Climate and Development

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tcld20

Win-win: designing dual-use in climate projects for effective anti-corruption in Bangladesh

Mushtaq Khan, Mitchell Watkins, Salahuddin Aminuzzaman, Sumaiya Khair & Muhammad Zakir Hossain Khan

To cite this article: Mushtaq Khan, Mitchell Watkins, Salahuddin Aminuzzaman, Sumaiya Khair & Muhammad Zakir Hossain Khan (2022): Win-win: designing dual-use in climate projects for effective anti-corruption in Bangladesh, Climate and Development, DOI: 10.1080/17565529.2022.2027741

To link to this article: https://doi.org/10.1080/17565529.2022.2027741

CLIMATE AND DEVELOPMENT
https://doi.org/10.1080/17565529.2022.2027741

Taylor & Francis
Taylor & Francis Group

Win-win: designing dual-use in climate projects for effective anti-corruption in Bangladesh

Mushtaq Khan [a], Mitchell Watkins [a], Salahuddin Aminuzzaman[b], Sumaiya Khair[b] and Muhammad Zakir Hossain Khan [b]

[a]SOAS University of London, London, UK; [b]Transparency International Bangladesh, Dhaka, Bangladesh

ABSTRACT
Climate adaptation projects in Bangladesh have been widely affected by high levels of corruption and resource leakage. However, the dual-use characteristics of climate adaptation investments create incentives for influential households to monitor projects in their own interest. We theorize that these households can effectively use informal power and networks to constrain corruption by contractors and officials. Increasing the level of dual-use benefits is therefore a viable way of reducing corruption in contexts of poor governance. We test this hypothesis using data from a survey of 1,901 households living near four recently completed climate projects and interviews with over 30 key informants. The results indicate that households are more likely to monitor climate projects if they provide dual-use benefits and households with above-average incomes from agricultural and business activities are the most likely to benefit from dual-use attributes. Furthermore, we find that higher levels of monitoring by these influential households are associated with reduced corruption during project implementation.

ARTICLE HISTORY
Received 25 February 2021
Accepted 6 January 2022

1. Introduction

Bangladesh is one of the world's most climate-vulnerable countries (Eckstein et al., 2019). Every year, flooding and cyclones threaten lives, property, land and infrastructure in the country's low-lying coastal regions. Rising global temperatures due to climate change are expected to increase the frequency and intensity of cyclones and monsoon rainfall that result in severe floods. These events are expected to exceed the country's current level of disaster preparedness. The challenge of climate change is amplified by Bangladesh's high level of poverty and population density. Nearly 12 million people – approximately 30% of the population in the country's coastal regions– live in poverty (World Bank, 2016). Sea-level rise and saltwater intrusion pose a severe challenge to the livelihoods of these households by threatening food security and access to fresh water (Pouliotte et al., 2009).

The government and international development partners have recognized that billions of dollars need to be invested in adaptation infrastructure to respond to the effects of climate change (Anderson et al., 2017; Rai et al., 2014). Adaptation refers to the adjustment of natural or human systems in response to actual or expected climate changes to reduce potential damage or exploit beneficial opportunities (IPCC, 2018). Adaptation investments have already started in Bangladesh and have focused on the construction of embankments along rivers prone to flooding and cyclone shelters in exposed areas (World Bank, 2013; 2015). Unfortunately, pervasive corruption, including embezzlement and illegal subcontracting, has severely impacted the implementation of climate adaptation projects (Mahmud & Prowse, 2012; Masum & Khan, 2020).

However, corruption has not affected all climate projects equally. Similar projects have often experienced different levels of corruption, resulting in differences in construction quality that affect the current and future welfare of coastal communities (Mohiuddin et al., 2017; Sharmin et al., 2017). Of the location-specific factors that can explain these differences, our research shows that the *effectiveness of monitoring* by local communities plays an important role in curbing corruption and improving the quality of projects. Our findings also show how we can improve the effectiveness of monitoring by designing projects to create incentives for better monitoring.

Local community monitoring is much more likely to reduce corruption if individuals with the *capacity* to influence corruption outcomes are incentivised to engage in monitoring. The capacity to influence outcomes can depend on economic capabilities (their capacity to spend time and money) and organizational capabilities (their political and organizational membership of powerful formal or informal organizations) (Khan, 2019). Groups engaging in corruption in construction projects are likely to be powerful in the local context. They are only likely to be constrained if a sufficiently powerful local counter-group with the appropriate incentives and capabilities is monitoring and countering their corruption. Village communities in Bangladesh are poor in absolute terms. In this context, relatively small differences in economic capabilities can translate into significant differences in political and organizational capabilities and therefore in corruption or anti-corruption outcomes.

CONTACT Mushtaq Khan mk100@soas.ac.uk

Governments in Bangladesh have long recognized that the developmental benefits of climate change projects are greatly enhanced if they are designed as dual-use investments (Mahmood et al., 2014; Rahman & Bhuiyan, 2016). Dual-use projects are designed to deliver *immediate benefits* to the local community as well as to help them to respond to *future climate change challenges*. For instance, river embankments also serve as roads, and cyclone shelters as schools or community centres, contributing to immediate improvements in welfare and income for those who can benefit from them (Mahmood et al., 2014; World Bank, 2015). Dual use has an obvious developmental justification in a developing country, but it also has a potential governance logic that is less well understood. We argue that the greater the immediate benefits of climate change projects, particularly for influential groups with the capacity to play an effective monitoring role, the more likely are they to take an interest in the quality of construction and to monitor progress on an ongoing basis. As a result, we hypothesize that increased monitoring by influential groups will improve the quality of project implementation and reduce corruption.

We test this theoretical argument by studying four climate change projects that suffered from different levels of corruption. We conducted surveys of 1,901 households affected by the projects to identify their levels of engagement in monitoring, the types of individuals who were involved and the effects on anti-corruption. We find that households are more likely to monitor climate projects if they provide significant and immediate dual-use benefits. The results also indicate that households with above-average incomes from agricultural and business activities are the most likely to benefit from dual-use attributes. This is not surprising as the benefit of dual use is likely to be greater for individuals with capabilities of exploiting these opportunities. Roads, for instance, are more likely to benefit farmers with a surplus to market, and schools and community centres will benefit citizens who value these services more. In the context of anti-corruption, this differential benefit is not a bad thing. Projects with larger dual-use benefits are likely to draw in larger numbers of influential citizens in monitoring, resulting in lower levels of corruption. Indeed, we find that higher levels of involvement of these 'influential' groups in monitoring are associated with lower levels of corruption in the projects. The findings suggest a practical and effective way of designing anti-corruption into projects in difficult governance contexts by deliberately enhancing the dual-use benefits for the entire community.

The findings of the study contribute to the literature on corruption in climate adaptation projects (Jakob et al., 2015; Lockwood, 2013; Mahmud & Prowse, 2012; Rahman, 2018). Corruption is often overlooked in the climate adaptation literature. Understanding how best to combat corruption in the sector is crucial for the construction of higher-quality infrastructure. Our study identifies a feasible and effective strategy that exploits the dual-use characteristics of adaptation projects to reduce corruption. While dual use is often built into the design of climate projects, local communities are usually not deeply engaged in the design of dual-use benefits. An effective anti-corruption policy would be to deliberately design projects that maximize dual-use benefits from the outset, with local communities being invited to provide inputs into the design. This would build in benefits of interest to the community as a whole, even if more advanced groups benefit more from these facilities. Our research suggests this would contribute to significant improvements in the governance of these projects in contexts of poor enforcement of formal rules and poor control of corruption.

The study also contributes to the nascent literature on local governance and climate change adaptation (Adekola et al., 2020; Baudoin, 2014; Fischer, 2020; Omukuti, 2020; Pasquini, 2020; Sharma et al., 2014). Our research supports existing studies that recommend that climate projects should prioritize local needs and enhance local inclusiveness to enhance local ownership of these projects (Fischer, 2020; Omukuti, 2020; Sharma et al., 2014). In contrast to the extant literature, our study demonstrates the benefits of incentivizing the involvement of influential households, who can use their informal power and networks to put pressure on contractors and officials to control corruption. In contexts of weak formal governance, this is an immediate and effective way of constraining corruption in the climate sector.

2. Climate change investment in Bangladesh

Since the 1960s, the Government of Bangladesh (GoB), with the help of international donors, has invested over $10 billion in the construction of polders protected by embankments, cyclone shelters, and emergency warning and awareness-raising systems to protect low-lying coastal areas (Adams et al., 2011). In 2012, the GoB established the Bangladesh Climate Change Trust Fund (BCCTF), funded by the national budget, to address the country's adaptation needs. To date, the government has committed approximately $450 million of its resources to the fund (GoB, 2020). In addition to the BCCTF, the government also allocates roughly $1 billion annually to climate-related expenditures. International donors and climate funds are additional notable sources of climate finance. Specifically, the World Bank has been working closely with the government in recent years to strengthen coastal embankments, construct cyclone shelters and improve early warning and evacuation systems (World Bank, 2013; 2015).

This study focuses on two of the most prominent types of climate adaptation infrastructure in Bangladesh: river embankments and cyclone shelters. Coastal and river embankments are an integral part of disaster risk reduction investments in Bangladesh and provide protection from tidal and river flooding, cyclone-induced storm surges and salinity intrusion. Embankments are often used to create polders, which are tracts of floodplain enclosed by embankments. By providing increased resilience to flooding, embankments help reduce the loss of life, assets, crops and livestock during natural disasters. Additionally, embankments provide dual-use benefits on an everyday basis if they are appropriately constructed by helping to increase agricultural production through better control of irrigation, creating catchment areas for fishing, and serving as roads in low-lying areas. By enhancing connectivity between communities, embankments can improve access to healthcare, schools and local markets.

Cyclone shelters provide temporary shelter to disaster-affected communities. Typically, cyclone shelters are

multistoried, reinforced concrete buildings that can, on average, accommodate 1,600 people (Mahmood et al., 2014). The shelters generally have an open ground-floor structure to avoid flooding from storm surges and top floors designed to accommodate people during and after a disaster. Like embankments, cyclone shelters provide dual-use benefits. They can serve as schools, community centres or business locations that can create business opportunities in the neighbourhood. Approximately 82% of shelters in Bangladesh are used as education centres, 8% as offices, 1% as health centres and 1% as community centres (CEGIS, 2009).

3. Corruption in climate change investments in Bangladesh

Corruption is a central challenge in the construction of climate adaptation infrastructure in Bangladesh. Since 2010, Transparency International Bangladesh (TIB) has tracked the implementation of more than 100 climate projects implemented by government and non-governmental organizations (NGOs) and has documented pervasive corruption in the sector (Mohiuddin et al., 2017; Sharmin et al., 2017). The documentation includes examples of the embezzlement of project funds, the violation of procurement laws, poor-quality construction and unfinished projects that are attributed to low levels of transparency, community engagement and monitoring.

Based on an analysis of 38 climate projects for which detailed information is available from TIB, we estimate that, on average, 35% of climate project funds are embezzled (Haque et al., 2012, 2013; Masum & Khan, 2020; Mohiuddin et al., 2017; Sharmin et al., 2017). Extraction operates through different mechanisms. Contractors can use lower-quality materials, leave a project incomplete, or extract further margins through illegal subcontracting. The latter operates through a contractor selling their contract before or during construction at a lower price, with the seller capturing the difference. This type of subcontracting can happen multiple times with each new contractor offering to complete the work at a lower price. Subcontracting more than 20% of the approved project budget is illegal and violates government procurement laws. Yet illegal subcontracting has been observed in nearly two-thirds of climate projects (ibid.). Embezzlement and illegal subcontracting clearly have a detrimental impact on the quality of project implementation. Of the 38 projects referred to above 30, or nearly 80%, were poorly constructed as a result of corruption-related leakages.

Corruption on this scale can only happen if contractors collude with implementing agencies, local representative bodies and enforcement agencies. Formal institutional processes of ensuring transparency and community engagement are well-known to be weak in Bangladesh (Hossain, 2010; Khan, 2017; Knox, 2009; Mahmood, 2010). Formal demands for disclosure of information are unlikely to be very effective – implementing agencies rarely disclose information about project selection and design, climate vulnerability assessments, site selection criteria, or details of project funding and procurement contracts. As a result, based on our fieldwork, we observe that rural communities are regularly excluded from relevant information. Moreover, as communities are generally not involved in project design, they have very limited ongoing involvement in monitoring activities. When consultations do take place, they are often superficial, usually a tick-box exercise to show that the community has been consulted. Community-led monitoring, reporting and verification mechanisms are usually weak or non-existent.

It is, however, useful to make a distinction between formal and informal processes of information generation and enforcement, particularly in these contexts. The formal processes of accessing information (transparency) or ensuring enforcement (accountability) are weak in Bangladesh, and even more so in remote rural areas where adaptation investments are usually located. Information about procedural violations or the extraction of resources, even when common knowledge, rarely leads to action because contractors collude with implementation and enforcement agencies to block these efforts (Khan et al., 2019). As a result, attempts to strengthen enforcement in developing countries using technical support, better equipment, training or higher salaries for enforcement agencies have usually failed to improve anti-corruption outcomes (Johnsøn et al., 2012). This is not surprising, because, in the absence of a strong rule of law, there are often substantial informal costs for officials who try to enforce rules against powerful coalitions. The failure to enforce in these contexts is therefore mainly a problem of power and the exercise of informal influence (Khan, 2018).

To improve anti-corruption outcomes in these contexts, we explore a different approach. When influential individuals exercise voice, they do so through both formal and informal channels, and the latter may be decisive in contexts where formal institutions are weak. We test the possibility that we can exploit conflicts of interest *between* influential groups if a coalition with sufficient influence and informal power can be incentivized to check the corrupt. If climate change investments can deliver immediate benefits to groups of people – including, in particular, influential local people – the latter may become sufficiently interested in the proper implementation of that project to change the balance of forces affecting implementation outcomes. Rule violators may then perceive a higher probability of exposure and persistent challenges through informal networks, and they may have to scale back their extraction.

A focus on formal processes has meant that anti-corruption efforts have usually failed to exploit informal mechanisms of accessing and using information that may often be more effective in controlling corruption. If all the influential parties engaging with a project happen to be interested in extracting resources, the formal anti-corruption processes are unlikely to be effective because of concerted informal pressures. In the political settlements of developing countries, the distribution of power in society as a whole does not support a general rule of law (Khan, 2018). The average citizen acting alone is unlikely to gain access to actionable information about who is extracting resources and how (even if the broad outlines are known at the local level). They are even less likely to be able to act upon this information to ensure enforcement. But if a large enough group of individuals with informal power become interested in a project, the effective pressure for better implementation can dramatically improve.

Power in these contexts is usually exercised through informal organizational networks within which individuals may informally share and exchange resources with each other and engage in collective action in order to protect their interests (Khan, 2018; 2019). These informal networks can connect factions within political parties, bureaucrats, police and law enforcers, entrepreneurs, traders and farmers and are ubiquitous in developing countries like Bangladesh (Khan, 2013). Individuals need to have some economic and organizational capabilities to participate in these networks, but once in, the network can further enhance their power and influence. They can benefit from better access to information, and access other powerful individuals who are more likely to provide help because they can informally share benefits or expect favours to be returned in the future. In contrast, formal relationships with police or law enforcers rarely work effectively in these contexts. Individuals can utilize their informal networks to get information or to pass on information to other powerful individuals in ways that create more effective constraints on others. For instance, information on violations can be particularly useful to competitors of those who are corrupt, who know how to use this information to embarrass the corrupt or to extract some of their corrupt gains for themselves. A citizen who is a member of a powerful network is more likely to be able to pass on information about corruption to those who are likely to use such information, and the corrupt are correspondingly more likely to be careful if they are being challenged by individuals linked to powerful networks (Khan et al., 2019). An informal chat with a contractor in a tea shop that hints at other powerful individuals who may be mobilized through their network may be much more effective in exerting pressure than the threat of a formal enquiry coming from a citizen with poor access to such networks. Indeed, just the fact that influential local individuals are taking an active interest in the quality of a project may be enough to constrain more egregious types of corruption.

There is a further ethical advantage of our approach. Encouraging people in developing countries to engage in anti-corruption activities can place less powerful people in danger, particularly if they are incentivized by external actors who later move away. In contrast, if we observe powerful locals are involved in effective monitoring activities in their own interest, they are likely to be doing so after properly considering risks. Our research seeks to identify the self-interest that induces powerful people to monitor in ways that reduce corruption. If future projects have these characteristics, the decision to monitor or not can be left to these locally powerful people who are best qualified to make these judgements. This is a more sustainable approach to anti-corruption than support for formal monitoring mechanisms like citizens forums where less powerful people may get involved because of temporary protection and incentives provided by external funding.

4. Hypotheses

Our nested hypotheses are as follows:

H1: Involvement in monitoring has costs, but if monitoring improves the quality of implementation of a project (such as an embankment), the returns from the dual-use functions of that infrastructure (for instance its usability as a road) can increase. For people in poor countries, the immediate dual-use benefits are more likely to influence their participation decisions than longer-term and more uncertain climate adaptation benefits. The probability of involvement, πI, will therefore increase with potential dual-use benefits, D, and will be higher for individuals with a greater capability of exploiting these benefits, proxied by their income levels Y.

$$\pi I_t = f(D,\ Y_t) \tag{1}$$

where πI_t is the probability of involvement in monitoring of a household of type t, D the level of dual-use benefits of the project, and Y_t incomes by household type. We simplify to assume two household types: 'influential' i and 'average' a, as relevant for the anti-corruption analysis.

H2: The effectiveness of anti-corruption, EAC, increases with the proportion of citizens who get involved in monitoring, particularly from influential households who are likely to be more powerful. Higher effectiveness of anti-corruption should, other things being equal, result in lower levels of corruption.

$$EAC = g\left(\frac{I_i}{i},\ \frac{I_a}{a}\right) \tag{2}$$

The number of influential households involved in monitoring as a share of all influential households, $\frac{I_i}{i}$, has a positive and possibly larger impact on anti-corruption because of the greater likelihood that these households belong to and are able to mobilize informal networks. The number of average households involved in monitoring as a share of all average households, $\frac{I_a}{a}$, should have a lesser but still positive effect on anti-corruption.

We define households as influential if they have above-average incomes in the local context. All such households may not belong to powerful informal networks, and some individuals who belong to such networks may have less than average incomes. Nevertheless, individuals with above-average incomes are more likely to be able to join powerful informal networks and therefore the share of above-average income households involved in monitoring as a share of all such households provides a reasonable proxy for the share of influential individuals involved in monitoring (Khan, 2018).

Climate change projects are complex and take several years to complete. Their designs are already determined by the time implementation begins. It is therefore not possible to directly test the proposition that if design is changed to provide greater dual-use benefits, anti-corruption outcomes would improve. So, we devised indirect ways of testing our hypotheses. We selected recently completed projects with known levels of corruption (corroborated by key informants) and then surveyed local communities to see if variations in the characteristics of benefits and citizen involvement across the projects were in line with our expectations.

5. Data sources: household surveys and key informant interviews

To test our hypotheses, we collected data on the involvement of influential households and the scale of corruption in four

Table 1. Overview of project locations and surveyed households.

Survey Area	Project Type	Implementing Agency	Completion date	Households Surveyed	Project Cost (BDT)
Gulishakhali, Barguna	Cyclone shelter	LGED	2015	406	25 million
Bharasakathi, Barisal	Cyclone shelter	LGED	2013	407	22 million
Nolua, Barisal	Embankment-Polder	BWDB	2014	488	100 million
Satkhira	Embankment-Polder	BWDB	2015	600	115 million

recently completed climate adaptation projects. As our approach requires intensive surveys of project areas, we were constrained in the number of projects that we could study. We selected two cyclone shelters and two embankment projects located in the comparably remote climate-vulnerable coastal districts of Barishal, Barguna and Satkhira. For each type of project, we selected one project that earlier TIB work suggested had lower corruption and better project implementation and another that appeared to have higher corruption and poorer implementation. We then conducted in-depth interviews with key informants to corroborate or qualify these prior perceptions and to add further detail on the different dimensions of corruption in each project. In all cases, the prior measures were corroborated by subsequent key informant interviews.

To control for other variables that could determine differences in levels of corruption, the projects were selected so that the same implementing agency delivered each pair, investment sizes were comparable, locations were in similarly remote regions, and the funding sources were the same. Both embankment projects were constructed by the Bangladesh Water Development Board (BWDB), and both cyclone shelters were constructed by the Local Government Engineering Department (LGED). Each project pair was subject to the same formal governance arrangements, such as requirements for citizen engagement, procurement processes and oversight. All four projects were funded through the Bangladesh Climate Change Trust Fund and completed between 2013 and 2015. A summary of the projects is presented in Table 1.

We collected primary data on the distribution of benefits, household income and the involvement of different types of households in monitoring activities in surveys of 1,901 households living near the four climate projects, conducted over 2018 and 2019. The projects selected were all completed within 3–5 years of the surveys, which was the closest we could achieve in terms of getting a sample of comparable projects. As any benefits from dual-use characteristics would persist over this period, we do not believe there is a significant problem with recollection, and it is unlikely that respondents would forget their level of involvement in a major project during this time frame. This strategy allows like-for-like comparisons without significantly exposing the study to time-variant factors affecting corruption or implementation quality. There were no changes in government or other significant time-variant events over this period that could be expected to significantly affect corruption levels across the projects.

Our survey employed random sampling procedures to select households living near the climate projects. For each location, *mouzas* (administrative districts) or villages were selected using a probability-proportional-to-size sampling strategy. Each mouza was then divided into clusters of 100 households. We then randomly selected 20 households from each cluster. To ensure data quality, researchers directly supervised data collection and routinely analyzed the survey data for inconsistencies in the responses. Additionally, five percent of the interviewed households were randomly selected and re-interviewed for quality control verification purposes during the survey process.

To measure household involvement, our survey asked, 'Were you or any of your household members involved in project implementation?'. We did not directly ask about anti-corruption activities because that would limit responses to participation in formal processes. Our intention was to capture a broader range of involvement through which informal networks may come into play. Survey responses were used to create a binary variable, *Household involvement*, equal to one for yes and zero otherwise. Nearly 20% of households reported involvement in project implementation. Respondents were allowed to describe their involvement, which included 'providing support or cooperation', 'reporting to authorities/local administrators if construction works were not going well', and 'conflict resolution'. The latter is important because large-scale constructions provide opportunities for land-grabbing and other forms of extraction or involve disputes over location or design. Interestingly, formal anti-corruption activities were not listed by respondents, but the forms of involvement are precisely the ones through which informal processes of information gathering and pressure come into play.

We know that informal networks play an important role in enabling or blocking policy implementation in countries like Bangladesh, and that important members of these networks are individuals with higher than average incomes and organizational capabilities (Khan, 2013; 2019). It is not feasible to directly identify individuals who are 'influential' in the sense of belonging to powerful networks in large surveys. So, as a proxy, we collected data on household income sources and identified households as influential if they had higher than average agricultural or business incomes in the local context. Not all of these households may belong to powerful informal networks, and it is possible that some households belonging to powerful networks may have lower than average incomes. Nevertheless, given our understanding of how informal networks are constituted, it is very likely that powerful and more influential households will have higher than average agricultural or business incomes in the local community. Therefore, a higher level of involvement of the latter group is a reasonable proxy for the greater involvement of influential individuals in particular activities.

To measure the level of corruption in each project, we conducted in-depth interviews with 31 key informants across the projects. The measurement of corruption is always difficult because transparent data are obviously missing and deliberately kept hidden for legal and political reasons. Key informant

interviews are commonly employed to measure and understand both systemic corruption (Persson et al., 2013; Trapnell, 2015) and sectoral-level corruption (Ahmad et al., 2022; Davis, 2004; Islam et al., 2017; Mahmud & Prowse, 2012). Compared to typical households, sector experts who were involved in a project are more likely to have in-depth knowledge about specific types of corruption that occurred during the implementation of the projects and are often willing to talk freely under conditions of anonymity and trust. Our informants were selected based on their knowledge of and involvement in these projects, with specific care taken to ensure that a range of different types of actors was interviewed within each project area to include multiple viewpoints. Our key informants included officials from the Ministry of Environment and Forests, BWDB and LGED; civil society representatives including local business owners, farmers and NGOs; representatives of funding bodies; officials involved in project supervision; district-level executives; project contractors; and investigative journalists. These interviews were conducted by researchers from Transparency International Bangladesh who are well-trained in ethical considerations, in ensuring that respondents are not endangered, identities are anonymized, and all respondents give their full consent. Semi-structured, open-ended interviews were conducted to assess the level of corruption in each project along six dimensions:

1. The degree to which formal community engagement was meaningful and transparent, including the use of information boards, information sharing and consultation. The strength or weakness of formal engagement is one possible indicator of corruption.
2. Evidence of probity or otherwise of key public officials involved in the project (local government, implementing agencies, community and political leaders).
3. Evidence of leakage and use of poor-quality materials in construction.
4. Evidence of collusion between contractors and implementing agencies.
5. Evidence of collusion between contractors and local political leaders.
6. Evidence of corruption in land-acquisition processes.

The six dimensions of corruption were selected based on prior investigative research by TIB (Masum & Khan, 2020; Mohiuddin et al., 2017). Each form of corruption was identified as a significant challenge to the implementation of past climate infrastructure projects. Asking questions about specific types of corruption at the project level is recognized as providing more robust information about processes of interest. General questions about corruption can result in respondents confusing processes of interest with many other types of higher-level or background corruption that can coexist in developing country contexts (Khan, 2006). Open-ended interview questions allowed informants to discuss additional types of project-level corruption not specified in our framework. However, this did not result in any new types of corruption being identified. For each interview, written notes were taken to record the reported presence or absence of corruption in each of the six dimensions for a given project. A key informant response of 'yes' to the presence of corruption in any dimension was accepted and recorded if the informant had personally looked into that aspect of corruption and found evidence that they found compelling. Similarly, a 'no' response to the presence of corruption was only recorded if the informant had looked into that aspect of corruption and found no evidence. If an informant did not know whether corruption of a specific type existed in a project, the response was recorded as 'don't know' and *not* interpreted as evidence of no corruption. This detailed approach aims to improve upon the average perception survey.

The interview process followed a saturation approach to ensure the robustness of the corruption classifications (Saunders et al., 2018). At least six key informant responses (either yes or no) were sought for each dimension of corruption in each project. As some informants could not answer positively or negatively about every dimension of corruption, the total number of key informants across the four projects was 31. If any key informant response for a particular dimension of corruption in a particular project was 'yes', we recorded a yes for that dimension of corruption. Only if all respondents said 'no' to the presence of corruption in a dimension did we score a 'no' for that dimension in that project. Reassuringly, for each dimension, informant responses were strongly aligned both with each other and with prior TIB assessments. This alignment makes us confident in the validity of the measures.

Next, we compared each project with another of the same type, that is the two embankment projects with each other, and the two cyclone shelter projects with each other. For each project type, the project that had verified corruption reported along more dimensions was classified as the higher corruption project relative to the other. The intuition behind this is that projects where corruption is observed along a greater number of dimensions are likely to have more systemic and therefore more serious corruption problems.

Table 2 presents the corruption scores of the projects. The cyclone shelter in Barguna was classified as a lower corruption project with corruption recorded along one dimension: leakages and the use of poor-quality materials. In contrast, the cyclone shelter in Barishal had reports of corruption along three dimensions and was classified as the higher corruption project. Here, key informants reported the corruption of key officials, collusion between contractors and the implementing agency, as well as resource leakage and use of poor-quality materials. Of the two embankment projects, the Barishal embankment project had lower corruption, with key informants reporting corruption along two dimensions: contractor collusion with implementing agencies and corruption in the land-acquisition process. In contrast, the Satkhira embankment project was clearly a higher corruption project with corruption reported across all six dimensions. The assessment of relative corruption *within* each project type is the only variation that we want to explain, we are not measuring or explaining corruption levels *across* types of projects. This variation allows us to compare the reported levels of monitoring from our household survey within cyclone shelter and embankment projects with lower and higher levels of corruption. Recall that projects within each project type were selected to be of comparable size, implemented by the same agency, at around the

Table 2. Corruption scores based on key informant interviews.

	Cyclone shelters		Embankments	
Dimension	Barguna	Barishal	Barishal	Satkhira
1. Absence of transparency	No	No	No	Yes
2. Corruption of key public officials	No	Yes	No	Yes
3. Leakage and use of poor-quality materials	Yes	Yes	No	Yes
4. Collusion between contractors and implementing agencies	No	Yes	Yes	Yes
5. Collusion between contractors and local political leaders	No	No	No	Yes
6. Corruption in land-acquisition processes	No	No	Yes	Yes
Classification	Lower Corruption	Higher Corruption	Lower Corruption	Higher Corruption

Source: Responses based on 31 key informants in semi-structured, open-ended interviews.

same time, and with similar formal accountability measures. These are the most important other variables that could explain variations in corruption levels within project type.

There is a potential endogeneity problem in testing the relationship between household involvement levels and project corruption. Causality could plausibly go in both directions and there may be missing variables. For instance, areas that are generally less corrupt would have lower project-level corruption and may also provide safer opportunities for higher levels of citizen involvement. Similarly, areas with lower corruption may have higher levels of trust that encourage citizen engagement in monitoring (Levi & Sacks, 2009). As a result, we may observe projects with high citizen engagement and lower corruption in areas with generally low corruption, but the citizen engagement would be endogenous. To see how serious this concern may be in our case, we looked at levels of overall corruption in our project areas using data on corruption in public services from a 2017 national survey of 15,581 households conducted by TIB (Alam et al., 2017). The survey provides district-level data on the 64 districts of Bangladesh, and our projects are in three of these districts. This allows us to compare relative levels of corruption across our districts and with the national average. The household survey asked respondents to report their experiences of bribery, extortion, fraud, embezzlement of money or property, negligence of duties, or nepotism across a range of sectors including education, health, local government, land management, agriculture, law enforcement, judicial services, utilities, banking, transportation, tax, NGO, passport, and insurance. The range of corruption covered provides the best available indicator of relative corruption levels across the country.

At the national level, 67% of households reported experiencing some form of corruption. In our project districts, 96% of households in Barguna reported corruption, 73% in Barishal and 34% in Satkhira. Now comparing our cyclone shelter projects, our lower-corruption project was in Barguna (the district with the highest level of overall corruption out of our three) and our higher corruption project was in Barishal (which had lower public corruption). Similarly, comparing our embankment projects, our lower corruption project was in Barishal, where the overall corruption was higher than the national average, while our higher corruption project was in Satkhira where overall corruption was lower than the national average and the lowest in our three districts. The lack of any obvious correlation between comparisons of local corruption levels and relative project-level corruption does not fully eliminate the possibility that there is some reverse causation, but it does tell us that interactions of this type are relatively weak. Other factors are at play explaining why we can have lower corruption projects in high corruption areas.

6. Methodology

Our aim is to demonstrate the importance of community monitoring, and in particular monitoring by individuals with the power and interest to affect changes in corruption levels, in achieving observable differences in project corruption. Our methodology employs a mixed-methods approach that combines quantitative data from a large household survey with project-level measures of corruption derived from 31 key informant interviews. The empirical strategy consists of three parts. First, we present survey data in section 7.1 that demonstrates that projects with higher levels of reported dual-use benefits have higher levels of household involvement in monitoring. In this section, we also utilize survey data to show that landowners and businesses were the largest reported beneficiaries of the climate projects.

Second, we test our hypothesis of a relationship between income and household monitoring of climate projects in section 7.2. Specifically, we examine if influential households with above-average agricultural and/or business incomes are more likely to be involved in project monitoring using data from our household survey. To examine the relationship, we estimate the following model:

$$\begin{aligned} Involvement_{ij} = {} & \beta_1 Agricultural\ income \\ & + \beta_2 Business\ income \\ & + \beta_3 Wage\ income + \lambda\ w_{ij} + \epsilon_{ij} \end{aligned} \tag{3}$$

where $Involvement_{ij}$ is involvement in project monitoring for household i in project-region j; w_{ij} is a vector of demographic and project controls; and ϵ_{ij} is the error term. Control variables are included for age, education, gender and project type. Equation (3) is estimated with a logistic regression with standard errors clustered at the project location. Results from the regression analysis find that households with above-average incomes from agriculture and business are statistically significantly more likely to be involved in monitoring.

The evidence from parts 1 and 2 of our analysis support H1 by demonstrating that projects with higher levels of dual-use benefits have higher levels of household monitoring, *and* higher-income households benefit more and therefore participate more intensively. The evidence supports the hypothesized relationship between levels of dual-use benefits, income levels and involvement levels, specified in equation (1). Given the

Table 3. Households Reporting Dual-Use Benefits and Household (HH) Involvement in Monitoring.

		Cyclone Shelters		Embankments	
Outcome Measure	**All Projects**	Barguna	Barishal	Barishal	Satkhira
Enhanced agricultural/fishing benefits	23%	44%	5%	49%	0.5%
Enhanced business/trading benefits	9%	24%	5%	11%	0.2%
Improved employment opportunities and wages	9%	7%	10%	21%	1%
Social benefits due to reduced travel time	23%	20%	35%	43%	0.3%
Better disaster preparedness	39%	52%	37%	69%	7%
% of HHs involved in project implementation	20%	37%	19%	26%	3%

relationship between dual-use benefits and participation, an increase in the *level* of dual-use benefits, *D*, should increase returns to participation for all groups, and therefore increase the probability of their involvement. The regression results also suggest that any improvement in levels of *D* will disproportionately benefit better-off (influential) households and that their probability of involvement will increase even faster.

The third and final part of our analysis presented in section 7.3 tests the hypothesized relationship between monitoring by influential households, defined as households with above-average incomes from agricultural and business activities, and project corruption. To examine this relationship, we combine descriptive statistics from our survey data on household involvement in monitoring with the relative project-level corruption measures derived from the key informant interviews. This data comparison examines variation in the relationship *within* each climate project type (cyclone shelters and embankments). The data analysis supports H2 and demonstrates that climate projects with higher rates of participation of both average and influential households with above-average levels of agriculture and business income experienced lower levels of corruption relative to its comparator.

7. Empirical evidence

7.1. Dual-use benefits and beneficiaries

The first step of our analysis is to identify the level of dual-use benefits and levels of household involvement across projects, as well as the household types that benefited most from the projects. Our survey asked respondents, 'How did you or your family benefit from the project?'. A summary of responses is reported in Table 3. The results show that a sizeable proportion of households living near climate adaptation projects reported benefits from improved disaster preparedness. Households also widely reported dual-use benefits from the projects including enhanced agricultural and fishing benefits and social benefits due to reduced travel time.

Importantly, the data show significant differences in levels of dual-use benefits and household involvement across the projects. Higher levels of agricultural and business benefits, in particular, appear to be strongly associated with higher levels of overall involvement in monitoring. Importantly, the long-term benefits of disaster-preparedness, which reflect perceived differences in construction quality, also vary across projects and, not surprisingly, correlate with the intensity of involvement in monitoring. Better employment opportunities and the benefits of reduced travel times to schools, mosques or markets are benefits for average citizens and are less closely correlated with overall participation rates in monitoring.

Table 4. Household perceptions of beneficiaries in their community.

Who benefited from the project?	Response count
1) Large landlords (> 5 acres)	856
2) Medium landlords (2-5 acres)	813
3) Small landlords (< 2 acres)	743
4) Landless	377
5) Business owners (small/medium/large/retail/wholesale)	229
6) Construction businesses	111
7) Fish farming	106
8) General farming	89
9) Schools	193
10) Hospitals	64
11) Political leaders	90
12) Local power groups	65

Note: Multiple category responses were allowed.

This evidence is in line with our first hypothesis that increased dual-use benefits, particularly for the better off, increase the probability of household involvement in monitoring.

The importance of agricultural and business returns from climate adaptation projects is reiterated in Table 4, which summarizes responses to our survey question: 'Which categories of people or organizations benefited from the project?'. Respondents believed that landlords, the landless and business owners benefited the most. Note that the landless benefit mainly through employment during construction. The statistics also highlight broader dual-use benefits as respondents reported that schools and hospitals also benefited. The infrastructure helped their connectivity or (in the case of schools) sometimes provided new premises.

7.2. Local interests and household involvement

The second part of our analysis tests the hypothesized relationship between income and household monitoring. Specifically, we examine if households with above-average agricultural and/or business incomes are more likely to be involved in monitoring. Here, our outcome variable of interest is household involvement in a project as described in the previous section. Our independent variable of interest is respondents' income level by source, reported in thousands of BDT (Bangladesh takas). In our sample, 40% of respondents reported household incomes from agriculture, 16% from business and 39% from wages. Agriculture, business and wage income have sample means of 20,500 BDT, 19,780 BDT and 36,500 BDT respectively.

Table 5 presents the regression results. They support our hypothesis that levels of agricultural and business incomes have a positive impact on a household's willingness to be involved in the implementation of climate adaptation projects. *Agricultural income* and *Business income* both have a positive and statistically significant effect on the probability of

Table 5. Determinants of household involvement.

	Dependent variable: Household involvement in project (1)
Agricultural income	0.006***
	(0.002)
Business income	0.001**
	(.0004)
Wage income	0.0005
	(0.001)
Cyclone shelter	0.887
	(0.909)
Male Respondent	0.692*
	(0.373)
Respondent Age	0.005
	(0.005)
Respondent Education	
Only read and write	0.525
	(0.636)
Pre-primary to primary	0.749
	(0.480)
Secondary to higher	1.107*
	(0.641)
Undergraduate or above	0.728
	(0.512)
Survey respondents	1900
No. of projects	4

Note: *p<0.10, **p<0.05, ***p<0.01. Coefficients are reported as the change in log-odds. Standard errors are clustered on project location and reported in parentheses. The excluded project type is Embankment. The excluded respondent gender is Female. The excluded education level is Illiterate.

household involvement. However, the effect size of *Business income* is smaller than *Agricultural income*. *Wage income* is not estimated to have a significant effect on household involvement. This finding is consistent with the results from Part 1 of the analysis. Recall that the largest reported beneficiaries of climate projects were land and business owners. Respondents did report limited employment or wage benefits from the projects. However, the regression analysis suggests that even high wage earners were unlikely to achieve a sufficient return from dual-use attributes to engage in monitoring for the projects in our sample. Project type and respondent age are also not estimated to have a significant effect on household involvement. Households where the respondent has secondary education are statistically more likely to be involved in project implementation relative to ones where respondents are illiterate. Lastly, the respondent's gender has a statistically significant impact on involvement. Male respondents are statistically more likely to report household involvement in project implementation, perhaps reflecting the fact that females may be less informed about monitoring and influencing activities that are more likely to be carried out by male household members.

Figure 1 presents the predicted probability of a household's involvement in project implementation at different levels of *Agricultural income*. A change in agricultural income from zero to 100,000 BDT per annum is associated with a 7.5% increase in the probability of involvement. Households with high incomes from agricultural activities also have a high predicted probability of involvement. For example, an otherwise typical respondent household with 400,000 BDT of annual agricultural income has a probability of involvement of 65%. This increases to 95% if the household earns 800,000 BDT annually in agricultural income (roughly USD 9500).

Figure 2 reports the predicted probability of household involvement against *Business income*. A change from zero to 100,000 BDT is associated with a 1.7% increase in the probability of household involvement in implementation. The estimated effect size is less than a quarter of that estimated for a similar increase in *Agricultural income*. The predicted probability of involvement is above 35% for respondents with business income of more than 800,000 BDT. In contrast, the probability of involvement is 19.2% for respondents with no business income.

7.3. Influential household involvement and anti-corruption

In step 3, we combine our survey data with the corruption indices generated from key informant interviews to examine

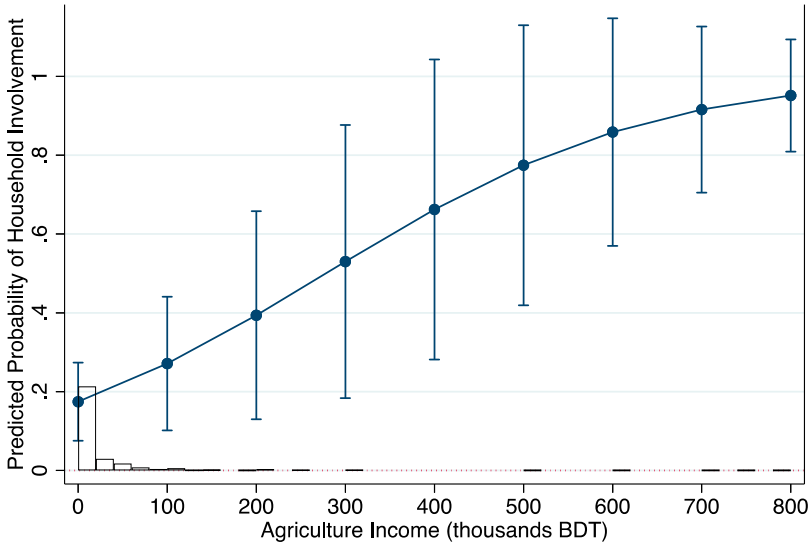

Figure 1. Predicted probability of household involvement as agricultural income increases.

Note: Predicted probabilities and corresponding 95% confidence intervals are based on the regression shown in Table 5. Agriculture income has a mean of 20,500 BDT and a standard deviation of 60,000 BDT.

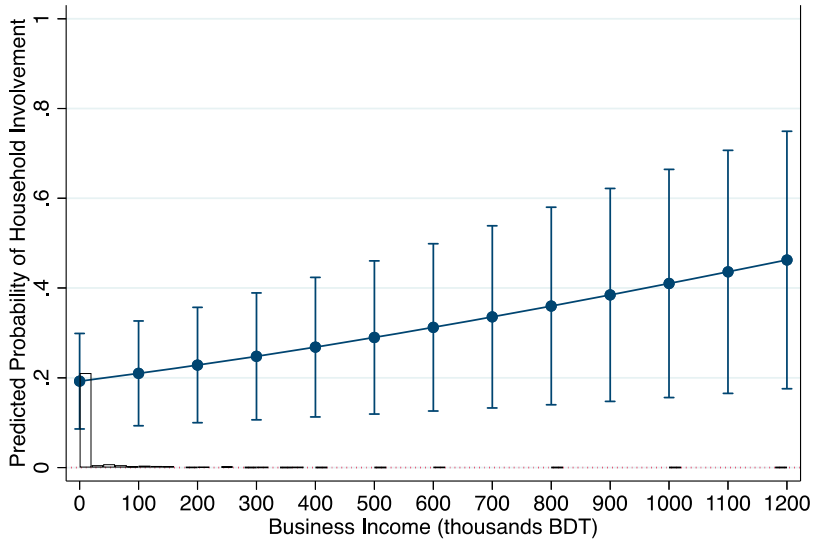

Figure 2. Predicted probability of household involvement as business income increases.

Note: Predicted probabilities and corresponding 95% confidence intervals are based on the regression shown in Table 5. Business income has a mean of 19,780 BDT and a standard deviation of 73,500 BDT.

H2, the relationship between household involvement in monitoring and the observed levels of corruption in the four climate projects. Table 6 reports the survey statistics on household involvement in project monitoring and corruption scores across our sites.

The first italicized row in Table 6 shows that projects where a higher percentage of all households were involved in monitoring had lower levels of corruption. In addition, the characteristics of the households involved in monitoring also matter. In lower corruption projects, a much higher percentage of the *involved* households was 'influential', proxied as households with above-average agricultural and/or business incomes. This is shown in the last italicized row. So, not only does the involvement of all households affect levels of corruption, in lower corruption projects, a much higher share of these monitoring households is made up of influential or powerful households. The results are summarized in Figure 3, which shows the data in the italicized lines of Table 6.

Table 7 provides further support for our hypothesis. It reports the share of households with above-average agricultural and/or business incomes involved in monitoring as a proportion of the total number of influential households in our project areas. This statistic captures the intensity of involvement of influential households $\frac{I_i}{i}$ in our four project areas as in equation (2). The last line in italics in Table 7 is shown visually in Figure 4.

Table 6. Households involved in monitoring project implementation and their characteristics.

	Cyclone shelters		Embankments	
Outcome measure	Barguna	Barishal	Barishal	Satkhira
Corruption Ranking Based on Key Informants	Lower	Higher	Lower	Higher
HHs surveyed	406	407	488	600
HHs involved in monitoring as % of all HHs	*36.7%*	*19.4%*	*25.8%*	*3.3%*
Involved influential HHs as % of all HHs involved in monitoring				
Involved HHs with high agricultural income	53.7%	17.7%	54.0%	20.0%
Involved HHs with high business income	11.4%	22.8%	15.1%	10.0%
Involved HHs with high agricultural and/or business income	*60.4%*	*39.2%*	*60.3%*	*25.0%*

Note: HH income is defined as high for values that exceed the category sample mean.

These tables and figures show several interrelated characteristics of our projects. First, corruption in otherwise identical projects was lower when the share of households in an area engaged in monitoring activities was higher. Secondly, in lower corruption projects, a higher percentage of the households involved in monitoring were influential households. This suggests that the impact of monitoring is higher when the monitoring households are influential. These two facts are from Table 6 and Figure 3. Thirdly, Table 7 and Figure 4 show an additional and related relationship. Corruption in projects was lower when a higher percentage of all the influential households in that locality was involved in monitoring. Said differently, when a larger share of influential households takes an interest in projects in their area, corruption is lower. All of these observations support our main hypothesis.

As we have defined influential groups with respect to *average incomes* in that area, and we measure the intensity of participation as a share of their total number, differences in the structure of local economies or the absolute numbers of richer people in an area cannot explain differences in intensity. The most plausible explanation is that some projects created greater potential benefits for local communities, and, in these projects, influential households became more involved in monitoring, and so did average households.

The level of involvement of both influential and average households is therefore correlated with observed levels of corruption. Our hypothesis H2 that influential citizens have a strong effect on anti-corruption through informal power networks, is consistent with this evidence. While greater citizen

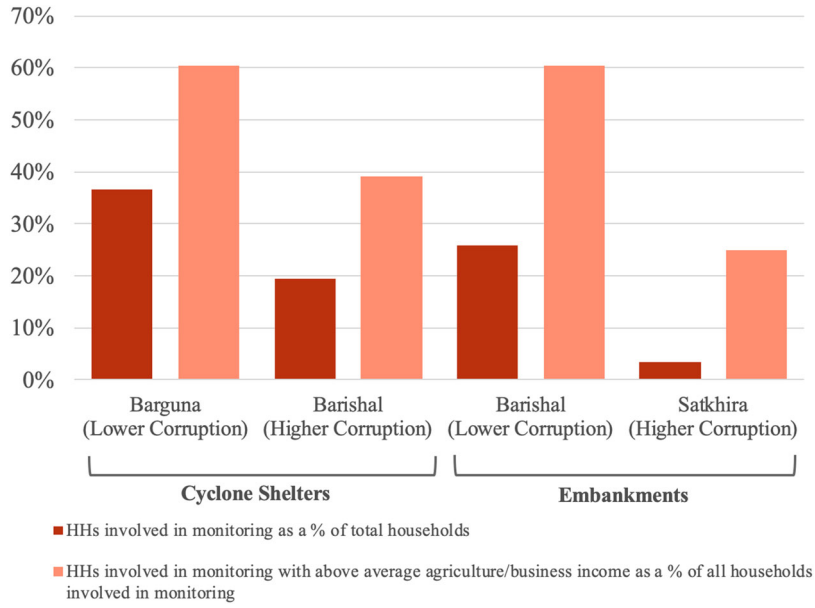

Figure 3. Involvement of all households and 'influential' households in monitoring.

Table 7. 'Influential' households involved in monitoring as a share of all influential households.

	Cyclone shelters		Embankments	
Outcome measure Corruption Ranking Based on Key Informants	Barguna Lower	Barishal Higher	Barishal Lower	Satkhira Higher
HHs surveyed with high agricultural income	133	61	158	77
HHs surveyed with high business income	45	81	74	97
HHs surveyed with high agricultural/business income	167	134	206	167
Involved influential HHs as a % of all influential HHs				
% of high agricultural income HHs involved in monitoring	60.2%	23.0%	43.0%	5.2%
% of high business income HHs involved in monitoring	37.8%	22.2%	25.7%	2.1%
% of high agricultural/business income HHs involved in monitoring	*53.9%*	*23.1%*	*36.9%*	*3.0%*

Note: HH income is defined as high for values that exceed the category sample mean.

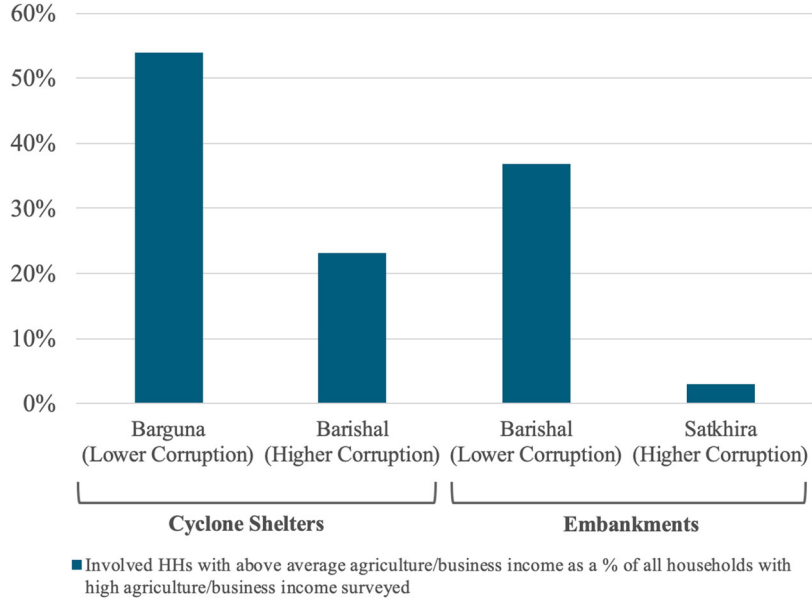

Figure 4. The share of 'influential households' involved in monitoring as a proportion of all influential households.

Note: Percentages of involved individuals with above-average agricultural or business income as a share of all individuals with above-average agricultural and business incomes in the project areas.

involvement does not remove corruption entirely, the differences in the incidence of corruption and associated impact on reported construction quality are significant from a policy perspective.

8. Discussion and conclusion

Pervasive corruption in the implementation of climate adaptation projects in Bangladesh has significantly affected the country's ability to prepare for climate change (Mahmud & Prowse, 2012; Rahman, 2018). Our analysis suggests that much more could be done to exploit the informal processes through which corruption is better controlled in some projects – namely, where citizens, and particularly influential individuals, are involved in informal monitoring *in their own interest*. We find that substantial differences in levels of corruption across similar climate projects are at least partly attributed to the greater involvement of influential societal groups, most notably land and business owners. We argue that these influential groups can generate informal pressures on contractors and officials when they directly benefit from project completion. In contexts of weak formal governance, these informal and usually unobservable pressures are an immediate and effective way of constraining corruption. Strengthening formal institutions and the rule of law is important in the longer run, but these are processes that can take decades to show results (Khan 2018).

Our evidence suggests a feasible strategy for enhancing the involvement of influential groups: design climate change projects to maximize dual-use benefits for local communities. Dual-use investments deliver immediate benefits to the local community and help them to respond to future climate change challenges. In our sample of projects, river embankments served as roads, and cyclone shelters as schools or community centres. Our data does not say that benefits need to be *targeted* to the influential. Rather, any community dual-use benefits are particularly beneficial for influential groups who are more able to use them. From the perspective of anti-corruption, this is no bad thing, because by drawing in these groups, effective anti-corruption can be achieved.

The generalizability of these findings to other contexts will depend on local social organization and the presence of sufficiently large numbers of locally influential and powerful individuals who can use informal power to constrain corruption in projects. Generalizability will also depend on whether lower corruption during the construction of projects can sufficiently improve dual-use benefits to make the monitoring activity worthwhile. This may not always be the case. Nevertheless, the generalizable result is that an important strategy for reducing corruption and improving project quality is to look for ways of increasing the self-interested participation of individuals who have the capacity to make a difference to corruption outcomes. Many features of project design will be technically determined by the location of rivers, feasible sites for cyclone shelters and so on. But, in practice, there are significant design choices at relatively low cost, for instance by asking if the benefits of new roads could be enhanced by linking to other roads, extending the embankment a little further, selecting the precise location of embankments or shelters, changing the specifications of roads and shelters to maximize economic benefits for the local community, and so on.

The best way of ensuring the maximization of feasible dual-use benefits is to engage local communities at the design phase (Fischer, 2020; Omukuti, 2020). If local engagement proves difficult, development partners and anti-corruption activists could at least ensure that projects are deliberately and carefully designed to provide the highest level of community benefits based on comparisons of alternative designs while also meeting the climate adaptation requirements. This may be sufficient to ensure that projects deliver enough immediate benefits to trigger the types of community involvement that can control corruption.

Acknowledgements

The surveys and data collection for this research were conducted by a large team at Transparency International Bangladesh. We would like to thank Newazul Moula and the survey team.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This publication is an output of the SOAS Anti-Corruption Evidence (ACE) research consortium funded by UK aid from the UK Government [IATI Identifier: GB-1-203752, Contract P07073]. The views presented are those of the author(s) and do not necessarily reflect the UK government's official policies or the views of SOAS-ACE or other partner organizations. For more information on SOAS-ACE visit www.ace.soas.ac.uk.

Notes on contributors

Mushtaq Khan is a Professor of Economics and Chief Executive of the Anti-Corruption Evidence (ACE) Research Consortium at SOAS University of London. He has a BA in Philosophy, Politics and Economics from the University of Oxford and an MPhil and a PhD in Economics from the University of Cambridge. His research focuses on development economics, governance, rent seeking and corruption, industrial policy and institutional economics, https://www.soas.ac.uk/staff/staff31246.php.

Mitchell Watkins is a postdoctoral research associate at the Anti-Corruption Evidence (ACE) Research Consortium at SOAS University of London. He holds a PhD in Political Science from the University of North Carolina at Chapel Hill. His research focuses on the political economy of foreign aid and governance in developing countries.

Salahuddin Aminuzzaman is a professor in the Department of Public Administration, University of Dhaka and an Adviser at the South Asian Institute of Policy and Governance, North South University, Dhaka, Bangladesh. He has Bachelor's and Master's degrees in Public Administration from the University of Dhaka and a Ph.D. from the University of the Philippines. His research interests include public policy, development management, and National Integrity Systems.

Sumaiya Khair is a Professor at the Department of Law, University of Dhaka, Bangladesh, and Adviser Executive Management at Transparency International Bangladesh (TIB). She has a Ph.D. from the United Kingdom, where she was also a Commonwealth Postdoctoral Academic Fellow. Her areas of interest include human rights, humanitarian law, child rights, legal empowerment, refugees and migration, governance and anti-corruption, labour standards and gender issues.

Muhammad Zakir Hossain Khan is Executive Director of Change Initiative, a think tank working on climate, environment, and natural resource management. He has also worked at Transparency International

Bangladesh (TIB) as climate finance governance analyst. His research interests include governance and policies affecting climate finance, environment, water and disaster risk management. He holds an MSc in Economics from North South University, Dhaka, Bangladesh.

ORCID

Mushtaq Khan http://orcid.org/0000-0002-1145-0950
Mitchell Watkins http://orcid.org/0000-0001-9816-1926
Muhammad Zakir Hossain Khan http://orcid.org/0000-0002-5163-245X

References

Adams, N., Dasgupta, S., & Sarraf, M. (2011). *The cost of adapting to extreme weather events in a changing climate*. World Bank Policy Research Paper No. 67845. World Bank.

Adekola, O., Lamond, J., Adelekan, I., & Eze, E. B. (2020). Evaluating flood adaptation governance in the city of calabar, Nigeria. *Climate and Development*, *12*(9), 840–853. https://doi.org/10.1080/17565529.2019.1700771

Ahmad, A., McCulloch, N., Al-Masri, M., & Ayoub, M. (2022). From dysfunctional to functional corruption: The politics of decentralized electricity provision in Lebanon. *Energy Research & Social Science*, *86*. https://doi.org/10.1016/j.erss.2021.102399

Alam, M. W., Rahman, F., Alam, M. N., Julkarnayeen, M., Das, K. B., & Mina, N. H. (2017). *Corruption in service sectors: National household survey 2017*. Transparency International Bangladesh.

Anderson, G., Mack, C., Khan, M. Z. H., Khondker, R., & Hyman, E. (2017). *Climate finance in Bangladesh: Situation analysis*. Climate Economic Analysis for Development, Investmen. t and Resilience (CEDAIR) Activity. Crown Agents USA and Abt Associates. Prepared for the United States Agency for International Development.

Baudoin, M. A. (2014). Enhancing climate change adaptation in Africa assessing the role of local institutions in southern Benin. *Climate and Development*, *6*(2), 122–131. https://doi.org/10.1080/17565529.2013.844677

Centre for Environmental and Geographic Information Services (CEGIS). (2009). *Report on cyclone shelter information for management of tsunami and cyclone preparedness*. CEGIS, Ministry of Food and Disaster Management.

Davis, J. (2004). Corruption in public service delivery: Experience from South Asia's water and sanitation sector. *World Development*, *32*(1), 53–71. https://doi.org/10.1016/j.worlddev.2003.07.003

Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2019). *Global climate risk index 2020*. Germanwatch.

Fischer, H. W. (2020). Policy innovations for pro-poor climate support: Social protection, small-scale infrastructure, and active citizenship under India's MGNREGA. *Climate and Development*, *12*(8), 689–702. https://doi.org/10.1080/17565529.2019.1676690

Government of Bangladesh. (2020). *Climate financing for sustainable development: Budget report 2019-2020*. Government of Bangladesh.

Haque, M., Rouf, M., & Khan, M. Z. H. (2012). *Climate Finance in Bangladesh*. Transparency International Bangladesh. (https://www.ti-bangladesh.org/beta3/images/max_file/wp_cfg_cfgp_12_en.pdf)

Haque, M., Rouf, M., & Khan, M. Z. H. (2013). *Challenges in climate finance governance in Bangladesh and way out*. Transparency International Bangladesh. (https://www.ti-bangladesh.org/beta3/images/max_file/fr_cfg_October_13_en.pdf)

Hossain, N. (2010). Rude accountability: Informal pressures on frontline bureaucrats in Bangladesh. *Development and Change*, *41*(5), 907–928. https://doi.org/10.1111/j.1467-7660.2010.01663.x

Intergovernmental Panel on Climate Change (IPCC). (2018). *Glossary of terms*. IPCC. (https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf)

Islam, R., Walkerden, G., & Amati, M. (2017). Households' experience of local government during recovery from cyclones in coastal Bangladesh: Resilience, equity, and corruption. *Natural Hazards*, *85*(1), 361–378. https://doi.org/10.1007/s11069-016-2568-6

Jakob, M., Steckel, J. C., Flachsland, C., & Baumstark, L. (2015). Climate finance for developing country mitigation: Blessing or curse? *Climate and Development*, *7*(1), 1–15. https://doi.org/10.1080/17565529.2014.934768

Johnsøn, J., Taxell, N., & Zaum, D. (2012). *Mapping evidence gaps in anti-corruption: Assessing the state of the operationally relevant evidence on donors' actions and approaches to reducing corruption. U4 issue October 2012 No. 7*. U4 Anti-Corruption Resource Centre.

Khan, M. H. (2006). Determinants of corruption in developing countries: The limits of conventional Economic analysis. In S. Rose-Ackerman (Ed.), *International handbook on the Economics of corruption* (pp. 216–244). Edward Elgar.

Khan, M. H. (2013). Bangladesh: Economic growth in a vulnerable limited access order. In D. North, J. Wallis, S. Webb, & B. Weingast (Eds.), *In the shadow of violence: Politics, Economics, and the problems of development* (pp. 24–69). Cambridge University Press. (http://eprints.soas.ac.uk/11680/1/Bangladesh_LAO.pdf)

Khan, M. H. (2017). *Anti-Corruption in Bangladesh: A political settlements analysis*. ACE Anti-Corruption Evidence Working Paper No. 003. SOAS University of London. (https://ace.soas.ac.uk/working-paper-3/)

Khan, M. H. (2018). Political settlements and the analysis of institutions. *African Affairs*, *117*(469), 636–655. (https://academic.oup.com/afraf/article/117/469/636/4690667) https://doi.org/10.1093/afraf/adx044

Khan, M. H. (2019). Institutions and development. In D. Nayyar (Ed.), *Asian transformations: An inquiry into the Development of nations* (pp. 321–346). Oxford University Press. (http://fdslive.oup.com/www.oup.com/academic/pdf/openaccess/9780198844938.pdf)

Khan, M. H., Andreoni, A., & Roy, P. (2019). *Anti-corruption in adverse contexts: Strategies for improving implementation. SOAS-ACE Working Paper No. 13*. SOAS University of London. (https://ace.soas.ac.uk/wp-content/uploads/2019/09/ACE-WorkingPaper013-AntiCorruptionAdverseContexts-Text-190909.pdf)

Knox, C. (2009). Dealing with sectoral corruption in Bangladesh: Developing citizen involvement. *Public Administration and Development: The International Journal of Management Research and Practice*, *29*(2), 117–132. https://doi.org/10.1002/pad.523

Levi, M., & Sacks, A. (2009). Legitimating beliefs: Sources and indicators. *Regulation & Governance*, *3*(4), 31–333. https://doi.org/10.1111/j.1748-5991.2009.01066.x

Lockwood, M. (2013). What can climate-adaptation policy in Sub-saharan Africa learn from research on governance and politics? *Development Policy Review*, *31*(6), 647–676. https://doi.org/10.1111/dpr.12029

Mahmood, M. N., Dhakal, S. P., & Keast, R. (2014). The state of multi-purpose cyclone shelters in Bangladesh. *Facilities*, *32*(9/10), 522–532. https://doi.org/10.1108/F-10-2012-0082

Mahmood, S. A. I. (2010). Public procurement and corruption in Bangladesh confronting the challenges and opportunities. *Journal of Public Administration and Policy Research*, *2*(6), 103–111.

Mahmud, T., & Prowse, M. (2012). Corruption in cyclone preparedness and relief efforts in coastal Bangladesh: Lessons for climate adaptation? *Global Environmental Change*, *22*(4), 933–943. https://doi.org/10.1016/j.gloenvcha.2012.07.003

Masum, M. R. A., & Khan, M. Z. H. (2020). *Climate change mitigation finance and project implementation in Bangladesh: Governance challenges and way forward*. Transparency International Bangladesh. (https://www.ti-bangladesh.org/beta3/images/2020/report/Mitigation-Finance/Mitigation_Finance_Governance_ES_EN.pdf)

Mohiuddin, G., Raouf, M., & Masum, M. R. A. (2017). *Climate finance and governance in project implementation: The case of Bangladesh Water Development board*. Transparency International Bangladesh. (https://www.ti-bangladesh.org/beta3/images/2017/Final_products_of_BWDB_study_2017/Full_Report_(English)_BWDB_CFG_TIB_23082017.pdf)

Omukuti, J. (2020). Do country-owned adaptation interventions reflect local level priorities? Application of a framings approach. *Climate and Development*, *12*(9), 827–839. https://doi.org/10.1080/17565529.2019.1699394

Pasquini, L. (2020). The urban governance of climate change adaptation in least-developed African countries and in small cities: The engagement of local decision-makers in Dar es Salaam, Tanzania, and karonga, Malawi. *Climate and Development*, *12*(5), 408–419. https://doi.org/10.1080/17565529.2019.1632166

Persson, A., Rothstein, B., & Teorell, J. (2013). Why anticorruption reforms fail—systemic corruption as a collective action problem. *Governance*, *26*(3), 449–471. https://doi.org/10.1111/j.1468-0491.2012.01604.x

Pouliotte, J., Smit, B., & Westerhoff, L. (2009). Adaptation and development: Livelihoods and climate change in subarnabad, Bangladesh. *Climate and Development*, *1*(1), 31–46. https://doi.org/10.3763/cdev.2009.0001

Rahman, M. A. (2018). Governance matters: Climate change, corruption, and livelihoods in Bangladesh. *Climatic Change*, *147*(1), 313–326. https://doi.org/10.1007/s10584-018-2139-9

Rahman, T., & Bhuiyan, S. H. (2016). Multipurpose community telecenters in rural Bangladesh: A study of selected union information and service centers. *Information Development*, *32*(1), 5–19. https://doi.org/10.1177/0266666913518445

Rai, N., Huq, S., & Huq, M. J. (2014). Climate resilient planning in Bangladesh: A review of progress and early experiences of moving from planning to implementation. *Development in Practice*, *24*(4), 527–543. https://doi.org/10.1080/09614524.2014.908822

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity*, *52*(4), 1893–1907. https://doi.org/10.1007/s11135-017-0574-8

Sharma, V., Orindi, V., Hesse, C., Pattison, J., & Anderson, S. (2014). Supporting local climate adaptation planning and implementation through local governance and decentralised finance provision. *Development in Practice*, *24*(4), 579–590. https://doi.org/10.1080/09614524.2014.907240

Sharmin, N., Rahman, F., Mohiuddin, G., & Juel Miah, A. S. M. (2017). *Climate finance and local government institutions: Governance in project implementation*. Transparency International Bangladesh. (https://www.ti-bangladesh.org/beta3/images/2017/Report_LGCFG_study23012017_Final.pdf)

Trapnell, S. E. (2015). *User's guide to measuring corruption and anti-corruption*. United Nations Development Programme.

World Bank. (2013). *Coastal embankment improvement project*. World Bank. (https://projects.worldbank.org/en/projects-operations/project-detail/P128276?lang = en&tab = overview)

World Bank. (2015). *Multipurpose disaster shelter project*. World Bank. (https://projects.worldbank.org/en/projects-operations/project-detail/P146464?lang = en)

World Bank. (2016). *Climate change poses urgent threat to poor of coastal Bangladesh*. World Bank. (https://www.worldbank.org/en/news/feature/2016/06/24/climate-change-poses-urgent-threat-to-poor-of-coastal-bangladesh)