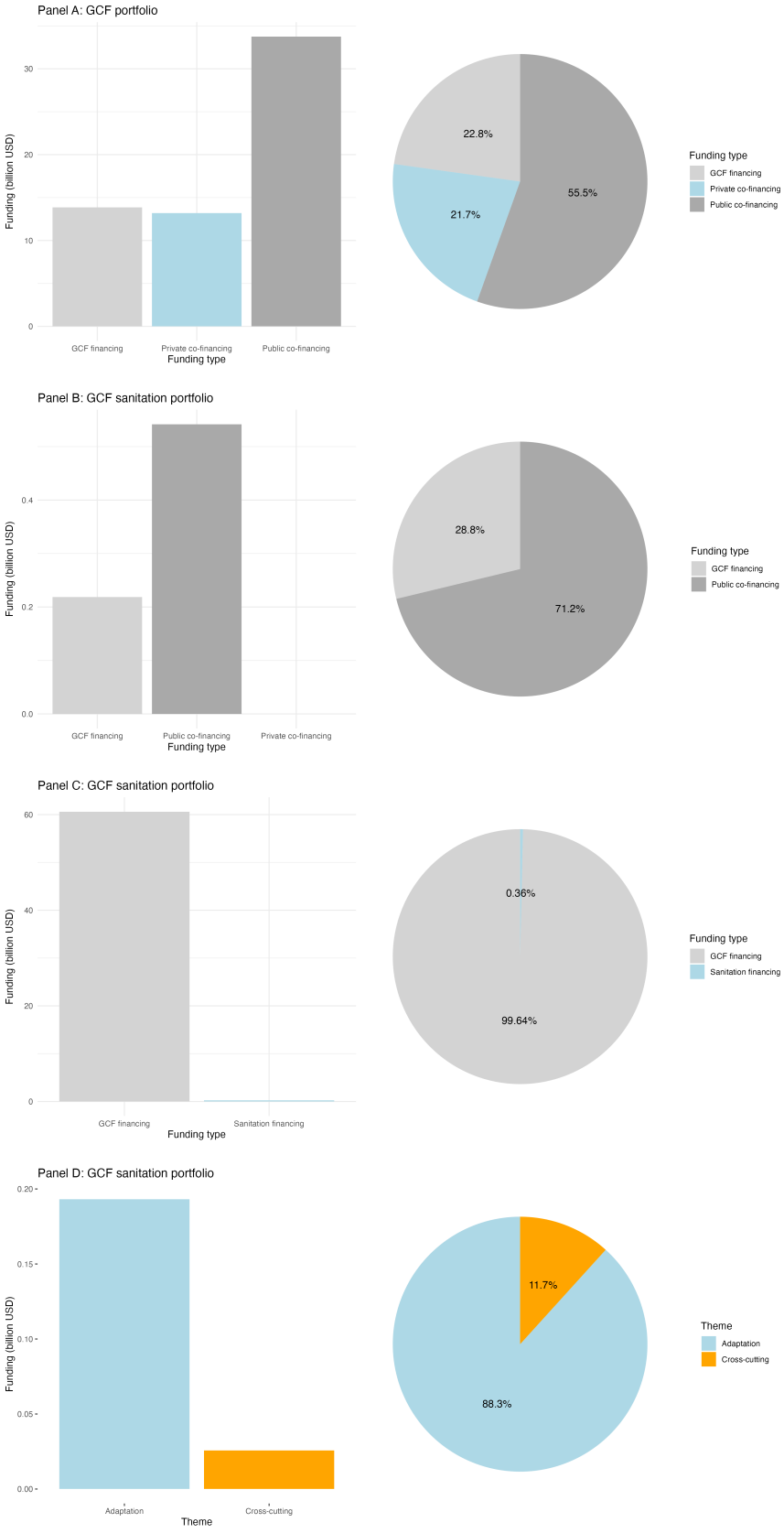


Figure 4.8: Panel A: Share of funding type for GCF project portfolio. Panel B: Share of funding type for GCF sanitation project portfolio. Panel C: Share of GCF sanitation funding of overall GCF funds (excluding co-finance). Panel D: Share of funding per theme (mitigation, adaptation, cross-cutting) for GCF sanitation projects (including co-finance).

4.2.2 Case Studies & Interviews

In this section results from the analysis of the 6 identified case studies and the 3 conducted interviews are presented. The case studies were compared against the GCF investment criteria, and a thematic analysis was performed to categorize factors that may strengthen the merit of sanitation projects or reinforce political (domestic as well as international) interests in investing in the sector.

Market Based Solutions

By analyzing the 6 case studies against the GCF investment criteria, market based solutions emerges as a compelling approach for securing funding. The potential of focusing on market based solutions is rooted in the ability to meet several GCF investment criteria simultaneously, hence contributing to a strong investment case and significantly strengthen a project's merits. A project that acts as, or aims to become an integrated part of the market and the economy would signal its efficiency and potential to maximize impact per dollar invested, be it for the GCF itself, or from public or private co-financiers.

In an interview with GCF staff concerned with the investment process (25 July, 2024), it was mentioned as an example that the strength of the energy sector is its "ability to generate willingness to pay". Additionally, it was highlighted that replicating this strength would not be impossible for the sanitation sector, at least to some degree. By integrating sanitation interventions with the market and either stimulating the demand, or making sure that the intervention meets already existing demand, the uptake of the intervention would increase and in turn increase impact per dollar invested.

Project **FP041** in Tanzania presents a good example where market based solutions are fostered by stimulating demand. For example, block tariffs to water utilities with preferable rates for the poor were strategically crafted. Additionally, the strategy on water pricing was crafted alongside plans to enact state subsidies targeting the water and sanitation sectors. Such strategy would stimulate demand for sanitation infrastructure and services through price discrimination mechanisms, enabling poorer users to enter the market while maintaining demand and profit generated from existing consumers from higher socioeconomic classes.

Such solutions would increase the impact per dollar invested and increase the total welfare of the economy by enabling more individuals to participate in the market for sanitation services, and in turn elevating the overall health of the population. Health is fundamental for several critical factors, both for the individual and the overall economy. Better health outcomes leads to a higher propensity or ability to obtain education, or to be productive in the labor force. These are important factors for inducing long-run paradigm shifts in the economy.

By rooting a solution in the market, long-run benefits could also be derived from lower prices via fostering of R&D activities bringing new and more efficient technology to the market, as firms compete for market shares. In turn, if a paradigm shift of this nature is achieved, it could generate more tax revenue for the government. This would potentially be in the governments interest, thus contributing to strengthening the country ownership making the intervention more sustainable over time.

In conclusion, market-based solutions have the potential to strengthen the merits of projects by satisfying multiple GCF investment criteria simultaneously, including efficiency

and effectiveness, paradigm shift, country ownership, and sustainable impact. These findings seem to reflect the results in section 4.1.2, which showed that higher readiness scores are associated with more climate-related ODA received. However, the effect does not appear to be driven by economic factors, such as ease of doing business, which in turn would facilitate the implementation of market-based solutions. An explanation to the insignificant effect of economic readiness on climate related ODA could be explained by the weak business case of the sanitation sector, as implied by the comments from GCF staff. On the other hand, some suggestive evidence was found that social factors, such as human capital (which can facilitate the implementation of market-based solutions), may influence the amount of adaptation funding received, although statistical significance was absent.

More interestingly, what was found in section 4.1.2 is that the quality of governance is highly correlated with increased funds received. In the context of market-based solutions, fostering such solutions requires a supportive regulatory framework. The Water Sector Regulatory Council (WSRC) in Palestine, which was involved in project **FP119**, exemplifies how a governing body can intervene to enhance the efficiency of the sanitation sector and improve its business case.

In Palestine, much of the responsibility for sanitation sector interventions under project FP119 is centralized within the WSRC. The WSRC oversees tariff setting, cost approvals for supply networks, and other essential services for water and wastewater delivery, ensuring compliance with policies adopted by the Palestinian Water Authority. It licenses regional water utilities and operators managing water supply, desalination, wastewater collection, and treatment facilities, including levying license fees. Additionally, the WSRC monitors compliance with license terms, develops performance incentive programs for service providers, and sets quality assurance standards for technical and administrative services. It also supervises operational processes for water production, transport, distribution, and wastewater management. Furthermore, the council maintains a database of technical, financial, and statistical information, publishes this data periodically, and addresses consumer complaints against service providers.

The fragmentation of responsibilities around the sanitation sector can be a detriment for the implementation of efficient regulations. This could be a major impediment for building capacity around the sector, which in turn could affect efficiency of funds obtained, but also the ability to prepare sanitation project proposals from a climate angle. WSRC demonstrates good examples of what measures can be taken in LMICs to organize responsibilities surrounding the sector. These measures could facilitate building capacity and integrating sanitation sector interventions with the market, hence significantly improving the merits of a project and its ability to attract funding.

Technology & Innovation

The implementation of progressive sanitation related technology also makes a strong case for strengthening the merit of a project, and could increase its chances of receiving funding, according to a comment from GCF staff in one interview (25 July, 2024).

Adoption of technology, such as circular economy facilities integrating sanitation systems, presents one example. A circular economy model centered around the sanitation sector could involve the transformation of fecal sludge into biogas via composting. This cycle contributes to a reduction in GHG-emissions generated from untreated wastewater, while also generating revenue from selling energy from renewable sources. Such solutions

could also catalyze the integration of sanitation sector intervention with the market due to the additional profit stream and potential efficiency gains from introducing climate smart technology. GCF staff stated that usage of innovative circular economy models to create market based solutions could enable sanitation projects to access loans with high degree of 'concessionality', and in turn mobilize investment from private co-financiers by reducing the risk profile.

Overall, it was emphasized by GF staff that the GCF is seeking more climate-smart technologies. This approach is grounded in the concept of achieving a paradigm shift and ensuring sustained long-term improvements. Since traditional solutions, such as providing septic tanks, may not lead to significant change, these projects could focus more on attracting alternative funding sources, such as the Bill and Melinda Gates Foundation or other philanthropic organizations, as suggested by the GCF staff member. These findings are also consistent with those in section 4.1.2, which demonstrated suggestive evidence that a country's social readiness score is associated with higher climate-related ODA targeting adaptation, although consistency of these estimations could not be ensured. On one hand, it appears plausible to infer that the readiness score, which showed a highly statistically significant effect on funding allocations, would be a prerequisite for fostering technological advancements due to its link with human capital development and innovation through the social component. However, such an inference should be approached with caution due to the weak consistency of the estimations presented in section 4.1.2

Overall, bringing new technologies to the market appears to be a great way towards shifting the paradigm and attract GCF funds. However, caution needs also to be taken in this regard. It is essential to deliver a solution in a cost efficient manner by keeping fixed and variable costs low, making it financially viable and marketable.

FP021 provides additional examples how technology can be used to increase cost-efficiency of a sanitation project in the context of disaster risk adaptation. For example, retention ponds were designed to reduce flow capacity of evacuation channels down-stream, by cutting peak flows – thus drastically reducing civil work costs. Moreover, the whole system has been designed to let water flow gravitationally, therefore avoiding pumping and associated energy costs and emissions.

Moreover, while the GCF emphasizes the importance of investing in climate smart technology, there are cases of projects receiving funding that took a different approach. For example, **FP041** illustrates how technology implementation can be adapted to better fit the context. The sanitation infrastructure implemented in this project uses 'locally adjusted on-site' technology that are deemed economically and technically more viable than sewerage networks. Such approach could be suitable when the implementation of more advanced centralized systems, like sewerage or circular economy systems, are too expansive for users. Cultural factors could also determine the uptake rate of an intervention, making less advanced and decentralized sanitation systems favorable in some cases.

Other Co-Benefits

Co-benefits, have already been touched upon in previous sections, such as market based solutions or technology and innovation. As mentioned before, co-benefits are an important indicator for project's merits, and is officially an indicator for the GCF investment criteria (see definition of investment criteria in appendix B). It is important for project proponents to be aware of all possible channels in which a project can contribute to the overall economy

and social conditions. Below are some examples of co-benefits in addition to those already mentioned. These co-benefits illustrates how a sanitation project can demonstrate its benefits to the economy and social life of the population more broadly, beyond just focusing on technology adoption or market based solutions.

The first example is **FP008**, which effectively emphasizes and describes the economic and social co-benefits of better access to basic human necessities, such as clean water, sanitation, and clean environment, for the poor. Additionally, emphasis has been put on economic co-benefits, such as job creation during project the implementation phase, as well as during the operation and maintenance of the expanded sanitation infrastructure.

Efficiency of urban infrastructure, including sanitation infrastructure, was also highlighted. Efficiency was mentioned to be adversely impacted by low population densities, which could be partly explained by the "low coverage of sewerage services resulting from inefficient regulatory frameworks" surrounding the sanitation sector. In middle income areas, piped water and sewerage provision was mentioned to reduce urban sprawl and counteract inefficiency stemming from the resulting low population densities. This in turn could unlock potential for private investment in housing development in rural or peri-urban areas, and also lower the cost of other infrastructure and services.

Additionally, tourism was mentioned as a factor that could increase demand for efficient waste management and water supply systems. Improved waste management and water supply systems could also be used to increase tourism, creating a positive feedback loop.

Other examples of co-benefits presented by FP008 include a gender action plan prepared to ensure that women were being consulted during project implementation to safeguard gender equality. Women's priorities are also reflected when planning the expansion of the infrastructure implemented. The infrastructure design will also factor in women's needs for regular and clear water and safe sewage disposal.

Finally, **FP021** mentioned that the vulnerability assessment of the project itself will contribute to economic co-benefits through raised awareness of adverse effects of flooding in the context of vulnerable infrastructure, and consequently reduced damage on infrastructure in the long term.

Capacity & Knowledge

Capacity building, knowledge accumulation, and knowledge sharing have been central to all the sanitation projects included in the analysis, primarily as a means to demonstrate their ability to induce a paradigm shift. These elements of capacity and knowledge are strongly linked to a country's readiness score, particularly through its social and institutional dimensions. They are also crucial for developing the competencies needed to foster market-based solutions and technological advancements. Therefore, capacity building emerges as a key factor that could significantly strengthen the merits of projects and increase the funding they receive, especially considering the association between the readiness score and climate-related ODA found from the panel data analysis in section 4.1.2.

The importance of capacity building and knowledge accumulation was emphasized by GCF staff in one interview (25 July, 2024). For example, the necessity for sanitation project proponents to come up with a distinct reasoning of what the impact is from a climate change point of view was highlighted. The ability of project proponents to clearly convey such distinct description relies on the current capacity and knowledge base of the people working on the project proposal, which relates back to the social component of the readiness index.

It was also noted that proposals received often comes in as development projects. In order to access GCF funds, projects needs to be clearly angled towards climate change mitigation and/or adaptation. This indicates a lack of capacity to frame sanitation projects as climate mitigation or adaptation related. Lack of experience in preparing climate targeted sanitation projects may be an underlying reason, as well as the lack of awareness of the sanitation sectors impact or vulnerability associated with climate change.

Developing the capacity to deliver climate targeted sanitation projects could enable project proponents to access more GCF funding. Synergies could also be harnessed by developing capacities to access both climate targeted and development targeted funds simultaneously. This could enable project proponents to spend less time and resources on project proposal preparation in the case funding from multiple sources is sought. The ability to efficiently access co-finance would in turn feed back into a higher likelihood of obtaining GCF funding, since co-finance mobilized by a project is an indicator for one GCF investment criteria (see definition of investment criteria in appendix B). These efficiency gains highlights the importance of fostering the capacity to frame sanitation projects through a climate lens to crowd-in investment, and that it is unlikely that it would crowd out funding for other climate-relevant sectors.

Additionally, according to GCF staff the capacity to frame sanitation projects as mitigation projects or cross-cutting projects may strengthen the case for sanitation projects investments, even if the size of the GHG-emission reduction is small. Introducing a mitigation component would also be registered as a co-benefit in the GCF proposal review, which is another indicator for their investment criteria, as mentioned earlier.

Another notable comment made was that all types of projects can access funding towards capacity building separately from the main project objective. The only caveat is that these applications must demonstrate a clear connection to climate change and be supported by the countries interest in order to ensure country ownership. The success of obtaining capacity building funds does however depend on the current capacity and knowledge level associated with preparing these applications, potentially leading to deadlocks.

The importance of capacity building was also reflected on and highlighted in an interview with a representative for an NDA (30 October, 2024), a key project proponent of one of the selected project proposals. For example, in their undergoing scoping study of one project in the pipeline, it was mentioned that a lack of technical experts conducting assessment on the ground as well as providing input into the project proposal design presents an a major impediment for preparing project proposals in general.

Such bottleneck could also tie into a potential neglect of the sanitation sector in climate finance discussions due to lack of awareness of its importance. In turn, this could potentially exacerbate funding barriers concerning SDG 6.2 and 6.3 as the status quo gives disproportionate priority to other sectors that are already facing challenges in project preparations.

In an interview with an implementing agency of one of the selected project proposals (28 October, 2024), a similar capacity constraint was acknowledged. The need for SDG 6.2 and 6.3 related investment in the area subjected to the project is much greater than what the project has received funding for. According to the interviewee, a lack of understanding of how to access funding in general inhibits the expansion of their national sanitation project portfolio. As mentioned previously, unawareness of the sanitation sectors relevance for climate change could be a factor that blocks access to climate finance from the GCF and other providers. Other factors, such as lack of competencies in quantification, monitoring

and reporting, or lack of intentions to bridge such competence gaps, could further contribute to the inertia.

On the other hand, examples of overcoming the deadlock do exist. For instance, a representative from an NDA noted that the lack of staff capable of drafting project proposals had been a significant issue, but this challenge had been alleviated in recent years. The work done on increasing the number of qualified staff available was mentioned to have contributed to a greater capacity for mobilizing climate finance. One factor mentioned that contributed to this progress was the inclusion of a mentor in the team who could instruct staff members, which in turn led to knowledge being passed down to others locally to enhance overall capacity levels. This example illustrates how capacity building can be fostered and lead to paradigm shifts.

Multiple other examples of how capacity building and knowledge accumulation have been fostered are found in the case studies. Project **FP008** in Fiji is intended to be used as a mean for identifying knowledge gaps throughout the project lifespan. Knowledge gaps mentioned includes inadequate climate adaptation and mitigation measures associated with water supply and waste water planning. The project focuses on providing the appropriate mechanisms to address the difficulty of proper measuring, reporting and verifying actions related to adaptation and mitigation, such as technology transfer and capacity building. Additionally, it addresses the lack of tools, guidelines and documents good practices and lessons learned. The lessons learned are intended to mainstream national adaptation and mitigation strategies into national and sector policies, planning processes and regulations, as well as making the project replicable on a regional and national scale.

Moreover, **FP021** focuses on social aspects related to capacity building and knowledge accumulation in the context of disaster risk management. For example the project's contribution to building a culture around risk management within public institutions is framed as an 'impact potential'. It also looks at how the core project focus of generating climate risk information can facilitate raising climate change topics on the political agenda, contributing to paradigm shifts in the long run. Technical support to the executing entity of the project is also to be provided to increase its capacity associated with the projects sanitation related output. The project will also develop and implement tools to enforce no-build areas in order to reduce damage from climate induced catastrophic events, such as flooding.

FP041 in Tanzania emphasizes the the importance of inter-ministerial coordination. A high level steering committee for cross-sector implementation would be responsible for developing standard procedures, organizational structures and working guidelines based on the experiences made during the project. Moreover, on a community level, local government authorities and water utilities receive capacity building and the necessary infrastructure and workforce to be able to serve the demand for sanitation infrastructure and services. Additionally, through the national climate change steering committee and national climate change technical committee, continuous monitoring of new processes is performed to establish feedback and review mechanisms for continuous improvement. The project also expects to increase knowledge about how to reduce climate-related risks among households and institutions through the project. Community based climate adaptation planning is also introduced and streamlined into the district development plans of local government authorities, serving as a rode model for future adaptation projects.

Inter-ministerial coordination was also emphasized as a driver for climate flows into the sanitation sector in an interview with a representative from an NDA of one of the selected

projects (30 October, 2024). In particular, it was mentioned that improving communication and coordination between departments who share the same goal of mobilizing climate funds to their respective focus areas could increase efficiency, and in turn the ability to access climate finance. The designation of sectoral focal points within respective ministry was highlighted as a factor that could catalyze change in this regard.

Lastly, project **FP155** in Jordan emphasizes the importance of education and intends to establish vocational schools with climate risk and adaptation awareness raising integrated into the school curriculum to train upcoming professionals and skilled workers. The project also aims to organize users for reclaimed water into water users associations in order to increase social cohesion and knowledge sharing associated with the intervention.

Stakeholder Engagement

Stakeholder engagement is another central element in improving the merit of sanitation projects and maximizing the impact per dollar invested. Engaging effectively with key stakeholders can serve as a catalyst for greater project implementation efficiency and increased uptake of the intervention. Stakeholders involved in GCF-approved sanitation projects can range from national governments to local communities. Adopting strong stakeholder engagement practices with all relevant actors can also serve as a lever for fostering country ownership and inducing paradigm shifts by mobilizing support for the intervention both locally and nationally, which is crucial for meeting the GCF's investment criteria. This is closely tied to the governance and social dimensions of the readiness score analyzed in section 4.1.2, which suggested that a link between the two dimensions and climate-related funding exists, although not statistically significant for social factors. An enabling governmental or regulatory framework could facilitate the cultivation of good stakeholder engagement practices, while social factors, such as human capital, could make the implementation both feasible and efficient. By strengthening stakeholder engagement, projects can improve alignment with national priorities and enhance their ability to attract more climate finance.

Project **FP008** highlights that the project proposal has been prepared in consultation with key sector stakeholders, including communities where the project will be implemented. Consultation would continue to be conducted throughout the project cycle with the intention to strengthen participation of the vulnerable and poor in project implementation. People affected by the project will be consulted through village meetings, social surveys, and interviews at the planning phase of the project, during the feasibility study and design phase, before and during construction of infrastructure, as well as during operation, maintenance and monitoring.

In Senegal where **FP021** was implemented, civil society was engaged in the development of the environmental and social management plan as well as the resettlement action plan for drainage infrastructure. An NGO called 'enda' is in charge of implementing the resettlement plans directly with the population. Education, information and communication services associated with the intervention will also be distributed to the population. The intention is to gain acceptance for drainage infrastructure, hence protecting it from harm and ensure that the infrastructure is well maintained.

FP041 focuses on a local community stakeholder engagement. To ensure ownership of involved communities for the intervention, labor input from the local community is volunteered as an upfront contribution in the project implementation phase. Responsibility of managing rural projects is also delegated to communities, thereby reducing the operation

and maintenance costs for the national government. This illustrates how effective stakeholder engagement can both be used to foster community ownership of interventions as well as ensuring cost-effectiveness.

Finally, project **SAP008** makes use of a wide network of NGOs' spread out across the program area. These NGOs have a total of 9945 branch offices. During the project lifetime, the NGOs will learn good practices which can be replicated in their own working areas, as well as shared with other entities to share best stakeholder engagement practices, induce paradigm shifts, and build capacity sustainably for the long-run.

Project Packaging & Cross-Subsidization

It is evident from the project overviews (see appendix D) that not a single project featured exclusively a sanitation component. All projects and programs involved at least one other focus, for a example water or agriculture.

Packaging sanitation interventions with other types of interventions can be an effective solution for sanitation projects to access funding in the case merits or readiness for the individual sanitation project are initially insufficient. In such case, packaging the project together with other interventions could allow for cross-subsidization. This happens when project components that are more attractive from a public or private investors point of view is packaged together with a less attractive component, for example the sanitation sector, which could suffer from a poor business case.

The strength of project packaging also lies in enabling the spreading out of fixed costs related to the project approval process. This was also highlighted by GCF staff in an interview (25 July, 2024), stating that the scalability of a project is important, and that they don't provide small scale funding below 10 million USD. By packaging sanitation projects with other types of interventions, project proponents can surpass this funding threshold, as well as potentially benefiting from economies of scale in implementation and execution of the project plan.

Politics & Awareness

Political priority and awareness of the significance of sanitation projects for the country emerge as important factors for accessing GCF funding. The issue of awareness has already been discussed in relation to capacity and knowledge. Therefore, this section focuses on the underlying political forces that may either hinder or promote efforts to raise awareness of the sanitation sector and its relevance to climate change.

As already mentioned, GCF staff pointed out in an interview that in order to receive capacity building funds, the country ownership around the capacity investment must be ensured. More precisely, the motivation to access these funds and to invest in capacity building must be backed in one of the country's national documents. This also applies for the funding towards the main project output, and as already established, 'country ownership' is a GCF investment criteria on its own.

To gauge the political priority around SDG 6.2 and 6.3, a collection of the identified projects' national documents mentioned in the project proposals was done. The national documents were scanned in order to assess the political prioritization of these SDGs. In all project descriptions it was mentioned that either an NDC or INDC (intended NDC) had been submitted.

To quantify the importance of the sanitation sector on the political agenda of the countries hosting these projects, the NDC-SDG connection tool was used. This tool ranks the focus on SDG 6.2 and 6.3 in countries INDCs or NDCs into four levels: no mention, low priority, average priority and high priority. In addition to the NDC-SDG check, a quick scan was done on the other relevant document that were mentioned in the approved project proposals to identify concrete action plans towards increased access to sanitation services and infrastructure.

According to table 4.7, it appears that across the identified projects, the focus on the sanitation sector in the NDCs (or INDCs) is either low or average. No country put a high priority on SDG 6.2 or 6.3. Some NDCs or INDCs did not feature any SDG 6.2 or 6.3 mentions. The rest ranked as having either low priority or average priority. For those countries that did not mention SDGs 6.2 or 6.3 in their NDCs, there were at least mentions of the need for sanitation sector investment in some of their other national documents, for example the national adaptation plan in Fiji. These results align with those found by Dickin et al. (2020), who underlined the lack of emphasis on the sanitation sector in countries' NDCs.

These findings indicate that some attention has been given to the sanitation sector in countries where a project was accepted by the GCF. However, the priority assigned to sanitation appears to be low, even in these countries. This low priority could explain why so few sanitation projects have been approved and may suggest that the project pipelines are lacking sanitation projects. It could also account for the relatively small financial allocation to the sanitation component compared to other sector-specific components. Therefore, it is crucial to address these domestic political priorities, as doing so could help bring more sanitation projects into the pipeline and increase the share of funding going towards the sanitation sector. Additionally, it would signal country ownership and strengthen the investment case for international actors, such as the GCF, who aim to maximize impact per dollar invested.

Project & Country	National Documents and Policy Frameworks	Mentions of SDG 6.2 and 6.3
FP008 - Fiji		
	• Green Growth Framework (GGF) • National Adaptation Plan (NAP) • Intended Nationally Determined Contributions (INDC)	• SDG 6.2 nor 6.3 mentioned in first or updated NDC submission • Sanitation sector policies mentioned in the GGF
FP021 - Senegal		
	• National Adaptation Plan of Action (NAPA) • INDC	• SDG 6.2 not mentioned in first or updated NDC submission. SDG 6.3 had an average priority in the first NDC submission, but was not mentioned in the updated submission. • Lack of sanitation and proper planning for sanitation improvements was highlighted in the NAPA.
FP041 - Tanzania		
	• NAPA • NAP • INDC	• The INDC of Tanzania puts a low priority on SDG 6.2 in both the first and updated submission and puts a low priority on SDG 6.3 in the first submission and an average priority in the updated submission.
FP119 - Palestine		
	• NAP • NDC	• The NDC of Palestine puts a low priority on SDG 6.2 in the first submission and no mentions in the updated submission. No mention of SDG 6.3 was made in the first submission, but an average priority was put in the updated submission. • The NAP mentions the lack of resources and low adaptive capacity to address the lack of sanitation services and infrastructure. There is a 'Master plan' for sanitation interventions. Awareness raising is mentioned as the main adaptation option concerning sanitation.
FP155 - Jordan		
	• INDC • NAP • GCF country program	• The INDC of Jordan puts a low priority on SDG 6.2 and 6.3 in both the first and updated submission. • Goals to improve access to sanitation are mentioned in the NAP. • A GCF country program exists, and readiness support has been granted to Jordan to increase the capacity of its NDA in the implementation of its adaptation plans. The NCCC has also been constituted to drive key priorities.
SAP008 - Bangladesh		
	• Bangladesh Climate Change Strategy and Action Plan (BCCSAP) • NAPA • National Plan for Disaster Management (NPDM)	• SDG 6.2 nor 6.3 mentioned in first or updated NDC submission. • Needs for sanitation investment mentioned in the NAPA.

Table 4.7: National documents and mentions of SDG 6.2 and 6.3 associated with the projects selected for analysis

5 Discussion

5.1 Challenges & Opportunities

The quantification of climate-related ODA and the GCF project portfolio done in this study highlights a limited interest in investments towards SDG 6.2 and 6.3. Between 2020-2022, 3.4% of ODA went to the sanitation sector, whereas only 0.36% of GCF funds (excluding mobilized co-finance) went to sanitation projects. These patterns are similar to those previously reported by Dickin et al. (2020), showing that the presence of the sanitation sector in climate finance disbursement is still weak. It should also be noted that in the GCF project portfolio, only 6 sanitation projects had a clear financial data associated with the sanitation component of the project. Since a previous report done by Bayoumi (2019), 3 project with a clear financial component related to SDG 6.2 or 6.3 had been added to the GCF's approved project portfolio. For these 6 projects, all of them except one received a minuscule fraction for the sanitation related component of the total funding. For instance, the agriculture and water sectors received relatively more funding, indicating that the interest in investing in other sectors is stronger.

All six identified GCF projects came from either upper-middle-income or lower-middle-income countries. For the sanitation components of these projects, only a small fraction of funding came directly from the GCF. Instead, the majority was provided by public co-financiers, such as development banks or philanthropic organizations. This funding pattern, combined with the income profiles of host countries, suggests a lack of capacity to frame sanitation projects within a climate mitigation or adaptation context. One possible explanation is limited awareness of the sector's relevance to climate change. The absence of funding for low-income countries supports this interpretation, as these nations likely face even greater capacity and awareness constraints.

Suggestive evidence from panel data on climate-related ODA supports the conclusion that poorer countries with lower readiness might be overlooked in climate finance allocations targeting the sanitation sector. A hump-shaped relationship between sanitation investment needs and funding indicates that countries with the greatest needs receive less funding on average. If this status quo persists, it could significantly hinder the sector's development, seeing progress towards SDG 6.2 and 6.3 stalling. Additionally, the sustainable development of sanitation systems could stagnate, or even regress, due to projected population growth in LMICs (as noted by UNDESA (2022)) and escalating climate-related disasters. Such setbacks would not only undermine reductions in GHG emissions within the sector but also exacerbate existing inequalities.

Much could also be gained by harnessing synergies between development and climate adaptation or mitigation capacities in the sector. By opening up access to more sources for funding, project proponents can increase the amount of funding obtained per labor

hour or dollar invested into the application phase—a process that can often be lengthy and costly. It would also be a missed opportunity to exclude the sector from opportunities to access innovative finance provided by the GCF, which in turn could crowd-in investment and mobilize co-financiers. Notably, no funding towards GCF registered sanitation projects came from private financiers, which suggests that the business case of the sector in LMICs needs to be reinforced in addition to efforts to build capacity in framing the climate rationale of sanitation projects. Results from the panel data analysis of climate-related ODA also revealed that economic readiness, as measured by the ease of doing business, does not influence climate-related funding for the sanitation sector. This provide a another indicator that the business case for sanitation projects may be missing.

A thematic analysis provided examples of how the business case of the sanitation sector could be strengthened. To build circular economy systems was revealed to be an attractive approach, according to GCF staff. Such solution could significantly strengthen the business case of the sector and open up the access to GCF funds, and in turn catalyze investments from other public or private sources.

Other less capital intensive approaches could be successful as well in cases were the adoption of more advanced technology appears unrealistic in the short term. For example bundling sanitation projects together with more profitable projects (e.g. agriculture or water project) could allow for cross-subsidization taking place from the sector with a stronger investment case than the sector with relatively weaker investment case.

Different demand stimulation techniques is another less capital intense approach that can help the sector to improve its merits. One method found in a case study analysis is to craft tariff schemes in combination with state subsidies. Another method could be to focus on providing less advanced sanitation technology to places were it better matches the demand, for example by adapting to local norms which have been reported to be one determinant for the uptake of sanitation interventions (van der Hoek et al., 2010).

Focusing on cross-subsidization or providing the more basic sanitation systems coupled with effective tariff schemes are solutions that could be suitable in the short run, as it helps increase uptake and allows the sector to access much needed climate-related funds (or funds in general) quickly. However, to achieve sustainable growth and shift the paradigm of the sector in LMICs, effort should be concentrated on developing the capacity to implement climate smart technology, such a circular economy systems.

Moreover, mitigation bias poses a significant challenge for the sanitation sector in accessing climate finance. According to the OECD (2024), most climate finance is directed toward mitigation projects. Abadie et al. (2013) attribute this to several factors, including the low cost of mitigation interventions in developing countries, reduced incentives to mitigate when adaptation investments are prioritized, the co-benefits of mitigation (e.g., environmental protection), its global impact compared to adaptation's localized effects, the ability of mitigation to reduce future adaptation needs, and uncertainties surrounding climate change projections and adaptation strategies. Furthermore, the difficulty in quantifying adaptation impacts, compared to the more transparent and measurable impacts of mitigation, may deter both public and private financiers, who often favor less ambiguous investments (Stadelmann et al., 2011).

Among the six sanitation projects identified in this study, all were heavily focused on adaptation. Moreover, this study found that most sanitation-related funding—whether from climate-related ODA or the GCF—was allocated to adaptation. Although most observed

funding is directed toward adaptation projects, suggesting that framing sanitation projects as adaptation-focused effectively mobilizes climate finance, interpreting this as a strength of the sector may be misleading, as the actual amount received remains small compared to other sectors. The lack of mitigation projects could explain the low amount of climate-related funding going towards the sanitation sector, in turn being the result of insufficient capacity to emphasize the mitigation potential of sanitation investments. Notably, waste management and disposal projects were the only sanitation sub-sector to predominantly receive mitigation funding, suggesting that awareness or capacity to frame mitigation-oriented projects may be more advanced in this area compared to others. The prospect of profitable carbon markets, which are exclusive to mitigation projects, further underscores the strategic value of emphasizing mitigation, both from the perspective of project proponents seeking funding opportunities and policy makers seeking to bring more GHG emissions under the scope of carbon pricing schemes.

Given these circumstances, it is crucial for the sanitation sector to build capacity to both implement and frame projects as mitigation-focused. Highlighting the mitigation potential of sanitation interventions could significantly improve access to funding, expand project pipelines, and strengthen the business case for the sector. This approach would also help reposition sanitation as a key sector in sustainable, climate-adapted development rather than solely a development-focused sector.

5.2 Results & Limitations of Panel Data Analysis

In terms of climate-related ODA, the geographical distribution of funding highlights that the countries with the greatest need of sanitation investment do not receive the most funding. Most funding is received by countries with medium to high access to at least basic sanitation and an overall moderate to low need for investment.

Results from a panel data analysis revealed indications that merits, such as the readiness to receive and utilize funds of a country leads to increased funding allocations, both towards mitigation and adaptation projects. More specifically, it showed that governmental quality seemed to be the greatest driver behind these results, along with some speculative evidence that social factors may play a role for adaptation funding.

Results also showed that proxies for international political interests are associated with positive effects on funding allocations for both mitigation and adaptation projects. This provides further insights into why countries with a high need for investment do not necessarily receive more funding.

While OECD DAC data provides one the most comprehensive data source of climate-related finance available, some concerns regarding data do exist, potentially weakening the robustness of the results and adding doubts to the external validity of these findings. The first obvious issue encountered in this study is the migration of the OECD database to a new platform, which limited the access to richer data sets, also used in previous studies. The data ultimately used excluded funding from multilateral and private donors. The data was also not provided on a project-basis, which made the quantification less granular, and the possibility to construct a cross-cutting funding allocation variable impossible. Due to less funding sources being accounted for in the data, many zero values were recorded for multiple years for several countries in the regression analysis. Inclusion of more funding sources would reduce the number of zero values, which could make the models used more

robust, but also open up the opportunity to use more sophisticated estimation techniques, such as GMM.

Ambiguity in the coding of OECD DAC sector codes presents another challenge. For example, waste management and disposal are categorized under the broader water supply and sanitation category. In this context, the Rio marker system assigns climate relevance based on specific indicators. For mitigation, the relevant indicator is 'biogas production by wastewater facilities', while for adaptation, it is 'reducing risks of urban flooding of water systems due to climate change and preventing contamination from sewage overflow'. However, this coding also includes indicators for types of waste unrelated to sanitation, making it difficult to determine which waste management and disposal projects align with SDG 6.2 and 6.3.

This ambiguity complicates the identification of causal links in research, potentially weakening the internal validity of studies like this one. It also risks creating confusion in policymaking, as unclear distinctions in coding could lead to misaligned priorities or misinformed decisions. Addressing this issue is crucial for improving the accuracy and reliability of research and ensuring that policy efforts are effectively targeted.

Other widely discussed criticisms in the literature include the absence of coding, over-coding, lack of granularity, and lack of verification. While the absence of coding was not directly encountered in this study—apart from restricted access to richer data—over-coding remains a significant concern. Over-coding, which stems from biases in the self-reporting process, can result in varying outcomes depending on the coder. For instance, donors may overestimate the climate focus of a project, assigning a score of '2' instead of '1' or '0' (Weikmans et al., 2017). This issue is well-documented: Weikmans and Roberts (2019) highlighted that the database is prone to substantial overestimation, and Weikmans et al. (2017) found that donor-reported climate-related aid activities are overestimated by 40–70

The reasons for over-coding are diverse and include human errors, ambiguous definitions of adaptation, and external or internal pressures on governments to inflate their climate-related contributions (Junghans and Harmeling, 2012). Addressing these issues is critical for improving the accuracy and credibility of coding systems, ensuring that reported data reflects actual climate efforts.

Weikmans and Roberts (2012) also highlights the absence of granularity in the coding process as a common issue. For example, this could occur when there is a no distinction made to determine if only a component of the project has a mitigation or adaptation objective or if the entire project is concerned by this objective.

Finally, the lack of validation or verification is another issue discussed in the literature. Often, the donor of the funds is the only actor responsible for the process of assigning the Rio marker, which could bias the outcome due to variations in knowledge of local contexts. For example, the OECD DAC states that the "quality of assignments relies on member's own checks"(Weikmans et al., 2017).

Despite these limitations, statistically significant results for some variables of interest were obtained. The findings suggests that project merits and political interests are important determinants of climate finance allocations to the sanitation sector, which points towards countries with the greatest need for funds are often not receiving them. However, caution is warranted when interpreting these results causally, as the consistency of the models used could not be confirmed.

Some limitations arising from cross-analysis between the GCF project portfolio and the OECD DAC database should be noted. Generalizing findings from the GCF investment framework to the ODA DAC database—and vice versa—can be unreliable due to differences in institutional structures and investment criteria. Additionally, the external validity of the findings may be imperfect, meaning they may not fully apply to other contexts. These factors should be considered when interpreting the results. Nevertheless, there is no evidence to suggest that strengthening the merits of sanitation projects would negatively or insignificantly impact the sector's ability to access climate finance. On the contrary, enhancing project quality and aligning with funding priorities are likely to improve access to climate finance. This conclusion is supported by the the results from analysis of both funding sources, which provide complementary evidence irrespective of the database or institutional framework considered.

5.3 Policy Implications & Future Research

In light of the findings from this study, it is crucial for policymakers to enhance the sanitation sector's access to climate finance. A key initial step in this process is to increase the visibility of the sector within climate change discussions, particularly by incorporating it more prominently in NDCs. Alongside this, efforts should be made to raise awareness about the sector's significant role in addressing climate change. Elevating sustainable sanitation issues on national political agendas will help accelerate the shift toward more sustainable growth.

Beyond raising awareness, strengthening the sector's capacity will be essential. This includes improving the ability to quantify impacts, prepare comprehensive project proposals, and implement climate-oriented sanitation initiatives. This is especially important for mitigation-focused projects, as there is currently a lack of sanitation initiatives in this area. Building capacity in this domain could substantially enhance the investment case for sanitation projects, thereby facilitating access to major climate finance providers such as the GCF and unlocking potential to benefit from prospective carbon markets. Additionally, it is vital to build capacity to emphasize the adaptation potential of sanitation, particularly given the nascent stage of defining climate-resilient sanitation and its monitoring indicators.

In conjuncture with efforts to strengthen capacity to design and implement projects, attention needs to also be put on improving regulatory frameworks surrounding the sector. In particular, regulatory reforms should focus on facilitating the capacity building process as well as building an accommodating business environment around the sector to help improve its business case.

To further support the policymaking process, future research should explore the governance capacities of countries and how they affect the sanitation sector's ability to access climate finance. This study interviewed only 3 stakeholders due to time and resource constraints, and future research should expand the sample to include a wider range of project proponents, government bodies, and private sector actors. This broader perspective could provide deeper insights into country-specific institutional or regulatory barriers and identify potential opportunities for improvement.

Further research could also examine country-specific factors that influence political interests or merits in relation to sanitation. For example, investigating the role of corruption in hindering the sanitation sector's access to climate finance, and comparing it with other

sectors, could yield valuable insights. Additionally, studying the impact of lobbying efforts in donor countries on the allocation of climate finance to specific sectors in recipient countries would help understand how external influences shape funding priorities.

Finally, continuous improvements in the quality, quantity, and accessibility of data on sanitation needs are essential. These improvements will enable researchers to produce more robust findings and provide policymakers with the critical information necessary for making informed decisions.

6 Conclusion

This thesis investigates the determinants and opportunities for increasing climate finance allocation to the sanitation sector, a vital yet underfunded component of climate adaptation and mitigation efforts. Through a mixed-methods approach, including panel data analysis, case studies and interviews, this study provides actionable insights into the barriers and enablers for bridging the funding gap in this sector.

Key findings reveal that the sanitation sector faces persistent underinvestment, receiving a disproportionately low share of climate finance despite its impact on climate change and significant contributions to SDGs 6.2 and 6.3. Panel data analysis identifies that recipient countries' readiness, project merits and political interests, are positively associated with funding allocations. However, countries with the greatest sanitation needs often remain under-served, underscoring systemic inefficiencies and injustices in the prioritization of funding allocations.

Case studies further illustrate that most sanitation-related projects funded by the GCF are concentrated in middle-income countries, with limited participation from private actors. This misalignment stems partly from low awareness of sanitation's climate-related benefits and a lack of capacity to frame projects with clear mitigation and adaptation objectives.

Despite these challenges, this study highlights opportunities to enhance the sector's investment appeal. Strengthening the ability of project proponents to quantify impacts, implement climate-smart technologies, and align proposals with funders' priorities can significantly improve funding prospects. Moreover, integrating sanitation into national climate strategies and raising its visibility in international climate dialogues are critical steps for increasing resource mobilization.

While limitations in data quality and scope constrain the generalizability of these findings, they do not invalidate core conclusions. Enhancing project readiness and aligning sanitation initiatives with broader climate finance objectives are pivotal for addressing global funding inequities. Future research should explore the role of institutional bottlenecks, donor-country lobbying, and innovative financing mechanisms to further refine strategies for closing the financing gap.

In summary, this study underscores the importance of elevating sanitation on the global climate agenda and provides a foundation for future research as well as targeted interventions aimed at securing sustainable funding for the sector. By addressing the outlined barriers and leveraging identified opportunities, the sanitation sector can play a transformative role in climate adaptation and mitigation, contributing to broader goals of sustainable development and human well-being.

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A Correlation Matrix

Figure A below illustrates the correlation matrix containing correlations between the variables used for the panel data analysis of ODA, as described in section 3.1.1.

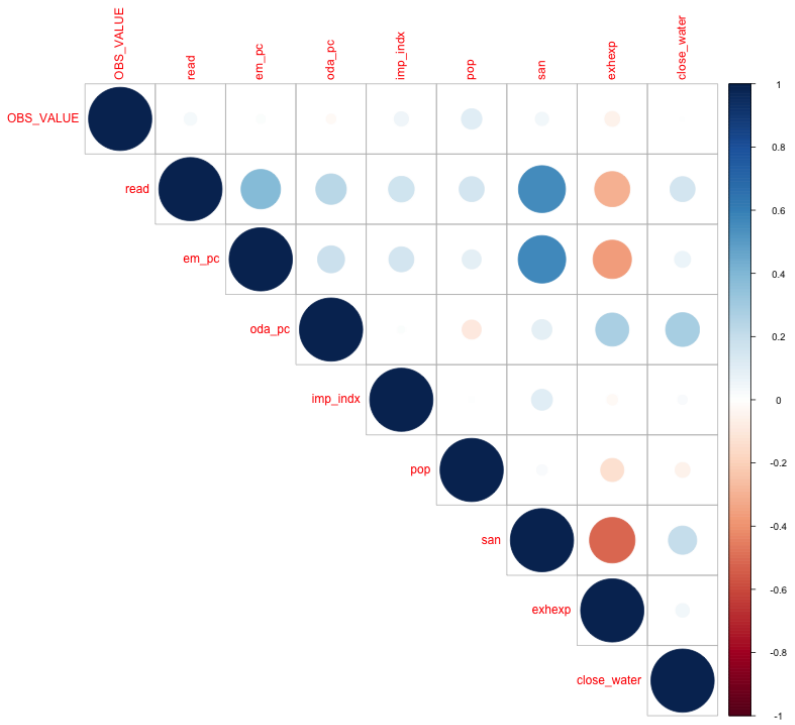


Figure A.1: Correlation matrix showing the correlation between variables used in the panel data analysis

B GCF Investment Criteria & Coding Framework

The below list of GCF investment criteria was used for reviewing the case studies as described in section 3.2.2.

1. **Impact Potential (Adaptation/Mitigation)**
    - **Mitigation Indicators:** Reduction in greenhouse gas emissions, improved energy efficiency, etc.
    - **Adaptation Indicators:** Resilience to climate impacts, water management improvements, etc.
2. **Paradigm Shift Potential**
    - **Innovations:** Advancements in technology or approach.
    - **Scalability and Replicability:** Potential for the project to be scaled or replicated in other contexts.
    - **Policy Contributions:** Support for systemic changes or contributions to policy improvements.
3. **Sustainable Development Potential (Co-Benefits)**
    - **Economic Co-Benefits:** Job creation, income generation, etc.
    - **Social Co-Benefits:** Health improvements, education enhancements, etc.
    - **Environmental Co-Benefits:** Biodiversity conservation, ecosystem service improvements, etc.
4. **Needs of the Recipient**
    - **Vulnerability and Capacity Needs:** Addressing specific vulnerabilities and capacity gaps of the target population.
    - **Urgency:** Timeliness and criticality of the project.
    - **Alignment:** Consistency with national priorities and strategies.
5. **Country Ownership**
    - **Stakeholder Involvement:** Participation of local communities and stakeholders.
    - **Government Support:** Commitment from national or local governments.

- **Policy Integration:** Alignment with existing national policies and development plans.

6. **Efficiency and Effectiveness**
   - **Cost-Effectiveness:** Efficient use of resources for maximum impact.
   - **Best Practices:** Incorporation of proven and innovative approaches.
   - **Sustainability:** Ensuring financial and operational continuity.

C Interview Structures

The list below outlines the structure and questions used in interviews as described in section 3.2.3.

Questions for GCF Staff Involved in the Investment Process

1. **Investment Criteria Prioritization**:
    - How does the GCF prioritize the different investment criteria when assessing projects? Does the same prioritization apply to sanitation projects?
    - Are there specific criteria that you believe are most critical for securing funding for sanitation projects?
    - Are there criteria that are harder for sanitation projects to meet?
2. **Challenges and Opportunities**:
    - What are the most common challenges you face when assessing a project proposal? Are there any particular challenges related to sanitation projects?
    - What common issues or gaps do you see in sanitation project proposals that could hinder their approval?
    - Are there particular technical, financial, or institutional barriers, or other barriers, that sanitation projects face more than other types of projects?
    - Can you describe any opportunities that project proponents could leverage to improve their chances of receiving funding? What are the key challenges for sanitation projects to receive funding? Is there a challenge project proponents should focus on addressing? Are there any strengths that can be leveraged to cover up for the weaknesses?
3. **Targeted questions**:
    - To what extent do revenue-generating activities, or general financial viability of a project, influence the decision to fund a project? To what extent does this affect decisions to fund sanitation projects?
    - How does the public good nature of a project factor into the assessment of its viability?
    - How does the focus on mitigation versus adaptation impact the funding decision for a project? Could sanitation projects proponents benefit from developing projects with a mitigation or cross-cutting focus, rather than a pure adaptation focus? If yes, why?

- Are there examples of projects where the stakeholder engagement approach significantly strengthened the project proposal? How can stakeholder engagement be leveraged to strengthen sanitation project proposals?

Questions for Project Proponents of the Case Studies

1. **Project Design and Submission**:
   - What key elements did you focus on when designing and submitting your project proposal?
   - Were there any aspects of the GCF investment criteria that were particularly challenging to meet?
   - What aspects do you think contributed the most to your success in receiving funding for the sanitation component?
   - What are the typical challenges or barriers that sanitation projects face when trying to enter the project concept note pipeline?
   - What challenges pertains to achieving financial viability of sanitation project and strengthen their business case?
2. **Lessons Learned**:
   - What lessons did you learn from the GCF funding process that could benefit future project proponents?
   - In hindsight, is there anything you would have done differently in your project proposal?
   - Why do you think so little climate finance goes towards the sanitation sector?
   - From your point of view, what can be done to increase the number of sanitation projects being submitted to the GCF and subsequently being funded?

Questions for Implementing Agencies

1. **Project Implementation and Management**:
   - What are the key challenges you face in the day-to-day implementation of the sanitation component of the project?
   - Can you share some of the most successful aspects of the sanitation project so far?
2. **Coordination and Communication**:
   - What communication strategies are in place to keep all stakeholders informed about project progress and challenges?
   - How do you engage with local communities and other stakeholders to ensure their involvement and support for the project?

- Can you think of any challenges that you experienced with regards to stakeholder engagement?
- What do you think has worked particularly well in keeping stakeholders informed and engaged in the project?

3. **Technical and Operational Challenges**

   - What are the primary technical challenges you encounter during the implementation of the sanitation project?
   - Can you highlight any technical innovations or strategies that helped overcome the challenges in the project?

4. **Capacity Building and Training**

   - What capacity building and training initiatives have been implemented to ensure that the staff can effectively manage the sanitation related part of the project?
   - Are there specific areas where additional training or capacity building is needed?
   - Have you observed any noticeable improvements in staff performance or efficiency due to the training programs? What specific successes stand out?

5. **Monitoring and Evaluation**

   - How do you monitor and evaluate the progress and impact of the sanitation project?
   - What metrics or indicators do you use to assess project performance and outcomes?
   - Did you face any particular challenges pertaining to monitoring and evaluation?
   - Have there been any metrics or indicators where the project exceeded your expectations? What do you think contributed to this success?

6. **Risk Management**

   - What are the main risks associated with the project, and how did you try to mitigate them?
   - Were there any risks you successfully mitigated that had a particularly positive impact on the project? How did you achieve this?

7. **Development of Tools and Guidelines**

   - What types of tools and guidelines are being developed to help mainstream sanitation interventions into national and sector policies, planning processes, and regulations?
   - Can you provide examples of how these efforts are expected to change the status quo in sanitation service and infrastructure provision and wastewater management?
   - Are there any tools or guidelines you've developed that have been particularly well received or are making a significant difference in the project's implementation?

8. **Lessons Learned and Best Practices**
    - Based on your experience so far, what key lessons have you learned from the implementation of the sanitation project?
    - Are there best practices or strategies that you would recommend for future projects of a similar nature?
    - What do you think can be done to create an environment that is more suitable to undertake sanitation projects in the future?
    - What do you think can be done to make it more attractive to invest public or private funds into sanitation projects?

Questions for Private Investors Who Invested in Other GCF Projects

1. **Investment Motivation and Criteria**:
    - What motivated your decision to invest in GCF-funded projects?
    - What specific factors made these projects attractive to you compared to other investment opportunities?
2. **Investment Criteria**:
    - What criteria do you use to evaluate the potential of a GCF project for investment?
    - How do the GCF's investment criteria align with your own investment criteria?
3. **Perception of Sanitation Sector**:
    - What is your perception of the sanitation sector as an investment opportunity?
    - What are the main factors that deter you from investing in sanitation projects?
4. **Barriers to Investment**:
    - What specific barriers do you see that prevent investment in sanitation projects?
    - Are there any particular risks associated with sanitation projects that you find concerning?
5. **Potential Incentives**:
    - What incentives or changes would make sanitation projects more attractive to you?
    - How could the GCF or project proponents better structure sanitation projects to attract private investment?
6. **Future Investment Interest**:
    - Would you be interested in investing in sanitation projects in the future? If so, under what conditions?
    - What information or assurances would you need to consider investing in sanitation projects?

D GCF Sanitation Project Overviews

Below is a brief summary of each identified sanitation project subject to the analysis in section 4.2.

Project	**SAP008: Extended Community Climate Change Project-Flood (ECCCP-Flood)**
Project Aim	The project aims to enhance the climate resilience of 90,000 beneficiaries by adopting and practicing climate-adaptive activities. Beneficiaries will: • Identify climate change impacts and plan for adaptation via 1,000 Climate Change Adaptation Groups (CCAG). • Protect their homes and resources by raising homestead plinths, enabling year-round vegetable cultivation and use as flood shelters. • Gain access to safe drinking water through 500 tube wells (5 beneficiaries per tube well) installed on raised plinths, benefiting 11,250 people. • Receive 2,810 climate-resilient sanitary toilets, benefiting 12,645 people. • Adopt climate-resilient livelihoods, such as cultivating stress-tolerant crops and rearing goats/sheep in slatted houses.
Sanitation/WW Output(s)	• Installation of resilient tube wells. • Construction of sanitary latrines.
Other Output(s)	• Formation and operationalization of Climate Change Adaptation Groups (CCAG). • Preparation of vulnerability assessments and adaptation action plans. • Trainings and workshops on climate change for beneficiaries and stakeholders. • Development and dissemination of knowledge products. • Raising homesteads above flood levels. • Reconstruction of climate-resilient houses. • Rearing of goats/sheep in slatted houses. • Cultivation of flood-tolerant crops.

Table D.1: SAP008 - Project Overview

Project	**FP008: Fiji Urban Water Supply and Wastewater Management Project**
Project Aim	Improving access to safe water and sewerage services by building infrastructure to increase water production by 20 percent and wastewater treatment (WWT) by 200 percent in the Greater Suva Area (GSA), and supporting the government to develop and implement policy and regulatory reforms in water and sewerage. A capacity development technical assistance was provided by the ADB to prepare the project.
Sanitation/WW Output(s)	• Wastewater Treatment Plant Upgrade • Pump Station Upgrades • Sewer Mains Upgrade • Sewer Extension
Other Output(s)	• Water supply • Capacity building • Project management

Table D.2: FP008 - Project Overview

Project	**FP041: Simiyu Climate Resilient Project**
Project Aim	The objective of the Project is to increase the climate resilience of rural and urban households, particularly small-scale farmers and women, living in the Simiyu Region, and to improve policies and regulation for cross-sectoral action towards climate adaptation.
Sanitation/WW Output(s)	• Wastewater treatment plant • Exhauster trucks • Public toilets
Other Output(s)	• Bulk water supply • Water distribution • Agriculture • Project management

Table D.3: FP041 - Project Overview

Project	**FP021: Senegal Integrated Urban Flood Management Project**
Project Aim	The Senegal Integrated Urban Flood Management project aims at supporting Senegalese policy on flood risk management through a disaster risk reduction perspective. It participates in the drainage infrastructure investment that is necessary in one of the most vulnerable areas of the capital city (Pikine Irrégulier Sud), but will also contribute to establishing a national-scale integrated policy for disaster risk management in order to optimize investment at the national scale and most importantly deal with the risk that will never be cost-efficiently covered by infrastructure.
Sanitation/WW Output(s)	• Drainage and sanitation infrastructure
Other Output(s)	• Flood risk mapping • Flood risk awareness • Structural and non-structural measures for flood risk reduction • Tools for adequate investment in flood management infrastructure • Real-time hazard monitoring in Greater Dakar • Protocols for infrastructure management under extreme rain events • Support to integrated flood risk management policy-making • Institutional strengthening and capacity building • Project management assistance

Table D.4: FP021 - Project Overview

Project	**FP119: Water Banking and Adaptation of Agriculture to Climate Change in Northern Gaza**
Project Aim	The project will increase the resilience of 4,200 people involved in agriculture and enhance the livelihood of 23,553 people, including 11,776 women. It will also alleviate the pressure on the aquifer, thereby improving access to domestic water for 200,000 additional people. Additionally, the project will increase the production of Palestinian renewable energy through the installation of an 8.5 ha photovoltaic (PV) scheme.
Sanitation/WW Output(s)	• Strengthening of PWA capacities in its role of coordination and quality control of the process of reuse of treated wastewater
Other Output(s)	• Production of additional quantities of water for agricultural use • Development of irrigation, water efficiency, and climate-resilient agriculture • Exit Strategy and Transfer of Operation and Management to Water Users • Empowerment and support of communities in the context of the conflict in Gaza • Capitalization of outputs/outcomes for replication and upscaling in Palestine

Table D.5: FP119 - Project Overview

Project	**FP155: Building Resilience to Cope with Climate Change in Jordan Through Improving Water Use Efficiency in the Agriculture Sector (BRCCJ)**
Project Aim	The goal of this seven-year project is to achieve increased climate-resilient sustainable development in Jordan. In line with the objectives of the Climate Change Policy (2013–2020) and the National Adaptation Plan (2020), the project is designed to enhance resilience to climate change in water management systems and farming communities. It addresses key barriers such as lack of infrastructure, limited capacity of rural farming households, and weak institutional frameworks through three synergistic components.
Sanitation/WW Output(s)	• Reuse of reclaimed water from 3 wastewater plants is optimized. • At least 4 Water User Associations trained on safe reuse of reclaimed water, with inclusion of women and men from the same land-owning households. • Construction of 3 reservoirs to store reclaimed water and installation of at least 3 km of water distribution systems by year 7.
Other Output(s)	• 400 public buildings and 7,850 households fitted with rooftop water harvesting structures. • Development of a Landscape Resilience Investment Plan for part of the Dead Sea Basin. • Training of 6,000 women and men farmers in climate-resilient production practices via Farmer Field Schools (4,050) and field days (6,000); at least 2,200 participants will be women. • E-extension reaching 30 percent of farming households (approximately 30,000 households). • Establishment of a cadre of 400 climate-wise women change agents for climate adaptation. • By year 7, 15,000 individuals sensitized on climate-adaptive measures. • Identification and initiation of reforms to address specific policy and regulatory bottlenecks. • Update of 6 national curricula in vocational schools (masonry, plumbing, and agriculture) and universities (agriculture, architecture, water engineering) to include climate-smart agriculture, water efficiency, and precision agriculture. • Capacity building for at least 6,440 individuals from the private sector, civil society, and local institutions (covering 4 governorates, 16 provinces, and 324 municipalities) engaged in climate change adaptation practices.

Table D.6: FP155 - Project Overview