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List of Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission reduction
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
DNA	Designated National Authority
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
GS	Gold Standard
IPCC AR4	IPCC Fourth Assessment Report
ITT	International Technology Transfer
LoA	Letter of Approval
LDCs	Least developed countries
NCCDM	National Committee on CDM, Malaysia
NCH	National CDM Clearing House, Kenya
N-S	North-South
PCN	Project Concept Note
PDD	Project Design Document
PoA	Programme of Activities
PP	Project Proponent
SD	Sustainable Development
S-S	South-South
TCCDM	Technical Committee of CDM, Malaysia
TT	Technology Transfer
UNFCCC	United Nations Framework Convention on Climate Change
UAE	United Arab Emirates
WCED	World Commission on Environment and Development

Executive Summary

The objective of this report is to provide an independent assessment of the impact of the CDM with respect to promotion of sustainable development in host countries and transfer of technologies from the developed world to developing countries. The following paragraphs present a summary of the methodology of the study, key findings from the research as well as options for enhancing the positive impacts of the CDM.

Methodology of the research study

The overall methodology for the study comprised of literature review, PDD analysis (using Stratified Random Sampling technique and multi-criteria assessment) and case study assessment (for evaluation of negative impacts of CDM).

Key findings on the impact of the CDM

Impact on sustainable development

At an operational level, DNAs articulate the concept of sustainable development to include at least three dimensions: the social, the economic and the environmental. The actual definition of sustainable development criteria and indicators, however, differs significantly across countries.

The majority of the studies of the impact of the CDM agree that CDM has a positive impact on the various facets of sustainable development in host countries. Employment generation was also one of the most widely reported impacts from the literature review. Studies note that the CDM is the only climate change mechanism that offers an innovative solution to the challenge of how to incorporate sustainable development considerations into emission mitigation activities. Even some of the studies that question the extent of the sustainable development impacts find that the CDM contributed to the development of a global carbon market, allowing for temporal and spatial flexibility in achieving emission reduction targets.

A common theme among stakeholder inputs to the CDM policy dialogue is that capacity building for low carbon development within developing countries may be one of the most important sustainable development impacts. This capacity building has not only engaged the local private sector in climate change mitigation and increased awareness of mitigation opportunities, but has also laid the foundation for domestic climate change policy, including emissions trading and other programmes, in many major developing countries.

In terms of project types, most studies conclude that industrial gas projects have lower co-benefits than renewable energy and forestry project s, but a few studies challenge this finding, arguing the industrial projects can also have significant benefits. All studies would agree that renewable energy projects can be particularly beneficial for developing countries. A study comparing project impacts in different countries suggests that Indian projects have greater benefits for infrastructural development than either Chinese or Brazilian projects, but with less technology transfer. On the other hand, Chinese projects contribute strongly to the protection of

the local environment and natural resources. A comparative assessment of performance of labelled projects (i.e. projects with additional certification from outside of the UNFCCC such as Gold Standard and Community Development Carbon Fund) versus the non-labelled ones concluded that overall the labelled projects do not significantly surpass the non-labelled ones in terms of sustainable development benefits. However, the influence of labelled projects to the social aspects of sustainable development tends exceeds that of comparable ordinary activities, while the contrary holds for contribution to economic development.

In addition to reviewing the literature, this study conducted an analysis of 202 registered PDDs to assess the reported contribution to sustainable development. The results of the PDD analysis show that 99% of PDDs reported sustainable development benefits: 96 % mentioned economic benefits, 86% mentioned social benefits and 74% mentioned environmental benefits. Most of the PDDs mentioned more than one sustainable development benefits. Amongst sustainable development indicators, most of the PDDs mentioned benefits of: improved local quality of life (82 %), employment generation (80%) and contribution to national energy security (76 %). In the sample of 79 small scale and 123 large scale projects, sustainable development benefits are mentioned more often by small scale projects than in large scale projects. Around 5% of these large scale projects mentioned no other sustainable development benefit other than transfer of technology. An assessment of claimed negative impacts of certain CDM project case studies did not lead to the validation of the assertions of adverse impacts by the authors of any of the case studies.

Impact on technology transfer

While technology transfer is not explicitly included as an objective of the Clean Development Mechanism, other COP decisions have alluded to the importance of technology transfer as part of the overall UNFCCC. In summary, the literature cites a range of impacts on technology transfer: from CDM contributing 'significantly' towards technology transfer (UNFCCC 2010), to technology transfer taking place in less than half of the CDM projects (Dechezlepretre et al 2008), to technology transfer being minimal (Das, K. 2011). Importantly, this last study uses a more stringent benchmark for establishing technology transfer than all of the other studies.

According to previous empirical studies, 27%-39% projects report technology transfer as a component of project design. Because projects are not required to report technology transfer, however, a substantial portion of projects that do not explicitly claim this benefit may nevertheless involve some form of transfer. For example, recent study based on a follow-up survey after an analysis of PDDs indicated that the actual transfer could be as high as 44%. Technology transfer is reported more often in large-scale projects. Most, but not all, studies find that unilateral and small scale projects are less likely to involve technology transfer. Host country policies can also impact the rate of technology transfer. Previous studies also indicate that the frequency of technology transfer claims have remained stable as a share of the number of the projects, but have declined as a share of estimated annual emission reductions.

From the PDD analysis carried out for this study, 27% of registered projects analysed reported some form of international technology transfer. Most of these projects reported both transfer of

equipment and knowledge. Some sectors, such as coal mine methane and reforestation, do not report any technology transfer within this sample, while others, such as renewable energy and methane avoidance, report higher than average levels. Small scale projects also report higher technology transfer levels than large scale projects, which is surprising given the findings of previous studies and may reflect the smaller sample size. The leading countries transferring technologies were Japan, Germany, USA, Denmark, Italy, and the United Kingdom.

Options for enhancing the impact of the CDM

The options below have been developed based on the reviews of the literature, stakeholder inputs to the CDM Policy Dialogue process, and interviews with experts in the field, and the analysis conducted by the research team. Given that the focus of this research was on the impacts of the CDM, the options for the future have not been subject to a feasibility analysis or an analysis of the politics around implementation. For more detailed institutional analysis and context, readers are referred to the two other research reports for the CDM Policy Dialogue on "Governance of the CDM" and "Future Context of the CDM". Not all of the options below can be implemented by the Executive Board, as many would require COP/MOP approval or may even be implemented by actors outside the UNFCCC.

For most stakeholders, sustainable development is one of the most important impacts of the CDM, and there is a desire to enhance this impact. In addition, almost all stakeholders would agree that any interventions should not infringe upon the host country's right to determine if a given CDM project meets their sustainable development priorities. There is broad commonality across countries on how they define sustainable development criteria at a high level, even though the detail of this application varies widely.

Depending on individual stakeholder priorities, there are three possible objectives for interventions related to sustainable development impacts: increasing the overall sustainable development benefits from the CDM project pipeline, measuring and reporting those benefits to the DNA and other stakeholders, and systematically preventing negative impacts. However, there may be differences amongst stakeholder groups in prioritising interventions. For example, stakeholders that feel that CDM projects are generally delivering many positive benefits may want to focus on preventing negative impacts rather than increasing the monitoring of benefits. On the other hand, stakeholders that feel that negative impacts are best addressed at a national level may instead focus more on measurement of impacts and enhancing benefits. The caveat to these choices is that it will be difficult to measure progress towards either greater positive impacts or fewer negative impacts without some form of monitoring and reporting system.

In the context of technology transfer, several actions could improve the transparency of technology transfer benefits, and enhance this impact of CDM. Some of the options could include improved database and data availability on technology components specifications and the name of the technology supplier; improved reporting on technology transfer in the PDDs; and guidance from DNAs in terms of providing a clear and more operational definition of technology transfer in the project approval process.

Chapter 1: Introduction to the Study

1.1 Background

When adopting the Kyoto Protocol in 1997, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) established the Clean Development Mechanism (CDM) with the twin goals of contributing to the sustainable development of developing countries and assisting developed countries to meet their emission limitation targets. During the last fourteen years public and private entities have engaged in the rapid development and implementation of this mechanism, which is expected to result by 2012 in over one billion tonnes of CO_2eq of emission reductions from project activities and programmes in over 70 countries. International cooperation to address climate change now stands at a crossroads as we approach the conclusion of the Kyoto Protocol's first commitment period in 2012. Parties have thus intensified their efforts to expand existing agreements and develop new ones in a manner that reflects their respective needs and capacities.

The CDM Policy Dialogue was established by the CDM Executive Board in late 2011 with the objective to provide recommendations on how best to position the CDM to respond to future challenges and opportunities, so as to ensure the effectiveness of the mechanism in contributing to future global climate action. The CDM Policy Dialogue is implemented by a high-level Panel composed of distinguished individuals who possess a broad range of experience and expertise in fields of relevance to the operation and aims of the CDM. This high-level Panel will conduct and oversee the CDM Policy Dialogue and will deliver, as its main output, an independent report with the Panel's recommendations for the future position of the CDM, its priorities and mode of operations. This report is to be ready by September 2012 and will be used to inform both the CDM Executive Board as well as the intergovernmental negotiation process, and other stakeholders concerned with market based mechanisms and carbon markets.

The high-level Panel is implementing the CDM Policy Dialogue through targeted research and different types of stakeholder meetings, so as to independently form a basis for drawing conclusions and making recommendations about different aspects of the mechanism. It is anticipated that three broad areas of issues will be addressed in the Panels' final report:

- The impact of the CDM
- The governance of the CDM
- The future context of the CDM

Within each of these areas a lead researcher will be appointed to lead research and analysis of the subject matter. Additional researchers will be engaged to carry out specific research projects complementing the research carried out by the research coordinators.

The output from each research area will be compiled into a research report (one for each area), including factual findings, as well as option papers for issues that requires interpretation. While each researcher is independently responsible for the research tasks assigned to him/her, the research coordinators are responsible for compiling all research into the research reports in a format suitable for the consideration of the Panel.

1.2 Research Questions

The study team from TERI addressed the following research questions as part of this study:

1. **How has the CDM contributed to sustainable development? What options are available to strengthen this contribution?**
    - 1.1 What criteria do host countries currently use to determine whether a CDM project contributes to its sustainable development?
    - 1.2 What evidence is there that indicates contribution to sustainable development from CDM projects?
    - 1.3 What are the options to strengthen the contribution to SD and what options are there to address or minimize the negative impacts of CDM projects?
2. **How has the CDM contributed to technology transfer? How could this contribution be strengthened?**

1.3 Purpose and Objective

The purpose of the research is to provide the High Level Panel of the CDM Policy Dialogue with a statistical analysis of the contribution of CDM projects (or lack thereof) to sustainable development and technology transfer of the clean development mechanism in its first decade of operation, as a contribution in answering the questions: How has the CDM contributed to sustainable development and technology transfer, and what are the options for strengthening these contributions?

This analysis shall be grounded first and foremost in the objectives of the mechanism as described in Article 12 of the Protocol, namely;

1. To assist Annex I countries to achieve their mitigation targets (by making available cost effective mitigation opportunities in non-Annex I countries);
2. To support sustainable development in non-Annex I countries.

1.4 Approach and Methodology[1]

The overall methodology for the study comprised of:

- Literature review
- PDD analysis (using Stratified Random Sampling Technique and multi-criteria assessment)[2]
- Case study assessment (for evaluation of negative impacts of CDM)[3]
- Stakeholder consultations

The following tables presents a brief outline of the adopted methodology vis-à-vis the research questions and the key stages/steps in the study:

Table 1.1: Overview of the research methodology vis-à-vis the resea**rch questions**

Research questions	Overall methodology
What criteria do host countries currently use to determine whether a CDM project contributes to its sustainable development?	Survey of national governments; third-party assessment, stakeholder consultations, literature review
How has the CDM contributed to sustainable development?	Literature review; PDD analysis; call for inputs; stakeholder consultation
How has the CDM contributed to technology transfer?	Literature review; PDD analysis; call for inputs; stakeholder consultation
What options are available to strengthen the contribution (and minimize negative impacts) of CDM to sustainable development and technology transfer?	Literature review; PDD analysis; call for inputs; stakeholder consultation

Table 1.2: Approach and methods of the study

Approach	Method	Outcome/output
Literature review	Literature review	Range of definitions of SD from lit rev and DNA responses
		Sustainability impact criteria/indicators
		Keywords to assess SD impact criteria/ indicators in PDDs
PDD analysis	Stratified Random Sampling (SRS) of registered CDM projects as of May 1, 2012	Identification of a sample of registered CDM to be subjected to textual analysis and in-depth assessment using criteria.
	Textual (keyword) analysis	Overall assessment of impact of CDM on

[1] Individual chapters focusing on specific research questions have detailed out the selected methodology in the respective sections, this section aims presenting an overview of methodology adopted by the study.
[2] Details in chapter 3, section 3.3
[3] Details in chapter 5, section 5.2

Approach	Method	Outcome/output
		SD/TT across regions/sectors/project types through exhaustive analysis of sample PDDs
	Assessment of sample PDDs using selected SD/TT criteria/ indicators	In-depth assessment of CDM's performance wrt SD/TT criteria/indicators across regions/sectors/project types
Case study approach to assess negative impacts of CDM	Literature review/stakeholder engagement	Selection of case studies
	Questionnaire survey	Evaluation of stakeholder claims
	Telephonic/face-to-face/ email interviews	Evaluation of stakeholder claims

The selection of sample of projects for the study was done using the method of 'Stratified Random Sampling.' The project pipeline (sourced from UNEP Risoe CDM Pipeline as on April 2012) was stratified based on project category /type/sector and thereafter a random selection of projects was undertaken based on probability/degree of incidence of a particular project type in the total pipeline. Steps were taken to ensure that the issue of scale of project is addressed during selection of sample projects in the study.[4] The CDM pipeline database published in May 2012 by UNEP Risoe was used in the study. This dataset, updated till 1st April 2012, had 3,963 registered projects.

[4] Refer to chapter 3, section 3.3 for the details on the selected sample of projects for the analysis.

CHAPTER 2: Mapping of Criteria set by DNAs to Assess Sustainable Development Benefits of CDM Projects[5]

2.1. Introduction

Under the Kyoto Protocol, the host countries were bestowed with the responsibility to decide on what contributes to sustainable development (Marrakech Accords, 2001). Each host country has to set up a Designated National Authority (DNA), with a prime responsibility to define and oversee if CDM projects from their country were achieving sustainable development. As DNAs decide on sustainable development criteria based on their national development priorities, there is a large variation in the way and detail in which these criteria are defined.

The following section attempts to map this diversity and provide a summary of the sustainable development criteria used by DNAs and the common approaches employed to provide the Letter of Approval (LoA) to project proponents.

2.2. Methodology

The present assessment is based on three main data sources: a compilation of questionnaire responses from DNAs, sustainability criteria as defined/provided in DNA websites and relevant literature sources. The study also incorporates the views expressed by various stakeholders during the global consultations conducted by the CDM Policy Dialogue.

Survey Questionnaire: A survey questionnaire was sent by the UNFCCC secretariat to all DNAs on 29th April 2012 with a deadline of 15th May 2012. Responses from 10 DNAs were received on the survey: Bhutan, Burundi, Republic of Korea, Zimbabwe, Mexico, Finland, Mali, Madagascar, Mauritius and South Africa.

Websites of DNAs: In addition to the questionnaire, an online search for DNA websites was also conducted on a limited number of countries. This sample was selected from five regions i.e. Asia and Pacific, Latin America, Africa, Europe and Central America; and Middle-East using the UNEP Risoe datasets (as of May 2012)6. Those countries which contribute greater than 5% to the CDM pipeline in their respective region were included in the online search. This led to a sample of 29 countries viz. Brazil, Chile, Colombia, Mexico, China, India, Indonesia, Thailand, Malaysia, Vietnam, Albania, Armenia, Azerbaijan, Cyprus, Georgia, Moldova, Serbia, Uzbekistan, Egypt, Kenya, Morocco, Nigeria, South Africa, Uganda, Iran, Israel, Lebanon, Syria and United Arab Emirates (UAE)7.

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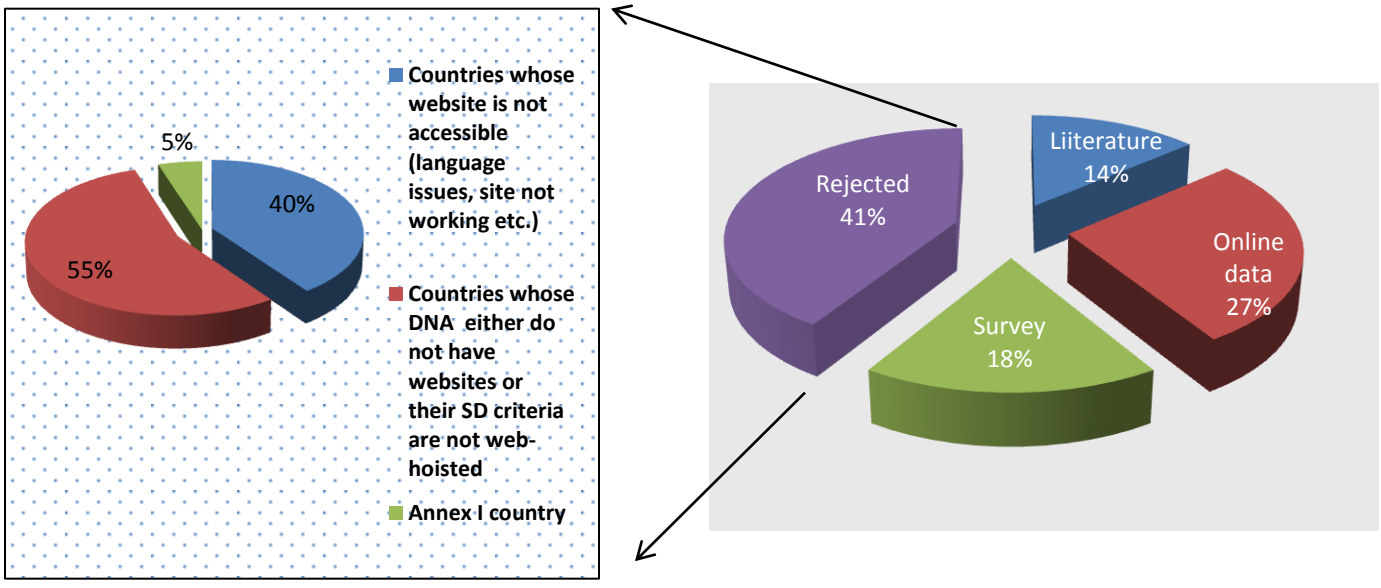
[6] Country groupings used in the study are adopted from UNEP Risoe CDM pipeline as of May 2012 (http://www.cdmpipeline.org/).

[7] It may be noted that in the case of Asia, this cutoff criteria of >5% was relaxed to >2.5% include Indonesia, Thailand, Malaysia and Vietnam. This was done to ensure better representation from the region.

Literature: The third source of information was literature containing references to sustainable development criteria used by DNAs. The countries analyzed in the identified literature included Peru, Bolivia, El Salvador, Panama, Nicaraguan, Ethiopia, Rwanda, Senegal, Tanzania, Burkina Faso, Mozambique, Zambia, Mali, Malawi, Democratic Republic of the Congo and Uganda. Since the literature containing references to the sustainable development criteria used by individual DNAs was part of a broader analysis, the DNA websites of some of these countries were also checked for their sustainable development criteria.

The study was initiated with a sample of 51 countries. Of these, criteria for 20 countries could not be accessed due to lack of information. Some DNAs do not have a website, others do not web-host their sustainable development criteria, while in some cases the information available on DNA website was not accessible (language issues, site not working)8. Finland being an Annex I country was not included in the assessment. Hence, this confines the current assessment to examination of sustainable development criteria used by 30 countries.

Figure 2.1 : Sample of countries used for assessment: Different data sources used



8 Details provided in Annexure.

Table 2.1: Sample of countries used for assessment: Different data sources used

Latin America	***Europe and Central America***	***Africa***	***Middle East***	***Asia***
Mexico	Finland	Burundi	UAE	Bhutan
Brazil	Uzbekistan	Madagascar	Israel	Korea
Chile	Georgia	Mauritius	Iran	India
Colombia	Serbia	Mali	Lebanon	Malaysia
Peru	Armenia	Zimbabwe	Syria	Thailand
Bolivia	Cyprus	South Africa		Vietnam
El Salvadoran	Moldova	Morocco		Indonesia
Panama	Albania	Kenya		China
Nicaraguan	Azerbaijan	Nigeria		
		Uganda		
		Egypt		
		Rwanda		
		Senegal		
		Ethiopia		
		Tanzania		
		Malawi		
		Mozambique		
		Zambia		
		Burkina Faso		
		DRC		

Colour coding:

	Countries which responded to the UNFCCC survey
	Countries belonging to this group have contributed > 5% to the CDM pipeline in their region
	Countries belonging to this group have contributed > 5% to the CDM pipeline in their region and have also responded to the UNFCCC questionnaire
	Countries whose website was not accessible at the time of study (either language issues, site not working etc.)
	Countries which lack a DNA website or whose SD criteria are not web-hosted
	Countries cited in literature

2.3. Criteria set by DNAs to assess Sustainable Development benefits of CDM projects[9]

Most of the surveyed DNAs[10] mention that they have an operational definition of SD in their country (6 of the 9 Non-Annex I DNAs who responded to the survey). In Korea, the operational definition is specified under the federal laws (Sustainable Development Act 2007, Korea) and in Mauritius under the national DNA regulations.

Broadly, most countries define their sustainable development criteria under the social, economic and environmental dimensions. Technological benefits are usually either incorporated into the economic benefits or are as a separate category altogether. The degree of details in which DNAs explain their sustainable development criteria differs among the countries assessed in this study. The common approaches used by countries can be defined as per the following typology:

1. General listing of criteria/indicators under the three/four categories 11: For example, India, Morocco, Brazil, Korea, Kenya, Armenia, Uzbekistan, United Arab Emirates (UAE), Peru, Senegal, El Salvador, Nicaragua, Bolivia and Mali give a list of indicators under categories such as social, economic, and environmental categories.
2. Listing of criteria and a set of indicators under each category: For example, Vietnam, Malaysia, Indonesia, South Africa, Rwanda, Zimbabwe, Mauritius, Panama and Serbia describe the criteria under each category and give a list of indicators suggesting what the criteria incorporate.
3. Listing of indicators under criteria with scoring of each indicator: E.g. Thailand, Bhutan and Georgia give elaborate scoring for SD indicators under a set of criteria under each category.

It must be noted that the information on sustainable development criteria of China could not be accessed. Hans Curtius - Tobias Vorlaufer (2009) comment on the Chinese DNA stating that there is no common knowledge about a possible set of criteria of the NDRC. "Reasons why and if a project could be rejected by the NDRC because of its insufficient contribution to sustainable development are not known, the reviewing process is not transparent." Olsen and Fenhann (2008) mention the China has prioritization by project types. Projects in the priority areas i.e. Energy Efficiency, Renewable Energy and methane are given priority. There is a requirement of at least 51% Chinese partnership in the projects.

The following sub-section describes the SD criteria used frequently by DNAs in the economic, technological, environmental and social dimensions:

Economic Benefits: DNAs investigate both local as well as national level benefits from CDM projects for assessing the economic benefits from them. However, the major focus of DNAs while assessing economic benefits of projects is on local and regional benefits.

9 Refer to Annex I for a summary of Sustainable Development Criteria in the social, economic and environmental dimensions across regions and countries in the sample

10 A survey questionnaire was sent by the UNFCCC to all DNAs on 29th April 2012 with a deadline of 15th May 2012. Responses from 10 DNAs were received on the survey: Bhutan, Burundi, Republic of Korea, Zimbabwe, Mexico, Finland, Mali, Madagascar, Mauritius and South Africa.

11 While these countries only provide a listing of criteria/indicators, some of them are quite elaborate.

The common project specific criteria are the impact on cost effectiveness of the project with respect to the baseline (Morocco, Georgia) and whether there is mutual consent between different stakeholders of the project (Indonesia, Korea).

Most DNAs expect CDM projects to contribute towards strengthening the local economy of the region by generating additional income for the local communities, by creating employment opportunities and by bringing in additional investment. DNAs judge the projects by the additional income they generate for the local populations with respect to the baseline (Madagascar, Thailand, Serbia, Bolivia, Burundi, Vietnam, Zimbabwe, Uzbekistan, Brazil, Bolivia and Nicaragua). The Indonesian DNA, however, adopts a 'no harm' approach by investigating if the projects are not lowering the local communities income and whether adequate measures are being taken to overcome the possible impacts of lowered incomes. However, most DNAs do not mention the details about how many stakeholders did the project benefit and how.

It is also apparent that while most DNAs expect the project to increase local income levels, they also judge projects on the basis of their impact on the investments in the region as well as in the priority sectors of their country (Mauritius, Mexico, Thailand, Korea, India, South Africa, Armenia, El Salvador, Senegal, Bolivia and Serbia).

DNAs also give stress on the projects' contribution towards generation of employment. Almost all DNAs have this criterion for their assessment of SD benefits. Most DNAs have a generic requirement that the project should contribute to creation of new jobs (Zimbabwe, Burundi, Madagascar, Morocco, Armenia, Serbia, Bolivia, Nicaragua, Israel, Uzbekistan, Senegal, Vietnam and Bhutan). However, some require specific information about the number of direct and indirect jobs created by the project (Brazil, Mauritius, and Thailand), the nature/quality of jobs (Malaysia, South Africa), the duration of employment generated (Thailand), jobs limited to the project or not (Thailand), gender equality (South Africa) and compliance with labor policies of the country (El Salvador).

Many DNAs give adequate impetus to the impact of the project on the promotion of clean energy in the country. Many DNAs cite generation from renewable sources of energy as economic criteria (Armenia, Mauritius, Thailand and El Salvador)/ substitution of energy sources with greater positive environmental impact (Georgia, Nicaragua). Some DNAs also look at impact the project has on the decrease in the cost of energy (Serbia, South Africa) and on the access of energy to the people (Zimbabwe, Nicaragua).

DNAs also assess the impact of the project activity on the investments in the region as well as in the priority sectors of their country (Mauritius, Mexico, Thailand, Korea, India, South Africa, Armenia, El Salvador, Senegal, Bolivia and Serbia). While the major focus of DNAs is local and regional economic benefits, some countries also give consideration to the impact of project activity on the macro-economic sustainability of the country. This is investigated by DNAs through the impact of the project on the balance of payments (Bhutan, Zimbabwe) of the country through the following parameters:

a. Impact of the project on foreign exchange requirements: Georgia, South Africa, Mauritius

b. Impact on Foreign Direct Investment: Morocco, South Africa, Mauritius

c. Impact on imports and exports (specifically fossil fuels): Rwanda, Mauritius, Morocco, Serbia,

d. Attracting foreign investments: Armenia, Morocco

Technological Benefits: DNAs usually define technological benefits using three key criteria: contribution towards improvement of technologies, technological sustainability and implications of the technology transfer on the host country.

Many countries define contribution of the CDM project towards improvement of technologies as the technological benefit of the project. While some seek that the project should use environmental friendly technologies that are appropriate as per local conditions (Israel, India, Serbia), others require the technologies to be the best available and proven (Mali, Uzbekistan, Malaysia). Some countries (Indonesia, Madagascar, and Kenya) specifically require the project to ensure that the technologies used are not substandard.

Almost all countries, studied in this analysis, state technological sustainability as a key criteria for CDM projects to attain sustainable development goals. While the definitions provided by countries differ, the host countries expect that the CDM projects should not only use good technologies but also assist in the overall goal of technological self-reliance of the country. Georgian DNA, which assigns scores to each of its sustainable development criteria, gives stress on decrease in foreign expenditure as criteria of technological self-reliance. It states that "*when CDM projects lead to a reduction of foreign expenditure via a greater contribution of domestically produced equipment, royalty payments and license fees, decrease in imported technical assistance may indicate an increase of technological sustainability.*" Other countries (e.g. Morocco, Thailand) also stress on "technological autonomy". Thailand, which also has scoring of indicators, gives a stress on indigenous development of technology.

Some countries (South Africa, Mauritius and Brazil) also evaluate the employed technology's potential to be reproduced or the projects impact on the uptake of such technologies within the country i.e. its replication potential.

Capacity and skill development is also considered to contribute to technological sustainability. While some countries are less explicit in stating whose capacity development should the project assist it, others specify if it is only of the personnel employed in the project activity (Thailand) or the community at large near the project site (South Africa, Zimbabwe). Transfer of knowledge is an additional criteria some countries employ (Indonesia, Israel). Brazilian DNA also evaluates the technological innovation of the project as compared to the baseline to evaluate its projects.

While many DNAs provide generic guidelines on a project's technological benefits (indirect indicators like technology transfer or implication of technology transfer to the country), some DNAs ask for very specific and detailed information to check technological sustainability. Peruvian DNA, for instance, asks the project proponent/s to submit a government approved technical feasibility study or demonstrate successful prior experience of the employed technology at a national or international level. Thai DNA requires the project proponent to submit the operational plan post stoppage of issuance of CERs for providing LOA.

Overall, the emphasis of DNAs on what constitutes technological sustainability differs. It can be convincingly argued that DNAs do give impetus to technological benefits obtained from the CDM projects in their country. However, the degree of detail in which the criteria is expressed differs from nation to nation.

Table 2.2: Summary of Sustainable Development Criteria in the economic and technological dimension across regions and countries in the sample

CRITERIA	INDICATORS	REGIONS/ COUNTRIES																														
		ASIA PACIFIC							**AFRICA**									**EUROPE AND CENTRAL AMERICA**				**MIDDLE EAST**		**LATIN AMERICA**								
		Vietnam	**Bhutan**	**India**	**Korea**	**Malaysia**	**Thailand**	**Indonesia**	**Kenya**	**Morocco**	**South Africa**	**Zimbabwe**	**Burundi**	**Madagascar**	**Mali**	**Mauritius**	**Rwanda**	**Senegal**	**Serbia**	**Georgia**	**Armenia**	**Uzbekistan**	**UAE**	**Israel**	**Brazil**	**Mexico**	**Bolivia**	**Peru**	**El Salvador**	**Panama**	**Nicaragua**
Economic	**1. Additional investment**			Y	Y		Y				Y							Y	Y		Y					Y	Y		Y		
	2. Employment generation: **2.1** Number of jobs created for the local community	Y	Y	Y	Y					Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y
	• within the project activity						Y																									
	• in the area						Y																									
	2.2 Quality of jobs created					Y					Y					Y	Y		Y							Y						
	3. Income generation	Y					Y	Y				Y	Y	Y					Y			Y			Y		Y				Y

CR	INDICATORS	REGIONS/ COUNTRIES																													
	4. Contribution to sustainability of balance of payments by: • Impact on foreign exchange requirements • Impact on FDI • Contribution to macro-economic sustainability • Impact on imports and exports		Y							Y	Y	Y				Y			Y	Y						Y			Y		Y
	5. Clean energy development: • Generation from renewable sources of energy • Access to clean energy • Cost of energy • Reduction in energy dependence and energy intensity						Y				Y	Y				Y	Y		Y	Y	Y								Y		Y
	6. Mutual consent on: • sharing the proceeds of CERs between project proponents • conflict related to the project between different stakeholders				Y			Y																							
	7. Effect on and encouragement of touristic and scenic activities																													Y	
	8. Cost-effectiveness of the project									Y										Y											
Technologi	**1. Contribution towards improvement of technologies** Use of technologies that are:		Y	Y	Y	Y		Y	Y			Y		Y	Y				Y		Y	Y		Y	Y				Y		

CR	INDICATORS	REGIONS/ COUNTRIES																												
	• cleaner, more efficient and environment friendly • locally appropriate • best available, modern and proven (not obsolete, substandard)																													
	2. Technological sustainability																													
	2.1 Indigenous technology development						Y	Y		Y		Y								Y					Y					
	2.2 Replication and demonstration potential of project										Y					Y									Y					
	2.3 Capacity and skill development/transfer of know-how						Y	Y			Y	Y				Y	Y							Y						
	2.4 Operational plan for the end of the project life (or the crediting period)						Y																							
	2.5 Degree of technological innovation of the project																								Y					
	2.6 A technical feasibility study/demonstration of prior experience with the technology																										Y			
	3. Technology transfer	Y										Y					Y				Y					Y	Y			
	4. Implications of technology transfer on host-country										Y					Y														

Environmental Benefits: Host countries provide an elaborate list of indicators to check the impact of projects on the environment. The environmental benefits of CDM projects can be broadly classified into the following:

i. GHG reductions achieved

ii. Impact on the environment and resources

iii. Contribution to sustainability of resources

Most DNAs in the sample consider the GHG reduction potential of the project to be one of its environmental benefits. The impact of the project on the local environment and resources is the most important criteria. While some DNAs give criterion of "impact of the project on environment", most of them elaborate the impacts further on the air, water, marine and land environment, and on biodiversity.

Most DNAs judge whether the project has contribution towards improvement of the land, water and air environment if it complies with the local standards and is performing better than the reference scenario. Solid waste generation and disposal is given special impetus by several DNAs (Vietnam, Bhutan, Korea, Thailand, South Africa, Mauritius, Georgia, Brazil, Mexico and Panama). Apart from these, several DNA include impacts on other environmental concerns like noise, aesthetics, odor, use of banned substances, electromagnetic radiations etc. For biodiversity, the approach of DNAs can be either "no harm" to biodiversity or "maintenance/improvement of biodiversity". DNAs also look at any possible impacts on the forest cover, species and protected zones; and on increase in green cover in the area of the project.

Apart from these, some DNAs only indicate that their environmental criteria are in congruence with those required for the Environmental Impact Assessment (EIA) under their laws (Peru, Nicaragua).

Several DNAs give a special mention to the sustainability of resource use (Korea, India, Vietnam, Rwanda, Malaysia, Indonesia, Morocco, South Africa, Mauritius, Serbia, Georgia, Armenia, Uzbekistan and Thailand).Some mention specific resources (water usage, forests, non-renewable resources, ecological functions etc.), defined under the following heads:

- Efficiency/sustainability of resource usage
- Access of local community to resources
- Avoidance of resource degradation

DNAs of Kenya and Georgia consider the project to have a positive environmental benefit if the project contributes implementation of the countries obligation to other global conventions and agreements apart from those on change of climate.

Overall, it is observed that most DNAs rely on the environmental laws and standards set by national, provincial and local governments in deciding whether the project is contributing positively to the local environment.

Social Benefits: The impact that a CDM project has in improvement of the quality of life of the local community appears to be the most frequently used criteria. However, DNAs usually specify some indicators that would justify improvement of life of local communities by the project. These are:

a. assisting in poverty alleviation through employment generation,

b. ensuring no adverse effects on health,

c. engaging in developmental activities to support the society,

d. enhancing accessibility to public services, and

e. promotion of local industry.

Among these as well, impact on human health and inclusion of developmental activities in the project appear most frequently. Indonesian and Zimbabwean DNAs ask for a documented procedure of adequate actions to be taken in order to prevent and manage possible accidents in the project boundary. Thai DNA requires submission of a management plan in compliance with the existing labor regulations to promote workers and nearby community health. If a project promotes better health for workers and the nearby community, it is given a higher positive scoring. Most DNAs consider involvement of the project in activities that enhance societal development as a social benefit. These activities include infrastructure creation, provision of healthcare and educational facilities, civic amenities etc. Poverty reduction is usually used interchangeably with local employment and income generation, hence does not appear that often.

The effective participation of the community in the project is also required by many DNAs, most of them requiring that the communities are involved throughout the project cycle- from consultation during project design and planning, to utilization of local resources and man-power during project implementation (Mauritius, Zimbabwe, Indonesia, Kenya, Thailand, Serbia, Georgia, Armenia, Bolivia, Peru, El Salvador and Rwanda). DNA of Indonesia and Zimbabwe expect that the comments and complaints from local communities are taken into consideration and responded to in the process of project design. Peruvian DNA requires a written agreement between the project proponent and local communities/ a letter of consent from the communities to provide the LoA. Impact on the relocation of communities is also stressed by a few DNAs (South Africa and Rwanda).

DNAs also give impetus to the ability of the project to generate technical skills and knowledge in the local community (Thailand, Kenya, South Africa, Madagascar, Mauritius, Serbia, Georgia, Armenia, Uzbekistan, Rwanda, Senegal, Israel and Nicaragua). Additionally, the project should enhance social equity, especially in terms of gender and racial equality in employment generated (Bhutan, South Africa, India, Bolivia and Rwanda) DNA of Rwanda gives a lot of stress to rights of workers. Further, some DNAs also indicate the impact of the project on doing 'no harm' to the cultural heritage (Malaysia, South Africa, and Rwanda) and social harmony (Panama, Zimbabwe, Kenya, Malaysia) in the region as contribution to social benefits.

Finally, many DNAs also account for broader social benefits from the alignment of the project to provincial and national government objectives; local development priorities and specific sectoral objectives. Other broader social benefits that DNAs mention include awareness raising effect of project (Uzbekistan, Burundi), its role in enhancing the resilience of communities (Bolivia), and its possible linkages with the socio-economic development of other sectors and regions within the country (Brazil, Mexico).

Table 2.3: Summary of Sustainable Development Criteria in the environmental and social dimensions across regions and countries in the sample

CRITERIA	INDICATORS	REGIONS/ COUNTRIES																												
		ASIA PACIFIC							AFRICA									EUROPE AND CENTRAL AMERICA				MIDDLE EAST		LATIN AMERICA						
		Vietnam	Bhutan	India	Korea	Malaysia	Thailand	Indonesia	Kenya	Morocco	South Africa	Zimbabwe	Burundi	Madagascar	Mali	Mauritius	Rwanda	Senegal	Serbia	Georgia	Armenia	Uzbekistan	UAE	Israel	Brazil	Mexico	Bolivia	Peru	El Salvador	Panama	Nicaragua
Environmental	**1. GHG emission reduction**	Y	Y	Y	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y		Y	Y				Y							
	2. Impact on environment: general	Y	Y					Y	Y			Y						Y				Y		Y	Y	Y			Y	Y	
	• Respect to environment												Y										Y								
	• Change in development practices with respect to environment												Y																		
	3. Impact on environment: specific																														
	• Impact on air, water and land resources	Y	Y	Y		Y	Y	Y			Y	Y				Y	Y		Y	Y	Y		Y		Y	Y	Y			Y	
	• Impact on solid waste generation or disposal	Y	Y		Y		Y				Y					Y				Y					Y	Y				Y	
	• Impact on marine environment					Y										Y									Y						
	• Impact on conservation/promotion of biodiversity (genetic, species and ecosystem) and ecosystems	Y		Y		Y	Y	Y		Y	Y	Y				Y	Y		Y	Y	Y		Y		Y	Y	Y			Y	

IT ER	INDICATORS	REGIONS/ COUNTRIES																													
	• Not permitting genetic pollution											Y																			
	• Improve green cover						Y																								
	4. Contribution to resource sustainability: • efficiency of resource usage • access of local community to resources • impact on resource degradation			Y	Y			Y		Y	Y	Y				Y	Y		Y	Y	Y	Y	Y	Y			Y			Y	
	5. Complying with existing land use planning							Y				Y																			
	6. Contribution of project to other global conventions and agreements (MDGs, biodiversity, desertification and etc.)								Y												Y										
	7. Other impacts (noise, safety, aesthetic, landscape, heat, odor and electromagnetic radiation)			Y	Y		Y				Y					Y					Y									Y	

CRITERIA	INDICATORS	REGIONS/ COUNTRIES																												
		ASIA PACIFIC							AFRICA									EUROPE AND CENTRAL AMERICA				MIDDLE EAST		LATIN AMERICA						
		Vietnam	Bhutan	India	Korea	Malaysia	Thailand	Indonesia	Kenya	Morocco	South Africa	Zimbabwe	Burundi	Madagascar	Mali	Mauritius	Rwanda	Senegal	Serbia	Georgia	Armenia	Uzbekistan	UAE	Israel	Brazil	Mexico	Bolivia	Peru	El Salvador	Panama	Nicaragua
Social	**1. Consistency with/ contribution to national, provincial and local development and sectoral priorities**	Y		Y					Y	Y	Y		Y		Y			Y	Y	Y		Y				Y		Y			Y
	2. Quality of life of locals (e.g. health, poverty alleviation, labor conditions)	Y	Y	Y	Y	Y	Y	Y			Y		Y	Y		Y			Y	Y	Y	Y		Y	Y	Y	Y			Y	
	2.1 Poverty reduction	Y		Y					Y		Y				Y	Y			Y							Y	Y				
	2.2 Impact on human health: • health of community in the project area • occupational health and safety measures	Y		Y	Y		Y	Y				Y				Y	Y		Y			Y			Y		Y			Y	
	2.3 Inclusion of developmental activities to support the society: (Healthcare, public infrastructure, civic amenities etc.)			Y			Y				Y					Y	Y		Y					Y	Y	Y			Y		
	2.4 Accessibility of local public services				Y			Y			Y	Y				Y				Y						y					

CR	INDICATORS	REGIONS/ COUNTRIES																													
	2.5 Promotion of local industries											Y					Y														
	3. Effective public/ community participation in project design, planning and implementation						Y	Y	Y			Y				Y	Y		Y	Y	Y						Y	Y	Y		
	4. Capacity /skill/ knowledge development						Y		Y		Y			Y		Y	Y	Y	Y	Y	Y			Y							Y
	5. Removal of social disparities		Y	Y							Y																	Y				
	6. Maintaining social harmony in the region				Y			Y				Y																			Y	
	7. Preservation of local culture/ heritage					Y					Y						Y											Y			Y	
	8. Relocation of communities										Y						Y														Y	
	9. Enhancing public awareness (On climate change, use of resources)												Y									Y									
	10. Contribution to regional integration and linkages with other sectors (within the country)																								Y	Y					
	11. Reduction of natural disaster risks, increase of the resilience to climate change and of capacities for adaptation																										Y				
	12. Support for CSR activities														Y																

Table 2.4: Summary of most frequently used criteria by Designated National Authorities in the economic (and technological), environmental and social dimensions of sustainable development benefits of CDM projects

Most frequently used criteria by DNAs	
I. To assess economic(and technological) benefits of CDM projects	
1.	Additional investment generated
2.	Employment generation
2.1	Number of jobs created for the local community: i. within the project activity ii. in the area
2.2	Quality of jobs created
3.	Income generation
4.	Contribution to sustainability of balance of payments by its: i. Impact on foreign exchange requirements ii. Impact on FDI iii. Contribution to macro-economic sustainability iv. Impact on imports and exports
5.	Clean energy development: i. Generation from renewable sources of energy ii. Access to clean energy iii. Cost of energy iv. Reduction in energy dependence and energy intensity
6.	Contribution towards improvement of technologies Use of technologies that are: i. cleaner, more efficient and environment friendly ii. locally appropriate iii. best available, modern and proven (not obsolete, substandard)
II. To assess environmental benefits of CDM projects	
1.	GHG emission reduction
2.	Impact on environment
3.	Impact on air, water and land resources
4.	Impact on solid waste generation or disposal
5.	Impact on conservation/promotion of biodiversity (genetic, species and ecosystem) and ecosystems
6.	Contribution to resource sustainability: i. efficiency of resource usage ii. access of local community to resources iii. impact on resource degradation

III. To assess social benefits of CDM projects	
1.	Quality of life of locals
1.1	Poverty reduction
1.2	Impact on human health: i. Health of the community in the project area ii. Occupational health and safety measures
1.3	Inclusion of developmental activities to support the society
1.4	Accessibility of local public services
1.5	Promotion of local industries
2.	Effective public/ community participation in project design, planning and implementation
3.	Capacity /skill/ knowledge development
4.	Consistency with/ contribution to national, provincial and local development and sectoral priorities

2.4. Procedures for Issuing Letter of Approval (LoA)

The procedures for granting letter of approval (LoA) differ variedly from country to country and so does the institutional setup of the DNA. However, most of the DNAs have a requirement of review of the project by technical and sectoral experts or relevant ministries (if required) to issue the final letter of approval to CDM project developers. China, for example, requires an independent review by technical and sectoral experts on the project's feasibility and impacts. Malaysia, on the other hand, has a mandatory requirement of an approval by a Technical Committee of CDM (TCCDM), which does technical evaluation of the projects design and submits its recommendations to a National Committee on CDM (NCCDM), which provides assistance to DNA on CDM policy issues.

Almost all countries have representation from key ministries in the approval process. Their role is to review and evaluate the project and provide support to the DNA in its decision making. In Kenya, interestingly, there is a National CDM Clearing House (NCH), with representation from public and private sector representatives, institutions, civil society and academia.

Most DNAs decide the compliance of the project with sustainable development priorities of the country keeping the designated sustainable development indicators as a reference. Usually the project is not expected to fulfill all the criteria/ indicators but describe the ones that they will be fulfilling. However, some countries do specify this information. For instance, DNA of Thailand, which has developed a method of scoring for each indicator under a defined set of criteria for all the three dimensions of SD (social, economic and environmental), mentions that a project needs to have a positive total score for all indicators mentioned in the project and the total score for each sectoral indicator positive. Indonesian DNA approves a project only when the project passes all

the individual indicators that are applicable to the project. Supporting qualitative and quantitative data is required for justification of fulfillment of the criteria.

The DNA of Rwanda organizes its sustainable development criteria in four categories: fundamental principles, environmental good practice, social aspects and economic benefits. Within these categories, there are "mandatory criteria" and "other relevant criteria." In order to receive a Letter of Approval, the project developer must demonstrate that all of the mandatory criteria are met. In addition, in the sustainable development checklist, at least one "other relevant criterion" from two of the three remaining categories – environmental good practice, social aspects and economic benefits is met.

Some DNAs incorporate certain special checks to ensure sustainable development is fulfilled. For example, South African, Brazilian and Malaysian DNA expect the PDDs to be validated by a DOE before submission for host country approval. The Rwandian DNA expects an updated sustainable development checklist demonstrating how the sustainable development criteria are being met once the project is operating, each time a verification of the project is conducted. Chinese government levies a tax from CDM projects viz. 2% tax on CERs from priority areas, 31% for N_2O projects and 65% for HFCs and PFCs. These revenues are redirected to sustainable development activities through a CDM Fund. CDM Fund offers grants and investments. While the grants are provided to support activities in climate-related capacity building and promotion of public awareness, investments mainly support industrial activities contributing to addressing climate change (CDM fund, 2012). The Indian DNA requires project proponents of large scale CDM projects to earmark 2% of annual CER revenue for sustainable development activities. A monitorable action plan for the use of this revenue is to be provided in the Project Concept Note (PCN). The PCN template has been recently revised with a detailed set of sustainable development indicators under the four categories of economic, social, technological and environmental well-being and detailed requirements for stakeholder consultation (DNA India, 2012).

Country	Innovative approaches by DNAs[12]
Peru	It visits the area affected by the project to understand the environmental and social impacts of the project. The report of the field visit is an important input into the process of evaluating the project. Additionally, the Project proponent needs to provide documents to prove that the communities accept the CDM project's implementation in that area[13].

[12] Note: This is not an exhaustive listing, rather examples taken up from the sample in the study
[13] The documents could be certificates of communal arrangements, social reports and agreements signed between project proponents and the community

Country	Innovative approaches by DNAs[12]
Rwanda	Projects proponents are required to submit an updated sustainable development checklist each time the verification of the project is conducted, demonstrating how the sustainable development criteria are being met once the project is operating.
India	For large scale projects, the project proponents are required to submit a monitorable action plan for large scale CDM projects earmarking 2% of annual CER revenue for sustainable development activities in the PCN. Recently, the DNA has come up with a proforma which requires the project proponent to provide details of activities in their projects that will provide sustainable development benefits.
Thailand, Philippines[14] and Georgia	These DNAs have developed a method of scoring the sustainable development indicators for Host Country approval.
Thailand	Thai DNA has a certification system in place called "Crown Standard" for giving incentive for Thai projects to contribute more to social and environmental dimensions of sustainable development. The project which receives the Crown standard has a lesser approval fee and a greater chance of obtaining the Gold Standard.
China	The government levies a tax from CDM projects, the percentage of tax depending on the project type. These revenues are redirected to sustainable development activities through a CDM Fund.
Kenya and Malaysia	DNAs give a list of priority sectors for CDM projects in their host country.

While there seems be an increasing trend for proactive involvement of DNAs in the approval process of CDM projects, limited capacity and resources constrain many DNAs for taking appropriate action. The online assessment also reveals that many countries do not have a DNA

[14] Personal communication with Grant Kirkmann (UNFCCC)

website. Previous studies (Arens et. al 2009) mention that the absence of a DNA website can function as a barrier for investors and can be a sign that these DNAs do not actively promote CDM within the host country. However, the lack of financial resources and capacity issues of such DNAs also need to be considered.

2.5. Insights from Literature

There is a dearth of literature specifically targeting the sustainability criteria employed by DNAs, with analysis of DNA practices and their sustainability criteria usually being a sub-section of a larger study, done on a limited sample of countries. Olsen and Fenhann (2008) in their study on sustainable development benefits conducted a review of the approval processes of 8 largest DNAs viz. India, China, Brazil, Morocco, Mexico, South Africa and Armenia conclude that most DNAs use a checklist approach for establishment of SD criteria. Pointing towards the weaknesses in the approval processes of these DNAs, the authors state that none of the countries require any monitoring of the sustainable development benefits to verify that the benefits are 'real and measurable'. They criticize the current process of approval by stating that sustainable development is not included in the assessment of Designated Operational Entities (DOEs) during verification and it is not a requirement at the international or national level that sustainable development benefits are actually realized. Boyd et al. (2009) raise questions on the whether the DNAs address the issue of accountability of project proponents in ensuring sustainable development benefits. Sterk et al. (2009) do a comparative analysis of conventional CDM projects with Gold Standard (GS) projects from 6 countries i.e. India, Panama, Bolivia, El Salvador, Nicaragua and Brazil. The authors conclude that the procedures and criteria of Panama and Nicaragua are well developed with detailed stakeholder consultations and stress on safeguarding approach. India exemplifies some good as well as bad projects in terms of sustainable development benefits to communities. It was suggested that a stringent stakeholder consultation requirement by DNA would help in improvement of the anomaly. Brazilian procedures were concluded to be satisfactory but have room for flexible interpretation. Bolivian indicators are said to be 'theoretically well-developed' while El Salvadoran lack specific parameters in the formulation of criteria. Overall, the study concludes that there is requirement for further clarity in the SD criteria of DNAs and more detailed stakeholder consultation procedures. Arens et. al (2011) studied the potential of CDM in 11 selected LDCs in sub-Saharan Africa: Burkina Faso, Democratic Republic Congo, Ethiopia, Malawi, Mali, Mozambique, Rwanda, Senegal, Tanzania, Uganda and Zambia. They found that only 3 of the eleven countries studied have a DNA website and pointed that absence of a DNA website can function as a barrier for investors and can be a sign that these DNAs do not actively promote the CDM within the host country.

2.6. Insights from Stakeholder Interactions and Survey of DNAs

The issue of sustainable development criteria and the role of DNAs have been raised in some occasions during the stakeholder consultation conducted by the CDM policy dialogue[15]. The key observations that emerge from stakeholder consultations conducted by the Policy Dialogue are as follows:

i. The current system, in which countries set their own sustainable development definitions and criteria, should remain - in order to ensure country specific indicators that are aligned with local socio-economic conditions and respect national sovereignty. The EB or secretariat could, however, assist in developing some voluntary guidelines for countries in requirement of assistance, especially in quantifying SD impacts.

ii. DNAs need to have a more continuous role in the CDM process with additional powers in the CDM project cycle to ensure sustainable development. Many participants thought that the role of DNA should be expanded to include monitoring the CDM project activity post approval.

iii. Need for further strengthening the capacity of DNAs (especially in Africa)

Some solutions were also suggested during various consultations (Tokyo Consultation, Africa Carbon Forum, Asia Consultation, Joint Coordination Workshop, Meetings with negotiating blocks during Bonn negotiation sessions).

These are enlisted below:

- Providing DNAs power to withdraw letter of approval
- Embedding sustainable development criteria in the project verification stage.
- Enhancing dialogue between DNAs to share ideas on best practices, sustainable development criteria, etc.
- Monitoring of sustainable development benefits by the host countries.
- Need for improved communication between the Secretariat and DNAs
- More stringent LoA issuance process

A need for monitoring of sustainable development benefits was raised in most consultations. Many stakeholders felt that CDM should be operational at the national level and DNAs should become more involved in the CDM process to ensure higher accountability. Some stakeholders suggested that if the DNA is not satisfied about a project meeting its sustainable development goals, it should be able to exercise its authority based on its own M&E systems, or request the EB

[15] The consultations reports that have discussions on sustainable development criteria and role of DNAs include Tokyo Consultations (10-11th May 2012), Africa Carbon Forum (18th-20th April 2012) and consultations with African stakeholders (4th July 2012), Asia Consultation (7th-8th June 2012) , Joint Coordination Workshop (15th-18th May 2012), Meetings with negotiating blocks during Bonn negotiation sessions (May 2012), Meeting with DNAs and NGOs during DNA forum (22nd-23rd March 2012).

to designate a DOE to crosscheck it and upon receipt of DOE report de-register the project. However, while stakeholders mentioned that a monitoring system was important to measure the sustainable development benefits from a project, some stakeholders questioned the usefulness of such a system. They have argued that while a greater scrutiny on sustainable development was important, a more rigorous system might be counter-productive and drive the market prices down. Others feared that incorporating SD criteria into the verification process would increase the transaction costs further (note: transaction costs are the biggest concerns expressed during consultations in Africa) which will send wrong signals to the already dwindling market.

In the online survey of DNAs conducted by UNFCCC secretariat from 29th April 2012 till 15th May 2012, responding countries indicated that monitoring was usually not done during the project implementation apart from for projects which require an EIA. However, the South African DNA mentioned that it compiles an Annual CDM Status in South Africa to monitor the sustainable development impact of projects. On the issue of having standardized sustainable development criteria, 4 of the 9 Non-Annex I DNAs who responded to the survey reject the idea, while 3 responded that determining SD should remain the decision of the host country, but some generic guidelines may be provided to assist countries who require it.

Conclusions

The DNAs are empowered under the Kyoto Protocol to assess the contribution of a CDM project to the sustainable development goals of their country. Countries define their sustainable development criteria in congruence with their national priorities. Broadly, most countries define their criteria under the social, economic and environmental dimensions. The institutional setup of the DNA and the procedures employed for granting letter of approval (LoA) differ from country to country. At present, the degree of detail in which the criteria are articulated by countries range from providing a simple listing of criteria/indicators to quantitative assessment by prescribing scoring to indicators.

The project design document and/or the project concept note along with relevant clearances are the key documents to assess the degree of compliance of a project with sustainable development priorities of the country. Such assessment is done keeping the designated sustainable development indicators as a reference. Most of the DNAs have a requirement of review of the projects by technical and sectoral experts and/or relevant ministries in the assessment. Some DNAs also employ special checks to determine contribution of project to sustainable development.

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CHAPTER 3: Impact of CDM on Sustainable Development Goals[16]

3.1 Introduction

Contributing to sustainable development in host countries is the first objective of the CDM mentioned in Article 12 of the Kyoto Protocol, and is given the same level of importance as assisting Annex I Parties to meet their emissions reduction targets. This chapter aims to understand and assess the extent to which CDM has, in fact, contributed to sustainable development and how these contributions can be enhanced. After a brief overview of UNFCCC requirements and procedures, the chapter provides an overview of the criteria currently used by DNAs to assess sustainable development contributions of CDM projects. This is followed by an extensive literature review on sustainable development in the CDM. We then present new analysis undertaken for this study on the reporting of sustainable development impacts in registered PDDs, and the resulting trends by country/region and project type in reported impacts. This is followed by a discussion of negative impacts of CDM projects, and how to evaluate the claims against some CDM projects of a variety of social and environmental harm caused by project implementation.

3.1.1 Definition of Sustainable Development

The report "World Conservation Strategy" published in 1980 by IUCN, UNEP and WWF, was the first recorded use of the concept of sustainable development (SD). The classic definition of sustainable development comes from the 1987 report "Our Common Future", by the World Commission on Environment and Development (WCED), a commission established by the General Assembly of the United Nations in 1983[17]. As per the report, sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Since the WCED, sustainable development has been referred to in a number of UN contexts, but not defined.

The IPCC Fourth Assessment Report, 2007, (IPCC AR4) includes in the concept of sustainable development the three elements of: economic development; social development; and environmental protection. IPCC AR4 was welcomed by the Conference of the Parties to the United Nations Framework Convention on Climate Change (Convention) in decision 3/CP.13.

Most recently the Report of the United Nations Secretary General's High Level Panel on Global Sustainability entitled "Resilient People, Resilient Planet - A Future Worth Choosing", reiterated the Brundtland Commission understanding of the concept of sustainable development[18].

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[17] Resolution 38/61 of 1983.

[18] Available at <http://www.un.org/gsp/report>.

Given the above it can be argued that within the United Nations system the general meaning of sustainable development can reasonably be based on the definitions provided in the WCED and IPCC AR4.

In the context of CDM, as discussed in chapter 2, the CDM procedure does not formally define SD criteria, in contrast to the other objective of the CDM, GHG emission reductions. The assessment of the contribution to SD of the projects is a sovereign matter of the host country and it is to the host Party's prerogative to confirm whether a CDM project activity assists it in achieving SD (UNFCCC, 2002, Decision17/CP.7). By not clearly defining the SD criteria required for the CDM, the UNFCCC allows the host country to adjust those criteria according to national development priorities.

3.1.2 Current UNFCCC requirements and procedures

Since the adoption of the Kyoto Protocol, there have been five CMP decisions that have provided guidance, in a consistent manner, on Article 12, as to how the sustainable development component of project activities is to be determined:

- Decisions 17/CP.7[19], 1/CMP.2, 2/CMP.3, and 2/CMP.4 that each have recitals that affirm or reaffirm "that it is the host Party's prerogative to confirm whether a clean development mechanism project activity assists it in achieving sustainable development";
- Decision 3/CMP.1, Annex, at paragraph 40, relates to the procedures for registration of a CDM project activity and provides that: "The designated operational entity shall: (a) Prior to the submission of the validation report to the Executive Board have received from the project participants written approval of voluntary participation from the designated national authority of each Party involved, including confirmation by the host Party that the project activity assists it in achieving sustainable development" […].

No further guidance has been provided as to how the DNAs should assess the sustainable development impact of CDM projects. The Project Design Document (PDD), which is used to register CDM projects with, simply requires the project proponent to include in the description *"the view of the project participants of the contribution of the project activity to sustainable development (max. one page)"*. It can be noted that the PDD for Programmatic CDM (PoA) does not even contain this requirement.

Over the years this set-up has been criticized by different CDM stakeholder groups, in particular by local NGOs, claiming the following shortcomings:

- The lack of definition of sustainable development makes the requirement that CDM projects shall contribute to the sustainable development in the host country meaningless.
- In several cases registered projects are not contributing to sustainable development, and in some cases are even detrimental to sustainable development.
- Since there is no definition of sustainable development in the CDM, the impact on sustainable development can neither be monitored nor known. The impact on sustainable development is in fact not a requirement for projects to report on[20].

[19] COP assumed the responsibilities of the CMP for this decision - see Decision 17/CP.7

- Based on the above, there is a concern that in some cases, the sustainable development impact from CDM projects is ignored.

Notwithstanding the recognition that the CDM clearly gives the host country DNA a clear and exclusive right to assess and confirm the contribution to sustainable development of a CDM project, the CDM Executive Board is currently engaged in discussions about to what extent the Board may provide guidance on this matter. In order to support this discussion the Board launched at its 61st meeting a Call for public inputs on sustainable development co-benefits and negative impacts of CDM project activities. The responses to the Call were presented in a synthesis report the Executive Board at its 65th meeting. The Board noted that the "assessment of the contribution of project activities to sustainable development is under the authority of DNAs", and requested the secretariat to "undertake an analysis of the potential implications of the proposed measures and of what issues are within the remit of the Board to address".

At CMP.7 (decision 8/CMP.7), the Parties requested the Board to "continue its work and develop appropriate voluntary measures to highlight the co-benefits brought about by clean development mechanism project activities and programmes of activities, while maintaining the prerogative of Parties to define their sustainable development criteria".

At EB67, the Board considered a concept note on highlighting sustainable development co-benefits on a voluntary basis (EB67 Proposed Agenda – Annotations. Annex 13). This note outlined the objective of enhancing reporting on co-benefits, the principles and constraints, and several options for implementation. Constraints include that any measure must be voluntary for project participants and that is must not undermine the role of the DNA in determining whether the CDM project contributed to sustainable development. Following discussion of this concept note, the Board requested the Secretariat to develop a tool to include the following features:

- A checklist approach based on best practices and drawing on a wide selection of possible sources;
- Flexibility to include the voluntary tool in existing CDM documents and workflows;
- A project participant or CME may make an initial declaration using the voluntary tool;
- A project participant or CME may choose to update, change or withdraw the initial declaration if circumstances change at any time prior to or after registration of the CDM project activity or PoA.

In the concept note for EB67, the Secretariat noted that such a checklist could be used in several ways in the CDM project cycle, namely:

- As an initial declaration at the start of project development
- As an initial declaration that is updated during project implementation
- As an initial and updated declaration that is subject to validation and verification
- All of the above plus possible adverse consequences for projects failing to perform

[20] The UNFCCC secretariat's report "*Benefits of the Clean Development Mechanism 2011*" attempts to correlate claims of sustainable development benefits as stated in the Project Design Documents (PDD) with observed impact in the implementation stage of the projects, and finds that this is difficult to do due to lack of data, but that correlation appears to be low.

3.1.3 An overview of sustainable development criteria set by Designated National Authorities

As discussed above and in Chapter 2, the assessment of the contribution to SD of the projects is a sovereign matter of the host country and it the host Party's privilege to approve whether a CDM project activity assists it in achieving SD (UNFCCC, 2002, Decision17/CP.7). Each host country has to set up a DNA, with a prime responsibility to define and oversee if CDM projects from their country were achieving sustainable development. Chapter 2 presents a summary of the sustainable development criteria used by various DNAs and the common approaches employed to provide the LoA to project proponents.

3.2 Literature review

This section summarises the review of scientific studies assessing the sustainable development performance on CDM projects. The last few years have seen a growing body of literature on CDM and its contribution to sustainable development. Most of it is published by researchers and academicians as peer-reviewed papers. Nevertheless, the number of opinion articles or perspectives of policy/think tank organisations available in the form of grey literature is also significant.

Note that the CDM procedure does not formally define SD allowing the host country to adjust the SD criteria according to national development priorities (UNFCCC, 2002, Decision17/CP.7). The reviewed studies, while acknowledging this, have in general accepted that sustainable development calls for convergence of the three pillars of economic development, social equity, and environmental protection. Each of these three dimensions of SD has been further defined in terms of criteria and indicators by the researchers. According to Olsen and Fenhann (2008), "defining SD once and for all is an impossible task".

3.2.1 Methodologies used in key studies

In order to capture the multi-dimensionality of the concept of 'sustainable development', majority of the studies on the subject assess the sustainability impacts of CDM projects using criteria and indicators. However, the selection of specific criteria varies in different studies. Most of the studies have used the PDDs as the primary source of data/information. However, in order to validate the claims made in the PDDs, a few studies (UNFCCC, 2011; Subbarao and Lloyd, 2011) have followed the textual analysis of PDDs with questionnaire survey among the relevant stakeholders and site visits for selected projects as part of their methodology.

Bulk of the research studies have divided the criteria used for the analysis under three broad heads – environmental impacts, social impacts, and economic impacts barring a select few which have focused on just the environmental dimension of SD in terms of CO2 emission reductions given that the primary objective of the CDM is to combat global warming (Huang and Barker, 2009). Remarkably, some studies (Nussbaumer, 2008; Alexeew, 2010; Castro and Michaelowa, 2008; Sutter, 2003; Subbarao and Lloyd, 2011) have included quality of stakeholder consultation/participation and stakeholder comments and perception as one of the indicators to

assess CDM projects. A few studies (Sutter and Parreño, 2007; Nussbaumer, 2008) have also assessed projects with respect to distribution of CER revenues. Some unusual criteria/indicators used by various analytical studies being quoted here include sustainability tax and CSR (Olsen and Fenhann, 2008), training (Watson and Fankhauser, 2009) and migration (Subbarao and Lloyd, 2011).

A couple of studies have used software for textual analysis of PDDs - Olsen and Fenhann (2008) conducted an evaluation of 296 PDDs using a software program called Nvivo7 and Lee and Lazarus (2011) employed Atlas.ti Version 6.2 software for the same purpose.

A limited number of these analytical studies have focused on assessing the suitability of the Gold Standard (GS) for CDM as a whole (Sterk et al, 2009) in order to enhance its SD component whereas a few research initiatives (Nussbaumer, 2008) have attempted a comparison of GS labelled projects with non-labelled projects of a similar type with respect to impacts on socio-economic development and environment conservation.

Table 3.1: Summary of Methodologies Employed and Conclusions of Reviewed Studies[21]

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
1.	Sustainability check-up for CDM projects; Christoph Sutter, 2003	Multi-Attributive Assessment of CDM (MATA-CDM of information received from stakeholder consultations/surveys.	6 case studies in South Africa, India and Uruguay	Clear trade-off between the two objectives of the CDM. Project developers can deliver SD benefits with projects that go beyond the minimal requirements given by the host country. This only works if there is a market for premium CERs with a higher price.
2.	Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects; Christoph Sutter & Juan Carlos Parreño, 2007	Multi-Attributive Assessment of CDM of information given in PDDs	16 projects registered as of August 30, 2005	Trade-off between the two objectives of CDM Contributions to SD are not well reflected in CER prices
3.	The promotion of sustainable	The data extracted from	All registered projects up to	Internal Rate of Return (IRR) of sustainable CDM projects'

[21] Refer to Annex III for details on SD criteria/indicators used by various studies.

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
	development in China through the optimization of a tax/ subsidy plan among HFC and power generation CDM projects; Martin Resnier, Can Wang, Pengfei Du, Jining Chen, 2007	PDDs was subjected to CDM Tax/Subsidy Optimization Model (CDMTSO Model)[22]	August 2006	would be close to 10%
4.	Empirical Analysis of Performance of CDM Projects, Climate Strategies; Paula Castro, Axel Michaelowa, 2008	Empirical analysis of PDDs of CDM projects (including registered, in the pipeline, rejected and withdrawn projects) followed by interviews with international experts and project developers and literature review	275 registered CDM projects, 18 projects in validation, 20 rejected projects and 4 withdrawn ones (as of June 2007UNEP RISOE). For the case study assessments, 4 projects from China, India and Brazil were selected.	The performance of CDM projects in terms of their contribution towards sustainable development does not have any evident impact on their success in terms of CER issuance, lead times, validation or registration success. Buyers do prefer good projects, with sustainability benefits, but they do not have a strong position since demand for CERs is larger than the offer. More detailed monitoring guidelines or measurable sustainability indicators may contribute to improve the sustainability performance of CDM projects.
5.	Sustainable development benefits of clean development mechanism projects: A new methodology for	Text analysis of the PDDs using software program Nvivo7 (QSR International,	Sampled 296 PDDs (out of 744 total as of May 2006)	The trade-offs between the two objectives of CDM exists in favour of cost-efficient emission reductions and that left to the market forces, the

[22] CDM Tax/Subsidy Optimization Model (CDMTSO Model), a sustainable development assessment method evaluates the CDM projects' economic and environmental benefits and an optimization program returns tax/subsidy rates at which the greatest number of CDM technologies becomes viable and where "better" CDM projects can be the most profitable.

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
	sustainability assessment based on text analysis of the project design documents submitted for validation; Karen Holm Olsen, Jørgen Fenhann, 2008	2006), developed for qualitative text analysis		CDM does not significantly contribute to sustainable development. Employment generation is the most likely impact of an average CDM project The distribution of SD benefits among the three dimensions is fairly even, with most benefits in the social dimension, followed by the economic and the environmental
6.	On the contribution of labelled Certified Emission Reductions to sustainable development: A multi-criteria evaluation of CDM projects; Patrick Nussbaumer, 2008	Using information in PDDS a Multi-Attributive Assessment of CDM (MATA-CDM). Gold Standard (GS) and Community Development Carbon Fund (CDCF) CDM projects were compared with non- labelled projects of similar type.	39 registered CDM projects (as of 1 April 2008). All Gold Standard (GS) and Community Development Carbon Fund (CDCF) CDM projects were selected.	CDM's role in assisting host countries in their effort to promote sustainable development is minimal Labelled (GS and CDCF) projects do not drastically out-perform non-labelled ones in terms of SD benefits
7.	Further Development of the Project-Based Mechanisms in a Post-2012 Regime; Wolfgang Sterk et al , November 2009	Based on information given in PDDs, analysis of GS to assess its robustness and its applicability for the CDM as a whole	5 registered GS projects (as of March 2009); 10 conventional CDM projects, 2 each from India and China, and 1 each from Bolivia, Brazil, El Salvador, Nicaragua,	Project types such as transport or sustainable waste management which are high on SD should also be included in GS besides renewable energy and end-use energy efficiency projects Existence of host country sustainable development criteria does motivate project

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
			Columbia and Panama	developers to think about SD aspects. Most DNA's SD criteria lack transparency and clarity. Stakeholder consultation is often only rudimentary, completely unregulated and poorly documented.
8.	Reforming the CDM for sustainable development: lessons learned and policy futures; Emily Boyd et al, 2009	Evaluation of direct and indirect benefits based on SD criteria through PDD analysis	A random sample of 10 projects that capture specifically (a) diversity of CDM project types that include biomass, waste heat recovery, hydroelectricity, fuel switch, land fill, construction and biogas and (b) regions. The cases were from India, Brazil, South Africa, and China.	CDM in its current form has negligible SD benefits SD benefits should be reflected in CER prices
9.	The Clean Development Mechanism: too flexible to produce sustainable development benefits?; Charlene Watson and Samuel Fankhauser, June 2009	Textual/keyword analysis of information given in PDDs	The study samples 10% of the 4064 projects (UNEP-RISOE, October 2008. All projects at all stages of validation except those rejected or withdrawn were considered.	Employment generation and training are leading benefits of CDM Indian projects contribute more to infrastructural development than either Chinese or Brazilian projects, but with less technology transfer Chinese projects contribute more to conservation of natural capital in the form of reduced pollution Industrial gas projects have meagre co-benefits and

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
				renewable and forestry projects have greater capacity to contribute to SD.
10.	The Clean Development Mechanism and Sustainable Development: A Panel Data Analysis; Yongfu Huang and Terry Barker, 2009	Environmental Kuznets Curve framework[23]	34 CDM host countries over 1990-2007, however, CDM host countries which have their first CDM projects in the pipeline after year 2006 were excluded.	CDM projects are correlated with a decline in CO2 emissions in host countries.
11.	Analysis of the relationship between the additionality of CDM projects and their contribution to sustainable development; Johannes Alexeew, 2010	Literature review and multi-criteria (economic, social and environmental) assessment of PDDs	A sample of 40 (31 small and 9 large-scale projects—15 biomass, 12 wind, 7 hydro, 4 energy efficiency and 2 HFC-23) registered projects, chosen from the pool of 379 CDM projects in India (as of January 2009). Only projects which applied the investment analysis method for proving additionality were considered.	Significant trade-off between the two goals of CDM-projects with an above-average sustainability performance lack a high probability of being additional and vice versa. Wind, hydro and biomass are consistently observed to have a high relative contribution to sustainability, but are not as likely to be additional; whereas industrial energy efficiency and HFC-23 projects are more likely to be additional, but do not contribute as much to SD
12.	Benefits of the Clean Development Mechanism 2011;	Multi-criteria assessment of PDD content and	All the 2,250 projects registered as of July 2011	All registered projects report multiple SD benefits SD benefits are confirmed for

[23] A Kuznets curve is the graphical representation of Simon Kuznets' hypothesis that as a country develops, there is a natural cycle of economic inequality driven by market forces which at first increases inequality, and then decreases it after a certain average income is attained. The environmental Kuznets curve is a hypothesized relationship between environmental quality and economic development: various indicators of environmental degradation tend to get worse as modern economic growth occurs until average income reaches a certain point over the course of development.

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
	UNFCCC, 2011	follow up survey of project participants		almost all projects where survey was conducted, but the specific benefits in the PDD and from the survey are not often the same. Employment creation and reduction in noise, odours, dust or pollution are the leading benefits of CDM projects
13.	Can the Clean Development Mechanism (CDM) deliver?; Srikanth Subbarao, Bob Lloyd, 2011	Desktop analysis of 500 PDDs. In addition, 5 case studies were investigated through site visits to verify the PDD documents.	500 registered small-scale CDM projects (as of May 2008) were selected for desktop analysis, covering a wide range of sectors.	Renewable energy projects can be particularly appropriate for developing countries in terms of SD benefits Small-scale, community based rural renewable energy CDM projects can offer good prospects for poverty and livelihood benefits in developing countries Ground-truthing is critical to ensure that SD claims in the PDD are actually delivered to the local communities
14.	Bioenergy Projects and Sustainable Development: Which Project Types Offer the Greatest Benefits?; Carrie Lee and Michael Lazarus, 2011	"Development Dividend"[24] (DD) framework and textual analysis of PDDs using the Atlas.ti Version 6.2 software (Atlas.ti GmbH	71 registered and 5 validation-stage biomass energy projects using plant-derived biomass (from a total of 291 registered biomass energy projects and 381 projects at the	The most common SD benefits claimed by project documents were renewable energy production, stakeholder identification, waste reduction, employment generation, and indirect income generation

[24]Development dividend can be defined as "benefits to developing countries beyond those strictly related to climate change, in the areas of economic growth through investment; technological evolution; poverty alleviation; environmental and human health improvements." In other words, the development dividend consists of those benefits that might arise from CDM projects other than the reduction of GHG emissions (Source: Development Dividend, Phase II Report, IISD 2006)

S. No.	Title of the study; author/s and year	Methodology	Cases studies- sample number, countries etc.	Conclusions
		2010)	validation stage as of January 2010	
15.	Is the Clean Development Mechanism Promoting Sustainable Development?; Yongfu Huang, Jingjing He and Finn Tarp, May 2012	Long-differencing estimator models with Human Development Index (HDI) as the dependent variable and CDM project development as independent variable	All registered projects in 58 CDM host countries over 2005-2010	Higher CDM credits per capita, higher ratios of CDM credits over both the economy and total emissions, and higher investment ratios are correlated with SD CDM plays a very positive role in encouraging developing countries to participate in the world's GHG abatement efforts

3.2.2 Conclusions from key studies

A review of literature on potential role of CDM in promoting sustainable development (SD), clearly illustrates that operationally there seems to be a consensus that the concept of SD encompasses at least three dimensions: the social, the economic and the environmental (Nussbaumer, 2008; Boyd et al, 2009; Alexeew, 2010; UNFCCC, 2011; Sutter, 2003; Subbarao and Lloyd, 2011; Sterk et al, 2009; Lee and Lazarus, 2011). Some of the common SD criteria for each of the 'three pillars' used by different research studies include a) **social criteria:** health, welfare, learning, employment, poverty alleviation, equity, improved quality of life, stakeholder participation; b) **economic criteria:** financial returns to local entities, a positive balance of payments, technology transfer; c) **environmental criteria:** reduction of GHGs and the use of fossil fuels, conservation of local resources, improved local air and water quality, better waste management, etc. However, it should be noted that the actual definition of SD and what constitutes it differ according to what different host countries consider as their development priorities.

The following paragraphs summarize the findings of the literature survey predominantly covering themes such as on CDM and SD, twin objectives of CDM and potential trade-off between the two, SD benefits of small scale and GS projects, and ongoing debate on international guidelines for assessing sustainability of CDM projects.

Majority of the studies agree that CDM does have a positive impact on the various facets of SD in the host countries (UNFCCC, 2011; Huang, He and Tarp, 2012). According to Huang, He and Tarp, 2012, despite its inadequacies and limitations, CDM is the only existing climate change mechanism offers an innovative solution to the challenge of how to incorporate SD considerations into

emission mitigation activities. On the other hand, Nussbaumer (2008) questions CDM's role in promoting SD in host countries. Nevertheless, the author finds CDM to be very successful in contributing to the development of a global carbon market, allowing for temporal and spatial flexibility in achieving emission reduction targets.

Several studies have attempted to understand the impact of CDM on SD in the host countries. According to Olsen and Fenhann (2008), the distribution of SD benefits among the three dimensions is fairly even, with most benefits in the social dimension, followed by the economic and the environmental. Of the various requisites of SD, employment generation is the most predominant impact of CDM projects followed by economic growth, improved air quality, and capacity building of the local population (Olsen and Fenhann, 2008; Watson and Fankhauser, 2009, UNFCCC, 2011). However a study by Lee and Lazarus (2011) concludes that the most common SD benefits claimed by project documents are renewable energy production, stakeholder identification, waste reduction, employment generation, and indirect income generation through local sourcing of feedstock. However, it should be noted that differences in dominant SD impacts from projects as suggested by various studies could also be influenced by differences in selection and definition of specific criteria and indicators for measurement, which tend to vary with the type of project assessed and whether the assessment of impacts applies to project/local level, regional or national level.

In terms of various project categories, industrial gas projects have minimal co-benefits as compared to renewable and forestry projects (Watson and Fankhauser, 2009). According to Subbarao and Lloyd (2011), renewable energy projects can be particularly beneficial for developing countries. In rural areas and remote locations, generation of renewable energy using local resources or otherwise can address the issue of energy access in the absence of adequate transmission and distribution facilities. Under such conditions, 'renewable energy solutions for village power applications can be economical, practical and functional to an extent or in some circumstances—sustainable'. The study further concludes that enhanced energy access and other related services can benefit the delivery of health and educational services in the rural communities through providing modern energy services such as lighting and refrigeration, including information and communication technologies. Renewable energy projects can in addition lead to economic development of micro-enterprises and the local economy including poverty alleviation. All this helps the local communities in reducing their reliance on government services which in turn builds the local capacity of managing community based rural energy initiatives. Awareness in the community about 'environmentally benign development' is also enhanced in the process. Olsen and Fenhann (2008) challenge the general perception that small-scale projects have greater contribution to SD than large scale projects, and HFC, N2O, EE industry, biomass and biogas projects have minimal SD benefits. Subbarao and Lloyd (2011), find that small-scale CDM projects have often failed to deliver significant or substantial long term development benefits to the community or region.

According to Watson and Fankhauser (2009), a comparison of projects from different countries shows that Indian projects have far greater thrust on infrastructural development than either

Chinese or Brazilian projects, but with less technology transfer. On the other hand, Chinese projects largely promote protection of local environment and natural resources but it is not clear whether this can be attributed to China's preference for energy efficiency and renewable energy projects to achieve self-sufficiency and surplus generation of energy resources. Further, in relative terms, levying of high taxes on CER revenues (2% from A/R and electricity generation, 30% from N20, and 65% from other industrial gas projects), has had no significant influence on SD benefits assured by project activities in other countries.

Numerous research studies have undertaken a comparative assessment of performance of labeled projects (Gold Standard, GS; and CDCF) vis-à-vis the non-labelled ones. Based on the findings of a comparative exercise of small-scale renewable energy and energy efficiency projects, Nussbaumer (2008) concludes that labelled (GS and CDCF) projects do not significantly surpass the non-labelled ones in terms of SD benefits. The author further states that although the influence of labelled projects to social SD tends to exceed comparable ordinary activities, but the contrary holds for economic criteria of SD.

A number of studies have focused on the potential trade-off between the two objectives of CDM-emission reduction and promotion of sustainable development (Sutter, 2003; Alexeew, 2010). According to Subbarao and Lloyd (2011), CDM in its current state and design is facing several challenges that are hindering the mechanism from delivering and adhering to its dual objectives.

3.2.3 Recommendations from key studies for enhancing sustainable development impacts

Boyd et al (2009) highlight the argument that the current make-up of CDM is not allowing the mechanism to attain its full potential towards promotion of SD as envisaged in its inception. The paper recommends instead of not addressing the situation at all or alternatively interfering with the market forces to incorporate the value of SD into CER prices, the best feasible option would be to 'politically favouring' CERs from projects with high SD ratings. In this regard, Sutter & Juan Carlos Parreño (2007) suggest that market forces should recognize CDM projects not only for emissions reductions but also for SD benefits and consequently the latter should be reflected in the CER prices as well.

Sutter (2003) also recommends creation of market for premium CERs (with high SD quota) with a higher price. Buyers of premium CERs not only evade reputation risks due to CERs generated by unsustainable projects but also have the opportunity of using these CERs for image building and public relation activities. The Annex I could promote high quality projects by enhancing eligibility requirements with respect to SD benefits from projects to be considered under domestic trading schemes. In order to address the trade-off between the two objectives, Alexeew (2010) suggests introduction of a sectoral crediting mechanism and a CER discounting scheme.

Alexeew (2010) highlights the need for clear rules for Designated Operational Entities (DOEs) on how they should validate CDM projects, including sanctions in the case of poor performance; more objective criteria to assess additionality, such as ambitious emission benchmarks and

quantitative thresholds for common practice; a strict exclusion of projects on which the CDM has little impact (i.e. low change in the IRR), and creation of a verification protocol.

Currently, for most projects, the assessment of expected SD benefits is done before the actual implementation of the activity unlike emission reductions which are regularly monitored by the DOEs. Therefore 'efficient and robust guidelines' for assessment of SD impacts of CDM projects is critical (Subbarao and Lloyd, 2011). Olsen and Fenhann (2008) also argue for the need of an international standard for sustainability assessment additional to national definitions.

In the context of monitoring and verification of SD benefits pledged in the PDDs, Subbarao and Lloyd (2011) feel that 'on the ground examination' of the actual state of affairs with regard to benefits generated from CDM projects is indispensable. Although, defining criteria and indicators help in documentation of CDM projects but cannot ensure delivery of those benefits to the local stakeholders.

Sterk et al (2009) are of the view that discarding other project types except renewable energy and end-use energy efficiency in GS is 'an arbitrary definition of sustainable development'. Project types like transport or waste management have immense SD benefits. According to the authors, the definition of SD criteria at the host country level does encourage project proponents to consider SD elements while conceptualizing CDM projects. However, there is no ex-post verification of the benefits pledged in the PDD. Furthermore, most DNA's SD criteria lack transparency and clarity which makes it easy to comply with the requirements. The process of stakeholder consultation is often 'only rudimentary, completely unregulated and badly documented'. The study recommends introduction of an additional set of guidelines and procedures to ensure SD benefits from CDM projects. The new guidelines could include criteria and indicators for assessing the environmental, social and economic impacts, procedures for stakeholder engagement, monitoring of SD claims, and independent assessment of the process. The implementation of the new modalities can be pursued with different levels of ambition- 'ambitious approach' (mandatory adoption of modalities), 'do-no- harm-approach' (mandatory adoption of modalities to ensure that at least projects have no negative impacts), and 'voluntary approach (voluntary modalities in line with the current negotiation text on promoting co-benefits).

Macro benefits of CDM

Some of the macro/global benefits of CDM can be listed as follows:

1. **Attracts investment for minimizing pollution and producing clean energy:** CDM projects attract foreign and domestic funding agencies/organizations/individuals to invest in projects aiming at reducing GHG emissions and generation of clean energy. This in turn can foster partnerships of foreign and local entities to promote low carbon growth.
2. **Global environmental benefits:** CDM encourages companies and governments to participate in projects that aim to sequester or reduce GHG emissions which further reduce global warming.
3. **Enhanced transfer and sale of clean and green technologies:** CDM projects promote use of low-carbon technologies and processes which in turn leads to transfer of technologies between regions and has also led to enhanced sale/purchase of high-end technologies.
4. **Reduced dependence on fossil fuels:** CDM projects promote generation of energy from renewable/non-fossil sources thereby leading to conservation of already scarce fossil fuels which in turn reduces atmospheric emissions.
5. **Enhanced role of private sector in addressing the issue of climate change:** CDM has encouraged the private sector to play an active role in mitigating climate change. Engagement of private sector entities in the process not only provides momentum to the issue but also augments its reach and effectiveness.
6. **Enhanced awareness and creation of a knowledge base:** CDM promotes enhanced awareness about impact of GHGs on climate and use of low-carbon technologies and processes. It also promotes educational activities and dissemination of information and research on the subject. The mechanism has also led to creation of a knowledge base in terms of evaluation and monitoring framework of GHG mitigation projects.
7. **Creation of jobs:** CDM leads to new jobs and employment opportunities, including income generation.
8. **Economic benefits to local stakeholders:** CDM projects lead to new industrial activities and business opportunities, inflow of funds and technologies, growth of infrastructure, and enhanced productivity.

3.3 Analysis of sustainable development reporting in registered PDDs

3.3.1 Methodology for PDD analysis and Sample selection

As discussed in chapter 1, the overall methodology for the study comprised of:

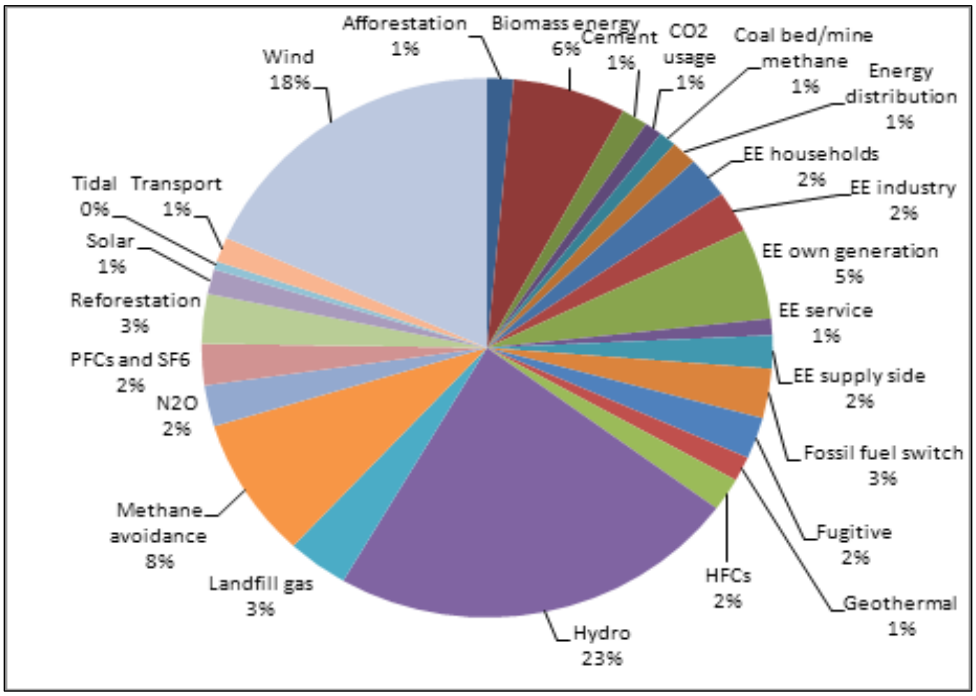
- Literature review
- PDD analysis (using Stratified Random Sampling Technique and multi-criteria assessment)

- Case study assessment (for evaluation of negative impacts of CDM)
- Stakeholder consultations

3.3.1.1 Selection of sample

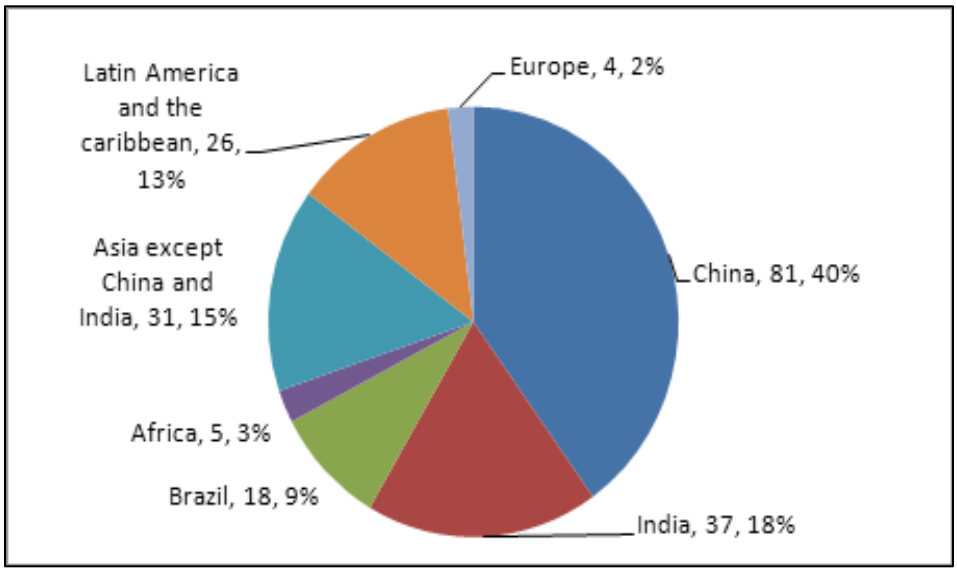
Given the limitations of time, a random stratified sample of 202 projects was considered for this study. 175 strata were identified representative of each region (from UN Regions + India + China + Brazil) and particular project type (from 25 UNEP Risoe sectors). At least one project was selected from each stratum. Where the number of projects was more than one, a random selection was done and for every twenty five projects, an additional project was chosen such that a representative sample was obtained. For random selection, a random number was generated corresponding to CDM-EB project reference number of projects in each stratum and projects with the largest random number were selected. A statistical analysis was conducted, to conclude that for a 95 % confidence level, the sample size should at least include 159 projects. Therefore, a sample of 202 was statistically significant[25]. The CDM pipeline database published in May 2012 by UNEP Risoe was used in the study. This dataset, updated till 1st April 2012, had 3,963 registered projects.

Figure 3.1:Composition of the study sample in terms of projects types



[25] Further, the sample represented approximately 5.1% of the total registered projects covering emissions reduction of around 176371 ktCO2e by 2012, and emissions reduction of 468155 ktCO2e from credit start to 2020. In terms of the start date of the project, the sample includes projects that started as early as 2002 to projects that started in 2011. Two projects from the sample have also entered the second crediting period.

Figure 3.2: Composition of the study sample in terms of regions



3.3.1.2 Definition of Sustainable Development and selection of SD criteria used in analysis

As part of the methodology adopted for the study, an extensive review of literature and assessment of select PDDs provided the range of SD definitions being used/referred to at the international level. It also facilitated the process of identifying sustainability impact criteria/indicators to be used for evaluation of CDM projects in the study. Analogous to earlier studies with similar objectives, in broad terms, the criteria used for the study comprised of social, economic, and environmental co-benefits which were further categorised into sub-criteria and indicators. It should be noted that identification of criteria and indicators for the evaluation was an iterative process alternating between reading, conduction of text analysis of the PDDs and developing and revising the taxonomy. Efforts were undertaken to avoid overlaps between the criteria due to the double counting of the same benefits, for instance accounting indoor smoke reduction both as a health benefit and an air-quality benefit.

Note that the criteria selected for PDD analysis were yes/no criteria rather than quantitative indicators. A 'yes' denoted presence of the co-benefit and a 'no' denoted absence of the co-benefit (and no worse off impacts). Each project in the selected sample of 202 projects was coded for SD indicators, based on which, further analysis was conducted and trends were studied. The PDD was used as primary source of information for this assessment.

The following table presents a summary of criteria and sub-criteria adopted by the study to evaluate SD impacts of CDM projects:

Table 3.2: Criteria to assess the sustainable development impact of CDM projects[26]

Criterion	Indicator	Keywords
Social		
	Improved local quality of life ▪ access to clean energy ▪ sustainable mobility ▪ better shelter ▪ food security ▪ access to drinking water ▪ improved sanitation ▪ targeted support to women folk of the region	Off-grid renewable electricity, biogas, micro hydro , public transport, housing, clean drinking water, sanitation, women, gender, portable water etc.
	Strengthening of local capacity and institutions	Training centre, local capacity, local bodies, women's group, skilled labour, technical education, schools, roads, primary health centre
Economic		
	Employment generation	Jobs, employment, man months, man days,
	Contribution to national energy security	Energy conservation, energy efficiency improvement, renewable energy generation, grid supply, replacing energy sourced from grid
	CER (income) generation	
	Infrastructure creation	Road, lighting, power transmission lines, gas pipes/lines, communication networks, water treatment plants,
	Transfer/introduction/promotion of cleaner and cost-effective technologies	Transfer of equipment, technology, know-how, soft skills

[26] List of criteria for TT in ANNEX/Section

Environmental		
	Improved local air quality	CO2, CO, SOx, NOx, suspended particulate
	Improved water quality, conservation of water	Clean water, water conservation, drinking water, portable water
	Conservation of local natural resources ▪ Sustainable land use ▪ Conservation of fossil fuel resources	Soil erosion, soil fertility, forest, sustainable biomass use, mines, minerals, biodiversity, conservation of fossil fuel resources
	Waste management	Minimisation of waste generation, recycling of wastes, energy from wastes

3.3.2 Limitations of the study

Before presenting the results of the study, the authors would like to highlight the potential limitations of this study owing to the methodology adopted and timeline of the study:

- The basis of the analysis are the PDDs and therefore only positive contributions to SD can be measured since project developers are unlikely to write anything negative about the project.
- Further, the description of SD contributions in the PDDs are only assured/potential benefits and do not reflect the actual delivery of the claimed SD benefits.
- The absence of negative impacts of the project activity, such as no negative impact on water, air quality or land, is not counted as a benefit unless it describes an improvement to the status quo/baseline.
- General statements about the sustainability of a project activity such as 'economic growth, social benefits and environmental improvement will be achieved' are counted as benefits, if they are documented with concrete examples.
- Despite taking utmost care, an element of subjective judgement on how to attribute the SD criteria during textual analysis of PDDs cannot be totally ruled out. To address the issue to some extent, inter-subjective testing with a second analyst coding the same PDDs to check for deviant analytical results was undertaken but not for the entire sample.

3.3.3 Results of PDD analysis

While all projects lead to benefits such as income generation through CERs[27] and GHG emissions reductions[28], 201 PDDs of 202 PDDs in the stratified random sample mentioned other SD benefits. 95.54 % of the PDDs mentioned economic benefits through employment generation, or contribution to national energy security, or income generation, or infrastructure creation or by transfer or promotion of cleaner and cost-effective technologies. 86.14% PDDs mentioned social benefits either as benefits in terms of improved access to clean energy, or sustainable mobility, or better shelter, or food security, or access to drinking water, or improved sanitation, or targeted support to women folk of the region, or strengthening of local capacity or institution. 73.76% PDDs mentioned environmental benefits either as improved local air quality, or improved water quality, conservation of water, or conservation of local natural resources, or sustainable land use, or conservation of fossil fuel resources or better management of waste. Most of the PDDs mentioned more than one SD benefit.

In terms of indicators, PDDs mentioned benefits in the context of improved local quality of life (82.2 %), employment generation (80.2%) and contribution to national energy security (75.7 %). Highest mention thus being of social or economic indicators of SD. Amongst indicators under environment, PDDs mentioned benefits in terms of improved air quality (66.3%), followed by conservation of local natural resources (52%). Figure 3.3 gives the %age of sample PDDs that mention various indicators of SD. technology transfer was considered as an important SD indicator. The analysis indicated (see figure 3.3) that 37.1% of the sample PDDs mentioned technology transfer in varied ways (including north-south and south-south transfer). Further analysis of this indicator suggested that 42.6 % of the PDDs mentioned 'no tech transfer' and it was unclear from the 18.3% of PDDs if technology transfer took place.

The sample represented 79 small scale projects and 123 large scale projects from across regions and project types. The analysis suggested higher incidence of mention of the SD benefits in PDDs of small scale projects than in case of large scale projects. Around 5% of these large scale projects mentioned no other SD benefit but transfer of technology. Most of these include N_2O abatement (50%) or HFC projects (33 %). Interestingly, two of these PDDs mentions a 'no harm' indicator and suggests that 'no jobs will be lost' by the project activity.

[27] Contribution of CER generation on SD is implicit in all cases, since a two per cent levy contributes to the adaptation fund. Few DNAs such as China and India make an explicit mention of utilizing a certain percentage of CER revenues from all or from large scale projects to contribute to the national or local SD cause.

[28] GHG emissions reduction is a global SD benefit from all mitigation activities.

Figure 3.3: Percentage of PDDs mentioning various indicators

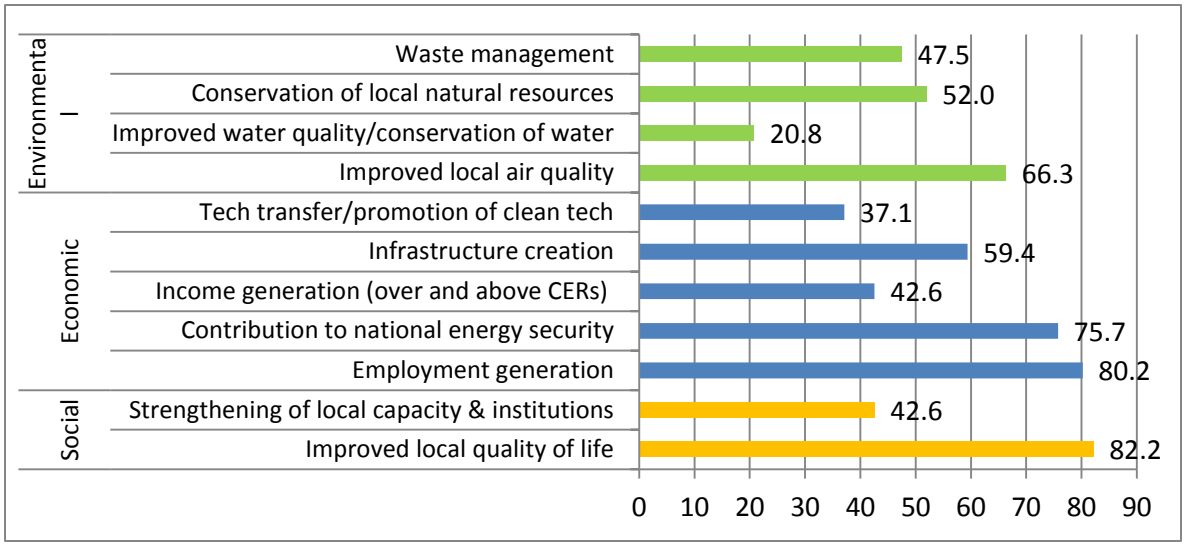
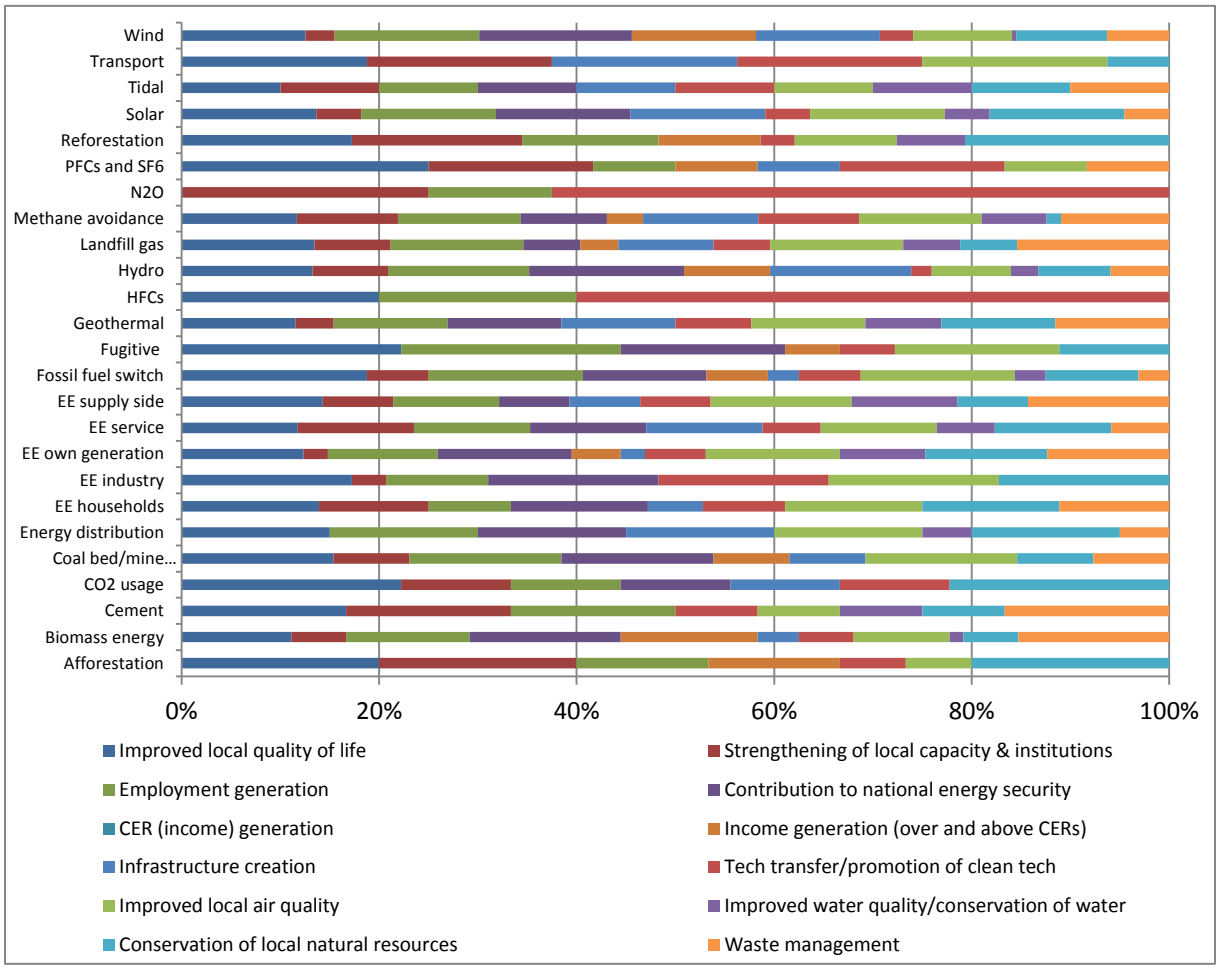


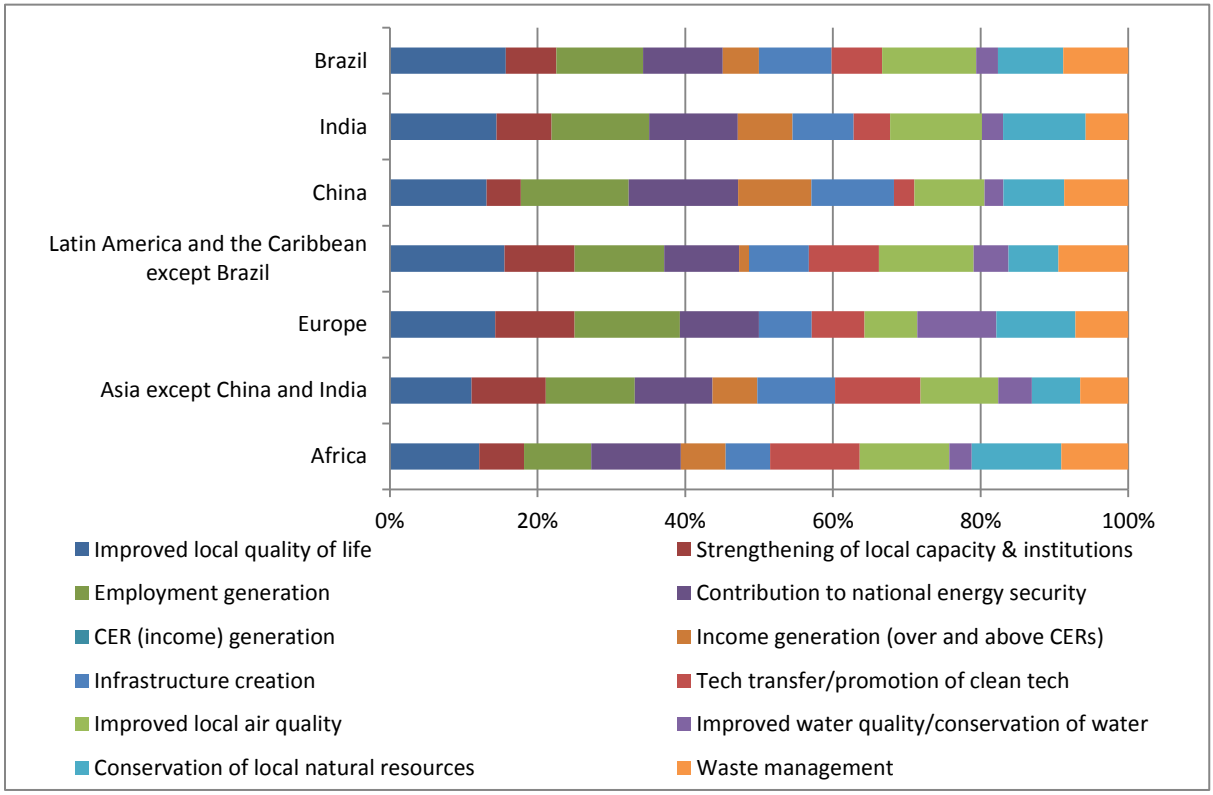
Figure 3.4: Sustainable development benefits cited by project type



The projects from different regions except China claim more or less equally in terms of social, economic, and environmental benefits. On the contrary, projects from China claim most in terms of economic benefits followed by social and environmental benefits. Out of 81 PDDs analyzed from China in the selected sample, 67 projects indicate social benefits, 80 projects indicate economic benefits, and 49 projects claim environmental benefits. On the other hand, out of the total 37 Indian projects in the sample, 36, 36, and 31 projects assure social, economic, and environmental benefits respectively. Similar trends were observed for projects from Brazil.

An analysis of trends of various indicators of SD benefits across regions suggests that amongst the key countries, there is highest mention of improved local quality of life (includes sub-indicators such as access to clean energy, sustainable mobility, better shelter, food security, access to drinking water, improved sanitation, targeted support to women folk of the region) in PDDs from India and Brazil. PDDs from China mention contribution to national energy security, the most. Rest of the Asia (except for China and India) indicates employment generation as the key benefit. Rest of the Latin America (except Brazil) also indicates improved local quality of life as the key benefit. PDDs from Africa indicate variety of indicators such as improved local quality of life, contribution to national energy security, technology transfer, improved local air quality and conservation of local natural resources.

Figure 3.5: Sustainable development benefits cited by region[29]



[29] Europe refers to Eastern Europe

Conclusions

The research study clearly shows CDM projects do have a positive impact on the various facets of sustainable development in host countries. Empirical analysis of the sampled 202 projects shows that 99% of PDDs reported sustainable development benefits: 96 % mentioned economic benefits, 86% mentioned social benefits and 74% mentioned environmental benefits. Most of the PDDs mentioned more than one sustainable development benefits. Amongst sustainable development indicators, most of the PDDs mentioned benefits of: improved local quality of life (82%), employment generation (80%) and contribution to national energy security (76 %). In the sample of 79 small scale and 123 large scale projects, sustainable development benefits are mentioned more often by small scale projects than in large scale projects. Around 5% of these large scale projects mentioned no other sustainable development benefit other than transfer of technology. An assessment of claimed negative impacts of certain CDM project case studies did not lead to the validation of the assertions of adverse impacts by the authors of any of the case studies.

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CHAPTER 4: Impact of CDM on Technology Transfer Goals[30]

4.1 Technology transfer in the UNFCCC and Kyoto Protocol

Article 4.5 of the UNFCCC31 refers to the promotion, facilitation and finance, as appropriate, for the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. It is a key commitment of developed country parties along with the transfer of financial resources. (Article 4.7, UNFCCC),32as well as a commitment of all Parties (Article 4.1(c), UNFCCC).33 While technology transfer is not explicitly included as an objective of the Clean Development Mechanism (CDM) as per Article 12 of Kyoto Protocol, Decision 17/CP.7(part of the Marrakesh Accords) on modalities and procedures for a clean development mechanism as defined in Article 12 of the Kyoto Protocol, in its preambular section mentions "Further emphasizing that clean development mechanism project activities should lead to the transfer of environmentally safe and sound technology and know-how in addition to that required under Article 4, paragraph 5, of the Convention and Article 10 of the Kyoto Protocol." Additionally, decision 3/CMP.1, Appendix B 34(which defines the information required in the project design states that (a) A description of the project comprising the project purpose, a technical description of the project, including how technology will be transferred, if any, and a description and justification of the project boundary;

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[31] Article 4.5 of the UNFCCC states that, "The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies."

[32] Article 4.7 of the UNFCCC, states that, "The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties. "

[33] Article 4.1(c) states that all Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall: (c) Promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors;

[34] Pg. 23, FCCC/KP/CMP/2005/8/Add.1).

Section A.4.3: Technology to be employed by the project activity (This section should include a description of how environmentally safe and sound technology and know-how to be used is transferred to the host Party(ies). Additionally, Article 10c of the KP[35] covers steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries.

While technology transfer may not be among the key drivers of the CDM this study attempts to assess the observable levels of technology transfer in the Clean Development Mechanism, and the trends, if any, with regard to technology or region. The study is a project level analysis, which has three parts, (a) an extensive literature review of empirical studies of technology transfer in the CDM; (b) a keyword and textual analysis of Project Design Documents of a representative sample of registered projects, from the larger list of 3,963 registered projects with a cut-off date of April 30th, 2012; and (c) assessment of select projects from the sample containing an element of technology transfer vis-à-vis Cool's operational definition of technology transfer (detailed explanation in sec 6.4.1). The projects which form the dataset have been registered over the period January 2003 to April 2012. It is important to note that technology transfer may or may not be included under a host country's national level sustainable development criteria.

4.2 Key recent developments at the Executive Board

The Executive Board at its sixty-first meeting, launched a call for public inputs starting on 3 June 2011 and ending on 3rd July 2011, requesting submitters to provide proposals on how to include co-benefits and negative impacts in the documentation of project activities and the role of the different actors and stakeholders in this process. No public call for inputs have yet been made in the case of technology transfer. The most recent initiatives are the two studies commissioned by the UNFCCC secretariat in 2010 and in 2011, which have not been discussed within the Executive Board meetings. Unlike sustainable development where a political process had been ongoing on the issue of co-benefits in the CDM (based on original proposals from Japan) to highlight co-benefits such as air pollution and other environmental SD benefits) no similar process had been

[35] Article 10 (c) of the Kyoto Protocol states that, "All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, without introducing any new commitments for Parties not included in Annex I, but reaffirming existing commitments under Article 4, paragraph 1, of the Convention, and continuing to advance the implementation of these commitments in order to achieve sustainable development, taking into account Article 4, paragraphs 3, 5 and 7, of the Convention, shall:
(c) Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies;

started at either the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) or the EB level (Barata, P, 2012).[36]

Of significance is the fact that the PDD format has undergone change over time, with reporting requirement for technology transfer changing over time. In fact the latest PDD format requires the project proponent to include under Section A.3 Information on technologies and/measures, unlike the earlier PDD versions 237 and 3,38 which required the project proponent to complete Section A.4 on Technical Description of the Project activity and Section A.4.3 on technology to be employed by the project activity.

4.3 Technology transfer requirements at DNA level

Almost all countries (studied in the present analysis, refer chapter 2), identify technological sustainability as a key criteria for CDM projects to attain sustainable development goals. While the definitions provided by countries differ, it appears that the host countries expect that the CDM project not only uses good technologies but also assists in the overall goal of technological self-reliance of the country. The most frequently used criterion is the contribution of the CDM project in the improvement of the technological base of the country. While some countries seek that the project should use environmental friendly technologies that are appropriate as per local conditions (Israel, India, Serbia), others require the technologies to be the best available and proven (Mali, Uzbekistan, Malaysia). Some countries (Indonesia, Madagascar, and Kenya) specifically require the project to ensure that the technologies used are not substandard. DNAs generally define technological benefits using three key criteria:

a. contribution towards improvement of technologies,

b. technological sustainability; and

c. implications of the technology transfer on the host country.

While many DNAs provide generic guidelines on a project's technological benefits (indirect indicators like technology transfer or implication of technology transfer to the country), some DNAs ask for very specific and detailed information as well. Overall, it can be convincingly argued that DNAs do give impetus to technological benefits expected from the CDM projects in their country. However, the degree of detail in which these criteria is expressed differs from country to country.

Almost all DNAs consider impact of CDM projects on 'technological sustainability'/'technological self-reliance'/'technological up-gradation' as one of the sustainable development criteria/indicators or as part of some sustainable development criteria/indicator (in most cases it

[36] Personal communication dated June 2012.

[37] Version 2 in effect as of 1 July 2006. Personal communication Taylor, S. June 2012

[38] Version 3 in effect 28 July 2006.Personal communication Taylor, S. June 2012.

is economic benefits). Chapter 2 presents a summary of the sustainable development criteria (including technological sustainability) used by various DNAs and the common approaches employed to provide the LoA to project proponents.

4.4 Key findings from the literature review

The literature on technology transfers induced by the CDM is quite extensive. This study has a significant coverage of those studies which have undertaken an empirical analysis of the CDM's impact on international technology transfer, based on an analysis of CDM PDDs. Except one study by Schneider at al., 2008 which is also a meta-analysis of previous empirical studies along the same lines as our study[39], all other studies were based on an analysis/evaluation of PDDs of registered[40] projects. The UNFCCC study of 2011 also examined registered POAs.

Prior to highlighting some of the key findings which emerge from the literature review, it would be pertinent to mention that these assessments while relatively recent, have been done over a varying time period and are not strictly comparable. Not only have different definitions of technology transfer been used in these studies, the number of projects examined vary, with some studies also including site visits, a follow-up survey/questionnaire to various stakeholders including project proponents, and other stakeholders, extending even to business, academia and policy-makers. Also the classification of project types by UNEP-Riso has been revised since 2008 from 21 to 25. The format of the PDD has also changed over time[41]. Reporting requirements for technology transfer have also changed over time as earlier there was no requirement of Project Proponents to provide the technology description.

4.4.1 Definition of technology transfer

While Chapter 34 of Agenda 21, on the Transfer of Environmentally sound technology, cooperation and capacity building has found mention in some of the studies, most studies have referred to the IPCC (2000) definition.[42] In its simplest form international technology transfer has been defined as import of a technology from abroad/technology not available in host country and needs to be imported. One study has defined the technological capacities at basic level, intermediate level or innovative level (Wang, B. (2009).

Cools (2007) operational definition of technology transfer, has comprised four key elements, viz., foreign origin, degree of novelty (new to market, province or specific industrial sector), capacity building (tacit know-how to enhance the ability to manufacture, operate, maintain and master new technologies) and performance improvement (improved environmental performance either in

[39] Our study is a meta-analysis and a PDD analysis.
[40] Registration is the formal acceptance by the Executive Board of a validated project as a CDM project activity. The process of registration is the prerequisite for the verification, certification and issuance of CERs related to that project activity". paragraph 36 (a) Annex decision 3/CMP.1
[41] There have been five revisions of the Project Design Document, since the beginning, one of which was an editorial revision.
[42] This definition is included in the main text.

terms of more efficient GHG reduction or the capacity to generate more CERs compared to existing technologies). Her operational definition has been used both in the EU China CDM facilitation project and in this study.

4.4.2 Methodology

The approaches followed in most of the assessments have primarily included a screening of Project Design Documents (PDDs) for a variable number of projects, ranging from 4,984 projects to 63 projects. One study has used both a PDD and an econometric analysis (using an econometric model) the latter, to analyse of the drivers of technology transfer that take place through CDM (Dechezlepretre, A., et. al. 2008). The comparative table refers to the methodology used in each study. The analysis of PDDs has often been followed by using a questionnaire/survey approach, including site visits.

4.4.3 Broad trends in technology transfer

According to a study commissioned by the UNFCCC in 2010, 30% of all projects in the pipeline involve technology transfer, accounting for 48% of the estimated emission reductions. The involvement maybe as high as 44% of all projects, given that 24% of the PDDs do not specify whether technology transfer occurs and survey[43] results suggest that 60% of these in fact may involve technology transfer.

The same study (UNFCCC, 2010) showed that the UNFCCC studies of 2007 and 2008, showed technology transfer to occur in 39% and 36% projects, accounting for 64% and 59% of estimated emission reductions, respectively.

Seres, S., et al. (2009), however states that the frequency of technology transfer claims have remained stable as a share of the number of the projects, but have declined as a share of estimated annual emission reductions. According to their study, overall the share of projects that claim technology transfer has fluctuated between 34% and 39%, but the share of total emission reductions covered by those projects has declined from 66% to 59%. Das, K. 2011 has estimated that 27% of projects have been found to comply with her operational definition[44] of technology transfer and account for 46% of the total estimated annual emission reduction.

[43] In the UNFCCC 2010, study a survey of projects covered by the UNFCCC 2008 study (3,296) was conducted to verify the use of technology transfer codes from the PDDs. 370 project developers responded.
[44] If a CDM project involves technology and/import of equipment only, it is not considered to be a case of technology transfer in her empirical study. Only when such an import is found to contribute towards technological learning and capability building in the host country in some from or other is it a case of technology transfer. A CDM project is considered as contributing to technology transfer under the following three scenarios for the concerned project: Type 1: TT: a host country entity develops a technology, specifically for a CDM project, in collaboration with some foreign entity; Type II, TT: A technology and/or equipment import is accompanied by in-house technological efforts by the host country project participant towards adapting or improving upon the imported technology/equipment; Type III,TT: A technology

There are very large differences across countries both in extent of transfer as well as technologies transferred.

The type of technology transfer-equipment and knowledge, equipment only, knowledge only, have stayed relatively stable in terms of shares of projects -about 54%, 32%, and 14% respectively. (Seres, S., et. al. 2009). Das, K., 2011, in her study showed that only 265 out of 1000 projects involve technology transfer; of which 259 qualify for (Type III) [45] technology transfer, in which technological learning and capability building are restricted only to the level of operation and maintenance of an imported technology and 6 projects involve technology transfer (of Types I and II), in which the host country entity is either found to develop a technology in collaboration with some foreign entity or the host country entity is involved in in-house technological efforts towards adapting or improving upon an imported technology.

The sources of technology transfer, both knowledge and equipment have remained quite stable over time. (Seres, S., et al. 2009).

Technology transfer is associated with larger projects of all project types. Although unilateral and small scale projects are less likely to involve technology transfer, it is more common among the larger of these projects, 27% of the unilateral projects were found to involve technology transfer while the equivalent rate for small scale projects was found to be 25% (UNFCCC, 2010).

Dechezlepretre, A. et.al. 2009, has noted that in terms of technology type, technology transfers mainly concerns end of the pipe destruction of non-CO_2 GHGs such as HFC-23, CH_4, and N_2O (chemical industry, agricultural sector and waste management). Wang.,B., (2009) is in agreement mentioning that the highest level of technology transfer in the form of foreign equipment and training of operational knowhow is in N_2O and HFC-23 decomposition projects.

Projects such as electricity production from biomass or energy efficiency measures in the industry sector, mainly rely on local technologies (Dechezlepretre, A... et. al (2009). Das, K. (2011) identifies technology transfer as being highest for agriculture and lowest for hydro. Besides hydro, share of technology transfer is low for cement, fossil fuel switch, biomass energy, energy efficiency own generation, and energy efficiency supply side projects.

The probability of transfer is enhanced when the project is developed in a subsidiary of an Annex I based transnational corporation. The involvement of a parent company may facilitate technology transfer by managing project registration, provision of expertise at technology level or provision of easier access to capital among other aspects (Das, K. (2011)). The likelihood of technology import maybe more likely in projects involving international consultants, who may even serve as technology suppliers (Das, K. (2011). The likelihood of technology transfer is enhanced when the host country participant in a CDM project is involved in a joint venture with a developed country

and/or equipment import is accompanied by training by foreign entities on operation and maintenance of the imported technology and or equipment.

[45] See footnote 11 on Type I, II and III categories of projects.

firm (Das, K. (2011). Having an identified credit buyer in the project also exerts a positive influence on the likelihood of transfer.

With respect to technological capabilities, they seem to have an ambiguous effect, on one hand high technological capabilities maybe necessary to adapt a new technology (as demonstrated in energy sector and chemicals industry); on the other hand high capabilities imply that many technologies are already available locally thereby reducing transfer likelihood (demonstrated in agricultural projects). The likelihood of technology diffusion is increased with a high technological capability (Dechezlepretre, A. et al (2008).

The host country has a significant influence on the rate of technology transfer. This could be through the inclusion of mention of technology transfer in their sustainable development national criteria, thereby giving it some impetus. Host countries can also indicate their preferences in line with national priorities, in terms of the qualitative aspects such as it being cleaner, locally appropriate, more efficient and environment friendly with the project contributing towards improvement of the technologies and/ upgrading the technological base. Illustrative examples of host country DNAs defining what kind of technology is in line with national priorities are included in a prior section. At the policy level host countries can also influence technology transfer by identifying and dismantling barriers that continue to block CDM activities in specific sectors (TERI, 2006).

4.4.4 Conclusions from technology transfer studies

Studies have concluded that CDM has either contributed 'significantly' towards technology transfer to developing countries in particular in the early years of a host country's involvement (UNFCCC, 2010), to international technology transfer taking place in less than half of the CDM projects (Dechezlepretre, A., et. al. 2008), to technology transfer being minimal (Das, K., 2011). The authors would like to point out that while the percentage of technology transfer by project are broadly comparable, the study which refers to the level of transfer as being minimal has more stringent benchmarks for technology transfer. The authors would like to point out that the quality of technology transfer is also of critical importance, in such evaluations.

Results have also varied over time for individual countries, as technology transfer was more evident in the initial years and has subsequently declined along with a tendency towards increased number of unilateral projects. Mention has been made of the more evident decline in technology transfer in particular over time, particularly for India, Brazil and China, the three countries having highest number of CDM projects. All other CDM host countries have a high rate of technology transfer that has declined modestly over time. More than one author has drawn attention to the fact that as number of projects of the same type in a host country increases, technology transfer falls. A rather interesting insight draws attention to the fact that it would be wrong to conclude that transfer frequency is low, as in the case of wind turbines in India(unlike China, Mexico and Brazil where import of wind turbines is widespread) , as in this instance it is

attributed to leading domestic producers. It is important that countries gain technological self-reliance and are in a position to replicate.

4.5 Analysis of technology transfer reporting in PDDs

4.5.1 Definition of technology transfer used in analysis

There are a range of definitions on technology transfer, both within the literature and in international agreements including that within the Agenda 2146 and UNCTAD.47 Different CDM project developers have interpreted the concept in their own ways, as is evidenced by their treatment of technology transfer in the PDDs.48 This study however has confined itself to the IPCC Working Group III, Report on Methodological and Technological Issues in Technology Transfer (IPCC, 2000) and the definition developed by Cools (2007), and does not attempt to examine the various definitions, as this is not the focus of the study. The IPCC defines technology transfer as a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research /education institutions. According to the IPCC, technology transfer comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions and integrate it with indigenous technologies. This transfer could be on purely commercial terms or on preferential terms.

Since the study involves an empirical investigation, it was evident that we would need an operational definition for technology transfer, and the definition developed by Cools (2007) was used.49 Her operational definition of technology transfer includes four key criteria i) foreign origin ii) novelty (new to market, province, or specific industrial sector), iii) improvement (improved environmental performance either in terms of more efficient GHG reduction or the capacity to generate more CERs compared to existing technologies), and iv) capacity (tacit know-how to enhance the ability to manufacture, operate, maintain and master new technologies). It is important to note while several PDDs claimed a technology transfer from one region to another within the same host country, or from one developing country to another developing country and while this is acceptable to certain DNAs, the focus of this study is strictly on international technology transfer from developed countries to developing countries. Seres (2009) acknowledges that these are fair claims in the absence of a definition on technology transfer in the CDM context. In fact the CDM glossary does not define the term.

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[46] Chapter 34 of the Agenda 21 is on Transfer of Environmentally sound technology, cooperation and capacity-building.

[47] 1985 Draft International Code of Conduct on the Transfer of Technology, negotiated under the aegis of UNCTAD.

[48] This is reflected in the project coding in the later part of this study.

[49] The more comprehensive the definition of technology transfer that is applied, the lower is the incidence. (Cools 2007).

4.5.2 Sample selection

As discussed in chapter 1 and chapter 3 (section 3.3), the selection of sample of projects for the study was done using the method of 'Stratified Random Sampling.' The project pipeline (sourced from UNEP Risoe CDM Pipeline) was stratified based on project category /type/sector and thereafter a random selection of projects was undertaken based on probability/degree of incidence of a particular project type in the total pipeline. Steps were taken to ensure that the issue of scale of project is addressed during selection of sample projects in the study.

Only registered projects were selected and coded as per the categorization developed by the UNEP-Risoe Center and 5 UN Regions + India + China + Brazil. Our study takes into account the new definitions of project types done by UNEP-Risoe post 2008). The characteristics of the sample are dealt with in Chapter 3 on impacts of CDM on SD.

4.5.3 Methodology for PDD analysis

Subsequent to the identification of the sample of 202 projects, the PDDs were manually screened on an individual bases. In the assessment that we have undertaken, we have approached technology transfer from two levels, explained as follows:

i. A typology of projects based on the nature (or typology) of international technology transfer (explained later in Section 4.5.3.1)

ii. Based on Cools definition (explained in Section 4.5.3.2).

The following paragraphs present a detailed illustration of the methodology and the findings of the two levels of analysis.

4.5.3.1 Level I Analysis

The level I analysis aims to identify projects with an element of International Technology Transfer (ITT), i.e. North-South (N-S) transfer of technology. This implies that incidence of South-South (S-S), use of State-of the Art indigenous technologies, indigenous and South-South technology transfers were not considered as technology transfer, but have been identified (refer to the findings section for details).

In level I of the analysis, the PDDs were manually screened on an individual bases, using the list of technology transfer keywords. The information about technology transfer as contained in the technology transfer keywords were searched for in the following sections:

- Section A.2 on Description of project activity,
- Section A.4.2 Technical description of project activity,
- Section A.4.3. Technology to be employed by the project activity and

- Section B5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality).
- Section F: Environmental Impacts
- Section G and Annex

The keywords used included were import, domestic, transfer, indigenous, foreign, abroad [50](Seres personal communication); equipment, hardware, know-how, capacity, training, license, joint-venture, etc. among others from our list (refer to annex IV for the list of criteria/indicators used for the study).

The remaining sections of the PDDs were searched for terms relating to technology transfer to ensure that all statements relating to technology transfer were captured. Based on the mention of technology transfer in the PDD the project was accordingly coded. We then categorized the technology transfer by project by claim by percentage.

The results of the level I analysis led to an identification of projects with an element of ITT (which would be further subjected to analysis on the basis of Cools definition as part of the Level II analysis).

The identified projects were further categorized into the following five typologies (adapted from Seres, S., 2012 [51], Cools, SLY 2007, and the 2010 study, and 2011 benefits study, and our expert judgement):in the following manner:

Type 1: Project will not involve technology transfer

Type 2: No mention or indication or evidence of technology transfer

Type 3: Projects in the pipeline expected to involve technology transfer

a) The project is expected to use imported technological equipment (either it imported from abroad or it is manufactured in host country but the rights to the technology (patents, license, trademark or copyright) are owned by foreign actors)(Source: Text in italics from Cools 2007)

b) The project is expected to use imported knowledge

c) The project is expected to use imported equipment and knowledge

- Type 4: Joint venture/ Collaborative development of new technology if venture partner is foreign
  Type 5: Origin of technology is unknown/unspecified [52]

[50] Seres S. Personal communication June 2012.
[51] Seres, S. (2009) mentions that often the source is not known because the technology supplier for a proposed project has not yet been selected so the source remains unknown for about 20% of the projects that claim technology transfer.

4.5.3.2 Level II Analysis

Out of the sample of 202 projects, the projects which were identified to have some element of ITT were further subjected to greater depth of assessment based on the key components of the Cools definition. The four key elements of Cools definition, viz,

a) Foreign Origin,

b) Novelty (new to market, province, or specific industrial sector, at the time of development of the project),

c) Improvement (improved environmental performance either in terms of more efficient GHG reduction or the capacity to generate more CERs compared to existing technologies); and

d) Capacity to operate and maintain the technology.

Points to be noted (for both level I and level II analysis)

1. Only projects with international technology transfer (ITT) (north-south), north-south + south-south (e.g. UNEP RISOE ref no 1899, 3702, 4320), and north-south + use of indigenous technology (e.g. UNEP RISOE ref no 2374, 4320) have been considered. South-south and transfer of technology/technology up-gradation within the country have not been considered.
2. The origin of north-south ITT could involve more than one Annex I country (e.g. UNEP RISOE ref no. 4394)
3. In the level II analysis, if the details of origin of the technology have not been specified then the project is deemed to have NO technology transfer (e.g. UNEP RISOE ref nos: 3430, 512, 2661, 3404, 4520, 4715, 4801).
4. In the level II analysis, those projects (PDDs) where the origin/source of the technology is not certain/identified have been deemed to have NO technology transfer (e.g. UNEP RISOE ref nos. : 411, 512, 1080, 1521)
5. Assessment of 'novelty' of the transferred technology in the level II analysis, included factors like whether the transferred technology:
    a. Is uncommon in the host country
    b. Is uncommon in relatively more industrialized countries
    c. Is not widely commercialized at the point of project development even in the supplier country
6. In the level II analysis, capacity enhancement in many cases denotes transfer of know-how to operate and maintain the technology at the time of project development/post-import of technology.

4.5.4 Results of PDD analysis

4.5.4.1 Results of Level I analysis

Some of the overall findings of level I analysis are enumerated below (table 4.1):

1. 26.73% (54 projects out of the 202 projects) in the stratified random sample indicated International Technology Transfer (ITT) in varied ways

[52] Seres, S. (2009) mentions that often the source is not known because the technology supplier for a proposed project has not yet been selected so the source remains unknown for about 20% of the projects that claim technology transfer.

2. 0.99% (2) of the assessed PDDs have no clear mention/indication/evidence of ITT (Typology 2)
3. 23.76% (48) of projects were expected to involve ITT in the form of transfer of knowledge/ equipment/both (Typology 3)
4. Within type 3 projects, 5.94% (12) of the sampled projects involve transfer of equipment only (Typology 3a)
5. No projects involving transfer of only knowledge have been identified in the sampled projects. (Typology 3b)
6. 17.82% (36) of the sampled projects within type 3 projects involve transfer of both equipment and knowledge. (Typology 3 c)
7. 0.99% (2) of the sampled projects involve joint venture or collaborative development of technology.
8. In 5.94% (12) of the sampled projects, it is confirmed that ITT had/would occur but origin of the technology has not been identified/specified at the time of PDD writing.

Table 4.1: Results of Level I analysis based on five classes of typologies defined for the analysis

Typology	T1	T2	T3			T4	T5	Results		
	No technology transfer	No mention or indication in the PDD	Expected to involve TT			Collaborative development of technology	ITT confirmed but origin unknown/unspecified at the time of PDD writing	Projects with more than one typology	Total projects with ITT in the sample (T2+T3+T4+T5)	Total projects in the sample (T1+T2+T3+T4+T5)
Number of projects	148	2	48			2	12	10	54	202
			T3 a)	T3 b)	T3c)					
			Equipment only	Knowledge only	Both					
			12	0	36					

Further, some specific findings from level I analysis are explained below:

1. **Origin of technology transfer:** The leading countries transferring technologies or facilitating transfer of technologies comprise Japan, Germany, USA, Denmark, Italy, United Kingdom, etc.
2. **TT by project type** (table 4.2): Methane Avoidance projects have the highest degree (4.95%) of ITT followed by energy efficiency in industry. Afforestation and Reforestation; and coal

bed and mine methane sectors have no technology transfer. Wind also has a substantial share in ITT.

3. **TT by project scale:** The number of small scale projects with ITT was higher (31 of 54 projects).
4. **TT by region** (table 4.3): In terms of technology transfer by region, Asia, excluding China and India, dominates with 20 projects (9.90%), followed by Latin America and the Caribbean except Brazil 10 projects (4.95%), and Africa 3 projects (1.48%) and Eastern Europe 1 project (0.49%).
5. **Among China, India and Brazil**, the shares are 9 projects (4.45%), India 7 projects (3.46%), and Brazil 4 projects (1.98%) respectively.
6. **Mismatch between imported technology and local requirements/conditions:** There were instances where there was a mismatch between the imported technology and local factors. For example, in the case of the "retrofit programme for decentralized heating stations in Mongolia" (UNEP RISOE ref no. 295), although the boiler was specifically developed for the CDM project, the Mongolian coal was not suitable. In the case of the "Municipal solid waste composting project in Urumqi, China", the imported machine did not match the municipal solid waste characteristics in China where all types of waste are collected together and mixed.

Table 4.2 : Projects with international technology transfer (ITT) across sectors/project types

S. No.	UNEP RISOE Sector Code	UNEP RISOE Sector	Number of projects with ITT (N-S)
1	1	Afforestation	0
2	2	Biomass Energy	3
3	3	Cement	1
4	4	CO_2 Usage	1
5	5	Coal bed/Mine Methane	0
6	6	Energy Distribution	1
7	7	EE Households	1
8	8	EE Industry	4
9	9	EE own Generation	4
10	10	EE Service	1
11	11	EE Supply Side	2
12	12	Fossil Fuel Switch	2
13	13	Fugitive	1
14	14	Geothermal	1
15	15	HFCs	3
16	16	Hydro	1
17	17	Landfill Gas	3
18	18	Methane Avoidance	10
19	19	N_2O	4
20	20	PFCs & SF_6	1

S. No.	UNEP RISOE Sector Code	UNEP RISOE Sector	Number of projects with ITT (N-S)
21	21	Reforestation	0
22	22	Solar	1
23	23	Tidal	1
24	24	Transport	1
25	25	Wind	7
		TOTAL	**54**

7. **Technology development specifically for CDM:** In some cases there was technology specifically developed for the CDM project. In the case of Hydro in China it was all domestic. In the case of waste heat utilization in China the domestic technology was less reliable. Similarly in the case of China there was a lack of proven domestic technology necessitating technology transfer for HFC23.

Table 4.3: Projects with international technology transfer (ITT) across regions

Sl. No.	Region	Number of projects with ITT (N-S)
1.	Africa	3
2.	Asia Except China and India	20
3.	Europe	1
4.	Latin America and the Caribbean Except Brazil	10
5.	China	9
6.	India	7
7.	Brazil	4
	TOTAL	**54**

8. **South-south transfer of technology:** In the studied sample of 202 projects, several projects involved south-south transfer of technology for CDM projects (e.g. UNEP RISOE ref No. 4753, 587, 1639, 3484, 4577, 4744, 4891, 4945).

4.5.4.2 Results of Level II analysis

As explained before, level II analysis was conducted using Cool's operational definition of Technology Transfer. 54 projects which were identified to have International Technology Transfer (ITT) in Level I were evaluated in Level II analysis.

The key findings are explained as follows:

1. **Foreign Origin:** 72.2% (39) of projects demonstrated foreign origin of the technology. 27.8% (15) do not specify the country from which transfer takes place. 2 projects show both a NS-SS transfer and one shows indigenous and NS transfer.

2. **Novelty**: Only 66.3% (36) projects determine that the technology used would be novel at the time of project development. One project demonstrated that the technology transferred was not widely commercialized at the point of project development even in the supplier country, indicating CDMs role in technology development.

3. **Improvement**: 98.1% (53) of the projects showed improvement in environmental performance either in terms of more efficient GHG reduction or the capacity to generate more CERs compared to existing technologies. Such a result is predictable considering that GHG abatement, reduction and avoidance are a key feature for CDM projects.
4. **Capacity to operate and maintain the technology:** 64.8% (19) indicated requirement of capacity enhancement for operation and maintenance. In some cases a need for capacity development was identified but no sources were indicated. A close correction is seen between novelty of a technology and requirement of capacity development.
5.

Table 4.4: Summary of Analysis based on Cools Definition

	Foreign Origin of Transferred Technology		Novelty of Transferred Technology		Improvement Brought about by Transferred Technology		Capacity Enhancement Brought about by Transferred Technology	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
	39	15	36	18	53	1	35	19
Total Projects	54		54		54		54	

Further, some specific findings from level II analysis are explained below**:**

1. **Regional trends:** Asia, excluding India and China, dominates in all the four dimensions of foreign origin, novelty, improvement and capacity for operation and maintenance followed by Europe.
2. **Sectoral trends:** An almost linear distribution is evident among the various sectors. Methane avoidance project types (project type 18) have maximum occurrences of novelty and capacity. Interestingly, it also has many projects where mention of destination is not clear/ not identified. Wind projects have the maximum occurrence in foreign origin.

Conclusions

The PDD analysis of the 202 sampled projects showed that 27% of registered projects reported some form of international technology transfer (only includes north-south transfer and not south-south transfer in the context of CDM). Most of these projects reported both transfer of equipment and knowledge. Some sectors, such as coal mine methane and reforestation, do not report any technology transfer within this sample, while others, such as renewable energy and methane avoidance, report higher than average levels. Small scale projects also report higher technology transfer levels than large scale projects, which is surprising given the findings of previous studies and may reflect the smaller sample size. The leading countries transferring technologies were Japan, Germany, USA, Denmark, Italy, and the United Kingdom.

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CHAPTER 5: Analysis of negative Impacts of CDM[53]

5.1 Introduction

There is a significant amount of literature and research on the benefits of CDM which focuses on empirically evaluating the impact of CDM on sustainable development and technology transfer. There is some grey literature on the negative impacts of CDM however there is limited empirical work on the negative impacts of project activities under the CDM. The scope of this work is to examine the claims in the literature on local negative impacts on three sustainable development criteria (environment, economic, social). This section further attempts to analyse the research question -whether the negative claims can be attributed to CDM project activities or if they are anecdotal or evidence based.

5.2 Literature Review

While there is a significant amount of literature and research on the benefits of CDM which focuses on empirically evaluating the impact of CDM on sustainable development and technology transfer, there is limited empirical work on the negative impacts of project activities under the CDM. Hitherto, such studies have focused on the overall mechanism, identifying flaws in the design of the mechanism; focusing on issues such as additionality, base line, definition of business as usual, among other issues. Such studies which look at the governance and design aspect of the mechanism are beyond the scope of this report and dealt with in the report on 'Governance'. The scope of this work is on the literature that examines the local negative impacts on three sustainable development criteria (environment, economic, social).

No peer reviewed literature could be identified around the issue of negative impacts. Amongst the grey literature, there is literature that highlights issues that either have a regional focus or comment on particular sector or category of projects. For instance, large hydro power projects are discussed for their negative environmental impacts on aquatic life and by leakage from the reservoir; and negative social impacts by displacement of communities from the vicinity, loss of agricultural land, and decline in biodiversity (Haya B. & Parekh P. 2011). CDM- Watch (2012) raises the issue of inequity emphasising that vulnerable groups such as poor rural populations, indigenous communities and ethnic minorities often bear the disproportionate share of the negative impacts, while the main beneficiaries are urban dwellers, commercial farmers and industries. Waste management sector has also been discussed as one of the problematic sectors. The brief (GAIA, 2011) summarises the issues in four cases to illustrate problems in the waste management projects. The issues include- further impoverishment of the urban poor, competition

[53] [53] *Authored by Neha Pahuja, Associate Fellow, The Energy and Resources Institute, New Delhi, India; email: neha.pahuja@teri.res.in*

with recycling, and lack of additionality. The brief further mentions that most visible impacts of the waste management projects, particularly in landfill gas capture and incinerator projects are in the context of the displacement of the informal recycling sector and the associated loss of livelihoods.

Further, there is literature that has strong regional focus such by Wally M. et al (2011) focusing on the projects that exist in Africa, or are being currently planned. The authors argue that CDM presents serious challenges and negative impacts. They also criticize proposals to further broaden the range of projects that are eligible for CDM by including GM crops and addition of biochar to soils as greenhouse gas emission offset projects. They conclude by raising issues around social and environmental problems, and exclusion of communities, with little or no real financial rewards. A study by Bond P. et al (2012) discusses six case studies from African countries including the South Africa's Bisasar Road landfill methane to electricity project; the Niger Delta gas flaring projects amongst others in the context of negative impacts. Each case claims to 'unearth' a micro-project problem. Tiwari A and D'souza N (2009), assesses seven CDM projects in India located in 'tribal belt' and examines 'people's perspective' on the CDM projects. The analysis is based on parameters for sustainable development indicators by Govt. of India, sustainable development indicated in the PDD and the nature of implementation observed during the site visit. The study concludes that while most cases violate promises made for sustainable development, some projects have negative livelihood threatening impacts and renewable energy projects have less environment impacts. In the two case studies on hydro, the study lists positive benefits also. Bullard N. & Chomthongdi J. et al, (2012) study selected CDM projects (five) in Thailand, India and Philippines, to assess if CDM projects have actually delivered the sustainable development, as claimed, and if there are negative impacts associated with these projects. The study highlights that conclusions are not 'black and white'. An important conclusion, however, is that there is lack of information and understanding (the potential negative impacts were discussed much less, during the local stakeholder consultation) it may be difficult for the communities to resist any negative impacts of the projects and to ensure their economic, social and environmental benefits. Some reports focus on regional problems such as human rights abuse in Honduras. There are few policy papers (Oxfam, 2011) highlighting CDM as an international mechanism with perverse incentives to exacerbate an already existing problem.

The CDM-EB launched a call for public input, inviting proposals on how to include co-benefits and negative impacts in the documentation of CDM project activities and the role of different actors and stakeholders in this process. In all, ten proposals were received. Most of proposals on negative impacts focused on increasing the role of DNA and improving the stakeholders' consultation.

5.3 Methodology

This section focuses on assessing the claims of the local negative impacts on three sustainable development criteria (environment, economic, social). The approach adopted includes literature review and case study analysis using a questionnaire survey and follow up interviews.

Relevant literature was identified through a google and google scholar keyword search. The keywords included in the search were:

'Negative impacts of CDM', 'Environmental impacts of CDM', 'CDM environmental integrity', 'CDM + environmental threat', 'CDM + livelihood', 'CDM + natural resources + threat', 'CDM + natural resources + adverse impacts', 'CDM + damage', 'CDM + social impacts', 'CDM + threat', 'CDM + No', 'Anti CDM', 'CDM + Human rights abuse'.

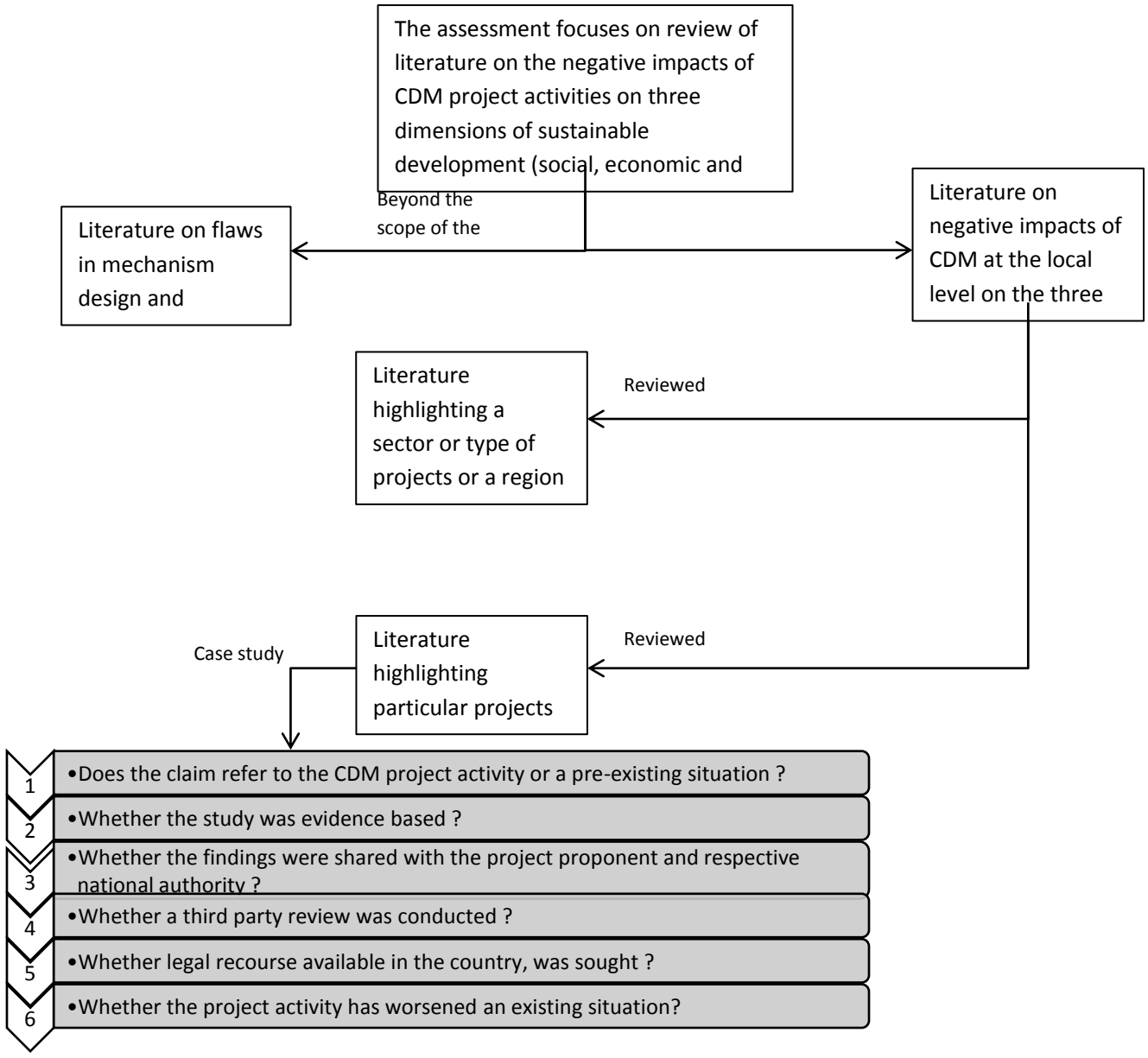
The objective was to identify literature focusing on the negative impacts of CDM projects on sustainable development. Reviewing the claims and the nature of such claims, in turn led to the identification of specific CDM projects, registered by the CDM-EB.

Each identified project was studied in greater detail on the bases of both its Project Design Document (PDD) and associated stakeholder comments (local and global), with respect to the claims in the literature. This was done by contacting the author, project proponent and other stakeholders[54]. The responses which were received were then screened and further reviewed as part of the assessment.

Direct dialogue was also initiated with the identified stakeholders as responses to the questionnaire were low or inadequate to objectively assess the validity of the claims. In order to ensure the objectivity of the assessment a uniform yardstick was used, which is illustrated in the figure 5.1.

[54] This would vary as per the project and response due to limitations of time available for the study.

Figure 5.1 Approach and yardstick for the assessment of negative impacts of CDM projects



5.4 Case Studies

Eight cases were selected from the review of literature for further analysis. Availability of information was critical in the choice of the cases. The cases, however, had a reasonable sector and regional coverage. In terms of the issues being examined, these projects have been discussed in literature for various issues including human right violation, environment, livelihood, social (displacement). The identified cases are as follows:

Case	Country	Issues under examination
Mtoni Landfill Gas Project	Tanzania	Livelihood of waste-pickers; environmental impacts (leachate); alternate project activity
The Pan Ocean Gas Utilisation Project	Nigeria	Promoting an activity which is illegal by the domestic law in the host country
Bisasar Road landfill	South Africa	Environmental issues due to the landfill
Aguan biogas recovery from Palm Oil Mill Effluent (POME) ponds and biogas utilization	Honduras	Human rights issue
Barro Blanco Hydroelectric Power Plant Project	Panama	Human rights issue
Okhla-Timarpur project	India	Livelihood of waste-pickers
Improving Rural Livelihoods through Carbon Sequestration	India	Stakeholder process, livelihood and Natural Resource Management
Xiaoxi CDM Hydropower Projects (135 MW) from China	China	Displacement and inadequate compensation, environmental impacts

The following sub-sections analyse the 8 case studies individually explaining the review of the claims made in literature, responses received from stakeholders[55] and the author's conclusions based on the common yardstick approach adopted.

Case 1: Mtoni Landfill Gas Project

Review of claims of negative impacts in literature:

An article in CDM-watch newsletter (2011) claims that Mtoni dumpsite causes the release of hazardous substances which have adverse impacts on fauna, flora and human beings. The article cites a study by the Institute of Human Settlements Studies, which suggests that soil around Mtoni dumpsite and the water is contaminated by the leachetes flowing to the Mtoni Estuary. Therefore, the vegetables grown and watered around the site contain a high concentration of heavy metals. This in turn, impacts the health and well-being of the people.

Project Details:	
Project Ref Number:	908
Host Country:	Tanzania
Credit Start Date:	1-Jul-07
Date of Registration:	2-Jun-07
Host Country Approval:	25-Jan-07

The project participant (PP) responded to the claims in the article, summary of which is presented in table 5.1. Further, the PP claims that the author was invited to visit the plant together with an Italian technician to verify his claims. However, the PP informs

[55] Responses were elicited from the author of the study, the project proponent and other relevant stakeholders as recommended by the authors/other external sources.

that after showing an initial interest, the author did not participate in the organized visit. Moreover, the PP questions the credibility of the article by claiming that the pictures used in his article do not show Mtoni CDM project and have not been taken at the site since this project was implemented.

Table 5.1: Summary of claims of the article and response from the PP

Claims of Article	PP's responses to the Article
Mtoni Dumpsite was forced to close due to the project participants activities. The closure of the dumpsite had an impact on livelihood. The landfill is abandoned.	The description of the project in the PDD, completed on 18/01/2007, was based on the idea that the dumpsite would close in 2016, according to which CER calculations were done and thus it is illogical to suggest that the closure of the dumpsite was due to the CDM project. In fact, the closure has had very negative implications on the project and the PP was not implicated in this decision and did not desire this decision. As a consequence of the closure of this landfill the amount of landfill gas that can be extracted has been drastically reduced. A security guard is present 24hrs and seven days a week at the plant. A local specialized technician works at the plant taking care of ordinary maintenance. Once every 3 months a specialized technician from Italy visits the plant to perform extraordinary maintenance, if necessary, and to monitor directly how the plant is working.
Dumpsite releases leachate into the Mtoni Estuary, especially during heavy rains, impacting local farmers, flora and fauna.	It is not clear how one can impute these negative aspects as a consequence of the CDM project as Mtoni landfill site was open and running well before the CDM project implementation. PP was not involved in the implementation of the dumpsite and therefore had no influence on the decision of where the landfill should be located or how the landfill foundations should be designed and managed to avoid waste waters. The CDM project seeks to avoid greenhouse gases (GHG) emissions into atmosphere and resolves an issue that is totally different to that which would be required to resolve the wastewater issue. Without the CDM project implementation, the landfill probably would never have been covered over thus increasing the consequences of the rain water and leaving the local people exposed to the heavy odors and methane gases as well as the other inconveniences such as mosquitoes that can be found close to open air dumpsites.
No sustainable development benefit through biogas electricity generation	True, since the landfill closed nine years before the expected date, the amount of landfill gas extracted is not sufficient to justify technologically or financially such implementation. The amount of landfill gas extracted is not enough to even produce 1 MW of electricity, and so the ratio (electricity produced) / (cost to produce electricity) is far too low for any investment.

Responses received to our Questions

1. **Author of the article:**

   The authors of this report were not able to contact with author of the article.

2. **CDM Watch (who published the article):**

   They suggested this project was not a good example to consider for negative impacts of the CDM.

3. **Another respondent (who works on the issue of negative impacts of CDM on waste sector):**

   They looked at the case of Mtoni landfill but were never able to get primary sources that they felt very confident about. Further, the respondent suggested that the case certainly looks bad from afar, and there seem to be contradictions between news reports and what was in the PDD, but without a personal visit, they do not feel that they have a clear picture of what has happened there.

Our Conclusion on the basis of the yardstick:

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*

   The claims most likely refer to a pre-existing situation. Therefore, it is difficult to attribute any negative impacts to the CDM project activity per se.

2. *Whether the study was evidence based?*

   Since, authors of this report could not contact the author of the article it is difficult to assess if the claims in the article were evidence based. However, the response from the PP suggests that the study was not evidence based.

3. *Whether the findings were shared with the project proponent and respective national authority?*

   The findings in the form of an article were published in CDM-Watch's newsletter, to which the PP responded. However, it is not clear if the author approached PP or any national authority.

4. *Whether a third party review was conducted?*

   It is not clear. However, PP response indicated that there was no third party review.

5. *Whether legal recourse available in the country was sought?*

   It is not clear.

6. *Whether the project activity has worsened an existing situation?*

   It is not clear but most likely no.

Case 2: The Pan Ocean Gas Utilization Project

Review of claims of negative impacts in literature:

Bond P. et al (2012) discuss the case of oil companies, involved in recovery and utilisation of flare gas, in Niger Delta. The case of Pan Ocean Gas Utilization Project is discussed in the report, which claims that the project promotes an activity which is illegal by the domestic law in the host country. Further, the study claims that no additional benefits have accrued to the local community.

According to Wally M. et al (2011), it is a clear example of the perverse incentives created by the CDM as companies will be rewarded for their failure to abide by the law.

A review of the legal and regulatory requirements related to flaring of associated gas in the country suggests that, flaring is not illegal in Nigeria[56], but subject to a fee. It is also evident from the literature that the fee for the flaring of gas was cost-effective than any other option. Strategic Gas Plan for Nigeria (2004), produced under the Joint UNDP/World Bank Energy Sector Management Assistance Programme, recommends capturing of all presently flared gas to improve the quality of life for the wider population in the Niger Delta area. Table 5.2 exhibits analysis of claims in reports versus the existing situation in Nigeria.

Project Details:

Project Ref Number:	2029
Host Country:	Nigeria
Credit Start Date:	21-Oct-10
Date of Registration:	1-Feb-09
Host Country Approval:	20-Mar-06

Table 5.2 Situation Analysis

Claims of Report/s	Situation Analysis in Nigeria
The project promotes an activity which is illegal by the domestic law in the host country	Flaring is not prohibited in Nigeria, but subject to a fee
No additional benefits have accrued to the local community in such projects	The same report contradicts by claiming 'handful of the people have gained employment in the main CDM projects' Strategic Gas Plan for Nigeria (2004), recommends that capturing all presently flared gas would greatly improve the quality of life for the wider population in the Niger Delta area.
Communities are still without electricity and the projects have not helped much	Cannot say much at this stage

[56] A Federal High Court ordered an oil company (Shell) to stop gas flaring in the Iwhrekan community as it was observed to violate fundamental right to life and dignity of human person (Ref). However, Shell was granted a stay of execution of the order, suspending the previous court order. In any case, both Shell and the other oil companies in the Niger Delta region have continued to flare associated gas up till date as have been highlighted earlier in this review.

Responses to our questionnaire:

1. **Coordinator of the report:**

   The coordinator of the report was not available to (refused to) respond.

2. **The PDD developer:**

   The issue about the High Court ruling is not relevant. This ruling was a state, not a federal, high court ruling on a specific flare of Shell's. It was never of general application in Nigeria, and anyway this state ruling was voided at the federal level. Flaring is widespread and the only constraint is that there is a fee, not a fine, paid for flaring at 10 naira per mscf. It is not illegal. The DNA does not consider this an issue. Regarding the issue of heat and noise, it is associated with the situation that exists prior to the CDM activity, and is eliminated by the project. So it is a benefit, not a cost, of the project activity.

Our Conclusion on the basis of the yardstick:

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*
   The claims refer to CDM project activity.
2. *Whether the study was evidence based?*
   Since the coordinator was unable to respond, it is difficult to assess if the claims in the article were evidence based.
3. *Whether the findings were shared with the project proponent and respective national authority?*
   Since the coordinator was unable to respond, it is difficult to assess if the national authorities were approached.
4. *Whether a third party review was conducted?*
   Not clear.
5. *Whether legal recourse available in the country was sought?*
   Since the claim is about the 'illegal' nature of CDM project activity and contradicts the review of legal and regulatory requirements and the claims of the PDD developer, it is most likely that legal recourse was not sought in this case.
6. *Whether the project activity has worsened an existing situation?*
   There is no mention of worsening of an existing situation in the article. The PDD developer, however, claims to eliminate heat and noise associated with a situation prior to the CDM activity.

Case 3: Durban Bisasar Road Landfill

Review of claims of negative impacts in literature:

According to the chapter titled- 'South Africa's landfill, fraud, division and racism'- in the report, 'CDM in Africa: Cannot deliver Money' (2012), produced jointly by University of KwaZulu-Natal Centre for Civil Society and Dartmouth College Climate Justice Research Project, claim that the landfill site has led to 'import waste from privileged white areas' to 'impoverished and working

class black areas deprived of basic human rights'. Further, the authors allege environmental health hazards causing diseases like cancer due to the landfill and cite the environmental lawsuit initiated in this context. The authors have referred to it as the case of 'environmental racism'. Another brief titled- 'Carbon Trading Prolongs Environmental Racism at Africa's Largest Municipal Dump', developed by GAIA, similarly, cite it as a 'toxic legacy of apartheid' and alleges that 'the project amplifies local environmental and health risks and undermines livelihoods while rekindling apartheid-era racial conflicts'. The brief further suggests that an alternative to the project could have been a Resource Recovery Facility emphasising on that climate benefits of increased recycling greatly outweigh the electricity offsets from landfill gas-to-energy. The brief also claims that landfill projects under the CDM, have a history of underperformance meaning that they extract less methane than anticipated. Hallowes D. & Victor Munnik V. (2008) also concludes on similar lines.

Project Details:

Project Ref Number:	1921
Host Country:	South Africa
Credit Start Date:	26-Mar-09
Date of Registration:	26-Mar-09
Host Country Approval:	22-Jan-08

The claims in the literature, however, are mixed in nature and cite local issues over Bisasar road landfill itself to the issues relating to CDM and flaws in this global mechanism. The claims specific to the CDM project activity are that the 'CDM has locked in municipal environmental racism, intra-community conflict, fraud and ineligibility' and 'adequate financing to pursue a different route (such as composting)' (P Bond & K Sharife, 2012). To summarise, one set of claims look at an already existing situation of alleged 'environmental racism' and 'health hazards' due to the landfill itself. There are no specific claims on the operation of CDM project activity per se. In this context, the CDM mechanism has been criticised for locking in the existing flaws and not being able to promote alternate projects such as recycling and composting, which are perceived to have positive impacts on livelihood.

Responses to our questionnaire:

1. **Coordinator of the report:**

   The coordinator of the report was not available to (refused to) respond. Another respondent stated that Bisasar is an example of how waste pickers were displaced and the local community badly affected by a CDM project. A lot has been written about this project. The GAIA brief though looks most closely at the CDM role.

2. **Another respondent:**

   One must distinguish, conceptually, the CDM project being implemented at Bisasar and the landfill site, itself. While criticisms have been levelled at the CDM project little of this criticism is founded in the specifics of the operation of that project, but are usually an amalgam of general CDM criticism and ongoing concerns over the location of the landfill site. The location and operation of the landfill site, which opened for operation in 1980, is a matter of ongoing concern for the community. However, issues pertaining to the location of the site must be distinguished from concerns related to the CDM project.

Civil society criticism rarely pays attention to this level of detail. In effect, lobby-groups that are seeking to have the landfill site closed or relocated use the device of the CDM project to promote their views on the landfill. Consequently, it is often difficult to determine whether a criticism in regard to the CDM project is genuine and informed or whether the criticism has, as a sub-text, ambitions related to the landfill site itself. The claims made in regard to the negative impacts of the CDM project tend to be anecdotal and not evidence-based. Example: The allegation that the landfill site causes cancer is not founded on any scientific study. In addition, this criticism, which is often used as a reason for the removal of the CDM project, is actually directed at the landfill site, itself.

Regarding the benefits of the CDM activity, the installation of the gas wells has had a positive effect on the surrounding environment, complaints regarding odour have dropped dramatically even though the site is now above the valley line and therefore more exposed. The CDM project has given a bursary to a female student from a disadvantaged background who has now graduated as a civil engineer. In addition, 11 permanent jobs have been created with some 250 temporary jobs during construction phases. Further, the understanding is that the carbon income from the project must be used to benefit the entire community of the municipality and not only those in the immediate vicinity of the landfill site.

Perhaps the most telling consideration is that the environmental regulatory regime in the country permits the taking of action against activities that are regarded as being detrimental to the environment, are operating without the requisite authorisation or operating in contravention of the terms of the authorisation that has been granted. There are a number of examples of where legal action taken by civil society formations has put a halt to activities with a perceived negative impact on the environment. No such challenge has ever been brought against the CDM project which continues to operate in accordance with the authorisation that has been granted for undertaking the project. Scrutiny, by the relevant authorities of the operation of the landfill site against the requirements of the relevant landfill permit has found that the broader site is operating in compliance with its permit.

In addition, and stemming from the authorities' perception of the positive environmental impact of this particular CDM project, full environmental impact assessments are no longer required by the authorities for landfill gas projects. The requirement for a full EIA has been replaced with the requirement for a "basic assessment" (a truncated EIA process provided for in South African environmental law). It is submitted that this change in the law demonstrates the confidence the authorities have in the benefit of these projects.

Our Conclusion on the basis of the yardstick

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*

   The claims refer to a pre-existing situation, except for the issue of livelihood of waste-pickers.

2. *Whether the study was evidence based?*

Since the coordinator was unable to respond, it is difficult to assess if the claims in the article were evidence based.

3. *Whether the findings were shared with the project proponent and respective national authority?*

   Since the coordinator was unable to respond, it is difficult to assess if the national authorities were approached.

4. *Whether a third party review was conducted?*

   Not clear.

5. *Whether legal recourse available in the country was sought?*

   Not clear, most likely not since South Africa has a stringent EIA process.

6. *Whether the project activity has worsened an existing situation?*

   There is no mention of worsening of an existing situation in the article.

Case 4: Aguan Biogas Recovery from Palm Oil Mill Effluent (POME) ponds and biogas utilization

Review of claims of negative impacts in literature:

An article in CDM watch newsletter (CDM Watch, 2011), claims that the company (project proponent), Grupo Dinant subsidiary Exportadora del Atlantico, is implicated in assassinations and other serious human rights abuses in Honduras. Further, the article emphasises concerns that additional funding through the CDM could be used to pay for more armed paramilitaries. This could further lead to more oppression of peasant communities, many of which are trying to reclaim land to which they are legally entitled. The article cites, a report by the Inter-American Commission on Human Rights in Honduras (2011) which confirms that 23 people have been killed between January 2010 and February 2011 inland convicts involving Grupo Dinant.

The report does not mention CDM project activity per se. Further, an international fact finding mission, comprising of six international networks and organisations, on Human Rights Violations in Bajo Aguán was launched to compile and analyse the testimonies from the region. The Mission contacted different actors and parties involved in the agrarian conflict in Bajo Aguán in order to gather observations and comments. The Oxfam's briefing paper, "CDM, though well intentioned, in practice serve to undermine local communities' land rights, providing incentives that increase the pressure for land or protecting harmful investments." The paper highlights the historical problem with Honduras in the context of land rights of local communities, but do not highlight the specific project activity.

Project Details:	
Project Ref Number:	3196
Host Country:	Honduras
Credit Start Date:	1-Feb-10
Date of Registration:	1-Feb-11
Host Country Approval:	13-Nov-08

Responses to our questionnaire:

1. CDM- Watch:

The responses were mostly generic and stated as follows:

Experience shows that the CDM in its current form has not achieved its dual objectives of reducing emissions and achieving sustainable development. Weak additionality rules have allowed for registration of many business-as-usual projects, thus failing to reduce global emissions. As for sustainable development, the benefits are meagre at best – in fact, a large majority of credits come from large industrial projects that deliver no social or environmental benefits and often heap adverse impacts on the poorest. Some projects are even causing severe environmental, social and human harm and/or violating national and international laws and standards, such as human rights.

The reasons for the current failure of the CDM to deliver on its dual mandate are numerous. One reason is that host countries define their own sustainability criteria. Developing countries rejected earlier attempts to establish an international sustainability assessment process. Their argument was that this would violate their national sovereignty. It is in the interests of the host country to secure as many CDM projects as possible because of the investment they bring. This means that host countries have little incentive to require strong sustainability criteria that could dampen investment. The sustainability criteria therefore usually lack specificity, transparency and stringency. Also, the assessment process that is performed by the host country DNAs is usually perfunctory.

The international community has a responsibility to ensure that the mechanisms it creates are consistent with achieving the protection of human rights. The Conference of the Parties recognised this obligation in Decision 1/CP.16, which stipulates that "Parties should, in all climate change related actions, fully respect human rights." In 2011, the CDM Executive Board registered two projects despite evidence of human rights abuses. Several other cases of abuses directly linked to CDM projects have been reported. The CDM must not support projects that cause human harm, including rights violations. It must be clarified that CDM projects that violate or threaten to violate human rights, including labour rights, are ineligible for registration or will be suspended.

Of particular importance, CDM projects must adhere to sustainable development co-benefit indicators and conduct a 'do no harm' assessment to avoid negative impacts of CDM projects. The local communities should have a role in certifying a project's contribution to sustainable development, and giving a significant part of benefits of the CDM credits directly to the local communities should be explored.

The evidence of the claims are desk reviews, review of PDDs and case studies, interviews with local organizations, eye witness accounts, local press reports and case study research done by local civil society organizations. Issues raised are always based on thorough research within our capacities, supported by local and international organisations and the media. Sources are referenced in the documents supplied. As you probably know, our role is the one of a Watchdog, raising problematic aspects of CDM projects to CDM actors and Parties as well as making concrete

suggestions for improvement. Investigating problematic projects on the ground is a challenging task which should be undertaken by the authorities responsible for doing so.

In the case of Aguan project letters discussing the claims were shared with the UK Government, Honduras DNA and CDM-EB. While responses were received from the UK Government and CDM-EB, no responses were received from the DNA.

2. Respondent from the fact finding mission

The responded confirmed that the testimonies received (not judicial evidence, since there has been no or few investigations) were the evidence which indicated that the PP's security guards have been involved in the violent acts committed against the peasants, including assassinations. Details of which are mentioned in the missions' report. Further the report mentions, "The testimonies indicate that those responsible for these events are the large landowners' private guards, members of the armed forces, and the National Police (Policía Nacional Preventiva)." "The Hearing noted the absence of effective institutions and of justice (several ttestimonies described having reported rights violations to the competent authorities, but the investigations have not progressed), which creates impunity. The report provided by the Public Ministry to the organizations that sponsored the Hearing confirms this. Moreover, it is evident that there is deep distrust of the authorities and a conviction that they only serve the interests of the landlords and work against the interests of poor communities. Given the state's lack of responsiveness, the peasants find themselves defenceless."

Our Conclusion on the basis of the yardstick:

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*

   The claims refer to a pre-existing situation.

2. *Whether the study was evidence based?*

   The study is based on testimonies during the filed visit. However, the objective was not specific to CDM activity but human rights issue in the region, an already existing conflict.

3. *Whether the findings were shared with the project proponent and respective national authority?*

   Not Clear

4. *Whether a third party review was conducted?*

   Yes, a third party review was conducted for the human rights issue by Inter-American Human Rights Court (IAHRC) but no mention of CDM project activity per se

5. *Whether legal recourse available in the country was sought?*

   Not Clear

6. *Whether the project activity has worsened an existing situation?*

   Not Clear

Case 5: Barro Blanco Hydroelectric Power Plant Project

Review of claims of negative impacts in literature:

The Barro Blanco Hydroelectric power plant (29 MW), has been criticized for human rights abuse and lack of local stakeholder involvement (in this case, indigenous Ngobe community). The issue has been raised in the open letters of the CDM-EB by the April 10 Movement for the Defense of the Tabasara River (M-10), Alianza para la Conservacion y el Desarrollo (ACD), Asociacion Ambientalista de Chiriqui (ASAMCHI), International Rivers Counter Balance coalition and CDM Watch.

Project Details:	
Project Ref Number:	3237
Host Country:	Panama
Credit Start Date:	1-Jan-13
Date of Registration:	26-Jan-11
Host Country Approval:	16-Nov-09

The two letters present the situation as follows:

1. The PDD failed to document the impacts of the Barro Blanco reservoir on the Bakama area of the Ngobe-Bugle Indigenous Comarca (autonomous territory). The validator was informed about this and provided with evidence of this situation. The letter claims that the validation report (2011) recognizes it but does not indicate what measures were taken.
2. Most of the local stakeholder consultations did not consider the opinion of the indigenous population of the region.

To the claims, CDM EB responded that the issues are under the purview of DOE and the steps taken by the DOE are in accordance with the requirement. Further, a Counter Balance fact-finding mission to Panama in October 2010 studied the Barro Blanco Hydroelectric Project, which was under appraisal for financing from the European Investment Bank and had received numerous complaints. The project developer later retracted their loan request. (Counter Balance, 2011)

Responses to our questionnaire:

1. **Authors/Organisations of reports:**

   The authors/colleagues from the organisation of the various reports were contacted, who suggested that initial claims were presented to the DOE, Comments during global stakeholder commenting period, CDM EB, Project owner, Panama Government. While the letters to and responses by the EB are available in public domain, other communication could not be accessed.

2. **Project Proponent:**

   PP could not be contacted.

Our Conclusion on the basis of the yardstick

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*

   The claims refer to a pre-existing conflict in the region.

2. *Whether the study was evidence based?*

   Not clear.

3. *Whether the findings were shared with the project proponent and respective national authority?*

   Not Clear

4. *Whether a third party review was conducted?*

   European Investment Bank did a review of the project while appraising it. The report (ref) supports the claims.

5. *Whether legal recourse available in the country was sought?*

   Not Clear

6. *Whether the project activity has worsened an existing situation?*

   Not Clear

Case 6: Xiaoxi Hydropower Project

Review of claims of negative impacts in literature:

Fact finding mission aimed to present findings relevant to judging whether the Xiaoxi hydropower project is likely to be WCD compliant. The report claims forced displacement and impoverishment due to the dam furthered by lack of transparency & potential for corruption in compensation scheme. Another article (yan, 2009) claims that no legal recourse was available for those suffering losses, and of a biased Environmental Impact Assessment process. Under EU and German law, any large hydro projects from which CDM credits are bought should comply with the recommendations of the World Commission on Dams (WCD). TUV-SUD was appointed to conduct the third party review for WCD compliance in this case. International Rivers has also critiqued (International-rivers.2008) the project's World Commission on Dams Compliance Report, which recommended the project.

Project Details:	
Project Ref Number:	1749
Host Country:	China
Credit Start Date:	19-Dec-08
Date of Registration:	19-Dec-08
Host Country Approval:	2-Jul-07

Responses to our questionnaire:

1. **Respondent 1:**

   Through interviews and observations, our consultant documented problems including the forced eviction of 7,500 people, a failure to restore pre-eviction incomes, arbitrary and inadequate compensation for re-settlers, a lack of legal recourse for those who suffered losses, and a non-independent EIA process marred by an obvious conflict of interest. The report was presented to the German company RWE, the validator TUEV-SUED, DEHSt the German DNA, the UNFCCC, and to the Secretary of State in the German parliament. DEHSt spoke with our campaigner and our consultant and agreed to look into the issue

further. From their phone call notes, I found that they contacted the German embassy in Bejing and a German industry association in Bejing about this case and asked them for more info about the situation on the ground. They asked for the resettlement plans and the compensation agreements between the affected people and the local authorities from TUEV-SUED, which agreed to translate and send them. DEHSt decided to send TUEV-SUED on a monitoring mission to Xiaoxi to verify the claims of the study. It was unfortunate that they sent the same company who validated the project to investigate the claims. However, my understanding is that the affected communities were eventually given more compensation for their resettlement, and the project has since been registered. In China, people can petition the government

2. **Respondent 2:**

Xiaoxi was indeed registered. I am not sure whether affected communities were eventually granted a better compensation package. Digging on the German Emissions Trading Website, I did manage to find out that the certification report from December 2010 was evaluated by the German government as inadequate (June 2011) with regards to resettlement - i.e. it did not verify whether affected persons were properly resettled. Therefore the German govt. asked RWE to provide documentation that resettlement was properly carried out. Only then would it consider the project as having fulfilled the requirements. It appears that eventually the compliance report was accepted, although further documentation showing that resettlement was adequate has not been made public.

Our Conclusion on the basis of the yardstick:

1. *Does the claim refer to the CDM project activity or a pre-existing situation?*

   The claims refer to the CDM project activity.

2. *Whether the study was evidence based?*

   The study is based on testimonies during the filed visit.

3. *Whether the findings were shared with the project proponent and respective national authority?*

   The report was presented to the German company RWE, the validator TUEV-SUED, DEHSt the German DNA, the UNFCCC, and to the Secretary of State in the German

4. *Whether a third party review was conducted?*

   EHSt decided to send TUV-SUD on a monitoring mission to Xiaoxi to verify the claims of the study. The affected communities were eventually given more compensation for their resettlement, and the project has since been registered.

5. *Whether legal recourse available in the country was sought?*

   No. the respondent indicated that in China, people can petition the government to address grievances but this is a tedious and often unsuccessful process.

6. *Whether the project activity has worsened an existing situation?*

   Not clear since the compensation was in the end increased

Case 7: Improving Rural Livelihoods through Carbon Sequestration by Adopting Environment Friendly Technology based Agroforestry Practices

Review of claims of negative impacts in literature:

Rath (2012) concludes that in the whole plantation and/or CDM business the farmer's position is most vulnerable because of the Lack of transparency at the provider level, complex process of validation and ignorance at the farmers' level to secure their rights in this new form of business. Panda (2012) in a presentation claims negative impacts on livelihoods highlighting pitfalls in the stakeholder consultations. The ecological concerns due to monoculture plantations of Eucalyptus Plantations are also emphasised to be incompatible with local biodiversity and ecology.

Project Details:

Project Ref Number: 4531

Host Country: India

Credit Start Date: 25-Jun-04

Date of Registration: 28-Feb-11

Host Country Approval: 15-Jul-09

Responses to our questionnaire:

1. **Respondent 1:**

   RCDC has recently released its study report on A/R CDM that took the following project as one of the case studies:

   "Improving Rural Livelihoods Through Carbon Sequestration By Adopting Environment Friendly Technology based Agro17 Practices" in Koraput, Kalahandi and Rayagada districts of Orissa and Visakhapatnam, Vizianagaram and Srikakulam districts of Andhra Pradesh in India by M/s (i) VEDA Climate Change Solutions Ltd (VCCSL) and (ii) JK Paper Ltd (JKPL). Some of the impacts include:

   - Virtual alienation of tribal land in the disadvantaged districts
   - Food security at stake
   - Long term adverse socio-economic impacts apprehended
   - Ecological concerns due to monoculture plantations of Eucalyptus
   - Plantations taken up are not exactly forests, and hence are incompatible with local biodiversity and ecology

   While the adverse impacts of Eucalyptus plantations have been studied and identified earlier, the present case was based on field studies by RCDC and Living Farms, along with critical analysis of the project validation report. The NGO stated that the report was shared with the National CDM Authority, India but without any response suggesting poor or no intention to interact with CSOs on the issue.

Our Conclusion on the basis of the yardstick

1. Does the claim refer to the CDM project activity or a pre-existing situation?

   The claims refer to CDM activity.

2. Whether the study was evidence based?

   Not clear though author suggests it based on testimonies during the filed visit and critical analysis of the validation report.

3. Whether the findings were shared with the project proponent and respective national authority?

   Not Clear

4. Whether a third party review was conducted?

   Not clear. Most likely not

5. Whether legal recourse available in the country was sought?

   The report was shared with the National CDM Authority, India but without any response suggesting poor or no intention to interact with CSOs on the issue.

6. Whether the project activity has worsened an existing situation?

   Not Clear

5.5 Limitations of the study

The study had to be restricted to a desk based review due to time constraints for completion of the study. Limited responses were received for the survey and were usually not specific to the questions asked. Further, there seemed to be a lack of willingness among respondents to share information. Acknowledging these limitations, the authors would like to declare that best possible attempts were done to hear the opinions of varied stakeholders during the course of the study.

Conclusions

Out of the above cases, enough responses were not available for Okhla-Timarpur project in India. Key findings from other seven cases indicate[57] that in four of the seven cases predominant mention is of a pre-existing situation while providing a critique of CDM for.eg in case of Bisasar Road landfill in South Africa and Aguan biogas recovery from Palm Oil Mill Effluent (POME) ponds and biogas utilization in Honduras. In such cases, there is limited reference of the impact of CDM project activity per se. Further, these studies do not indicate whether the CDM project activity has worsened the pre-existing situation.

In most of the cases, reports or responses do not indicate/or provide the evidence used to make the claims of negative impacts of the CDM project activity. Only three cases indicate field visits and filed testimonies as the evidence for their claims for.eg in case of Xiaoxi CDM Hydropower Projects in China and Improving Rural Livelihoods through Carbon Sequestration in India.

It is not clear if the claims were presented to/discussed with the Project Proponents (as most of the respondents did not respond to this). In the case of Xiaoxi CDM Hydropower Projects in China, the claims were presented to the funding partner, who in turn asked for a third party verification of the claim. In another case, that of Mtoni Landfill Gas Project in Tanzania, the project proponent responded to a newsletter article on negative impacts of the project.

In case of Aguan biogas recovery from Palm Oil Mill Effluent (POME) ponds and biogas utilization, a third party review was conducted by IAHRC for the human rights issue and situation in Hondurus. Limited reference, however, was made on the CDM project activity per se. In other case of Xiaoxi CDM Hydropower Projects in China, the funding project partner sent a monitoring mission to the project site to verify the claims.

None of the respondents indicated that national legal recourse was availed for the issue. Only one respondent suggested that the report on 'Improving rural livelihoods through carbon sequestration' project in India was shared with the national authority on CDM in the host country but did not get response.

Overall, the analyses of case studies do not lead to validation of the assertions of adverse impacts by the authors of any of the case studies.

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CHAPTER 6: Future options and way forward[58]

6.1 Sustainable development

For most stakeholders, sustainable development is one of the key impacts of the CDM. Stakeholders desire to further enhance the sustainable development benefits from the CDM. However, stakeholders have cautioned that it should not infringe upon the sovereignty of host countries and should not increase the transaction costs.. Though a common definition of sustainable development does not exist for the CDM, most of the host countries have articulating their priorities for their own sustainable development. A review suggests many commonalities on the way each DNA defines sustainable development. Amongst other commonalities, most of the DNAs in their definitions invariably include the three pillars of social equity, economic development and environmental protection, as well as preventing negative impacts from CDM projects.

Depending on stakeholder priorities, there are three possible objectives for interventions in this area: increasing the overall sustainable development benefits from the CDM project pipeline, measuring and reporting those benefits to the DNA and other stakeholders, and systematically preventing negative impacts (e.g. human rights violations). However, there are differences amongst stakeholder groups while considering interventions. For example, most of the stakeholder groups that feel that CDM projects are generally delivering many positive benefits, may want to focus on preventing negative impacts rather than increasing the monitoring of benefits. On the other hand, stakeholder that feel that negative impacts are best addressed by national regulation and enforcement may instead focus more on measurement and increasing positive sustainable development impact.

The empirical analysis of PDDs, review of literature, consultation with experts, the current discussions in the CDM_EB, and inputs from stakeholders to the CDM Policy Dialogue on sustainable development highlight the a number of options to enhance SD benefits and alleviate negative impacts from CDM project activities. Table 6.1 presents a summary of potential future options and a discussion on the possible role of different potential actors in the CDM cycle:

[58] *Authored by Nimisha Pandey, Neha Pahuja, Ritika Tewari, Amrita Achanta Narayan, The Energy and Resources Institute, New Delhi, India; Naoyuki Yamagishi, WWF Japan.*

Table 6.1: Summary of potential future options and a discussion on the possible role of different potential actors in the CDM cycle

Broad concept	Options being discussed			Role of different actors in CDM project cycle				Analysis
		Pros	Cons	DNA	DOE	PP	EB	
Definition of SD criteria/indicators	Generic definition	May facilitate systematic declaration of benefits in PDDs	International definition may fail to capture national circumstances/ requirements in many cases May raise sovereign concerns further decreasing in 'political will'	A critical role in the process for enhanced ownership and effective implementation	Though no role in the process of defining SD but an important stakeholder	Though no role in the process of defining SD but an important stakeholder	Call for Inputs and discussions in progress (EB 65, EB 66)	The DNAs are best placed to define SD as they understand the national/ local circumstances Also DNAs need to play an active role in defining SD to enhance 'political will'
	Project-type specific definition	May provide further clarity to documentation of benefits specific to project types May lead to enhanced uptake of project types considered to be high on SD	May further increase the complexity in the process May create an 'artificial competition' among various project types and exclude projects that may be high on GHG emissions reductions	A critical role in the process for enhanced ownership and effective implementation	Though no role in the process of defining SD but an important stakeholder	Though no role in the process of defining SD but an important stakeholder	A critical stakeholder	Shall make the process even more complex especially for DNAs with limited capacities May create an 'artificial competition' among various project types and exclude projects that may be high on GHG emissions reductions
Revision of PDD format	Revision of PDD format	May improve the documentation process of claimed benefits thereby increasing recognition	The PPs/consultants may find it difficult to adopt the new format. Also, the PPs might be less willing as it might lead to	Important stakeholder	No role	No role	Creation/revisions in the PDD format is the mandate of EB which is technically equipped to so	May create challenges for countries with limited capacity so need for further capacity building Increased reporting can only benefit, if DNAs are highly motivated and

			increase in transaction costs					have an active role in the process. Given that DNAs have an interface with PPs
Declaration, monitoring and verification of SD impacts	Declaration/reporting only	-	-	Critical stakeholder	Important stakeholder	Important stakeholder	Important stakeholder	Denotes the current situation
	Declaration/reporting +voluntary monitoring	May improve the documentation and effective implementation of the claimed benefits	May further increase the complexity in the process Shall increase the transaction costs substantially	A key role in screening projects and monitoring of SD benefits	Could have a role in monitoring SD benefits on request of the DNA	Important role in implementation	Important stakeholder	Monitoring and verification of SD can happen at the DNA level to enhance DNAs' engagement and ownership in the process and also avoid significant increase in transaction costs (involved national/local authorities may be aware of the local circumstances and better equipped) If the DNAs wish and in the absence of able local institutional structures, services of DOEs can be availed to perform monitoring

	Declaration/reporting +mandatory monitoring	May improve the documentation and implementation of claimed benefits	May further enhance the complexity in the process Shall increase the transaction costs substantially May act as a deterrent for newer projects as was the case for DOE liability in case of PoAs May raise sovereign concerns further decreasing the 'political will'	A key role in screening projects and monitoring of SD benefits	Could have a role in monitoring SD benefits	Important implementer	Important stakeholder	Monitoring and verification of SD should happen at the DNA level to enhance DNAs' engagement and ownership in the process and also avoid significant increase in transaction costs (involved national/local authorities may be aware of the local circumstances and better equipped) If the DNAs wish and in the absence of able local institutional structures, services of DOEs can be availed to perform monitoring
Safeguards against negative impacts	"Do no harm" safeguards	May reduce potential incidence of negative impacts	In most cases it is difficult to distinguish between a pre-existing scenario from post-CDM implementation scenario to be able to attribute the negative impacts to the CDM project activity	A key role in defining the "Do no harm" safeguards	Important stakeholder	Important stakeholder	A critical stakeholder	As in the case of defining overall SD criteria/indicators, DNA should be responsible for developing a "do no harm" safeguards for the country to enhance 'political will' and DNAs' engagement and ownership in the process
	List of unsustainable project types, not eligible under CDM	May reduce potential incidence of negative impacts	May lead to exclusion of certain project types (thereby loss of GHG mitigation opportunities) based on prejudices or anecdotal evidences	Important stakeholder	Important stakeholder	Important stakeholder	A critical stakeholder	The exclusion of projects on such grounds may have spill-over effects on other sectors of economy (for eg. Exclusion of large hydro)

			for a limited project examples (given that each project is unique and SD impacts are localized in nature)					Attribution of SD impacts (positive or negative) to CDM projects is specific to the local conditions. Therefore defining list of unsustainable project types at the international level may not be true for all contexts
Consequence of non-performance on SD benefits pledged in PDDs	Project suspension	May ensure delivery of SD benefits	Risk of genuine projects being penalized cannot be totally ruled out	Key stakeholder	Important stakeholder	Important stakeholder	Critical stakeholder	On verification of non-compliance by the DNA (or any DNA approved agency), the DNA can request EB to suspend the concerned project Overemphasis of SD benefits from CDM may lead to reduced consideration of the requirements of 'additionality' and emission reductions
Capacity building of DNAs	Capacity building of DNAs by EB	Shall enable countries with limited capacities to undertake CDM more vigorously May lead to uptake of potential project types	-	Key stakeholder	Important stakeholder	Important stakeholder	Critical stakeholder	Besides capacity building by EB, there could be sharing of information/ experience/ best practices at the regional level (south-south cooperation, etc.)

6.1.1 Summary of options for SD

This section gives the overall suggestions on enhancing the impact of the CDM on the basis of the roles identified for each stakeholder and understanding of pros and cons for each option.

Definition of Sustainable Development indicators could enhance documentation of the SD benefits. Given that DNAs are aware of their national circumstances and in many cases already have SD criteria, they could make it more explicit by reporting their own sustainable development criteria on the UNFCCC webpage, just as the national definitions of a forest are currently reported.

Improved reporting of sustainable development benefits in the PDD could enhance documentation of SD benefits while also recognising the SD benefits of the projects. Objective but simple modifications in the PDD format could be low cost win-win option.

Monitoring and verification of sustainable development benefits could enhance documentation of the SD benefits and effective implementation. There could be many variations to monitoring as discussed in the table above. However, many stakeholders have cautioned that it should not but infringe on the host country's sovereign right to determine if a project meets their own sustainable development criteria and it should not increase the transaction costs. Monitoring and verification of SD benefits could be undertaken by the DNA, according to national criteria and procedures. This would, however, add to the transaction costs.

Consequences for lack of performance could range from providing information to project developers to assist with compliance all the way to suspending the project for further issuance of CERs. This could be based on the project not following through on sustainable development benefits and/or the project violating one of the safeguards. The DNA could however decide, according to national criteria and procedures.

Enhanced stakeholder consultation and appeals process – DNAs could work towards strengthening the process of local stakeholder consultation.The relevant local authorities can be made more aware about sustainability issues and their role in its effective implementation. Negative sustainable development impacts could be one of the possible grounds for a grievance. The governance reforms proposed under stakeholder consultation and an appeals process are also relevant for sustainable development impacts, particularly negative ones.

Safeguards against negative impacts, such as human rights violations, corruption, and labour exploitation, could also be strengthened in several ways. As a first step, the DNA could ensure that claims of negative impacts were taken up within the legal structure and processes of the host country. In addition, the PDD could be expanded to include a checklist on key safeguard issues. As with benefits, this could happen at the start of the project only, or could be reported periodically after implementation. Verification of compliance with safeguards could be undertaken by the DNA along with that of SD benefits.

Preferences for specific project types or technologies could be established to differentiate eligibility and procedures across project types. This would, however, eliminate genuine projects in some instances as each project is unique and circumstances are local. This would require broad political agreements, as well as a sound empirical evidence base upon which to prioritise.

Capacity Building for DNAs could strengthen the ability of DNAs, particularly those with the least resources, to apply their national criteria for sustainable development in the project approval process. This could include sharing of experiences at a regional and sub-regional level, and providing information on "best practice" in project evaluation.

A model could be proposed as follows from the discussions above. Each DNA could explicitly declare their own definition of SD criteria to the EB. The EB could revise the PDD format to ensure explicit documentation and reporting of potential SD benefits. The DNA could enhance monitoring, and verification of the SD benefits pledged in the PDDs, the inputs received during the various stakeholder consultations emphatically highlight definition and determination of SD as being entirely the host country's prerogative. However, if a particular DNA wishes, it can opt for using the services of a DOE in addition to its own national/local governance institutions (depending on the project type/criteria to be monitored, etc.) at its own discretion. In such an arrangement, the DOEs/local authorities shall report the results to the DNAs only. A provision could be made to allow a project developer (seller)/ or a buyer to approach the host country DNA for verification of SD benefits or certification of absence of negative impacts from a project. The DNA can further delegate this task to a DOE or relevant local authorities. The cost of this exercise can be borne by whosoever approaches the DNA for the purpose.

Currently, the role of DNAs is limited to approving/rejecting a CDM project activity based on potential SD impacts. Based on inputs received from stakeholder consultations, there is a need for DNAs to be engaged throughout the implementation of the CDM projects in the respective countries. This would enable the DNAs to deregister a project/withdraw its consent if they determine that a particular project is not performing as committed in the PDD. Once again, the DNA, if it wishes, can avail the services of DOEs or relevant national/local monitoring and enforcement agencies to verify the same.

In order to further ensure fair implementation of CDM projects and delivery of claimed SD benefits, the DNAs could work towards strengthening the process of local stakeholder consultation. The relevant local authorities can be made more aware about sustainability issues and their role in its effective implementation.

All assessments of the claimed negative impacts from CDM activities should be undertaken within the legal structure and processes of the host country and all appeals/actions in this regard should be routed through DNAs and national legal recourse.

The DNAs which lack the requisite capacity and resources to undertake the above listed actions can be supported /facilitated through sharing of experiences/resources at a regional/sub-regional/international level, and be provided information on "best practice" in project implementation and evaluation if they wish.

6.2 Technology transfer

Based on our analysis some suggestions based on both the literature review and the PDD analysis:

The UNFCC could consider improving the way that data are generated and presented from the large number of projects in the pipeline. A database could be created with more information on

the technological specification and the name of the technology supplier and/technical project developer in the PDDs. This may further facilitate technology transfer for new entrants.[59]

The authors on the bases of the PDD analysis found that information on TT tended to be limited, often inadequate in detail and lacking in consistency. There is a need for more comprehensive and clear information on technology transfer to enable decision making by DNAs (Das, K. 2011). However the authors are not certain whether this is likely in light of the structure of the latest version of the PDD.[60]

At the PDD level, it may be useful for Designated National Authorities to adopt clear and more operational definition of technology transfer in the project approval process.

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[59] The authors are aware that recent TT studies have digitized and analyzed data that was previously unusable. Further digitization is under way. The UNFCCC also plans to establish web interfaces so that project documentation is submitted directly in digital form.

[60] **A.3. Technologies and measures**

Describe the technologies and measures to be employed and/or implemented by the project activity, including a list of the facilities, systems and equipment that will be installed and/or modified by the project activity. This includes:

(a) A list and the arrangement of the main manufacturing/production technologies, systems and equipment involved. Include in the description information about the age and average lifetime of the equipment based on manufacturer.s specifications and industry standards, and existing and forecast installed capacities, load factors and efficiencies. The monitoring equipments and their location in the systems are of particular importance;

(b) Energy and mass flows and balances of the systems and equipment included in the project activity;

(c) The types and levels of services (normally in terms of mass or energy flows) provided by the systems and equipment that are being modified and/or installed under the project activity and their relation, if any, to other manufacturing/production equipment and systems outside the project boundary. The types and levels of services provided by those manufacturing/production systems and equipment outside the project boundary may also constitute important parameters of the description. The description should clearly explain how the same types and levels of services provided by the project activity would have been provided in the baseline scenario.

Also provide a list of:

(a) Facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project activity;

(b) Facilities, systems and equipment in the baseline scenario, as established in section B.4 below.

If the baseline scenario is a continuation of current practice, thus identical to the scenario existing prior to the implementation of the project activity, there is no need to repeat the description of the scenarios, only state that both are the same.

Do not provide information that is not essential to understanding the purpose of the project activity and how it reduces GHG emissions. Information related to equipment, systems and measures that are auxiliary to the main scope of the project activity and do not affect directly or indirectly GHG emissions and/or mass and energy balances of the processes related to the project activity should not be included.

Include a description of how the technologies and measures and know-how to be used are transferred to the host Party(ies).

At the host country level, Das, K., (2011) suggests that the host country could influence the extent and nature of technology transfer, by including technology transfer under its SD criteria, defining the criteria or indicators of technology transfer clearly and implementing these criteria stringently.

ANNEXURES

Annexure I: Information available from websites of DNAs

Region	Country	DNA	Does the website exist? (Yes or No)	SD criteria published in the website	URL
Latin America					
	Brazil	Ministério da Ciência, Tecnologia e Inovação	Yes	Yes	http://www.mct.gov.br/index.php/content/view/323893.html?execview=
	Mexico	Interministerial Commission on Climate Change (Comisión Intersecretarial de Cambio Climàtico)	Yes	Yes	http://www.cambioclimatico.gob.mx/index.php?option=com_content&view=article&id=70&lang=en
	Chile	Ministry of Environment of Chile	No	No	-
	Colombia	Ministry of Housing and Territorial Development	Yes	Yes	http://www.minambiente.gov.co//contenido/contenido.aspx?catID=1266&conID=7716&pagID=9091
Europe and Central America					
	Cyprus	Ministry of Agriculture, Natural Resources and Environment	No	-	-
	Moldova	Ministry of Environment and Natural Resources	No	-	-
	Uzbekistan	Ministry of Economy of the Republic of Uzbekistan	Yes	Yes	http://mineconomy.uz/cdm/files/Resolution_9_2007_eng.pdf
	Albania	Climate Change unit, Ministry of Environment, Forests and Water	No	No	-

		administration			
	Armenia	Ministry of Nature Protection	Yes	Yes	http://www.nature-ic.am/en/Projects_Approval_Criteria
	Azerbaijan	Climate Change And Ozone Center, Ministry of Ecology and Natural Resources	Mention of the Centre at the Ministry website	No	http://www.eco.gov.az/en/ozon-esasname.php
	Georgia	Ministry of Environment Protection and Natural Resources	Yes	Yes	http://moe.gov.ge/index.php?sec_id=123&lang_id=ENG
	Serbia	Ministry of Environment and Spatial Planning	Yes	Yes	http://www.ekoplan.gov.rs/DNA/index_en.html
Africa					
	Kenya	National Environment Management Authority	Yes	Yes	http://www.nema.go.ke/
	South Africa	Department of Energy	Yes	Yes	http://www.energy.gov.za/files/esources/kyoto/kyoto_frame.html
	Egypt	Egyptian Environment Affairs Agency	Website URL not working	-	http://www.cdm-egypt.org/
	Morocco	Secrétariat d'Etat chargé de l'Eau et de l'Environnement	Yes	Yes	http://www.cdmmorocco.ma
	Nigeria	Federal Ministry of Environment	Yes	Just a mention of CDM	
	Uganda	Ministry of Water and Environment	Yes	No details	http://ccu.go.ug/
Middle East					
	United Arab Emirates	Environment Agency - Abu Dhabi	Yes	SD decision making tree on website	http://www.cdm-uae.ae/portal/dev.criteria.aspx
	Iran	Department of Environment	Yes	No	http://www.climate-change.ir/en/
	Israel	Ministry of Environment Protection	Yes	No	http://sviva.gov.il/error.htm
	Lebanon	Ministry of Environment	Yes	No	http://www.moe.gov.lb/home.aspx?lang=ar-lb

	Syria	Ministry of State for Environment Affairs	No	-	-
Asia and Pacific					
	China	National Development and Reform Commission of the People's Republic of China	Yes	Information not accessible	http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=905
	India	Ministry of Environment and Forests	Yes	Yes	http://envfor.nic.in/cdm/host_approval_criteria.htm
	Malaysia	Ministry of Natural Resources and Environment	Yes	Yes	http://www.nre.gov.my/Environment/Documents/CDM%20Handbook%202nd%20edition.pdf
	Vietnam	Ministry of Natural Resources and Environment of Vietnam	Yes	Yes	http://www.noccop.org.vn/images/article/Viet%20Nam%20CDM%20Pipeline_a43.pdf
	Thailand	Thailand Greenhouse Gas Management Organization	Yes	Yes	http://www.tgo.or.th/english/index.php?option=com_content&view=category&id=27:approval-process&Itemid=45&layout=default
	Indonesia	National Committee on CDM: Carbon Trading Division	Yes	Yes	http://pasarkarbon.dnpi.go.id/web/index.php/dnacdm/cat/5/sustainable-development-criteria-.html

Color coding:

	Countries whose SD criteria were available on their DNA websites
	Countries whose website is not accessible (language issues, site not working etc.
	Countries who either do not have websites or their SD criteria are not web-hosted
	Countries cited in literature

Countries from Literature				
Country	**DNA**	**Does the website exist? (Yes or No)**	**SD criteria published in the website**	**URL**
Bolivia	Vice-ministry of Natural Resources and Environment	Yes	Yes	http://www.mmaya.gob.bo/webpncc/biblio/guia%20de%20presentacion%20para%20proyectos%20MDL.pdf
Panama		Yes	Yes, but language issues	http://www.anam.gob.pa/
Peru	Ministry of Environment (ministerio del ambiente)	Yes	Yes	http://www.fonamperu.org/general/mdl/aprobacion.php
Senegal	Direction de l'Environment et des Etablissements Classés	Yes	Yes	http://www.jo.gouv.sn/spip.php?article5278
Tanzania	Division of Environment, Vice-President's Office	Yes	Site not accessible	http://www.dnatanzania.go.tz/index.php?link=19
Ethiopia	Environmental Protection Authority (EPA)	Yes	Site not accessible	http://www.epa.gov.et/contactEPA.htm
Rwanda	Environmental Affairs Department	Yes	Yes	http://www.rema.gov.rw/dna/index.php?option=com_content&view=article&id=64&Itemid=74
Malawi	Environmental Affairs Department		No: site not functional	http://www.eadmw.org/index.html
Mozambique	Ministério para a Coordenação da Acção Ambiental (MICOA)	No	-	-
Burkina Faso	Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable	No	-	-
Zambia	Climate Change Facilitation Unit, Ministry of Tourism, Environment and Natural Resources	Yes	Yes (but could not be opened)	http://www.ccfu.org.zm/index.php/documentation
Democratic Republic of the Congo	Ministère de l'Environnement, Conservation de la Nature et Tourisme	Yes	Language issues	http://www.mecnt.cd/index.php?option=com_content&view=article&id=163&Itemid=300092
Bhutan	National Environment Commission	Yes	Yes	http://www.nec.gov.bt/climate/cdm/Draft%20CDM%20&%20VER%20Toolkit.pdf

Annexure II: Questionnaire for Designated National Authorities (DNAs)[61]

Sustainable Development

1. Is there any operational definition of "sustainable development" in your host country?

2. What criteria and process does your country currently uses to determine whether a CDM project contributes to its sustainable development?

3. What evidence is there that indicates contribution to sustainable development from CDM projects? Are there any specific indicators used in your assessment?

4. What concerns have been raised about the sustainable development impact of the CDM? How could these be addressed?

5. Should a more standardized set of criteria for sustainable development be adopted?

[61] The questionnaire had questions on the 3 areas of research of the panel i.e. Future Context, Governance; and Impact of CDM (including specific questions on sustainable development, regional distribution and stakeholder consultations). The present study has only used information from questions on sustainable development.

Annexure III: Summary of methodologies and indicators employed in the reviewed studies for SD

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
1.	Sustainability check-up for CDM projects; Christoph Sutter, 2003	Multi-Attributive Assessment of CDM (MATA-CDM of information received from stakeholder consultations/surveys.	Social Criteria - Stakeholder Participation - Improved Service Availability - Capacity Development - Equal Distribution of Project Return Environmental Criteria - Fossil Energy Resources - Air Quality - Water Quality - Land Resources Economic Criteria - Microeconomic Efficiency - Technology Transfer - Regional Economy - Employment Generation	6 case studies in South Africa, India and Uruguay
2.	Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects; Christoph Sutter & Juan Carlos Parreño, 2007	Multi-Attributive Assessment of CDM of information given in PDDs	- Distribution of CER returns - Improvement in local air quality - Likelihood of real emission reductions	16 projects registered as of August 30, 2005
3.	The promotion of sustainable development in China through the optimization of a tax/ subsidy plan among HFC and power generation	The data extracted from PDDs was subjected to CDM Tax/Subsidy		All registered projects up to August 2006

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
	CDM projects; Martin Resnier, Can Wang, Pengfei Du, Jining Chen, 2007	Optimization Model (CDMTSO Model)[62]		
4.	Empirical Analysis of Performance of CDM Projects, Climate Strategies; Paula Castro, Axel Michaelowa, 2008	Empirical analysis of PDDs of CDM projects (including registered, in the pipeline, rejected and withdrawn projects) followed by interviews with international experts and project developers and literature review	The following parameters have been evaluated in terms of their relevance for project performance: - Host country - Unilateral or bilateral character of the project - Type of project developer - Project category and type - Project size - Designated Operational Entity in charge of validation In the case studies, three further key CDM project parameters have been assessed: - Quality of the additionality argumentation - Quality of the stakeholder consultation - Quality of the expected sustainability benefits as stated in the PDDs.	275 registered CDM projects, 18 projects in validation, 20 rejected projects and 4 withdrawn ones (as of June 2007UNEP RISOE). For the case study assessments, 4 projects from China, India and Brazil were selected.
5.	Sustainable development benefits of clean development mechanism projects: A new methodology for sustainability assessment based on text analysis of the project design documents submitted for validation; Karen Holm Olsen, Jørgen Fenhann, 2008	Text analysis of the PDDs using software program Nvivo7 (QSR International, 2006), developed for qualitative text analysis	- Environmental (air, water, land) - Social (health, welfare, learning, employment) - Economic (growth, energy, balance of payments) - Other benefits (sustainability tax, CSR)	Sampled 296 PDDs (out of 744 total as of May 2006)
6.	On the contribution of labelled	Using information in	Social	39 registered CDM projects

[62] CDM Tax/Subsidy Optimization Model (CDMTSO Model), a sustainable development assessment method evaluates the CDM projects' economic and environmental benefits and an optimization program returns tax/subsidy rates at which the greatest number of CDM technologies becomes viable and where "better" CDM projects can be the most profitable.

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
	Certified Emission Reductions to sustainable development: A multi-criteria evaluation of CDM projects; Patrick Nussbaumer, 2008	PDDS a Multi-Attributive Assessment of CDM (MATA-CDM). Gold Standard (GS) and Community Development Carbon Fund (CDCF) CDM projects were compared with non-labelled projects of similar type.	- Stakeholder participation - Improved service availability - Equal distribution - Capacity development Environmental - Fossil energy resources - Air quality - Water quality - Land resource Economic - Regional economy - Microeconomic efficiency - Employment generation - Sustainable technology transfer	(as of 1 April 2008). All Gold Standard (GS) and Community Development Carbon Fund (CDCF) CDM projects were selected.
7.	Further Development of the Project-Based Mechanisms in a Post-2012 Regime; Wolfgang Sterk et al , November 2009	Based on information given in PDDs, analysis of GS to assess its robustness and its applicability for the CDM as a whole		5 registered GS projects (as of March 2009); 10 conventional CDM projects, 2 each from India and China, and 1 each from Bolivia, Brazil, El Salvador, Nicaragua, Columbia and Panama
8.	Reforming the CDM for sustainable development: lessons learned and policy futures; Emily Boyd et al, 2009	Evaluation of direct and indirect benefits based on SD criteria through PDD analysis	- Environment - Economic - Technology transfer - Health - Employment, - Education - Other social benefits	A random sample of 10 projects that capture specifically (a) diversity of CDM project types that include biomass, waste heat recovery, hydroelectricity, fuel switch, land fill, construction and biogas and (b) regions. The cases were from India, Brazil, South

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
				Africa, and China.
9.	The Clean Development Mechanism: too flexible to produce sustainable development benefits?; Charlene Watson and Samuel Fankhauser, June 2009	Textual/keyword analysis of information given in PDDs	- Employment - Livelihood - Infrastructure - Technology transfer - Pollution - Environment - Education - Training	The study samples 10% of the 4064 projects (UNEP-RISOE, October 2008. All projects at all stages of validation except those rejected or withdrawn were considered.
10.	The Clean Development Mechanism and Sustainable Development: A Panel Data Analysis; Yongfu Huang and Terry Barker, 2009	Environmental Kuznets Curve framework[63]	Environmental dimension of SD in terms of CO2 emission reductions.	34 CDM host countries over 1990-2007, however, CDM host countries which have their first CDM projects in the pipeline after year 2006 were excluded.
11.	Analysis of the relationship between the additionality of CDM projects and their contribution to sustainable development; Johannes Alexeew, 2010	Literature review and multi-criteria (economic, social and environmental) assessment of PDDs	- Stakeholder participation - Social benefits for poorer parts of society - Supporting the development of poorer regions - Impact on life quality - Impact on air - Impact on soil - Impact on water - Sustainable and innovative technology - Employment generation - Financial benefits of the project - Cost-efficiency of the GHG abatement	A sample of 40 (31 small and 9 large-scale projects—15 biomass, 12 wind, 7 hydro, 4 energy efficiency and 2 HFC-23) registered projects, chosen from the pool of 379 CDM projects in India (as of January 2009). Only projects which applied the investment analysis method for proving

[63] A Kuznets curve is the graphical representation of Simon Kuznets' hypothesis that as a country develops, there is a natural cycle of economic inequality driven by market forces which at first increases inequality, and then decreases it after a certain average income is attained. The environmental Kuznets curve is a hypothesized relationship between environmental quality and economic development: various indicators of environmental degradation tend to get worse as modern economic growth occurs until average income reaches a certain point over the course of development.

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
				additionality were considered.
12.	Benefits of the Clean Development Mechanism 2011; UNFCCC, 2011	Multi-criteria assessment of PDD content and follow up survey of project participants	A set of 15 indicators empirically derived from a sample of 350 CDM projects. - Direct/indirect financial benefit for the local and/or regional economy - Local/regional jobs generated directly/indirectly - Development/ diffusion of local/ imported technology - Investment in the local/ regional infrastructure - Efficient utilization of natural resources - Reduction in noise, odours, dust or pollutants - Improvement and/or protection of natural resources - Available utilities - Promotion of renewable Energy - Labour conditions and/or human rights - Promotion of education - Health and safety - Poverty alleviation - Engagement of local population - Empowerment of women, care of children and frail	All the 2,250 projects registered as of July 2011
13.	Can the Clean Development Mechanism (CDM) deliver?; Srikanth Subbarao, Bob Lloyd, 2011	Desktop analysis of 500 PDDs. In addition, 5 case studies were investigated through site visits to verify the PDD documents.	- Employment generation - Migration - Access to electricity - Education - Health - Socio-economic and human development - Distribution of benefits - Use of local resources - Environmental aspects - Stakeholder comments and perception	500 registered small-scale CDM projects (as of May 2008) were selected for desktop analysis, covering a wide range of sectors.

S. No.	Title of the study; author/s and year	Methodology	Indicators used	Cases studies- sample number, countries etc.
14.	Bioenergy Projects and Sustainable Development: Which Project Types Offer the Greatest Benefits?; Carrie Lee and Michael Lazarus, 2011	"Development Dividend"[64] (DD) framework and textual analysis of PDDs using the Atlas.ti Version 6.2 software (Atlas.ti GmbH 2010)	Set of 15 indicators covering a wide range of economic, environmental and social SD criteria	71 registered and 5 validation-stage biomass energy projects using plant-derived biomass (from a total of 291 registered biomass energy projects and 381 projects at the validation stage as of January 2010
15.	Is the Clean Development Mechanism Promoting Sustainable Development?; Yongfu Huang, Jingjing He and Finn Tarp, May 2012	Long-differencing estimator models with Human Development Index (HDI) as the dependent variable and CDM project development as independent variable	- CDM credits per capita (CER_POP) - CDM Contribution to the Economy (CER_GDP) - CDM Actual Emissions Reductions (CER_CO2) - CDM Investment Capability (INV_GDP)	All registered projects in 58 CDM host countries over 2005-2010

[64]Development dividend can be defined as "benefits to developing countries beyond those strictly related to climate change, in the areas of economic growth through investment; technological evolution; poverty alleviation; environmental and human health improvements." In other words, the development dividend consists of those benefits that might arise from CDM projects other than the reduction of GHG emissions (Source: Development Dividend, Phase II Report, IISD 2006)

Annexure IV: Criteria/keywords for assessment of technology transfer

S. No	Broad criteria	Sub-criteria	Keywords
1.	Transfer of equipment/hardware	Transfer of equipment/hardware	Hardware, equipment, import, local equipment suppliers, manufacturing facility, environmentally sound technologies, EST, material transfer agreement, new product, patent licensing, product marketing, product demonstration, regulatory approvals, intellectual property rights, IPRs, unilateral, non-unilateral, pilot project
2.	Transfer of knowledge	Capacity building	Information, knowledge, know-how, skill, capacity building, training, technical training, demonstration projects, process demonstration, intellectual property rights, IPRs, unilateral, non-unilateral, foreign direct investment, FDI, pilot project
3.	Collaborative R&D	Collaborative R&D	Technology partnership, joint research, joint R&D, innovation, indigenization of technology, manufacturing facility, partnership with local organizations, environmentally sound technologies, EST, S&T collaboration, science and technology, regulatory approvals, intellectual property rights, IPRs, joint venture, JV, unilateral, non-unilateral, foreign direct investment, FDI, pilot project
		Collaborative manufacturing of technology	Joint venture, JV, manufacturing facility, unilateral, non-unilateral, foreign direct investment, FDI, pilot project
4.	Capital investment *(this could have overlaps with the criteria of transfer of knowledge/ equipment but needs to be considered individually as well as there could be projects which do not involve transfer of knowledge/equipment)*	Capital investment	Procurement of technology, patent rights, royalty, license fee, unilateral, non-unilateral, upfront finance, upfront fund, foreign direct investment, FDI

Annexure V: Summary of methodologies employed and conclusions of reviewed studies for assessment of technology transfer

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
UNFCCC (2010) The contribution of the Clean Development Mechanism under the Kyoto Protocol to technology transfer	IPCC definition	Screening of PDDs of 4,984 projects. This was followed by a survey of projects covered by the 2008 study(3296 projects), using a questionnaire to the project developers. If the source of the TT was not recorded in the PDD, then the project developers were contacted to determine the origins of the technology.	PDDs of 4,984 projects that were in the pipeline as of 30 June 2010, of which 2,389 were registered, 170 were being considered for registration and a further 2,425 undergoing validation by third party verifiers engaged in CDM. These projects in the pipeline are associated with 81 countries and over 25 project categories. Data used for the study were a combined and reconciled set from both the UNFCCC secretariat and the UNEP Riso Centre.The claims of	30% of all projects in the pipeline accounting for 48% of the estimated emission reductions involve technology transfer. The involvement maybe as high as 44% of all projects, given that 24% of the PDDs do not specify whether technology transfer occurs and survey results suggest that 60% of these may in fact involve technology transfer. The rate of technology transfer also varies by project type, for example only 13% of hydro projects versus all N_2O projects show technology transfer. Other examples of significant numbers of projects involving technology transfer include 34% for both biomass energy and wind projects, 78% of methane avoidance projects, 39% of energy efficiency (own generation) and 82 % of landfill projects. Technology transfer is associated with larger projects of almost all project types. Although unilateral and small –scale projects are less likely to involve TT, it is more common among the larger of these projects. 27% of the unilateral projects were found to involve TT, while the equivalent rate for small scale projects was found to be 25%. The study also indicates that TT was more common in the early years of CDM than it is today. The UNFCCC studies of 2007 and 2008, showed TT to occur in 39% and 36% of projects, accounting for 64% and 59% of estimated emission reductions from the CDM. Decline in TT through CDM was more evident for the three countries having highest CDM projects –China, India and Brazil.

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
			technology transfer were verified by confirming and elaborating information with a significant sample of project participants.	For China, the results show that over 90% of projects entering the pipeline entering the pipeline in 2004 and 2005 made use of TT while the same can be said for 14% of projects in 2009 and 2010. Brazil and India showed similar declines starting from lower points. All other CDM host countries have a high rate of TT that has declined modestly over time. This result is viewed as being consistent with the increasing trend towards unilateralism (approval only by host party in the CDM). The share of such unilateral projects rose from 70% in 2004 to almost 95% in 2010. Similarly there have been fewer approvals of participation in projects now being given by developed countries, with the share of projects with developed country involvement falling from over 95% in 2004 to 60% in 2010. CDM has contributed significantly towards to TT to developing countries in particular in the early years of a host country's involvement. Over time the need for such international TT declines as local sources of knowledge and equipment become more established and awareness of technologies grows. This reflects increasing maturity in a host country's use of the CDM –the scope for further inflow of technology is reduced and the need for technology diffusion within the country becomes more prominent. However the vast number of developing countries involved in the CDM currently remain at the stage in which substantial levels of TT are being received and this can be expected to continue. There is also evidence that developing countries can greatly influence the rate at which technology is transferred.

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
				Afforestation, biomass energy, cement, fugitive gas, Hydro, PFCs and SF_6 and reforestation projects are less likely than average to involve TT, while energy efficiency (Industry), HFCs, N_2O, transportation and wind projects are more likely than average to involve TT. Some preliminary results from technology needs assessments by developing countries also suggest that revenue from CERs may help to overcome economic barriers and technology licenses and other agreements associated with projects may help overcome barriers concerning intellectual property rights. With regard to diversity of sources of TT, 58% of the transferred technology originates from Germany, USA, Japan, Denmark, and China. 84% of the transferred technology originates in developed countries. Among the developing countries the suppliers of technology are China, India, Chinese Taipei, Brazil, and Malaysia. Most developed countries tend to receive CERs from projects for which they are technology suppliers.
UNFCCC 2011	IPCC definition	PDD analysis and survey of project participants Projects were coded with regard to whether the	Analysis of PDDs of 3,276 CDM projects and programmes of activities registered and ruled as such as by 31 July 2011(3,266 projects and 10 POAs).	The rate of technology transfer has declined over the life of the CDM, with the decline being steeper than the overall average in Brazil, China and India. The rate of technology transfer for other host countries has been much higher than the overall average and has declined only slightly. Changes in mix of registered projects may affect the rate of technology transfer since each project type has a different

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
		project used imported equipment, used imported knowledge, used imported equipment and knowledge, did not involve technology transfer, did not contain statements with respect to technology transfer, and contained other statements relating to technology transfer.	Responses to ongoing survey of project participants concerning the sustainable development and technology transfer impacts of their projects and POAs; Published research on and analyses of the CDM and its impacts; the UNEP- Riso CDM Pipeline; the Institute for Global Environmental Strategies CDM Project Database.	frequency of technology transfer. Need for local technology transfer falls as local sources of knowledge and equipment become more available and expertise in the technologies grows. The vast majority of developing countries involved in the CDM currently remain at the stage at which substantial levels of TT still need to be, and are being received. Results indicate that: -the frequency of TT differs significantly by project type; -larger projects are more likely to involve TT; -small scale projects are less likely to involve TT; - the host country has a significant influence on the rate of TT; -TT falls as the number of projects of the same type in a host country increases; -TT was more common during the early years of CDM and has become less frequent since 2008.
EU China CDM Facilitation Project. Technology Transfer in CDM projects in China	Definition/interpretation of TT from an operational context and from the viewpoints of various stakeholders	Qualitative and quantitative approach based on interviews with European organizations in the Chinese CDM market,	202 PDDs were reviewed using the operational definition of TT, followed by site visits, interviews of project owners and involved stakeholders, and	The authors state that while TT is not an explicit objective of CDM, their assessment shows that CDM projects have helped the importing of technologies to China. However with the goals and expectations of China in mind, the level of TT is low and not generating the benefits hoped for. Approximately 40% of the PDDs indicate TT occurs.

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
	involved in the Chinese CDM projects/market. Chapter 34 of Agenda 21 IPCC, 2002 Operational definition has key elements: foreign origin and degree of novelty (new to market, province, or specific industrial sector), capacity building (tacit know-how to enhance the ability to manufacture, operate, maintain and master new technologies),	Interviews with 10 Regional CDM service centres, Reviews of Project design documents.	European organizations and case studies.	The field survey indicates that where TT was claimed in the PDDs closer investigation of the projects shows that in fact around 2/3 cases involved transaction of equipment at commercial prices (i.e. not subsidized) with no indication of training or transfer of knowledge. The remaining 1/3 of the cases indicated capacity building, i.e. primarily training on operation and maintenance. As a market mechanism, CDM is not explicitly driven by facilitating TT but by cost calculations and revenues from CERs. While private sector participation in GHG reduction has indeed increased, TT is still not a primary interest for the private sector. With respect to the Chinese perspective on the EU and CDM, the authors state that the EU needs to recognize that there are significant benefits for the EU for supporting TT to China, not only the business and trade opportunities but also the benefits of mitigation of climate change. There are some suggestions of how to target financial support With respect to CDM project management and monitoring, the authors suggest the need for a clearer and more operational definition of TT in the project approval process at least at the DNA level. There are also recommendations relating to the identification of priority areas in terms of degree or potential for TT; the

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
	and performance improvement (improved environmental performance either in terms of more efficient GHG reduction or the capacity to generate more CERs compared to existing technologies).			establishment of an information exchange platform between project owner and technology provider, such as regular technology exchange conference; enhance the verification along the project chain and ensure that the TT information described in the PDD is consistent, observable and measurable.
TERI 2006	IPCC definition.	PDDs were scrutinized	Project design documents of the 171projects registered as of May 1, 2006.	Of the PDDs of the 171 projects registered as of 1 May 2006, 52 PDDs revealed definite occurrence of International technology transfer largely through import of equipment;39 PDDs state explicitly that no international technology transfer was involved in the project. The remaining 80 PDDs are ambiguous about the occurrence of International Technology Transfer. They do not identify foreign equipment or expertise as being used in the project, but also do not explicitly state that all technology used is domestic. CDM can and does result in additional transfer of climate friendly technologies to developing countries. Such transfers can by no means be taken for granted. Whether they occur or not will depend upon existing conditions and capacity in the host country. The existence of domestic technologies in the host country will make ITT unattractive

Details of the study	Definition of Technology transfer if any	Methodology	Cases studies- sample number, countries etc.	Conclusions
				(perhaps due to higher costs, incl. transaction costs.) Host country policies and priorities will play an important role in determining the success of CDM in achieving ITT. If host countries wish to maximize ITT under the CDM, they must support and perhaps initiate projects in the sectors with the greatest potential for ITT. On positive side CDM has resulted in some amount of international transfer of technology. It has also provided a fillip to the adoption of climate friendly technologies in certain sectors. However some important sectors such as transport, buildings, forestry continue to be neglected. Also likely that many opportunities for international transfer of technologies remain untapped. Host nations may need to re-examine priorities and develop fresh policies that utilize the complete potential of the CDM to transfer climate friendly technologies. They also need to identify and dismantle barriers that continue to block CDM activities in specific sectors.
Dechezlepretre, A. Glachant, M. and Meniere, Y. 2008.	Technology not available in host country and needs to be imported.	Using PDDs of 644 CDM projects registered until May 2007, as the source of information on technology transfer,	Dataset includes 644 CDM projects registered upto May 1, 2007.	Data showed that international technology transfers take place in less than half of the CDM projects. Very few projects involve the transfer of equipment alone. Instead projects often include the transfer of knowledge and operating skills allowing project implementers to appropriate the technology. Technology transfers mainly concern two areas: one being the end of the pipe destruction of non-CO2, GHGs such as HFC, CH_4, and N_2O (chemicals industry, agricultural sector and waste management). Other projects such as electricity production from biomass or energy efficiency measures in the industry sector, mainly rely on local technologies. Another

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				finding was that Mexican and Chinese projects more frequently attract technology transfers while European countries were the main technology suppliers. All other things being equal transfers in large projects in terms of emission reductions are more likely. Furthermore, the probability of transfer is 50% higher when the project is developed in a subsidiary of an Annex I company. Having an official credit buyer in the project also exerts a positive influence on transfer likeliness (+16%). With respect to technological capabilities they have an ambiguous effect, on one hand high technological capabilities maybe necessary to adopt a new technology (demonstrated in energy sector and chemicals industry). On the other hand high capabilities imply that many technologies are already available locally, thereby reducing transfer likelihood (demonstrated in agricultural projects). Limitations of exercise include information on technology transfer provided by project participants in PDDs, which are not verified against independent sources of information, leading to a possible overestimation of level of transfer. Also projects are registered in a very short period of two years. This prevents using this information to characterize the dynamic aspects of diffusion. Third the data does not permit investigation of the diffusion of technology within host countries which maybe as significant as international transfers.
Dechezlepretre, A. Glachant, M. and Meniere, Y. 2008.	Technology transfer is defined as the import of a technology from	Using PDDs of 644 CDM projects registered until May 2007, as	The four countries studied included India, China, Brazil, and Mexico.	Very large differences across countries, both in extent of transfer as well as technologies transferred. In China, Mexico and Brazil the import of wind turbines is widespread however India mainly depends on local suppliers. India would seem to perform badly in this area since transfer

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	abroad.	the source of information on technology transfer, econometric analysis using a model was done.		frequency is low (23%) as compared to others (75 to 100%), however this is attributed to leading domestic producers such as Suzlon India. Transfers to Mexico (68% of CDM projects) and Brazil (40% of CDM projects) are related to strong involvement of foreign partners and good technological capabilities. Strong technological capabilities are positively correlated with international technology transfers in China. In contrast, the technological capabilities of India seem to be geared towards the replication of CDM projects involving domestic technologies only. Policy lessons include the importance of project partnerships promoting projects in subsidiaries of Annex I countries companies and involving a credit buyer in the project clearly alleviate barriers to international transfers. The study also highlights the importance of capacity building as a means to accelerate technology diffusion. Additionally, a strong technology capability facilitates the import of foreign technology but it is also a source of domestic technologies to be diffused locally.
Schneider, M., Holzer, A., and Hoffmann, V.H. 2008	IPCC definition	Analysis based on existing empirical studies and conceptual considerations. The analysis was supported by semi-	Empirical studies such as by Dechezlepretre A., (2008), Haites et. al.,(2006) and Seres, S., (2007) among others.	The CDM increases the commercial viability of low carbon technology transfer by setting a price on carbon. Therefore a high and stable carbon price would be desirable for the future if technology transfer is to be increased under the CDM or a similar mechanism. The actors created as a result of the CDM reduce the barriers of lacking information and access to capital. The UNFCCC could improve the way data are generated and presented from the excessive number of projects. A database

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		structured interviews with proponents from business, academia and policy.		could be created with more information on the technological specification and the name of the technology supplier and/technical project developer in the PDDs, as well as for information on key problems occurring during operations in the monit oring reports. This would serve as a valuable information for private actors to reduce search costs for choosing the proper technology and its provider. It could also serve as bases for better risk assessment of different technologies thereby increasing access to capital. The study also concluded that CDM does not improve the international framework of receiving countries which is considered vital to attracting international technology, hence the need for host country specific improvements in investment conditions for key technologies, without relying only on CDM. Common deal structures can increase the quality of technology transfer by involving international intermediaries can trigger, assistance in project design and long term collaborative quality management.
Seres, S., Haites, E., and Murphy, K. 2009	IPCC definition	Analysis of the technology transfer claims in the PDDs of 3296 projects in the CDM pipeline as of June 2008, of which over 1000 had been	PDDs of 3,296 projects were examined. Author states that the paper covers a much larger number of projects than any of the earlier analyses capturing changes in the mix of projects and enabling more	The frequency of technology transfer claims has remained relatively stable as a share of the number of projects but has declined as a share of the estimated annual emissions reductions. Overall the share of projects that claim technology transfer has fluctuated between 34% and 39%, but the share of the total emission reductions covered by those projects has declined from 66% to 59%. Similar pattern hold for small-scale and regular projects. The type of technology transfer- equipment and knowledge, equipment only, knowledge only – has remained relatively stable in terms of shares of projects –

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		registered.	robust statistical analyses.	about 54%, 32% and 14%, respectively. The sources of technology both knowledge and equipment have remained quite stable over time. The three largest host countries all show a significantly lower rate of technology transfer taking into account project characteristics. Where there were more projects of a given type implemented in a country, the rate of technology transfer declines. This suggests that transfer of technology for the initial projects spreads beyond the individual CDM projects, which enables later projects to rely more on local knowledge and equipment. Analysis of technology transfer claims for project type for China, India and Brazil confirms s declining trend for China and Brazil but not for India.
Das, K. 2011	IPCC definition	Analysis of PDDs of 1000 projects, chronologi-cally from the UNFCCC portal	The registration date of the 1000th project being 26 March 2008. The 1000 projects were spread across 49 host countries and 23 project categories.	The contribution of CDM to technology transfer can at best be regarded as minimal. Of the 1000 projects studied only 265 involve technology transfer. Among these 259 qualify for Type III technology transfer in which technological learning and capability building are restricted only to the level of operation and maintenance of an imported technology. Only six projects involve TT of Types I and Type II, in which the host country entity is either found to develop a technology in collaboration with some foreign entity or the host country entity is involved in in-house technological efforts towards adapting or improving upon an imported technology. Host country has some scope to influence the extent and nature of technology transfer under CDM by including technology transfer under its SD criteria, defining the criteria or indicators of TT clearly and implementing these criteria stringently. Also

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				not always clear as to what kind of weight is being actually attached to the different criteria by a DNA while taking a decision on approving a CDM project. A problem also identified in this study among others is the tendency among developing countries to compete with each other to attract the CDM projects with the aim of securing a larger share of foreign funds, often by way of lowering the standards of sustainable development benefits, thereby leading to the problem of a race to the bottom. There is a contrasting viewpoint which states that different host countries have different priorities and what may look like a 'race to the bottom' may in fact be a conscious strategy on the part of host countries, choosing to focus on the potential benefits from the CDM as a strategy for economic development. Important for developing countries to chart out its mitigation strategies in alignment with its overall development objectives and priorities and arrive at a list of priority areas needing technology transfer. In instances where TT is included under SD criteria for CDM project approval there is often no clear conceptualization of TT. Given information on TT is sketchy and inadequate in PDDs, need for more comprehensive and clear information on TT to enable decision making by DNAs. Author has also suggested the possibility of having a monitoring mechanism on the ground to verify the claims made in the PDDs. Project based TT has certain limitations as it may not be conducive to TT spillovers and cumulative technological learning, which could be addressed through programmatic CDM. The involvement of a public entity or govt. agency as

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				broker or initiator of TT may facilitate early deployment and development of a technology. The author also states that developing countries must also explore all other possible avenues for facilitating climate related TT beyond the CDM. The author also suggests that developing countries explore the possibilities of international collaboration on technology development and transfer through various multilateral, regional and bilateral fora and other initiatives. 27% of the projects have been found to comply with the operational definition of technology transfer and account for 46% of the total estimated annual emission reduction. The percentage share of projects with technology transfer is highest for agriculture and lowest for hydro. Besides hydro, the share is very low for cement, fossil fuel switch, biomass energy, energy efficiency own generation and energy efficiency supply side projects. For number of projects involving technology transfer, agriculture tops the list, with biogas coming a distant second, followed closely by wind and landfill gas. Some other findings are that likelihood of technology import maybe expected to be more likely in projects involving international CDM consultants. They may even serve as technology suppliers. Also use of foreign technology more likely in projects hosted by subsidiaries of Annex I country based transnational corporations. This involvement of a parent company may facilitate TT by managing the project registration, provision of expertise at technology level or provision of easier access to capital among other things. Likelihood of TT is also enhanced when the host country

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				participant in a CDM project is involved in a joint venture with a developed country firm.
De Coninck , H.C., Haake, F., van der Linden , N. 2007.	IPCC definition.	A survey of PDDs were used to obtain detailed description of project activity; supplemented by interviews of project developers where information was incomplete.	The evaluated projects included all registered projects by January 1st, 2006. The total number of projects is 63 projects registered in 20 different countries. PDDs were analysed and an questionnaire approach was used.	A significant share of the projects use technology from outside the host country, notably in large scale non- CO_2 and in wind energy. The technology used in the projects originates from either the EU or the host country. The value of investment in technologies originating from industrialized countries is estimated at approx. Euro 470 million of which 390 is from the European Union. In comparison to total foreign investment which amounted to approx. Eur 50 billion in 2002, the investments in CDM appear to be small.
Wang, B., 2009.	IPCC definition Also defined are the technological capacities at the basic level, intermediate and advanced or innovative level.	PDDs and their appendices were analysed. Project site visits and interviews of all actors involved in CDM projects were conducted between Dec 2008 and	HFC 23 (11), N_2O decomposition projects (42), Coal mine methane utilization projects (59), Cement Waste Heat Recovery projects (89) and wind power projects (271) in the CDM pipeline by March 1, 2009 are covered.	TT in CDM projects mainly belongs to low level of TT, in the form of importing individual foreign equipment and operating skills, it is not only costly but may also hinder Chinese local substitute technology from being developed. The highest level of TT in the form of foreign equipment and training of operational knowhow is in N_2O and HFC23 decomposition projects. The author states that since CER income is high and certain, buying foreign technology does not impose a significant financial burden on the project owners. There is also a lack of local substitute technology.

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		November 2009.		The author also refers to the fact that CDM projects in priority areas such as energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization pay a 2% fee from their CER revenues while the non-prioritized projects such as HFC destruction and N_2O abatement pay 65% and 30% respectively. This fee is innovative because it directs investment into Chinese priority areas and diminishes the comparative disadvantage of renewable energy, energy conservation and efficiency projects which are not taxed highly in comparison to N2O and HFC projects. Two key factors that affect occurrence of TT in China's CDM projects are CER income and the availability of local substitute technologies. When CER income is high and secure and when local technology availability is low, TT is very likely to occur. In the majority of CDM projects when CER income is marginal and local technology availability is high, other factors play a more important role in deciding levels and forms of TT in CDM projects. These include the time effect (whether the expectation for future CER income is strong), the technology diffusion factor (lowering the cost hurdle) government investment (either by its policy leverage or direct participation) and additional investors and brokers (such as international carbon traders and CDM project consultants who participate because of market incentives). The author refers to the incompatibility of the Chinese DNA efficient approval procedures with the much slower CDM validation and registration process creates a significant time lag between CER realization and project investor's decision to employ foreign technologies. This greatly constrains the

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				effectiveness of using CER income to offset the financial hurdle in TT. Another insight according to the author is that China's prioritized forms of TT stress the localization of the manufacturing of foreign equipment and obtaining the production license and eventually independent property rights. This orientation conflicts with the interest of foreign technology providers, who favour selling their own equipment to make maximum profits. Therefore China's strategy to localize foreign technology will eventually reduce the employment of foreign technology in CDM projects by stimulating competitive peer local technologies. Although few carbon traders and consulting companies have implemented TT in CDM projects in China, the strong economic incentive to do so and the advantage of traders and consultants in linking international technology providers and Chinese CDM projects owners, would likely make them active agents in promoting TT through CDM. In conclusion the author states that both the Chinese government's priority strategy of localizing foreign technology and market allocation forces should advance the forms of equipment and operating know-how to higher levels, given China's large potential for new technology deployment.

The Energy and Resources Institute (TERI), New Delhi, India, is an autonomous, not-for-profit, research institute established in 1974. Its research activities are in the field of climate change, policy, energy, environment, water, biotechnology, forestry, and the whole range of sustainable development issues. It has more than 26 years of experience of working on these issues and its research activities are largely supported by grants from ministries and departments of the Government of India, the industrial sector and international organizations such as USAID, Swiss Development Co-operation, the European Community, the World Bank, the DFID, the ADB, the Ford Foundation, the MacArthur Foundation and various UN agencies.

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