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Public and Private Involvement in CDM Projects: Insights  
for Future Carbon Markets and Public-Private  
Partnerships in Sustainable Development

By

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## Abstract

Clean Development Mechanism projects have waxed and waned in their popularity and have expired as of 2020. As we look towards the future of sustainable development initiatives in carbon financing and carbon markets, we must learn from the lessons the CDM initiative provides us. Though CDM projects were critiqued mainly for their additionality problem, this paper focuses on public-private interactions and their impact on local stakeholders and CDM projects as a whole. This research analyzes data from 258 project design documents from the CDM registry for registered projects in Vietnam from 2008-2019. The results reveal differences in project types, local stakeholder impacts, and the level of documentation and reporting with majority public versus majority private participation. This is a first step in gleaning some lessons from CDM public-private partnerships and paves the way for further investigation into best practices going forward.

## Introduction

Sustainable development promotes a framework focused on meeting the needs of the present without compromising the needs of future generations (SDG, WEF, UNFCCC). As we reckon with climate change, we have come to realize development cannot continue solely focusing on GDP growth and consumption. Continuing to shovel fossil fuels into national growth agendas will only continue to compromise our future needs for current ones - ill-advised since we have already begun facing the effects of such choices (IPCC, World Bank). Therefore, academics have been turning to the field of sustainable development for solutions. As entities have innovated and created various initiatives for solving climate change issues, we have been forced to come to terms with the fact that there is no one solution that will solve this problem (World Bank, 2014). Each new policy comes with its own set of complications and contradictory impacts that create new barriers. One such policy born out of the Kyoto Protocol is the Clean Development Mechanism (UNFCCC, 2022).

The United Nations Framework Convention on Climate Change (UNFCCC) has been running climate conferences for years and one of the more noteworthy outcomes was the Kyoto Protocol. The Kyoto Protocol asked Annex I countries (mostly developed countries) to commit to reducing or capping their greenhouse gas emissions to help curb global warming. On average, participating countries' commitments reduced emissions by 5% compared to 1990 levels while in effect from 2008-2012 (UNFCCC, 2022). Under the Protocol, there are several ways a country could meet these goals: implementing policies nationally that would mandate emission reductions, trading emissions on an international market, engaging in clean development mechanism (CDM) projects, and through joint implementation projects. Countries with emission

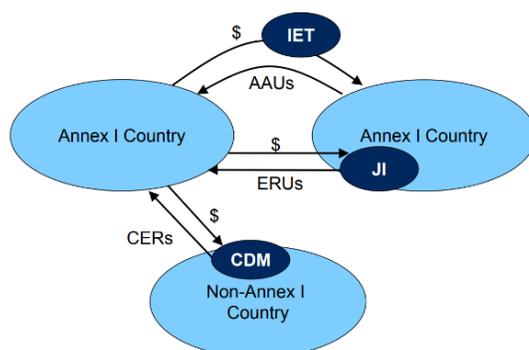
units to spare could trade with a country that needed more emission units under the trading scheme - this is what has been widely called the carbon market. Opting into the CDM allows for countries with emission reduction commitments to build an emissions reduction project in a developing nation. These projects can earn certified emission reductions (CER) equivalent to one tonne of CO<sub>2</sub>, which can be added toward a country's own targets. The abatement costs in these emerging markets are far lower than abatement costs in the financing country - leading to reductions at a far lower price and offering flexibility in the attainment of emission commitments (UNFCCC, 2022). Finally, joint implementation is similar to CDM, but the project is carried out in another country with emission reduction targets (typically other Annex I countries).

Though the Kyoto Protocol effectively ended in 2012 (with a brief resurgence thanks to the short-lived Doha Amendment that legally extended the efforts of Kyoto until 2020), many of the mechanisms put in place by the Kyoto Protocol still found themselves to be reasonably successful. It helped mobilize partnerships across the globe, stimulate the flow of investment and development to developing countries, and raised funds for sustainable development initiatives effectively. As of 2018, CDM projects have raised \$303.8 billion in climate and sustainable development projects and mobilized almost 140 countries in engaging (CDM Achievements and Benefits at a Glance, 2018). The Kyoto Protocol took a critical first step towards a sustainable future - and through its various mechanisms and innovations created a framework for carbon financing and climate change mitigation tactics in the context of development.

CDM projects provide an interesting example of public-private partnerships and corporate social responsibility in effect since it is entirely voluntary and project participants have a wide range of options with regards to how to implement emission reduction projects. Investigating exactly what private and public involvement means in sustainable development will help shape better

policies in the future that will leverage them with greater efficiency. CDMs also offer insight into developed and developing nation interactions and how power differentials can create gaps in a policy's intentions and impact (Wittneben, 2007). Academics have pointed out that sustainable development can inadvertently provide a new arena for old power differentials to re-establish themselves through unequal development, extractive projects under the banner of sustainability, and “dirty development” with CERs acting as essentially a subsidy for industries to pollute in lower-income countries (Evans and Musvipwa, 2017). This paper investigates how power differentials and public-private interactions play out in the context of CDMs in order to inform best practices for the future.

Figure 1: The Kyoto Flexibility Mechanisms

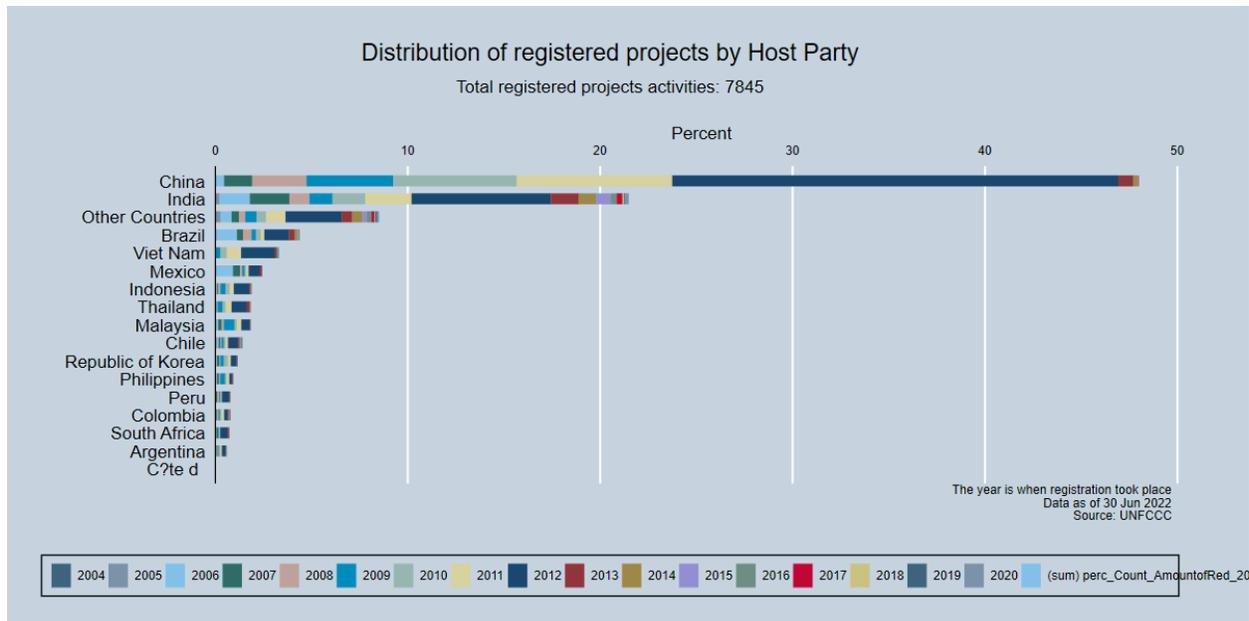


(Guidebook to Financing CDM Projects, 2007)

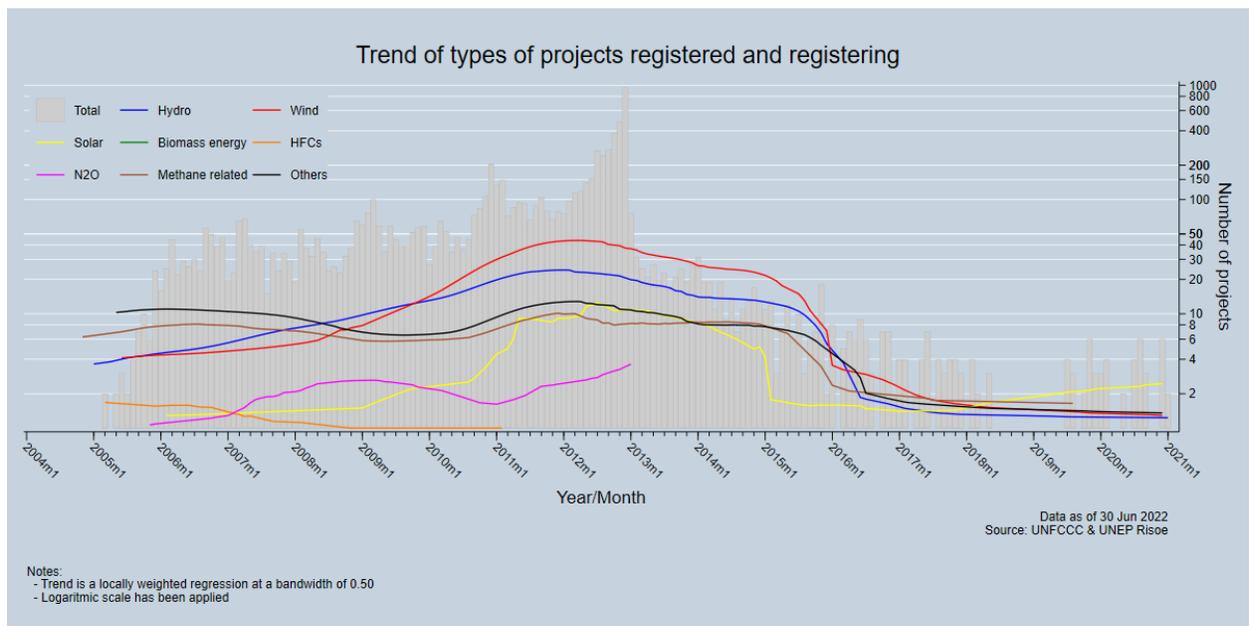
CDM projects typically involve investors from developed nations undertaking emission reduction projects in developing countries like hydropower or waste gas harnessing projects. The main steps for a project to receive approval are submission of a “project feasibility assessment, development of a project design document (PDD), host country approval, project validation, registration, emission reduction verification and credit issuance” (Guidebook to Financing CDM

Projects, 2007). The important stakeholders at play here are the CDM project developer, a Designated Operational Entity (DOE) responsible for project validation and verification, a Designated National Authority (DNA) from the host country to approve the project, and the CDM executive board to facilitate the process. CER credits can also be bought and sold by private entities, speculators, and governments that have emission reduction requirements which lead to various investors signing on to be a participant in a project and working through an expert entity in the field like a hydropower construction firm.

Despite having a late CDM start with projects only starting in 2008, the country of Vietnam provides an attractive candidate when trying to better understand CDMs and public-private partnerships. Vietnam has the fourth highest number of registered projects after India, China, and Brazil with a representative sample of CDM projects that mirrors the population (See figures below). Vietnam's centrally planned economy means that many of its economic sectors are run by the government. State-owned enterprises dominate the electricity sector and. The Vietnamese government has assigned the Ministry of Natural Resources and Environment of Vietnam to oversee CDM projects as the DNA and most other climate change projects as well (Nguyen et. al. 2011). With such a strong public sector it provides an ideal host country to study public-private interactions.

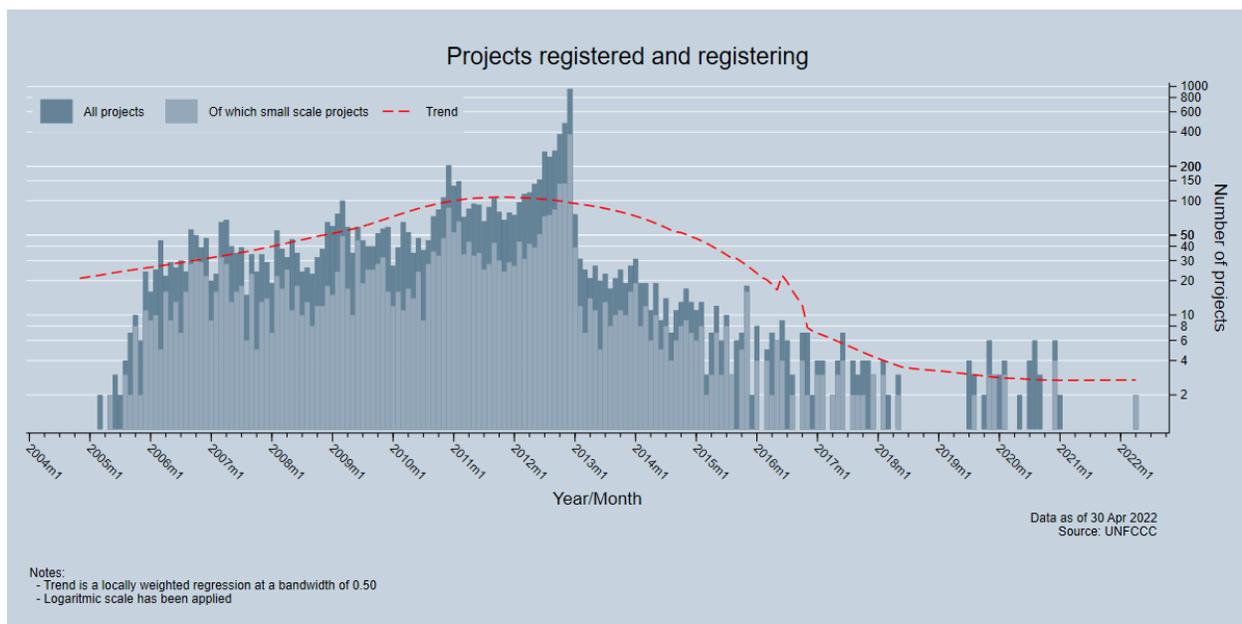


(UNFCCC, 2022)



(UNFCCC, 2022)

The requirements of the Kyoto protocol state that any registered CDM project must reduce emissions in the host country that would not be reduced without the CDM credit and must involve some sort of sustainable development benefit like technology transfers. Additionality, the idea that the greenhouse gas emission (GHG) reduction would not occur without the help of an offset like a CER, was a highly contested requirement since it turned out to be hard to prove. CDM projects and CER emission market trading reached their peak in popularity around 2012 and have been in decline since then. In 2020, CDM projects and administration expired under the renewed Doha Amendment which means we likely will not see any new CDM project activity. There has been discussion around a new carbon finance market that will replace the CDM market which makes this a timely study to understand from past experience the strengths and weaknesses of the CDM market.



(CDM UNFCCC, 2022)

The sheer volume of projects registered during CDM's active years shows the great success of the initiative, especially for a first attempt at an international carbon financing endeavor.

Unfortunately, due to a carbon panic in 2012, the CER market crashed from a high of 25 Euros/tCO<sub>2</sub> in 2008 to .5 Euro/tCO<sub>2</sub> (VoxEU, 2022). This experimentation in carbon financing and meticulous standardization and documentation, however, gives us insight into how public-private partnerships and how developing and developed nations interact in a sustainable development context.

Public-private partnerships have gained a lot of interest as a way to generate funding for conservation and sustainability that is waiting to be "unlocked". The Clean Development Mechanism is one of the earliest and most well-documented examples of such projects. It is one of the first standardized global funding and crediting mechanisms for undertaking emission reduction projects. It is monitored and administered by the UNFCCC and there is an extensive database of active, registered, rejected, and past projects. With 8,231 registered projects in the database, 140 countries participating, and highly detailed documents for each project, this dataset provides useful insight into how CDM projects are planned and implemented.

Some of the biggest public funding options for global sustainability projects currently are the World Bank BioCarbon Fund, the Clean Development Mechanism, the Global Environment Facility and the Green Climate Fund. These offer an opportunity for bilateral and multilateral investments in sustainable development and emission reductions. However, they have only made a small dent in the financing needed to accomplish the IPCC goal of restricting global warming to 2° Celsius. Thus, new funding structures and collaborations are necessary for developing solutions. This is where private sector involvement and funding are encouraged as a way to generate revenue that can fill the gap (Clark et. al. 2018). However, according to a report by the

Intergovernmental Committee of Experts on Sustainable Financing, there are potential pitfalls with increased private participation. There is less oversight, potential for a lack of long-term benefits to the host country, and bias in the types of projects undertaken to maximize benefits to the donor. Thus, they emphasize the need for investment in long-term projects that are country-led and engage in multilateral cooperation (UNSDG, 2014).

This question of how to balance private interests and public good brings us to corporate social responsibility. Heikkurinen and Bonnedahl argue that “the replacement of societal and governmental actors with business actors has had implications for the power structures within and between societies,” (Heikkurinen & Bonnedahl, 2013). Due to these changes in power structures, it is important to evaluate the impact of this change specifically within sustainable development and socioeconomic and environmental justice contexts. Though the market is assumed to be a neutral and efficient way to meet growing demand, it can lead to unintended results in how the various actors involved are impacted. Studying the CDM market, who the participants are, how projects have been implemented over the course of the past decade, and the impact of public and private involvement will hopefully shed light on what public-private partnerships looks like. With the UN and its SDGs increasingly promoting public-private partnerships as a way to bridge the funding gap in sustainable development, it is critical we take lessons from past experiences and apply them going forward (KS et. al., 2016). This will help inform future investigations into what the actual impacts of the Kyoto protocol were and where this leaves us for future sustainable development projects where there are interactions between public/private and developing/developed actors.

Vietnam was not under any commitments to reduce their greenhouse gas emissions under the original Kyoto protocol. However, at COP26, it committed to reach net-zero carbon by 2050 and

reduce emissions by 9% (Dezan Shira & Associates, 2021). Voluntary emission reductions and an interest in sustainable development is a common goal pursued by CDM host countries and Vietnam was no exception- taking on several CDM projects of their own to receive CER credits for greenhouse gas emission reductions in accordance with their self-imposed net-zero carbon goals.

## Literature review

### CDM Projects

According to Brunt and Knechtel, of the various types of CDM projects registered, renewable energy projects administered as a small-scale CDM project have the most benefits for poverty reduction. Some of the benefits realized through these projects include clean water access, improved education and gendered benefits, and income increases.

Despite research showing small-scale renewable energy projects have the most potential to accomplish Kyoto Protocol sustainable development goals, a study on small-scale CDM projects analyzing their impacts shows that the potential benefits have not necessarily been realized. They used project design documents to score employment generation, access to electricity, education, socio-economic development, and stakeholder perception. On average, every category scored only a minor beneficial impact even in seemingly obvious categories like electricity access for an electricity generation project. The researchers also followed up on their analysis by surveying five of the sites where these projects were located and found that the projects with government involvement and local stakeholder participation tended to deliver on promises and provide more benefits than private projects that excluded local stakeholders (Subbarao & Lloyd, 2011).

Another concern that arose with the project design documents is the lack of oversight or accountability for following through on promised goals. One study points out that project

developers will choose a higher internal rate of return benchmark to be able to validate CDM credits and widen profit margins since there is no set benchmark IRR rate (Watts, Albornoz, & Watson, 2015).

Furthermore, a significant concern that has been widely studied and brought up with respect to CDM projects in general is the issue of additionality. Doubt has been cast upon CDM projects for taking advantage of the system by trying to get credits for a project that would occur anyway even without the added incentive - which reduces the original Kyoto Protocol initiative's efficacy. However, in response, the CDM board has required project developers to prove that the project would not occur without CER credits as an added incentive. This seems to have helped the problem but still not eradicated additionality. One study conducted in 2011 evaluated CDM projects' effect on reducing sulfur dioxide emissions in China using an indirect estimation of the connection between income and emissions based on the Kuznets curve. They find that it is uncertain if CDMs really contributed to emission reductions or if these projects would have happened anyway. "As of 2008, the cumulative installed capacity of wind power in China was 12,152.79 MW, of which 11,389.58 MW was installed during 2005–2008.<sup>15</sup> In the same period, the CDM wind farms generated a total capacity of 5154.92 MW. This suggests that about 55% of wind power projects have been built without the assistance of the CDM" (Zhang & Wang, 2011). There have also been questions concerning the misplaced incentives that lead to biases in the kinds of projects undertaken and successfully completed. The types of projects that are most often proposed by developers are those that bring the greatest CER revenues, clean energy generation projects, and those involving large organizations with technical expertise (Thomas et al., 2010). This can result in an over-representation of projects that are the least expensive rather

than maximizing projects that maximize emission reductions and are beneficial for the host country's sustainable development.

Another requirement by the CDM board for certification is that project developers must demonstrate in their PDDs how their project will benefit the host country in their development. The most common responses are technology transfers and providing employment locally while the project construction is ongoing. With respect to local employment, the impacts that were stated by developers were mixed with certain sectors (like agriculture) being negatively impacted while manufacturing is positively impacted. However, these effects are small to begin with, and fade away after 1-3 years of construction and operation beginning (Mori-Clement & Bednar-Friedl, 2019). This suggests the sustainable development contribution stated in many PDDs is overstated with respect to creating jobs and stimulating the local economy's employment levels. Regarding technology transfer claims, studies have shown around 43% of registered CDM projects claim to transfer technology - and typically these claims are vague and usually reference simply the use of technology that doesn't already exist in the host country for the project. One study demonstrates through a literature review and independent data analysis that the mechanisms and technology that projects claim to bring to host countries actually evolved separately and were not due to the CDM project (Lema and Lema, 2013).

### Geographical Context

Vietnam had huge potential for CDM project implementation in the height of the activity since it had abundant natural resources to harness, high demand for electricity, and inefficient uses of energy. Electricity generation was a primary focus for both the Vietnamese government and for project builders since there was both abundant potential and demand. Demand for electricity in Vietnam increased by 14.9% per year between 1996-2000, 15.3% from 2001-2005, and 14.1% in

2006-2007 (Nguyen, 2011). It had a slow start in implementation due to low capacity in the government for approval and monitoring of project activity, appeared more risky to investors and builders, and a lack of standardized criteria by the CDM board for the country. Despite this, project activity skyrocketed beginning in 2008 and now it has one of the highest number of registered projects in the world.

## Methodology

This study provides qualitative and quantitative coding of CDM projects with particular attention paid to their funding and participant makeup. To understand how these projects have shaped up and how that impacts the kinds of projects that are successful, there are 31 variables measured in this study. There have been many studies showing that there are several issues with the CDM process and biases but most have either focused on outcomes on GHG emissions or tend to be older studies from 2010 and before. There are some studies that analyze biases in the types of projects chosen, but again, tend to be older from 2012 and before. There are no studies that divide participant and investor makeup and analyze their impacts on local stakeholders.

By collecting data on the kinds of projects registered in the study and variables from their design documents, I compare how public and private participants or investors affect these projects. This focus stems from research that has shown that (1) sustainable development projects with private actors playing a large role changes the power dynamics between those involved and (2) the understanding that there hasn't been much research on the inherent power differentials that could arise from developed nations paying for projects in developing nations. This will help illuminate where there needs to be more research on the correlations found in this paper and gaps in research that could be filled.

The author collected data from the UNFCCC registry on registered CDM projects from 2008 to 2019 in Vietnam, and coded for funding, location, participation, and purpose variables. Vietnam was chosen because it has one of the highest rates of registered CDM projects and has a similar makeup of projects to the overall types of projects undertaken through CDMs. Only registered projects were included in the dataset because those that were deregistered or failed to be accepted had too much variability in the projects for the stage they reached in project implementation before being disqualified. Registered projects have some level of standardization and verification by the CDM Board which provides a more consistent dataset.

The set of variables coded in this study are collected from documentation in the project design documents. On average, there were some variables that were much more consistently reported than others and I will discuss why that may be the case later. However, with all the parameters in place, there were 258 projects to code for this study which provides a sizable sample to analyze. I analyzed what kinds of projects seem to predominantly be proposed and approved in the CDM process and why that seems to be the case. This study will highlight general trends in CDM projects with respect to participant and investor makeup as well as other relevant descriptive variables like their CER trading price and investment costs.

The variables included in this dataset are listed in the table below. PDDs include detailed information for a lot of the variables but also are purposefully vague at times with certain variables. For instance, the purpose of a lot of international investors is very unclear with their name being listed as a participant but not explained in any other part of the document. This makes it difficult to decipher who is investing, participating, and what role each actor plays. It seems to be purposeful since the same participants are listed whenever a document is unclear - like Sweden Carbon Assets or Bunge Emissions Holdings Sarl. CER prices and conversions

from VND to USD are done at the rate that would have been relevant at the time of registration. Every project is required to prove they contribute to the host country's development as well as accept local stakeholder comments. Thus, positive project impacts are any positive sustainable development impacts listed by the project builder and negative project impacts are any concerns listed by stakeholders in the comments. However, on average, there are more positive impacts listed than negative impacts irrespective of participant or investor makeup which could be due to the overstatement problem that other studies have mentioned (Dechelzeptre, 2008) (Ghatala, 2006). Or, perhaps, there really are greater development contributions than negative impacts. Vietnam has a single-party centrally planned economy that has several state-owned enterprises that provide public services. State-owned enterprises make up 28% of the GDP and span a wide variety of sectors from gasoline to banking to agriculture (ADB, 2021). This affects the way the host country addresses CDMs since DNAs change from project to project and many times tend to be state-owned enterprises. Some examples we see in these CDM projects include Petrovietnam, State Capital Investment Corporation, Vietnam Bank for Rural and Agricultural Development, and Bank for Investment and Development of Vietnam. Though they are technically state-owned which means there is some degree of public influence and control of these projects, they are listed as private entities in many of the PDDs. However, since the government is so heavily involved, these state-owned enterprises are included in the public category.

Variable	Units	Relevant Question
Type of Project	Waste Gas Harnessing Hydropower Biomass Energy Generation Wind Power Reforestation Wastewater Treatment Solar Power	Differences in Types of Projects Taken On
Greenhouse Gas Emissions over project lifetime	Tonnes of CO <sub>2</sub>	Differences in Types of Projects Taken On
Size of Project	Large (Anything larger than the small-scale definition) Small (Type I: renewable energy project activities with a maximum output capacity of 15 megawatts (or an appropriate equivalent); Type II: project activities relating to improvements in energy efficiency which reduce energy consumption,	Differences in Types of Projects Taken On

	<p>on the supply and/or demand side, by up to 60 gigawatt hours per year (or an appropriate equivalent);</p> <p>Type III: other project activities that result in emission reductions of less than or equal to 60 kilotonnes of carbon dioxide equivalent annually.</p>	
Location	<p>Rural (More than 30 miles away from a city)</p> <p>City</p> <p>Offshore</p> <p>Coastal</p>	Differences in Types of Projects Taken On
Cost of Project	USD (Converted from VND at the rate at the time of project)	Differences in Types of Projects Taken On
Operating Costs	USD (Converted from VND at the rate at the time of	Differences in Types of Projects Taken On

	project)	
IRR	%	Differences in Types of Projects Taken On
Revenue Estimate	USD (Converted from VND at the rate at the time of project)	Differences in Types of Projects Taken On
Project Participants	Company Names	Descriptive Statistic
Domestic Participants Purpose	Investment Monitoring Implementation Management Building Operation Project Owner	Patterns in Participation and Investment
International Participants Purpose	Technology Transfer Operation Maintenance Management Technical Support Funding Unclear	Patterns in Participation and Investment

	CER buyer	
Private Participants Purpose	Investment Monitoring Implementation Management Building Operation Project Owner Technical Support Funding Unclear CER buyer	Patterns in Participation and Investment
Public Participants Purpose	Funding Onsite monitoring Implementation Project Management Building Operation Project Owner	Patterns in Participation and Investment
State-Owned Enterprise	Yes No	Patterns in Participation and Investment

Majority Public/Private	Public Private Split (50-50)	Patterns in Participation and Investment
Majority International/Domestic	International Domestic Split (50-50)	Patterns in Participation and Investment
Single or Multiple Investors	Single Multi	Patterns in Participation and Investment
Public/Private Investors	Public Private Split (50-50)	Patterns in Participation and Investment
Majority International/Domestic Investors	International Domestic Split (50-50)	Patterns in Participation and Investment
CER trading price at time of project registration	USD (Calculated at the rate of a CER at the time of the project)	Differences in Types of Projects Taken On
Local Positive/Negative Impacts	<b>Positive</b> Jobs Electricity Supply	Impact of Public/Private Actor Involvement on Local Stakeholders

	<p>Technology Transfer</p> <p>Tax Contribution</p> <p>Water Quality Improvement</p> <p>Production Efficiency</p> <p>Reduced Odor</p> <p>Production Efficiency</p> <p>Infrastructure Improvements</p> <p>Air Quality Improvement</p> <p>National Income Growth</p> <p>Jobs</p> <p>CER revenue donation</p> <p><b>Negative</b></p> <p>Natural resource impacts</p> <p>Agricultural Loss</p> <p>Uncertainty around Positive Impacts</p> <p>Displacement</p> <p>Biodiversity Impacts</p> <p>Land Use Impacts</p> <p>Pollution</p> <p>Upsetting local social order</p> <p>Construction damage</p>	
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	Geological Impact	
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Table 1

## Results

Of the foreign participant countries listed, Switzerland, the United Kingdom, and Sweden were the most common investors for Vietnam (See Chart 1). It is noteworthy that the government of Vietnam also has taken an active interest in participating in CDM activity which is in line with its target to reduce its carbon emissions and realize its development potential. Although countries are listed as parties involved, many times they work through multilateral organizations like the Asia Pacific Carbon Fund or through private corporations that are experts in the field like Swiss Carbon Assets Ltd. There are also speculative trading firms like EDF Trading that purchase CER credits for trading on the market. Often, international participants are listed as a participant but only serve as a CER buyer with little involvement in project activity. Many participants are listed in PDDs that seem to be kept vague consistently across projects with no information other than their name and contact information listed. This is something worth looking into further.

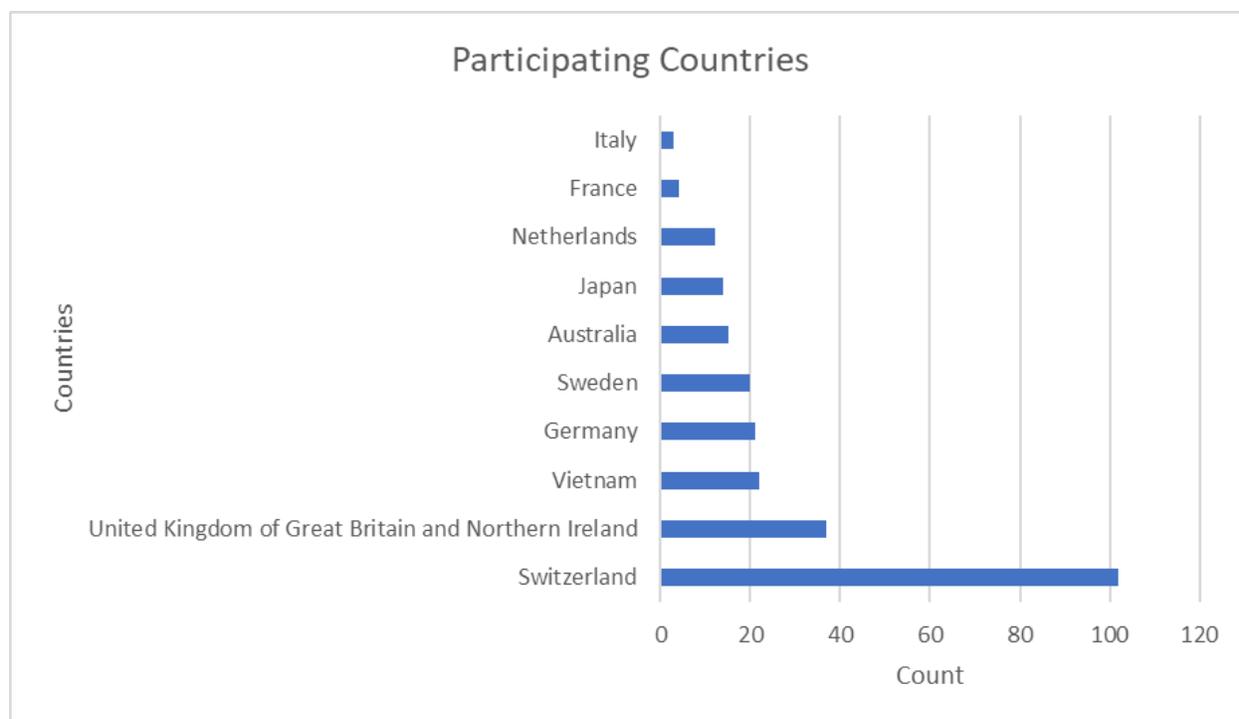


Chart 1

The most common types of CDM projects undertaken were hydropower, waste gas power generation, and waste biomass power generation like rice husks or tapioca starch waste. The vast majority of projects were in hydropower - likely due to Vietnam's abundant water resources. Hydropower also tends to be a very profitable venue for project developers since they tend to have high benchmark IRR rates that developers can then request more CDM support for. We can also see some of the biases mentioned in other studies in the literature review like the low numbers of reforestation projects. Though reforestation is considered a much more effective GHG emission reduction method with fewer negative local stakeholder impacts, hydropower and other power generation projects have realized more investment. This is partially due to Vietnam's natural resources and abundant water resources that make it a natural candidate for hydropower. There is also an emphasis on power generation due to Vietnam's skyrocketing electricity demand

as mentioned earlier by the government. This does reveal, however, a disincentivization of useful project types that could lead to better impacts that do not receive as much notice or investment.

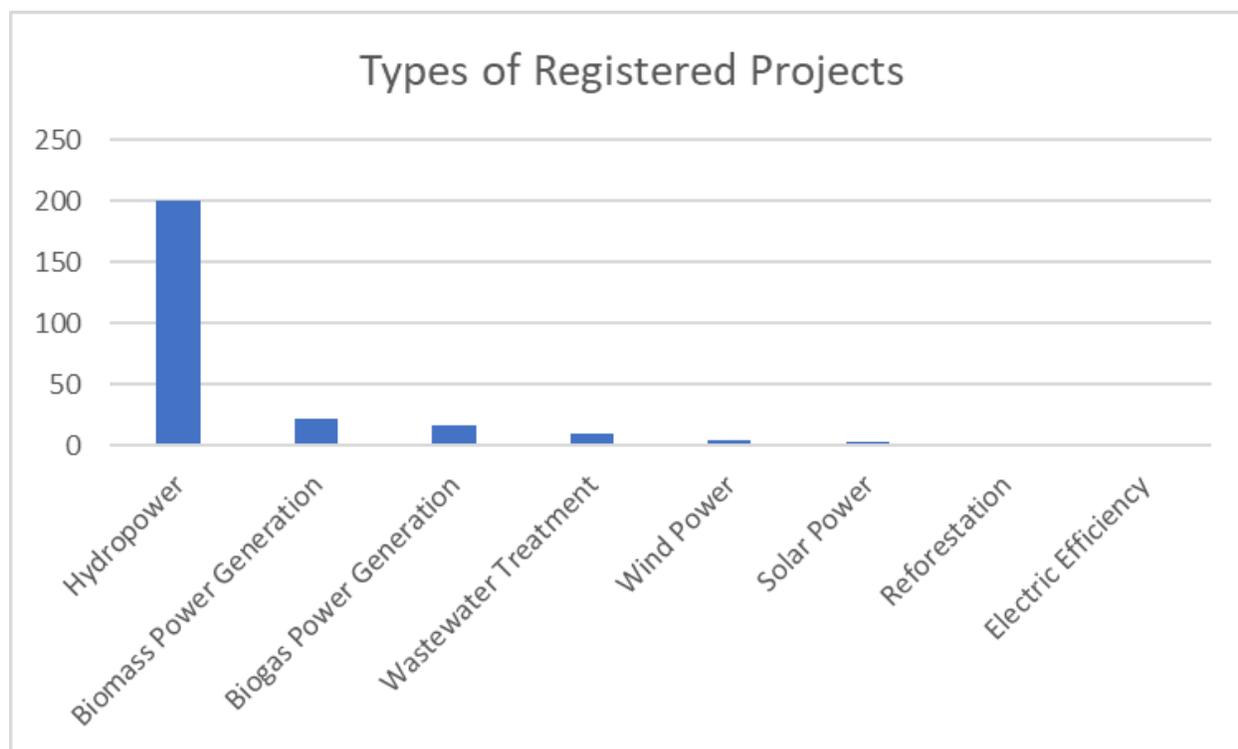


Chart 2

There were more small-scale CDM projects than large-scale registered projects with 58% of registered projects in Vietnam falling under this category. As listed in Table 1, small-scale projects are defined by the CDM board as any project that fall under any one of these three categories: “Type I: renewable energy project activities with a maximum output capacity of 15 megawatts (or an appropriate equivalent), Type II: project activities relating to improvements in energy efficiency which reduce energy consumption, on the supply and/or demand side, by up to 60 gigawatt hours per year (or an appropriate equivalent), Type III: other project activities that result in emission reductions of less than or equal to 60 kilotonnes of carbon dioxide equivalent

annually.” This means anything above these measures qualifies as a large-scale project.

However, there has been some criticism around this definition as being too vague and loosely defined (OECD, 2001).

The prevalence of these small-scale projects could be due partly to Vietnam entering the market late (in 2008) which meant they had much less time to take on large-scale projects before the crash in 2012 that slowed down interest and investment considerably. There could also have been more hesitation among investors to invest large amounts of capital into projects in a host country that was deemed riskier due to its lower levels of development, technology, and state capacity.

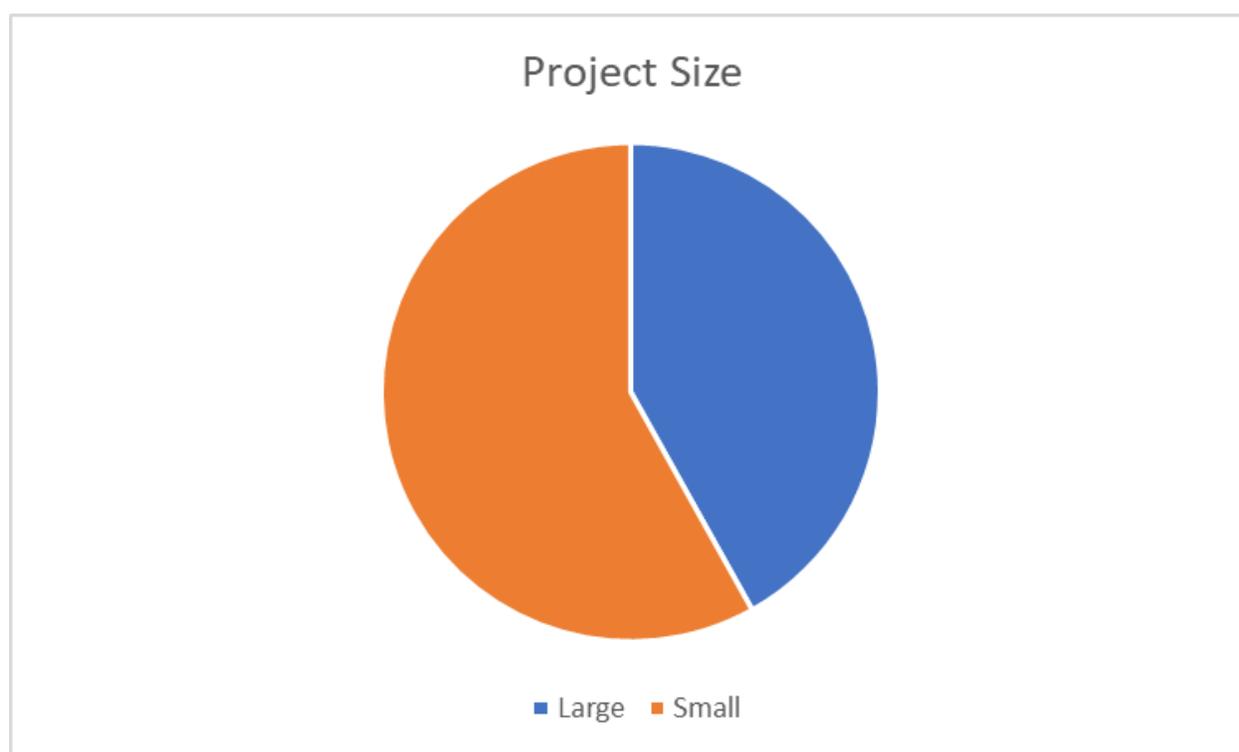


Chart 3

Since there were far more small-scale projects registered for Vietnam, then it follows that a majority of the projects cost under 8 million dollars with very few reaching 60 million or more. This is in stark contrast with India and China which took on higher percentages of large-scale

projects. This might be to Vietnam's benefit since large-scale projects tend to cause negative impacts locally like displacement and loss of agricultural land at higher rates (del Rio, 2007). However, we would need to collect more field data to understand the impacts of various levels of investment on project outcomes and local impacts.

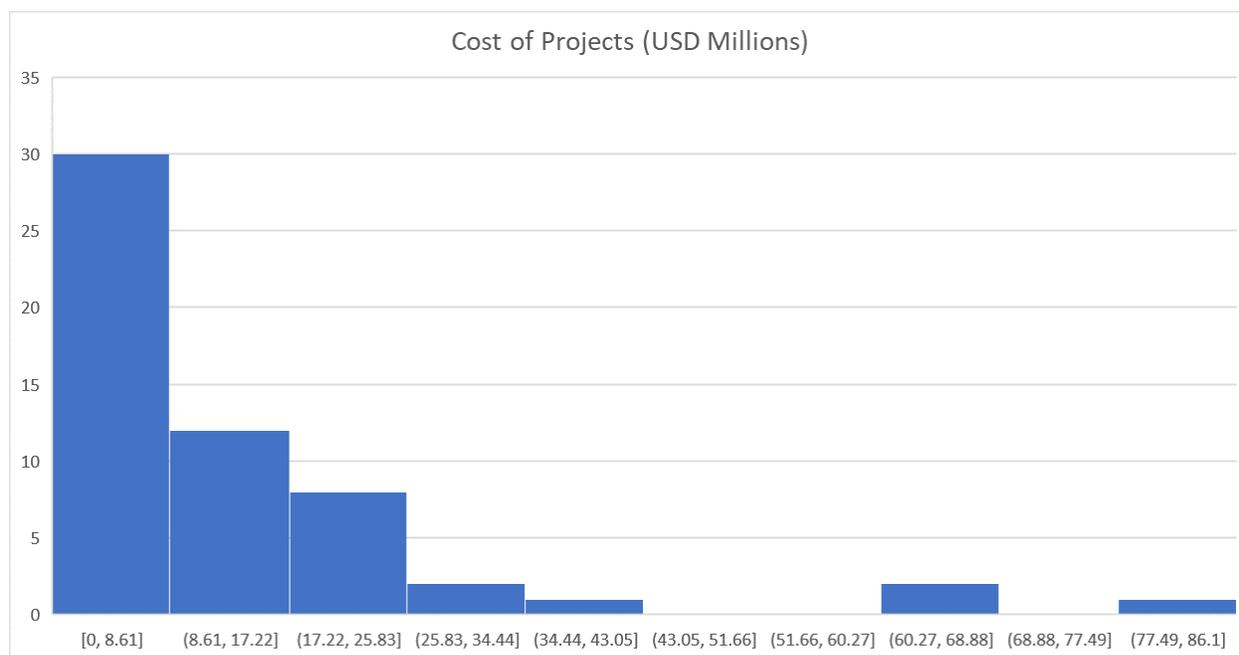


Chart 4

Now, where the most interesting data trends occurred were in the domestic and international participants' involvement with the project. On average, domestic participants tended to list their responsibilities in the CDM project at far higher rates than international participants. Almost 30% of international participants left no details in the PDD on their specific responsibility. When domestic participants had no details, it was specifically because the company had been created just for the sake of the CDM project and would not exist otherwise. This suggests there are instances where the international participant was much more heavily involved but do not explicitly state their purpose. There are several reasons international participants have sparse documentation: (1) documentation rules and requirements by the CDM board are vague leaving

it up to participant discretion to include details, (2) they simply are a CER buyer with no other investment or participation in the project, (3) they are part of a large multinational organization like Ecotawa or RWE Power AG that include several countries that are not listed or have a local consultant that works on the project which means the parent organization is not actually involved despite being listed. Further investigation is required since these are speculative reasons that need more evidence for confirmation.

The types of tasks taken on by each group also differs. Almost 40% of domestic participants explicitly listed that they were the project owner and tended to be responsible for construction, project implementation, and operation. Meanwhile, international participants - when they explicitly stated their purpose - were typically responsible for investment, technical expertise, or were just involved as the CER buyer once the project was completed.

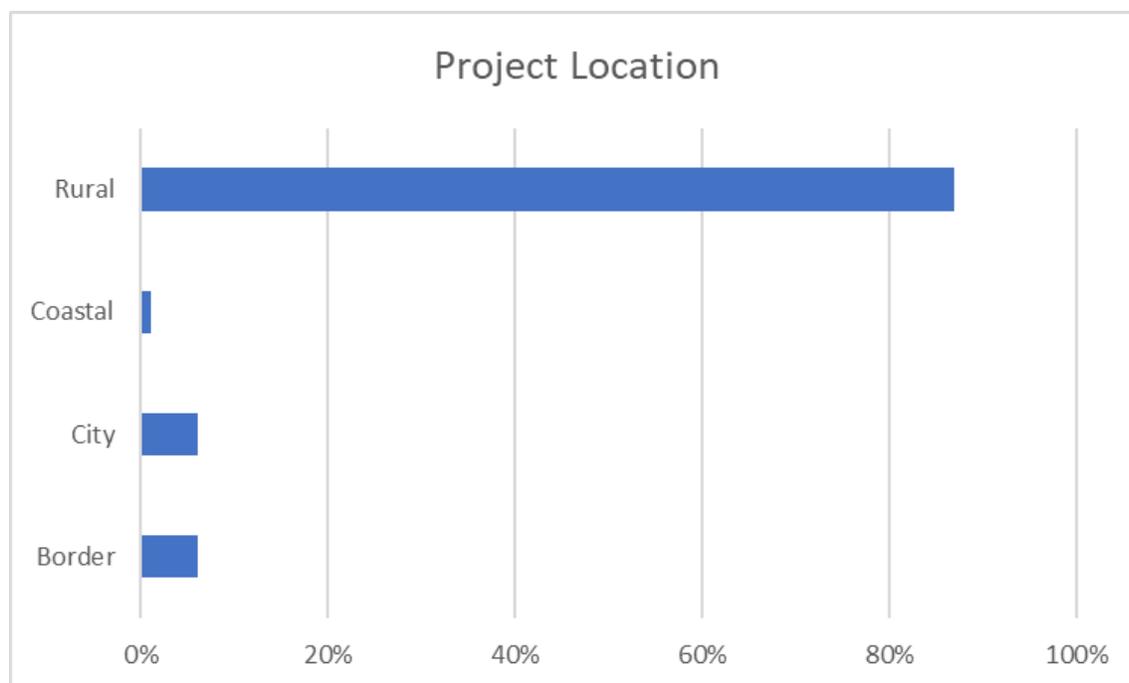


Chart 5

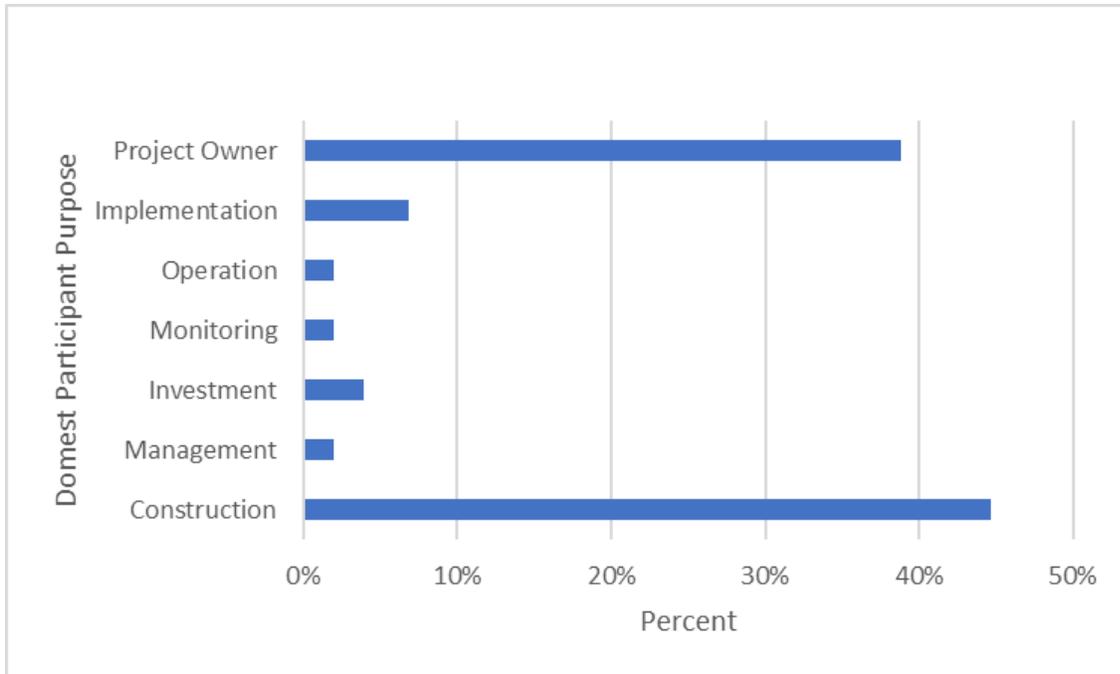


Chart 6

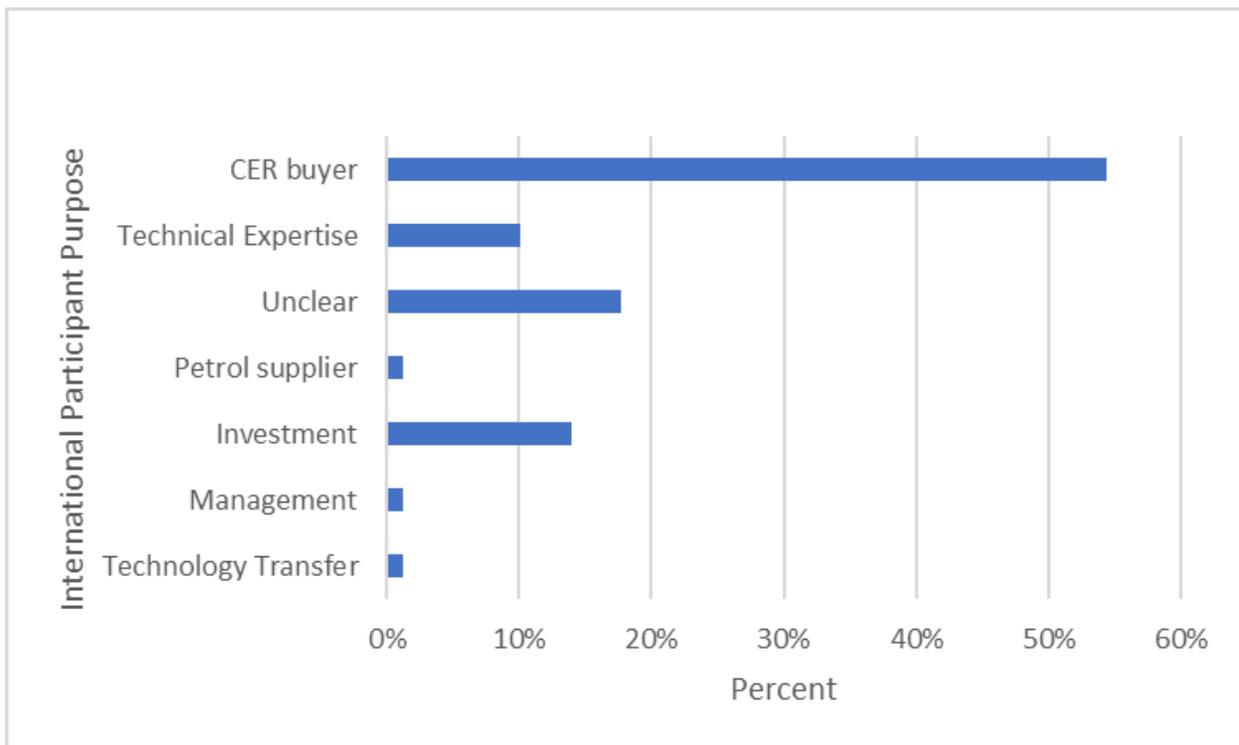


Chart 7

The CER Trading Price was calculated at market rate for that year by the total lifetime GHG emissions reduced by the project. Thus, there is a linear relationship between the two variables. However, since the CER rate changes year-to-year and from market to market, there is some variation in the trend.

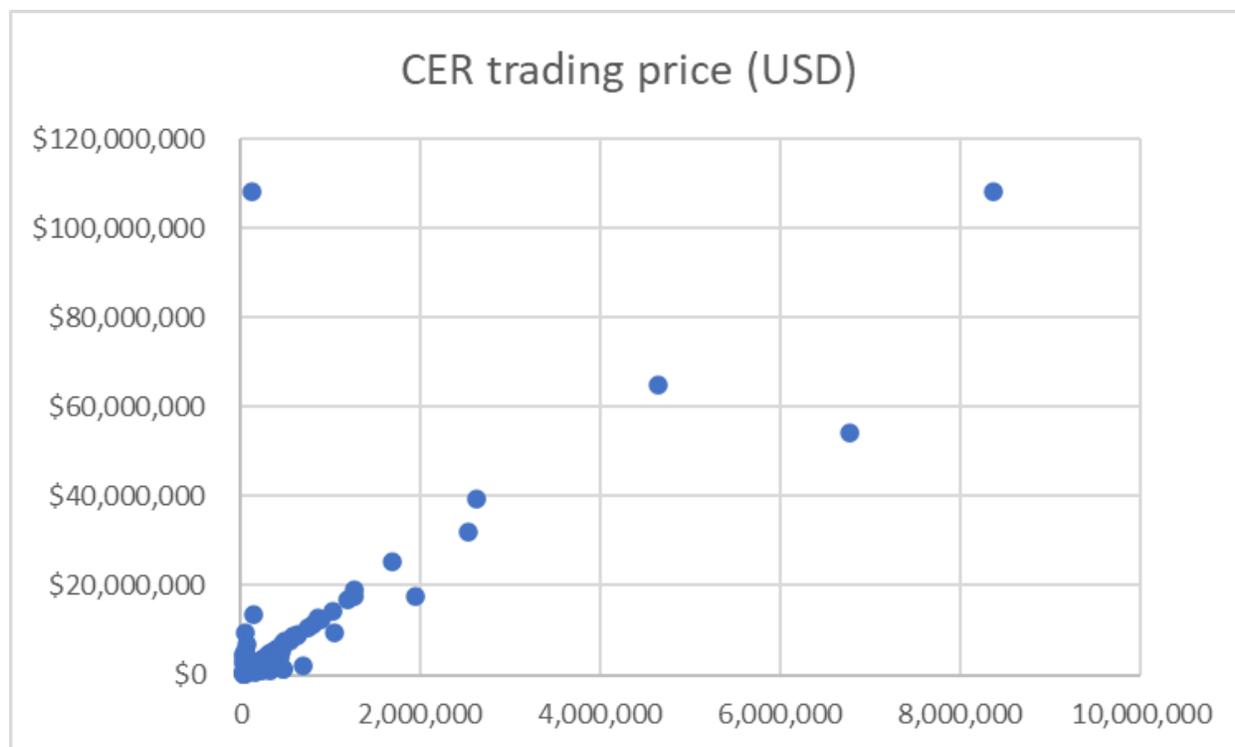


Chart 8

A majority of both participants and investors were private and domestic (Chart 9-12). Since the host country is required to be involved and the government of Vietnam tends to contract out to local private firms for many of their projects, this is unsurprising. Investment has low levels of public-private interaction while participation has a much higher concentration of “split” actors. These charts show that Vietnam was likely actively pursuing sustainable development and

voluntary emission reduction goals even before it was required to make any commitments, thus the high levels of public and split involvement in CDMs.

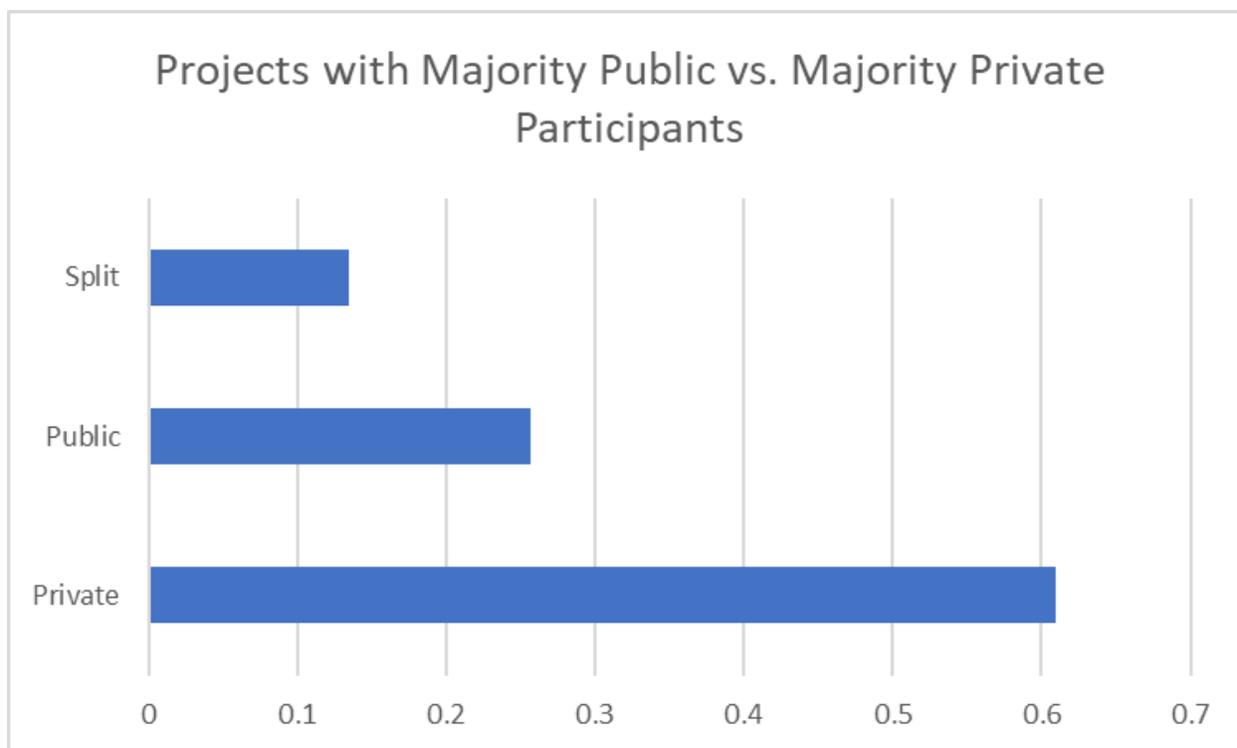


Chart 9

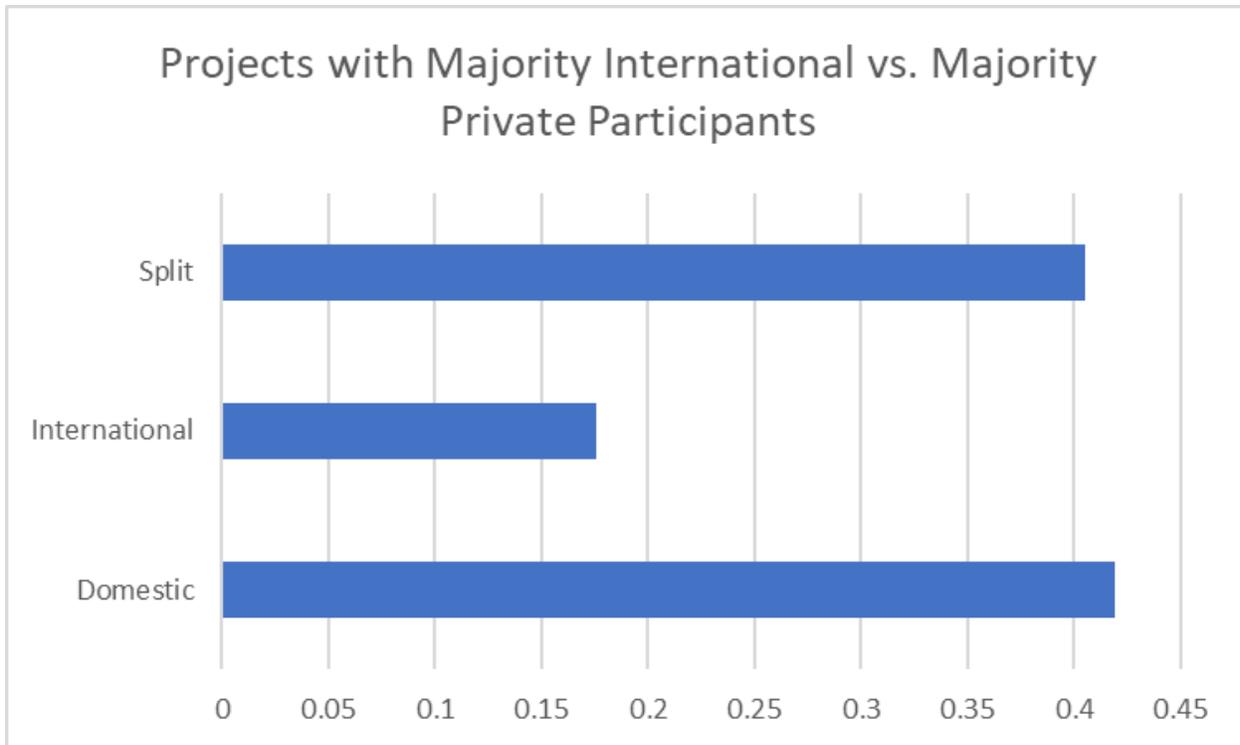


Chart 10

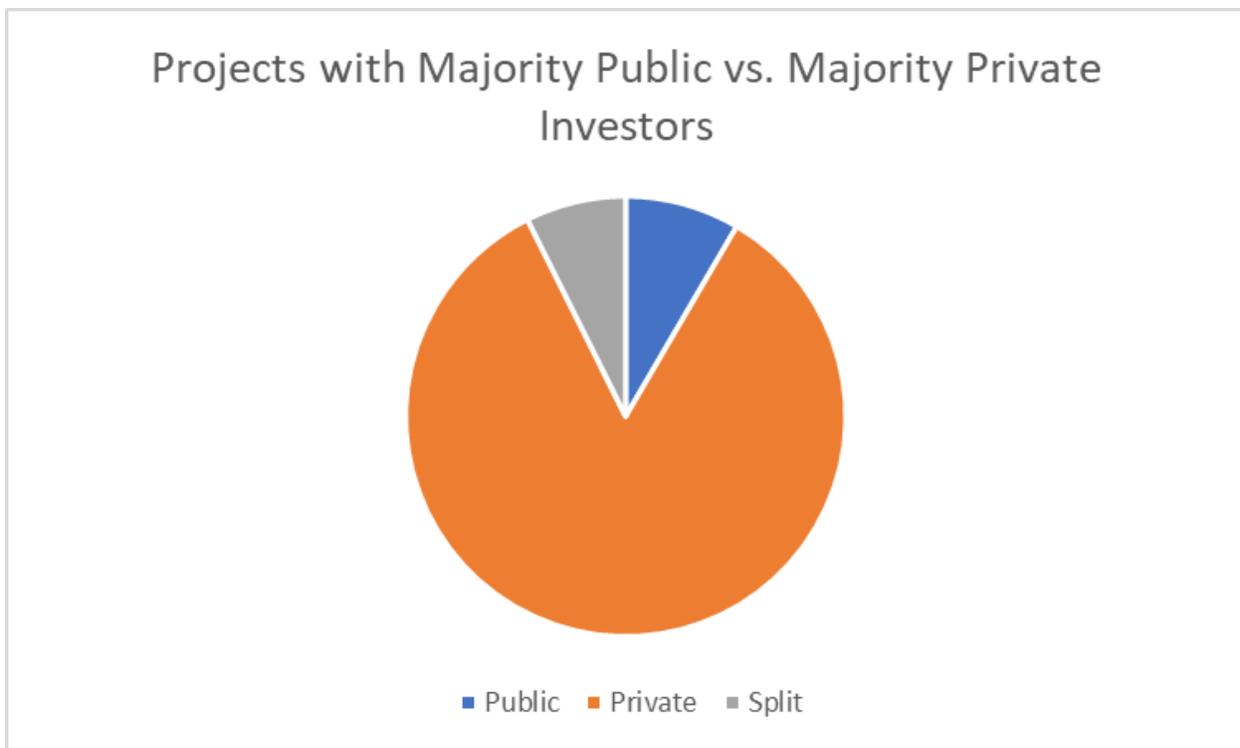


Chart 11

## Projects with Majority Domestic vs. Majority International Investors

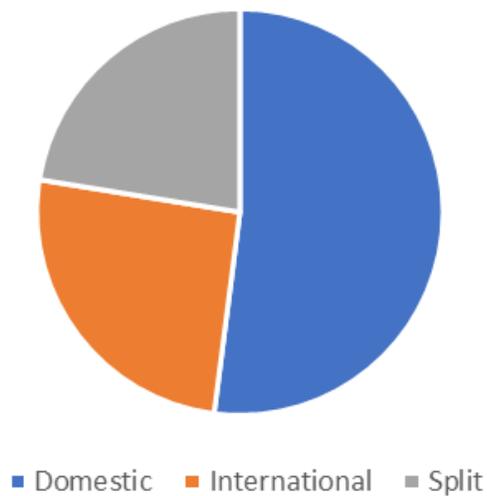


Chart 12

## Projects with Multiple Investors vs. Single Investor

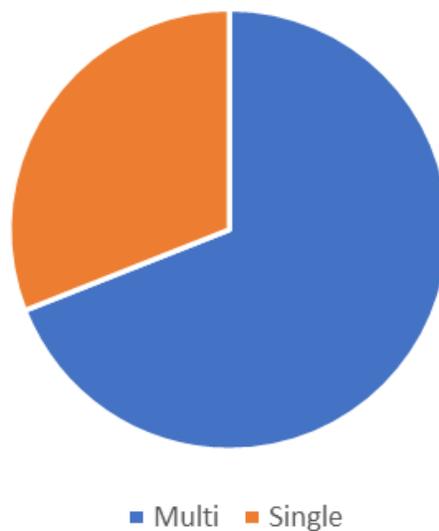


Chart 13

## Impacts

Participants	Public	Split	Private
Positive Impacts	2.3	2.9	2.3
Negative Impacts	1.2	2.6	1.6

Table 2

Investors	Public	Split	Private
Positive Impacts	2.4	1.5	2.5
Negative Impacts	1.3	1.2	1.7

Table 3

Positive local stakeholder impacts range from air quality improvement to CER revenue donation to the local community. Negative local stakeholder impacts include cultural and social impacts and displacement and loss of agricultural land. Though there is a wide range in the severity of impacts, it is difficult to weigh the impacts according to their severity since there is little data on how much each impact affects local stakeholders. Thus, Table 3 gives equal weighting to each impact mentioned and averages them across public and private investors and participants. On average, 79% of projects with a majority of private participants had positive local stakeholder impacts while 83% of public participant-led projects had positive local stakeholder impacts. Split participation has the highest average for both positive and negative impacts at 2.9 and 2.6. With investors, private and public actors seem to have similar levels of positive impacts while private actors have the highest negative impacts. Though this requires more in-depth breakdowns of each category and whether there is a causal relationship between the type of investor or participant and their positive versus negative impacts, preliminary results seem to show overall

that having public-private interactions provides the best results for positive local stakeholder impacts but perhaps needs more oversight and regulation to reduce the negative impacts.

## Next Steps

This is preliminary research that documents PDD data in a database and tries to reveal gaps and biases in the types of CDM projects undertaken in Vietnam. However, there are several issues that cannot be addressed without further data collection. There is no methodology or guidelines for how documentation occurs in PDDs which means there is a lot of heterogeneity in how project designs are reported. Some documents include incredible levels of detail down to greenhouse gas emission calculations by year while many don't even include project revenue or costs. This leaves a lot of gaps in the data that could cause bias in research. There is also an incentive for project developers to overstate their costs and understate revenues or benefits they receive from the project which will also inevitably lead to biases. There is also very little accountability with these projects. PDDs are aspirational project designs that the developer intends to do which means not all the promised outcomes will be realized. However, there is very little accountability for who will take responsibility for failure to deliver on any promises made in PDDs. For instance, many large-scale projects lead to displacement and agricultural land loss which can be devastating for rural populations where most of these projects occur. Though most participants promise to provide compensation for these losses, whether it is enough or delivered as promised remains to be seen. Research shows that hydroelectric dams tend to be implemented undemocratically with failure to deliver on many of the compensation and benefits to impacted communities that they promise (Mayer et. al., 2022).

Beyond data biases, there is a lot of analysis that needs to be done for a more robust outcome. To understand whether the participant or investor make up of a CDM project impact the kinds of projects or local impacts requires collecting more data, performing more rigorous testing, and understanding the context of other host countries and how they were impacted. The next steps for this research would be to run regression analyses to find correlations that need to be investigated and find sources that explain any unusual patterns.

## Conclusion

CDM projects are unique in that they are a long-running, global initiative with clear oversight and detailed documentation at least in the planning stages. They reached widespread buy-in from many sectors and countries and mobilized a lot of investment in sustainable development, helped facilitate technology transfer that has been valued at millions of dollars, and created infrastructure and pathways for countries to continue working together in pursuit of sustainable development goals (Stockholm Environmental Institute, 2016). As the field now moves away from CDMs, it is important to think about what comes next and how we can apply the lessons learned from this first attempt.

Public-private partnerships and corporate social responsibility seem to be a popular solution that many are pursuing to leverage more investment and capital. If we are to go down this path, it is important to see where the weaknesses and strengths were in CDM projects. This study begins investigating exactly what private and public involvement means in sustainable development as well as how power differentials could affect projects when developed and developing countries engage.

Sustainable development projects are moving towards more privatized funding options such as public-private partnerships, investment funds set up by banks and other private actors, and corporate actors with CSR goals who fund sustainable projects independently. Private actors can be a great source of necessary revenue in accomplishing sustainable development goals, but they need more accountability to ensure projects are implemented justly. This research is a first step in trying to understand whether there are any differences between public and private involvement, and if so, how they differ. It shows that there are differences in the types of projects taken on, at least in the context of Vietnam, and in their impacts on local stakeholders. It is important to study how effective different funders and participants are in accomplishing their sustainability goals they promise to deliver, how they engage the host country as well as local communities, and their impacts on long term sustainable development for the stakeholders involved. By doing so, we can better understand how accountability, oversight, and efficiency can be improved both for public and private actors and more generally in the field of sustainable development.

There has been much research that shows that additionality, lack of accountability, and biases in the types of projects implemented plagued CDM projects. However, there is not much research on public-private partnerships and how they impact their host countries and CDMs as a whole. If we are to reform future iterations, we must create more comprehensive policies that address these issues. We must create more robust tests for additionality through benchmark IRR rates, better accountability after projects are completed to ensure the PDD was implemented as promised, and incentives for developers to take on less lucrative projects. There needs to be better guidelines for PDDs and what level of detail must be provided as well as better ways to ensure developers cannot evade giving accurate details on their IRR and revenues among other benefits.

Local stakeholder participation has been shown to increase public involvement and heightened visibility for CDM projects while the lack of participation leads to more private involvement which increases the chances of stakeholder participation being used simply as a rhetorical tool (Benites-Lazaro & Mello-Thery, 2019). This was clear in Vietnam's case as well since PDDs that specified that local stakeholders had no negative comments or brushed over any concerns by stating they are following the law in their project tended to be larger hydropower projects that had more displacement and land loss that would impact local communities. Therefore, in future carbon financing initiatives, it is important to create strict and verifiable guidelines for stakeholder participation that actually engages in participatory decision making. It is also important to structure sustainable development projects with public and private involvement strategically to ensure efficiency and positive impacts.

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