KYOTO PROTOCOL, CLEAN DEVELOPMENT MECHANISM (CDM) AND PAKISTAN: AN OVERVIEW OF THE CDM PROJECTS IN PAKISTAN

By

Abid Ali

Thesis submitted to the Lahore School of Economics
in partial fulfillment of the requirements for the degree of
M. Phil Environmental
Science
[2010-12]

[30,704 words]

Supervised by: Dr. Tariq Abdullah

Abstract

As the first commitment period of Kyoto Protocol ends in 2012, the scientists and policy makers look forward to make concrete policies to address the climate crisis. The present market based solutions to mitigate the climate change have faced a lot of criticism. The Clean Development Mechanism (CDM) was intended to be a practical implementation of the "common but differentiated responsibility" principle of the Kyoto Protocol. Attempts to address the climate crisis in the Global South have principally adopted CDM. However the underlying approach of Carbon Trading as an "efficient" method of achieving climate mitigation has faced a considerable barrage of criticism in global activist organizations and in the research literature concerning climate change. This study argues that clean development is a suitable objective for government policy but the tool of the Clean Development Mechanism has little to offer in this regard and is in fact more likely an obstacle to any genuine commitment to clean development. The CDM profile of the country has been made to highlight the discourses of CDM. Different distributions of the CDM illustrate not only the skewed character of CDM but also highlight the absence of CDM from the most polluting sectors of the Pakistan's economy. This research explores the controversial aspects of CDM including issues of perverse incentives, additionality and baseline manipulation. It explores the relevancy of such critique in case of CDM projects in Pakistan and questions whether CDM is a break from business as usual in the context of Pakistan. It highlights the skewed nature of the CDM globally and locally and questions the integrity of CDM in country in making progress towards clean development in Pakistan. The CDM is more likely to feed the needs of the North to meet their emission reduction targets and its role in contributing to sustainable development in the South remains highly questionable.

Keywords: Climate change, Kyoto Protocol, Clean Development Mechanism, Pakistan.

Dedication

This thesis is dedicated to my parents

For their endless, unconditional love and support

Acknowledgements

The writing of this dissertation has been one of the most substantial academic challenges I have ever had to face. I am especially grateful to my supervisor; Dr. Tariq Abdullah for his time, encouragement, comments and continual support during my research work. His expertise, understanding, and patience added considerably to my graduate experience. I own particular gratitude to Isbah for her moral support, insightful information and helpful comments.

My research could not have been completed without the love and moral support of my friends especially Ajmal, Ahsan, Farrukh, Fatima, Maryam, and Kazim. I would like to thank my class fellows Sara, Sidra and Mr. Nasir for their kindness, friendship and support. I would like to pay my deepest gratitude to all my teachers; Mr. Paracha in particular who offered his unlimited support in my research. Furthermore I would also like to acknowledge with much appreciation the support from the staff of the Centre for Policy and Environment.

It would be unfair if I do not acknowledge the role of libraries and their staff especially Ms. Andleeb who provided me with technical as well as academic help. Saeed's technical help has always been exceptional. Many thanks to all the interviewees who gave considerable amount of their time. Finally I would like to thank my parents, siblings; Ghazanfar, Shumaila, Sajid and my uncle Basharat Ali for their unconditional love and everlasting support. They always supported and encouraged me with their best wishes.

Table of Contents

Kyoto Protocol, Clean Development Mechanism (CDM) and Pakistan: An overview of the CDM Projects in Pakistan

Contents

Page Number

List of Tables

Page Number

List of Figures

List of Charts

List of symbols

AAUs	Assigned Amount Units
AJ&K	Azad Jammu and Kashmir
BAU	Business as usual
CCGT	Combined Cycle Gas Turbine
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism
CDR	Common but Differentiated Responsibilities
CERs	Certified Emission Reductions in units of tons of CO_2 equivalents
CH_4	Methane
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of Parties
DNA	Designated National Authority
DOEs	Designated Operational Entities
EIA	Environmental Impact Assessment
EB	Executive Board
EE	Energy Efficiency
EES	Energy efficient stoves
FAR	Fourth Assessment Report
FAQ	Frequently Asked Questions
GHGs	Greenhouse Gas (es)
GWh	Giga Watt hour
GWP	Global warming potential
HFO	Heavy Furnace oil
IEE	Initial Environmental Examination

IPCC	Intergovernmental Panel on Climate Change
kCERs	Thousand Certified Emission Reductions
kWh	kilo Watt hour
LNG	Liquefied Natural gas
MW	Mega Watt
MoU	Memorandum of understanding
OGDCL	Oil and Gas Development Company Limited
PCF	Prior Consideration Form
PDDs	Project Design Document(s)
ppm	Parts per million
PSDP	Public Sector Development Programme
RDF	Refused Derived Fuel
TDF	Tire Derived Fuel
TPH	Tonne per hour
UASB	Up flow sludge blanket
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WAPDA	Water and Power Development Authority

1. Introduction

1.1) Introduction to the topic

1.1.1) Background

Climate change has been happening in the history of the planet but the change in climate that we see now is human made unlike the climatic changes in the past. The discovery of human influences on climate and role of Greenhouse gases (GHGs) in increasing the temperature of the earth has attracted the World wide attention to the issue of climate change. There is a strong consensus on the fact that Industrial revolution has brought a radical change in the relationship between human society and the environment. The impacts of industrialization and massive use of fossil fuels have been felt globally in the form of glacial retreat, severe weather conditions, rising sea levels etc. The irony of the issue is that the poorer nations who have not contributed historically to climate instability face the most dangers due to climate change and also lack the facilities and capital to mitigate the impacts of climate change. Ecological movements and research writings highlighted a lot of environmental issues that have emerged since the beginning of industrialization. The development path that the North took to industrialize was the dirtier path and has created devastating conditions on the Earth. When unintended consequences of this development of the North were felt, the need to mitigate the impacts of climate change were felt and a process of negotiations started to come up with an economically feasible and ecologically sustainable solution to the problem.

1.1.2) Climate Change and International efforts towards mitigating the climate change

In the 1960s and 70s, the scientists had started realizing the severity of the issue of climate instability. There was an emergency environmental movement as well and a lot of influential literature like Rachael Carson's "Silent Spring" came out that helped create an environmental awareness. Also this era had seen a series of disastrous environmental impacts that highlighted the strong dependence of food production on the world's climatic system. The first international effort towards understanding the issue was the establishment of UNEP (United Nations Environment Program). It was the result of a U.N convened conference on Environment that was held in Stockholm in 1972. UN World Food Conference in Rome (1974), the UN World Water Conference in Mar Del Plata, Argentina (1976) and the UN Conference on Desertification (1977) recognized climate impacts as a key concern. As a result of these efforts, the First Climate Conference was held in Geneva in 1979. In this conference an attempt was made to assess the state of knowledge of climate change and understand the impacts of changing climate on human society. The outcomes of this conference were the World Climate Programme and world Climate Research Programme. These Programmes then engaged doing research and formulating policies on climate change. Two other major World Climate Conferences have been held in Geneva in year 1990 and 2009. These conferences assessed and analyzed the work of climate scientists and recommended measures to combat challenges of food security and production and climatic changes. In 1985, the International Conference on Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in

Climate Variations and Associated Impacts was held in Villach, Austria. Policy towards mitigating human-induced climate change were discussed here. A 1988 World Conference on the Changing Atmosphere held in Toronto concluded that humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war so we must stop before it is too late. The conference recommended a 20 per cent reduction of carbon dioxide emissions by 2005. The depletion of Ozone layer came out to be an alarming issue and policies towards addressing it were discussed and elaborated in Montreal Protocol in 1987. A major breakthrough in understanding the issue of climate change in 1980s was the formation of IPCC (Intergovernmental Panel on Climate Change) by the joint efforts of United Nations Environment Programme (UNEP) and World Meteorological Organization (WMO). It was formed in 1988 and aim was to carry out an extensive scientific research on the issue of climate change and its impacts on societies and economies. The IPCC since its formation, has published four extensive assessment reports on climate change, its impacts and ways of adapting to climate change. In the late 80s, the terms like sustainable development were coined in an effort to save Earth and its resources for the future generations. In 1980s, as the media became more active in reporting the environmental and associated issues and their impacts, the World became aware of the Bhopal tragedy, discovery of Ozone Hole, Chernobyl nuclear accident, severe floods in Bangladesh and oil spills like Exxon Valdez. The appearance of these events called for a major breakthrough effort to mitigate climate change in the light of the rapid changes in environment, Rio Environmental Summit was called in 1992. This was the first ever

"World Summit" on Environment and Development. The representation of 178 nations was a great step towards addressing the climate issue. In the summit, 154 Nations signed the UNFCCC (United Nations Framework Convention on Climate Change) and agreed on stabilizing the greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climatic system. The parties to the Convention have been meeting in COP (Conference of Parties) every year since 1995 to help formulate policies on climate change. In the 3rd COP, Kyoto Protocol was agreed that is the only environmental treaty till date. It binds industrialized countries (Annex-1 countries) to reduce greenhouse gas emissions by an average of 5.2 per cent below 1990 levels for the period of 2008-2012 (the first commitment period of Kyoto Protocol). It was supposed to be the most serious measure against the climate change but as we stand in the year 2013, we see that a lot of emission reduction targets that were placed on the industrialized nations have not been met. The 20 year follow up of the Earth Summit held in Rio de Janerio in 2012 but that too was unable to address the issues like the crossing of planetary boundaries and the environmental problems of nuclear energy. The lack of commitment of U.S who is the biggest polluter historically and backing off of other Nations like Canada have posed serious threats to the future of climate negotiations to come to a concrete and genuine solution to climate change.

1.1.3) Kyoto Protocol and Clean Development Mechanism (CDM)

The Kyoto Protocol was agreed upon initially on 11th December, 1997 and then came into force on February 16th 2005. The purpose of this international treaty is

to bring about reductions in the net emissions of greenhouse gases and thereby achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Kyoto protocol in 1997 focused on the responsibilities of the global North to bring about reduction in their emissions of GHGs. It devised a mechanism of doing this by putting emission caps on the industries in the North. The over compliance of carbon emissions after meeting the emission caps produce carbon credits that can be traded and sold. Whoever buys this carbon credit gets the permit to produce one ton of the carbon in excess of their cap. So cap and trade system allows companies with high greenhouse gas emissions to buy an emission allowance from companies which have fewer emissions. This mechanism was the main focus of the UNFCCC treaty in Kyoto. Besides others, one of the proposed solutions to combat climate change was the idea of carbon offsets. The path of development that industrialized nations took was the "dirty path" and is the main cause of global warming. The atmosphere was used as a dump for products of fossil fuel consumption by the industrialized countries. Now global South in the process of development is likely to follow the same footsteps of the global North's development. As these practices have threatened the climate sustainability, it is believed that to avoid worsening the climate change problem, the dirty path of development of the north should not be replicated in the developing world. This resulted in the idea of clean development, i.e., the development that could be achieved without disturbing the climate's sustainability and that would lessen the use of fossil fuels in production, transportation and consumption. Climate change mitigation is not just about North reducing its emission

levels but also deals with the transfer of cleaner technologies to the South. The North claims to have excelled in the field of science and technology and has better and cleaner technologies than South. One of the aims of the treaty is to provide incentives to the North to transfer cleaner technology to the countries in the South. These cleaner technologies would hence contribute to clean development and earn carbon credits that North can use to meet their emission reduction levels (caps). As the developed world historically has contributed most to the global warming, they have to bear the main burden. Kyoto Protocol acknowledges the fact of skewed usage of atmosphere as a dump for products of fossil fuels consumption by the North and hence came up with the idea of "Common but Differentiated Responsibilities" which recognizes historical differences in the contributions of developed and developing States to global environmental problems, and also takes into account the differences in their respective economic and technical capacity to tackle these problems. This is the fact that Kyoto has put the legal binding limits on the GHG emissions of the Annex-1 countries and Non-Annex-1 countries do not face any such obligations.

Since the entire development and economic models of the North are based on the consumption of fossil fuels so these legal binding at Annex-1 countries require a great change in the production and industrial processes of the industries in the North. U.S insistence and persistence on this "made" Kyoto Protocol realize this and hence a few flexibility mechanisms were introduced in the Protocol to help the Annex-1 countries meet their emission reduction commitments in a less painful manner. This has created an International emission trading regime that involves buying and selling of the emission permits in the carbon markets. By introducing these flexibility

mechanism, Kyoto Protocol has successfully commodified the GHGs. The flexibility mechanisms provided in the Protocol are Cap and Trade, Joint Implementation and Clean Development Mechanism (CDM). The first two mechanisms involve the Annex-1 countries making the exchanges of emission permits amongst themselves whereas CDM is the only mechanism that involves the developing or Non Annex-1 countries. As the Protocol gives the flexibility to North to reduce their emissions "wherever it is cheaper to reduce" so CDM is very attractive for the North as they do not have to bear less costs in this regard. The low environmental standards and loopholes in environmental legislations makes it easier for North to reduce their emissions in the South rather than doing so domestically.

The world has recognized climate change to be a serious problem and the effects of climate change are visible on different regions of the planet. It has been characterized in the IPCC fourth assessment report;

> "Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases." (Intergovernmental Panel on Climate Change, 2007)

Most of the scientists who contributed in making the IPCC FAR (Fourth Assessment Report) agree that the increase in temperature is because of the human contribution to Greenhouse Gas Effect. Most of the anthropogenic Greenhouse gases come from the burning of the fossil fuels. The fossil fuels are and have been the backbone of the industrial revolution. Millions of tons of GHGs have been emitted by the burning of these fuels since the industrial revolution. Many environmental issues

are unintended consequences of this massive industrialization. Many environmental activists like Rachael Carson tried to understand these unintended consequences and played a great role in creating awareness about these issues. Historically, the atmosphere was used as a dump for the waste of products of fossil fuel consumption by the industrialized countries. Capitalist accumulation of the North is the result of fossil fuels based industrialization. This mode of capitalism has been named "Fossil fuel capitalism" by Huber (2009). The industrialized countries owe a climate debt to South that has arisen due to the continual dumping of the carbon emissions in the atmosphere by the industrialized countries over a period of more than two centuries. The cost of this is now being felt globally in the form of climate crisis. The climate debt is meant to be addressed by technology transfer and financial assistance which are presented as major parts of the CDM projects.

The path of development that industrialized nations took was the "dirty path" and has resulted in massive emissions of GHGs in the atmosphere. It has destabilized the Earth's climate system. This instability of Earth's climate has been elaborated by (Rockstrom et al., 2009) who identifies a set of nine thresholds that if crossed may lead the planet to a catastrophe. Three of these thresholds are already crossed and climate change is one of these thresholds. Others are rate of biodiversity loss and human interference with the nitrogen cycle. The nations who adopted this path historically are the main contributors to global warming. The industrialized countries primarily responsible for the climate crisis are rich countries and they expect to adapt to climate change by wealth and advanced science. Though science has provided North with the short term and end of pipe solutions to adapt to climate changes but

these short term adaptive measures cannot provide a reliable safeguard to North as well. But the crux of the issue is that the bulk of the damages due to climate change will be faced by poorer nations in the World who are not even responsible for the climate crisis. The impacts of climate change have already started to appear in the Global South. Economic development and industrialization based on fossil fuel consumption may not be equally distributed but impacts on climate due to such industrialization and dirty development are distributional in character (Mendelsohn et al., 2006). Since humanity has realized the severity of the issue, there has been more of talks and negotiations on the issue and less of the practical steps to mitigate the climate change. As a result of the negotiating process, Kyoto Protocol came out to be the only practical step towards addressing the issue of climate stability. But if the Protocol is a first good step, an inadequate measure to mitigate climate change or a business enhancing strategy for the North have been the points of controversy since the rise of Kyoto Protocol. It is true that the international climate mitigation efforts have been politicized from the beginning as demonstrated with the induction of the flexibility mechanisms in the Kyoto Protocol and emergence of Clean Development Mechanism in place of the Climate Adaptation Fund for climate vulnerable countries. The Kyoto surprise', the Clean Development Mechanism came out to be result of the wee hours negotiations of the Kyoto Protocol on the last negotiation day. It was based on the proposal of a 'Clean Development Fund' put forward by Brazil. The Clean Development Fund (CDF) proposed that if Annex-1 countries failed to meet their legal bindings they should be penalized through a requirement to contribute to the CDF. CDF was changed to CDM due to the U.S involvement at the last hours of the

Kyoto negotiations. Now as a result in spite of South receiving funds from the North, South generates carbon credits for them and industries in the South have become auxiliary markets for them. Although the industrialized countries allocate massive funds and grants to mitigate the climate change but doubts and uncertainties to their commitments emerge as U.S being the biggest polluter did not ratify the only International climate treaty, the Kyoto Protocol. Kyoto Protocol acknowledges the fact of skewed usage of atmosphere as a dump for GHGs and has adopted an approach of Common but Differentiated responsibilities to mitigate the carbon emissions. The Protocol was agreed in the 3rd COP (Conference of parties to UNFCCC) [1]. It puts the legal bindings on the industrialized countries or Annex-I countries (as the UNFCCC categorizes them)[2] to reduce their overall emissions of GHGs by average on 5.2% from the levels of 1990 during the first commitment period of Kyoto Protocol i.e., 2008-12 (Fenhann, J., 2004). Kyoto Protocol has three flexibility mechanisms for the industrialized countries to meet these legal bindings. These mechanisms are Emission Trading, Joint implementation and Clean Development Mechanism. Clean Development Mechanism (CDM) is the only mechanism of the Kyoto Protocol that involves the developing world under the framework of GHG emission reductions. Under the CDM, a country with legal bindings of emission reductions can implement an emission reduction project in the Non Annex-I countries to meet their legal emission reduction targets. This is intended to help the Non Annex-I countries to achieve sustainable development and gain

[1] Parties to the UNFCCC, i.e., The countries that have signed the Convention on climate change
[2] UNFCCC categorizes industrialized and developing countries as Annex-I and Annex-II respectively under Article 4, paragraph 2(g) of the convention (United Nations Framework Convention on Climate Change, 2002)

economic benefits in the form of CERs (Certified Emission Reductions[3]) which are sold or purchased in the carbon markets worldwide as tradable permits to pollute (McGee and Block, 1994). CDM does not only provide North the facility of cheap way to meet their legal bindings but also claims to help the Non Annex-I countries to achieve sustainable development. Pakistan being a Non Annex-I country and a signatory to the Kyoto Protocol can also avail benefits from the CDM projects. By 1st April 2012, 49 projects from Pakistan are in the pipeline and 13 of these projects have been registered with the UNFCCC Executive Board (UNEP Risoe Centre Statistics, April 2012). Much literature has been produced about the CDM. It can be characterized into three types; one type of literature on CDM supports the already existing framework of the CDM and believe it to be an efficient market tool to mitigate climate change. The "optimists" believe that CDM does not only help mitigate climate change but can also help South to adopt a sustainable path of development; the second type of literature highlights a few bottlenecks in CDM and propose changes to already existing framework of the Kyoto Protocol. The "fixers" believe a few changes need to be made for better and efficient implementation of CDM. This type of literature focuses on maximizing the sustainable development benefits of CDM. The third type of literature is critical about the CDM. The "skeptics" of CDM not only criticize the market based approach to mitigate climate change but also reject the framework of Kyoto Protocol altogether (Paulsson, 2009). Skeptics have raised a few issues with the structure and functioning of CDM. They believe that Kyoto Protocol gives rights to rich industrialized nations to pollute more

[3]CERs are carbon credits that are the units issued for emission reductions from CDM project activities and are equal to one tonne of CO_2 equivalent (CDM Glossary UNFCCC website)

and is not a step in the direction of climate stability. They argue that the addiction to fossil fuel consumption of the North cannot be overcome by such marginal changes. In the light of this extensive literature produced, the case of CDM projects in Pakistan has been explored in the thesis.

1.1.4) Controversies over the structure and functioning of CDM

In order to understand the issue of climate change and emergence of climate mitigation mechanisms such as the CDM, it is important to have an idea of the controversies about the functioning of CDM on a broader scale. The structure of CDM has also been criticized as the skeptics believe that the current mode and form of CDM cannot deliver and cannot provide real measurable additional GHG reductions and the demand of the Voluntary Carbon Market (VCM) located in the North. The functioning of CDM is entirely dependent on the functioning of the Cap and Trade. Thus some needs of emission reductions of North are satisfied by the South through CDM making South a service-sector of the North and is a new form of colonialism (Bachram, 2004). It is the basic functional contradiction attached to the CDM. On other hand, CDM claims to stabilize the GHG emissions globally and help South in sustainable development which is a point of debate as well. The skeptics say that CDM is like a failed emission balancing effort that does not provide for any additional reductions. The controversies would be discussed in the next few chapters in detail.

1.1.5) CDM Project Cycle

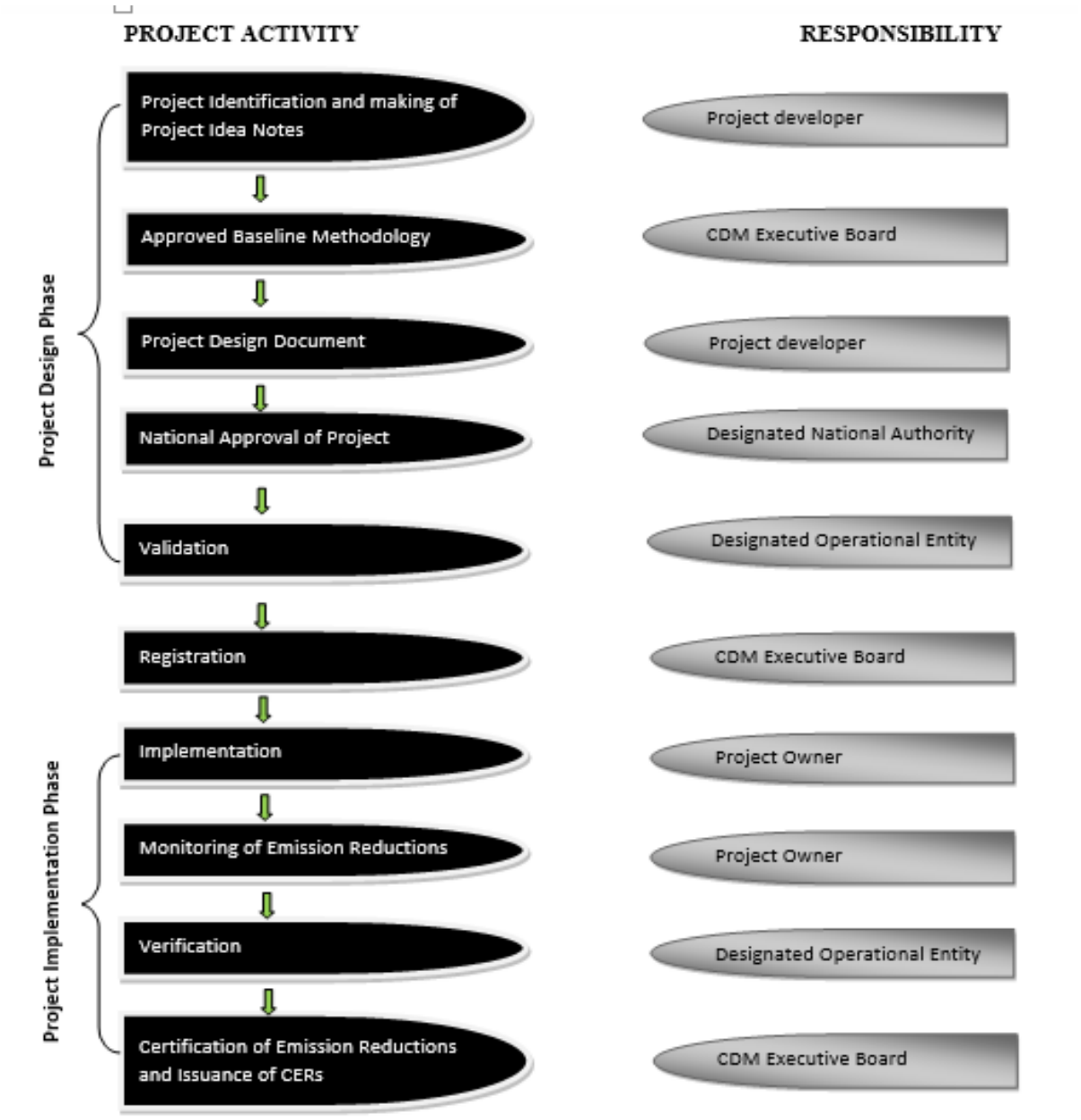

Chart-1: CDM Project Cycle

Chart-1 : CDM Project Cycle: The chart shows the different stages of the CDM Project cycle against the authorities responsible for the specific part of the CDM project

The character of CDM is unique in nature. On one hand a simple looking project cycle seems to guarantee the transparency of the project while on the other hand there are a number of transaction costs involved at the various stages of the project cycle of

CDM. There are a number of processes and parties involved in carrying out a CDM Project. It starts from Project idea. Then the project developer pursues the idea into writing or designing the activity. A Prior Consideration form (PCF) has to be submitted to UNFCCC within 180 days of the project activity start. It is to notify the start of the project activity to UNFCCC secretariat and DNA. It is submitted to the UNFCCC to show the intentions to seek the CDM status. The PCFs are maintained on record and are available at the UNFCCC website. A brief description of each step of the CDM Project Cycle as drawn above is given as under;

1) Project Idea Notes

The CDM process starts with the PINs (Project Idea Notes) that are the concept notes of the Project that include the information about the location, size, expected amount of CERs, project lifetime and associated environmental and social benefits or effects. After the project developer, a consultant or any investor identifies a probable CDM project by looking at the CDM eligibility criteria of UNFCCC, it makes the PINs that are not the requirement of the UNFCCC but they are made so as to hunt for the potential buyers of the CDM credits. The PINs are a way of getting the feedback from the carbon market and it is helpful to the project developer.

2) Approved Baseline Methodology

There are two scenarios presented in a CDM project. One of them is the project scenario and other is the most plausible alternative scenario to the implementation of the project activity (the baseline scenario). The difference of the two provides the emissions reductions that a project estimates to achieve. Any

CDM project should provide real and measurable long term benefits for the mitigation of the climate change. For this purpose the projects provide a baseline to which the emission reductions are additional which is said to be additionality. Each CDM project is required to select from the approved baseline methodologies provided by the CDM Executive Board. Baseline methodology can also be created by the project proponent but that has to be approved by the CDM Executive Board.

3) Project Design Document

After the project proponent has selected the approved emission baseline methodology, it makes a Project Design Document (PDD). PDDs are the key documents involved in the approval and registration of the project. Unlike the PINs, PDDs (Project design Documents) are the necessity of the UNFCCC that any project proponent should make. The PDDs contain the project description and information such as the estimated amount of emission reduction over specific period of time, life of the project, monitoring plan, additionality of the proposed project, purpose of the project, list of participants, an assessment of the environmental impacts due to the proposed project activity and stakeholders' comments.

4) National approval of the Project

The PDDs when made are submitted to the Designated National Authority (DNA). DNA is the entity in a country that approves and authorizes the participation in the CDM. The DNA overlooks the project to verify if it will contribute to the sustainable development in the country and then approves the

project and issues a LoA (Letter of Approval), a pre-requisite for the registration of the project. For the country approval, mostly an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) is also submitted that highlights if the project activity is going to have any significant environmental impacts. After approval of the project design document by the DNA, now the project is ready to be submitted to the DOE (Designated Operational Entity) for validation.

5) Validation

Validation is the process that determines that if the project activity is eligible to get registered under CDM or not under the rules of CDM. DOEs are the independent (domestic or international) auditors that are accredited by the UNFCCC EB (Executive Board). DOEs are responsible for the validation of the project. After the project developer has made the PDD, it invites the DOEs to validate the project. The costs of hiring are borne by the project developer. PDDs along with the letter of National approval of the project and all other relevant documents are submitted to the DOEs for their review and approval. Validation process also involves the stakeholders' participation by making the PDDs available to the public for comments during a certain period of time (30 days). It is the duty of the DOE to invite and incorporate the stakeholder comments and then include the comments in validation report. It might be a longer process as the incorporation of comment and recommended corrective actions by the DOE may take time to implement. The DOE submits the validation report and host country approval to the UNFCCC EB (Executive Board) for registration.

6) Registration

The request for registration is made by the DOE on the project developer's behalf. The UNFCCC EB on receiving the validation report and national approval of the project registers the project eight weeks after the mentioned documents have been received. But if a review of the validation is done by the EB, the eight weeks span may go longer. Certified Emission Reductions may start prior to the registration under the Marrakesh accords but CERs would only be issued once the project has been registered.

7) Implementation

The project can start making CERs at the point of validation before the project gets registered with the EB. Many projects may already be implemented before registration. From the time of implementation of the project before or after the registration, the project should be monitored for the emission reductions. Project owner is responsible for the implementation process.

8) Monitoring of emission reductions

CERs (Certified Emission Reductions) start generating from the implementation of the project so regular monitoring should be done that how efficiently is the project following the PDD procedures. Monitoring follows the plan as given in the PDDs. GHG emission reductions are calculated on the basis of these monitoring reports. The monitoring reports have to be submitted to the DOEs for verification and certification. These monitoring are done by the project owner themselves.

9) Verifications

This part of the cycle is carried out by the DOEs that are contracted by the project developer. This monitoring DOE should be different from the validation DOE that did the validation of the project. Verification process verifies the amount of CERs being generated from the project during a specific period. Monitoring reports are made public by the contracted DOE and also sent to the EB. This step leads to the last step of the CDM project cycle i.e., issuance of CERs.

10) Certification of emission reductions and issuance of CERs

If the project has actually generated the emission reductions during a specific period of time, it is certified by the DOE with a certification report and a request from the DOE to issue CERs to the project developer. These CERs are issued by the EB. The CDM registry administrator working under the authority of the EB transfers the CERs to the appropriate accounts that include if any costs of the processing of the project, administrative expenses of the EB and remaining CERs are transferred to the accounts of the project developer. Under the UNFCCC regulation, 2% share of the CERs transferred to project developer go to the climate adaptation fund for every project (http://cdm.unfccc.int/).

1.2) Introduction to thesis

Much literature on Clean Development Mechanism (CDM) has been produced since the emergence of CDM out of Kyoto Protocol. It is supposed to be a tool to mitigate climate change. CDM has dual objectives; to help the developed countries to meet their binding targets to reduce the Greenhouse gas (GHG) emissions and to help

the developing world to develop in a sustainable manner. The functioning and structure of CDM, its capacity to address the climate change problem has been discussed by many authors and there is an extensive amount of literature present on CDM. The three types of literature have been discussed in the previous section. (Streck, C., 2004, Karp, L., & Liu, X., 2000, Nygard, J., 2006, Huang, Y., & Barker, T., 2012 etc.) support CDM and believe that market based mechanisms could be a feasible solution to climate crisis, (Drew, J. M., & Drew, M. E., 2010, Sutter, C., & Parreano, J., 2007, Bumpus, A. G., 2011 etc.) show some concerns over the present framework and structure of CDM. This type of literature not only supports the market based mechanisms to counter climate change but also suggests some improvements for the better structure and functioning of CDM. (Barbara, H., 2009, Docena, H., 2010, Lohmann, L., 2006 etc.) are a few examples from the literature that reject the method of market based mechanisms to combat the climate change issue. The authors who have produced such literature believe that mitigating the climate change needs a long term approach while these market based mechanism like carbon trading and cap and trade only provide short term incentives and subsidizes the big polluters. There is a lot of criticism present in the literature that prompts us to revisit the idea of inviting CDM to Pakistan. In the thesis it has been tried to point out the ways and issues that make the CDM controversial in accomplishment of its official goals i.e., mitigating climate change and bringing sustainable development in South.

1.3) Motivation for research

Since the severity of climate crisis has been realized, it is believed that the development path that North had taken was a dirty path of development and it should

not be and cannot be replicated in the South without severe implications for the global climate. It is thus recommended that development now should be through a cleaner path. CDM is also presented as a tool to get on the cleaner path of development. Skeptics of CDM have highlighted a lot of loopholes in the CDM that make its integrity questionable. There are two objectives of the CDM; help Annex-1 countries to meet their legal bindings and bring sustainable development in the South. In many research writings and reports, it has been pointed out that it does not meet these goals.

CDM should help Non Annex-1 countries to get on the cleaner path of development but perhaps the unwritten story is different. In reality, CDM is just helping North to meet its legal bindings set by the Kyoto Protocol and the second goal of CDM is hardly given any importance. Kyoto Protocol has made the Non Annex-1 countries the service sector of the North. North enjoys the facility of meeting the emission reduction targets not by reducing their emissions but by providing South with financial incentives to reduce their emissions. CDM is a zero sum game and does not bring any decrease in overall global emissions of the globe. If the CDM works well, the emissions that take place in the North are offset by the emissions reductions in the South so there is no reduction in net emissions. The question arises that if Pakistan through its participation in CDM would just contribute to the extension of the "service sector" for the North to reduce emissions or can Pakistan through CDM enter a low carbon development pathway and make a genuine contribution to global emission reductions? This question has been discussed in detail in thesis.

Larry Lohmann argues,

"the CDM is creating incentives for emissions-related environmental laws not to be enforced, since the greater the 'baseline' emissions, the greater the payoffs that can be derived from CDM projects" (Lohmann, L., 2006)

These sort of issues have been inherent with the structure of CDM. For industries in the South, CDM is an attractive capital generating opportunity. It might be interesting to note that the worst and biggest polluter gets the maximum benefits out of CDM. The dirty industries are an attraction for North as well as they can get more emission permits by investing in such a project. In such a scenario, there are chances that the "influential" in the South might compromise on the implementation of environmental legislations to attract more CDM investment (Wara, M., and Victor, D., 2008). Weakening of environmental legislations might generate more profits for the industries in the South. This has been described in literature as a race to the bottom. In this research we have tried to explore if Pakistan also engages in such a race i.e., if there are any CDM projects in Pakistan that have a conflict with the environmental legislation approach to mitigation.

Kevin Smith in his China Dialogue,

"Despite the regulatory framework that surrounds the CDM, there is both the incentive and the opportunity for project developers to distort key information, so as to make a project appear more effective and generate more credits – or gloss over any local resistance to the project." (Smith, K., 2007)

There are many controversies associated with the structure and functioning of the CDM projects in the developing world. Skeptics have characterized CDM as Costly, Dirty and Money making schemes that have nothing to do with the climate

change mitigation and sustainable development. The complexity of CDM's structure and its bias towards big polluters has been criticized. There are many contradictions present in the carbon market itself of which CDM is a big part. In any market where commodities are exchanged for capital, buyer is very much concerned about the quality of the commodity and so is the seller. But in the carbon market, "How good is the commodity?" is a question that has no importance. Buyer and seller are not concerned about the quality at all. They require only the stamp of approval by some authority. This shows the built in contradiction present within the structure of carbon market. The need for the introduction of Gold standard CDM validate this which means that the quality of commodity was not good before which means that other CDM projects did not generate sustainable development and had inadequate sustainable development aspects (Bumpus, A. G., & Liverman, D. M., 2008). Gold standard CDM or other emission reduction projects are high quality projects that are intended to maintain a high standard in both the goals of the CDM i.e., providing for real and verifiable emission reductions as well as contributing to the sustainable development.

The CDM projects should be additional by definition i.e., they should not be "business as usual" and should provide additional emission reductions that would not have occurred without the CDM project. The wikileaks documents[4] about the CDM and its additionality in India were leaked in the year 2010. They reveal the fact that many of the projects in India are not additional. The additionality of the projects has been questioned in many other projects worldwide as well.

[4] http://wikileaks.org/cable/2008/07/08MUMBAI340.html# (accessed 22nd August, 2012) is the wikileaks document that was leaked in 2011.

There are two scenarios that are compared in a CDM project; project scenario and a counterfactual. The difference among two generates the CERs. Greater the difference, more the profits. The research reveals that the baseline scenario (counterfactual) of the CDM projects is manipulated in many cases to extract more Certified Emission Reductions (CERs). The emission reduction project under the CDM must not result in increased emissions as a result of the project activity outside the project boundary. If these emissions arise as a result of the project activity outside the project boundary, these emissions then have to be deducted from the share of CERs. This issue of leakages is important in the CDM. It has been highlighted in the literature as well. Callon (1998) has described this as a framing process inevitably leading to overflows. The reduction in emissions at one place may somehow or other lead to increase in emission at other place because the global ecosystem is a network of interacting processes. There have to certain overflows. If the emissions in the North are capped, it might lead to leakages in the South as a result of the shift of production from North to South. The case of Nitric Acid plants in South Korea is an example (Schneider, L., Lazarus, M., Kollmuss, A., 2010). On a smaller scale, leakages may also mean overflows of the gases from a CDM project boundary. For example, the use of rice husk for energy displaces its use as organic fertilizer, resulting in more chemical fertilizer that results in more energy use. The reductions in one type of emissions at one place may lead to increase in other types of emissions at other places outside the project boundary. In the thesis, the case of leakages in CDM projects of Pakistan has also been tried to explore in the light of already existing

literature. These major issues along with other minor issues and their relevance to CDM has been explored in this research work.

1.4) Research questions

I) How are the CDM Projects distributed globally?

Significance: CDM serves the compliance market which is based in those countries in the North who have acceded to the Kyoto Protocol. These countries who have accepted mandatory emission reduction targets and are using the Cap and Trade mechanism to determine the demand for CERs which are generated by the CDM in the global South. The demand for the carbon offsets is based in the Global North and the skewed distribution of the CDM projects reflects the nature of CDM as providing carbon offsets for demand in the North rather than helping the South move in direction of clean development.

Methodology: The global CDM data has been accessed from the UNFCCC (http://unfccc.int) and the UNEP Risoe Centre (http://www.cdmpipeline.org/) websites. These websites provide data on many aspects of the CDM project cycle worldwide as well as country specific data. It also makes available the individual Project Design Documents (PDDs) for all registered or under validation projects CDM projects. Project Design Document is the basic document required to get the CDM project registered. It documents in detail the project boundary,

project baseline scenario, additionality, quantified emission reductions from the CDM project, stakeholder comments and monitoring plan. It contains a lot of information about the CDM project.

Answer: The Clean Development Mechanism does not help South move in the direction of low carbon development which is part of the common responsibility and it has replaced the legitimate demand of the South for climate reparations based on the historical use of the atmosphere as a dump for carbon dioxide by the North by the need to earn CERs and create carbon offset projects to help the North meet its emission reduction targets. The CDM projects globally are distributed in a skewed manner where three Big players of the CDM; China, India and Brazil having more than 74% of the annual estimated CERs.

II) How are Certified Emission Reductions (CERs) produced by the CDM projects in Pakistan distributed among the various CDM projects within Pakistan?

Significance: The CDM is biased in the favor of large carbon offset projects and rather than helping low carbon projects to grow in number and help displace the large carbon emission projects it helps to sustain the large projects by providing them additional financial flows in the form of CERs which can be sold in the emerging carbon markets.

Methodology: The country related data on CDM has been accessed from the UNFCCC (http://unfccc.int) and the UNEP Risoe Centre (http://www.cdmpipeline.org/) websites. A few categories according to the type of emission reduction activity have been identified and the distribution of CERs among them has been made by the collection of estimated annual kCERs from the websites.

Answer: Skewed distribution is found in the distribution of Annual kCERs among CDM projects of Pakistan. This skewed distribution shows that the contribution of annual kCERs from two projects exceeds the contribution from all other CDM projects within Pakistan.

III) How are the two aspects of CDM projects related to each other?

Significance: One aspect of CDM projects is carbon offsetting character which is measured quantitatively in terms of CERs. The other aspect of CDM is its contribution to sustainable development and the sustainable development aspects are described in qualitative terms in PDDs. Literature suggests that there might be an interesting synergy or a trade-off present between both these two goals of the CDM. In a trade-off one aspect grows at the expense of the other while in a synergetic relation growth of one aspect will help growth of another aspect in a mutually reinforcing way.

Methodology: Literature about the CDM projects has been studied and sustainable development aspects in the PDDs of the projects are seen in

the light of this literature. Information about the CERs has been collected from the (http://www.cdmpipeline.org/) website. These sustainable development aspects of CDM projects are seen in relation to the amount of CERs that they create. Environmental science provides assessment of the different environmental impacts of industries and industrial processes.

Answer: The study suggests a trade-off rather than a synergy. The largest carbon offsetting projects like industrial gas destruction projects appear to have the least sustainable development contribution. The smaller carbon offsetting projects like cooking stoves projects on the other hand have the most significant contribution to sustainable development.

IV) CDM is intended to be zero sum game. Compliance with emission reduction targets in the North can be met by the offset projects in the South. Does CDM fail in this objective in Pakistan? What kinds of CDM projects have questionable additionality?

Significance: As CDM is intended to be a zero sum game so it is not going to lower the overall emissions of the globe and moreover if it fails in its goal, it might rather increase the overall emissions. It is important to see that if the offset projects in the country are implemented transparently. Every CDM project should be additional in character that means that it should reduce the GHG emissions below those that would have occurred in the absence of the CDM project activity. Literature suggests that there are a few types of projects like large hydropower projects that are not

additional in character. CDM auditors are told that project cannot proceed without additional finance and on the other hand project financiers are told that project does not depend on carbon finance for viability. In Pakistan, there might be a few projects with questionable additionality as well that questions the integrity of CDM as well as climate mitigation tool.

Methodology: The additionality part from the PDDs of the CDM projects in Pakistan have been studied in the light of the literature to highlight the projects that might have questionable additionality.

Answer: The CDM projects such as energy efficiency projects are dominantly driven by the energy crisis and not by the CDM in the country. Moreover fuel switch projects are have a dubious additionality as well. The industrialists in Pakistan are looking for the cheaper and readily available fuels so the switch of fossil fuels does not seem additional in case of Pakistani CDM projects. Big hydropower projects have also been criticized over their additionality in the literature.

V) Is environmental legislation preferable to CDM projects for offsetting GHG emissions in some sectors?

Significance: In some sectors of the economy GHG emissions can be offset in many ways but CDM is preferred in many cases. Environmental legislations in this regard could also play a great role in limiting the amount of GHGs but the absence of proper environmental legislations and

their implementation makes more attractive environment for CDM. Moreover industrialists here are more concerned with the additional carbon finances coming through CDM and not with the climate change mitigation.

Methodology: The analysis is done by reviewing the critical literature on CDM.

Answer: Attraction of additional finances through CDM makes it an attractive option for the industrialists and policy makers as the additional income through CDM improves profitability. In particular the N_2O coming from the Industrial gas destruction projects could be easily controlled by legislation but CDM is preferred in this case as well.

VI) What are some of the limitations of CDM approach to GHG mitigation in Pakistan?

Significance: The climate change mitigation is a long term approach and should be done through more reliable and long term solutions while on the other hand market tool of CDM being a project based mechanism is unable to offer a lot in this regard. CDM is a project based approach with methodologies more readily applicable to point source emissions rather than distributed emission sources. The calculation of distributed emissions is yet another limitation of this project based approach. In case of

Pakistan, CDM fails to address more polluting sectors like transport which involve distributed emission sources.

Methodology: The analysis is done by reviewing the critical literature on CDM.

Answer: A sectoral approach is better than individual project approach to mitigate climate change. It can help create an environment conducive to less carbon intensive projects. Distributed emissions are more difficult to address in a CDM project based approach. Point emissions can be verified with less uncertainty, distributed emissions involve larger uncertainties. These emission uncertainties are larger in cooking stoves projects and the transport sector. The transport projects engages with larger emissions and yet is absent from CDM. Cooking stoves project engage with smaller carbon offsets and are part of CDM because of their relatively more significant sustainable development impacts.

1.5) Thesis organization

Chapter-2 gives an account of the detailed literature survey related to the research questions. It introduces the climate change debate and highlights the significance of CDM in mitigating the climate change. It introduces the reader with the contested perspectives associated with the CDM and builds a case for exploring the relevancy of this critique in Pakistan.

Chapter-3 briefly explains the research design and methodology used to answer the research questions. It discusses the important data and its sources included in the study. It also gives a brief on the interviews conducted during the study.

Chapter-4 is Results and Discussions that describes the results of the study after the analysis of the data and literature.. The results of the research are further discussed to answer the research questions with a more detailed description than that summarized alone.

Chapter-5 presents the brief conclusion from the results and discussions of the study. It highlights the main findings of the study and discusses the prospects of CDM in the second commitment period beginning in 2013.

2. Literature Review

Apparently there has been no study of CDM in context of Pakistan. A few consultants have made presentations that are available on the internet which are intended to promote CDM projects in Pakistan. This material is promotional in character and does not give enough information to provide for a holistic picture of the CDM in Pakistan. Many theoretical, empirical and critical studies have been conducted internationally. One of such study is the case of the CDM projects in Philippines (Docena, 2010) published by Focus on Global South organization. This study has both a theoretical analysis and provides rich empirical data about the clean development mechanism in Philippines. Another such study, Rindefjeall et al., (2011) talks about the CDM projects in Chile. Bubalo (2010) gives a brief about the CDM projects in the Republic of Macedonia. Gupta (2003) also raises such issues as the CDM prospects in India and questions the use of a market based approach to solve environmental problems in India. Sirohi (2007) examines the socio-economic component of sustainable development commitments of the CDM projects. One of the studies that resembles the aims and objectives of this research is the case of CDM projects in Brazil (SWECO, 2007). Friberg (2009) is another study about the CDM in Brazil. Wang, (2010) studies the CDM projects in China. Shroeder (2009) also look at the economic aspect of CDM in China. Pedersen (2008) gives a brief about the CDM projects in Malaysia. There are many studies like Streck (2004), Vlachou (2010), Figueres and Streck (2009), De et al., (2009) and Huang & Barker (2008) that analyze Clean Development Mechanism as a tool to combat climate change and bring

sustainable development. They highlight the CDM's role in bringing sustainable development and opportunities for the developing countries in CDM. Ellis et al., (2005) wrote about the lessons that can be drawn from CDM experience to date. There has been a debate on the existence and functions of the Kyoto Protocol and many authors have critically analyzed it. Olsen and Painuly (2002), Repetto (2001), Ghosh (2007) and Rowland (2001) are a few studies that question the existence and role of the Mechanism. In one of the critical writing about the CDM, Bachram (2004) argues that the dynamics of emissions trading, whereby powerful actors benefit at the expense of disempowered communities in both North and South, is a modern incarnation of a dark colonial past. Lohmann (2008) mentions the complexity of identifying the roles of sellers, buyers and intermediaries in the life cycle of a CDM project. Lohmann (2006) explains why carbon trading -- one of the largest world commodity markets ever created proves to be ineffective in dealing with the climate crisis.

2.1) Contested perspectives from literature

In the last few years since the beginning of the first commitment period of the Kyoto Protocol in 2008, there has been an extensive discussion in academic literature on CDM, its structure and functioning. As described in the literature survey, there are a few studies that are supportive in favor of CDM and they believe it to be an appropriate and effective tool to mitigate the climate change. There is also literature present on the subject that seems to be in favor of the market based solutions to climate change but suggest that a few changes in the structure and functioning of the

CDM are needed. Then there is a type of literature that altogether rejects the approach to mitigate the climate change through the market based mechanisms. This type of literature takes the stance of describing and elaborating the controversies associated with the CDM worldwide wherever CDM is present. Controversies are like contradictions or sources of conflict that have resulted due to the structural and functional loopholes in the CDM. A lot of conflicts have been generated in the CDM with time. These contested perspectives cover a variety of themes. A few of them are presented hereunder; many of them fall into the category of hot components of carbon markets as described by Callon (2009).

2.1.1) CDM is a Zero Sum game

Since CDM is an emission trading mechanism so it does not reduce the emissions rather it allows the North to exceed their emission reduction targets by offsetting the extra emissions in the South. Some GHG emissions that happen in the North are offsetted in the South through CDM and overall flow of GHGs remain the same and even keeps on increasing till date. It keeps on increasing as North finds it easy to offset the emissions elsewhere and keep on increasing their carbon emissions which are the results of overflows coming out of the particular framing process of Kyoto. At the same time it enables revenue in favor of the biggest polluters in the South who are able to show emission reductions in their industrial activities. It should be noted that even the claims of CDM being a zero sum game is contentious as it is "zero sum game" only in the idealistic scenarios where emission reductions in the South are additional. If they are not additional they will result in overall increase in

emissions. (Lohmann, L., 2006) argues that many CDM projects do not contribute to reduce the overall GHG emissions. On the base of such critique, skeptics argue that the CDM inclines to make South just the service sector of North with a questionable positive result. In this way it does not contribute to climate change mitigation and fails to play its role as a break with the high carbon development paradigm as described by the framers of the Kyoto in the South.

2.1.2) The Additionality of CDM is questionable

CDM project that reduces the GHG emissions in addition to what would have occurred in the absence of the project activity are said to be additional in character. Business as usual projects have a variety of carbon emissions while additional projects have less emissions than the baseline project. Business as usual outlines the future scenario that is, what would be the emissions emerging from the industry if it goes on as it is without being a CDM activity. It is said to be the baseline scenario. Baseline scenarios are not present in reality. The baseline scenario enables the approximate calculation of emission reductions. It is counterfactual that is not the present scenario but a future scenario that they expect would occur in the future without the CDM project. This is like speculating about the future scenario. Skeptics argue that there can be many possible future scenarios depending upon the inflation rates, the probable economic shifts, the changing energy demands and many other factors. All of these things can influence the probable future scenario. In such circumstances, how one particular counterfactual could be given preference over other counterfactuals? The baseline scenario has a great importance in CDM as it

determines the amounts of CERs. The more dirty the baseline, more the incentives it would bring in terms of more CERs. The project developers paint the baseline scenario in a more conventional way to make greater the difference between the baseline scenario and the project scenario. The more the difference, more the emission reduction credits. It is why there is considerable incentive for manipulation in the baseline scenario present in the Project Design Document.

In the demonstration of additionality, project proponent needs to explain how his project is additional that is, how it could not have been possible without the CDM finance. This part of the CDM project is highly criticized and cynics say that many projects are not additional in character. The hydropower projects that have a long span are presented as an example of such critique. The big hydropower projects would have gone anyway with or without CDM finance so additionality of such projects is doubtful. Additionality is the basic requirement for being a CDM project. In the demonstration of additionality, project proponent shows that the project has a few barriers either financial, technological or prevailing practice. In the presence of these barriers it is not possible to implement the project without the CDM finance. This is the statement that is verified by the DOE and submitted to the EB to seek the CDM status. Skeptics however have highlighted a few issues that there are two sets of statement that the project proponent makes. One of these statements is made to be submitted to the EB to seek the CDM status. An account of certain barriers to the project implementation without the CDM finance is given here. On other hand the project proponent submits a statement to his financial backers that his project is financially viable even without CDM finance. These are two sets of contradictory

statements for different people and for different aims and objectives.[5] In such circumstances, doubts emerge on what is the true statement and if the project is really an additional project in nature. Timothy Mitchell[6] believes that if someone is not a good "Storyteller", he cannot get his project through. Besides the critique on additionality aspect, recently a few documents about CDM were leaked by the Wikileaks (Yan, 2011) that suggests that most of the CDM projects in India are not additional and hence do not qualify for availing the CDM benefits.

2.1.3) Leakages

Leakage refers to the increase in emissions outside the project boundary which occurs as a result of the project activity's implementation. They could be said to be spillovers from the project boundary. For example in case of CDM hydro projects, due to reservoir construction, land is inundated which almost necessarily puts organic material under water that leads to its decay (Burian, 2006). This may result in emission of methane which has high GWP. Although some leakages of the industrial systems are considered in the CDM project but market leakages or leakages of a broad spectrum character are hardly considered (Rosendahl & Strand, 2009). For example the biomass CDM project where a fossil fuel is substituted by biomass such as rice husk to produce energy. In such a project, extra emissions due to transport of biomass may be considered but it is noteworthy that the usage of biomass in industries may stimulate the enhanced usage of inorganic fertilizers by the farmers in the fields resulting in increased GHG emissions. This type of leakage is frequently

[5] www.the**cornerhouse**.org.uk/sites/the**cornerhouse**.../40**poisonmarkets**.pdf (Accessed on 28th April, 2013)
[6] Ibid,

considered in a CDM project as it is an indirect socially mediated effect. In developing countries, rice husk and other biomass products are used extensively for heating and construction purposes. The industrial use of biomass may deprive the indigenous people of this resource and they may switch to using bricks for construction, using kerosene oil or natural gas for cooking and heating purposes. The question emerges that if these "stimulus emissions" are going to be taken into the account of leakages or not (Schneider et al., 2010) highlights a broader theme of leakages in the case of industrial N_2O projects. Since North has the emission reduction targets so capping at one place can easily lead to some spillovers or leakages at another place in South when production or an industry is outsourced. There is every likelihood that many countries in the North might also outsource or offshore the production to the South where they would not only benefit from the cheap labor and weak implementation of environmental legislations but would also generate CERs and sell them instead of having to buy them. Outsourcing of adipic acid plants and nitric acid plants to the countries like South Korea and China is an example of such leakage[7].

2.1.4) Gaming the CDM

The HFC-23 projects being the highest CER earning projects are at the core of the criticism on the CDM worldwide. These projects focus on eliminating or minimizing the emission reduction from the facilities producing HFC-23. HFC-23 with a global warming potential of 11,700 is a potent greenhouse gas which is an

[7] http://www.sei-international.org/index.php/news-and-media/1888-no-evidence-of-gaming-in-cdm-nitric-acid-projects (accessed on 23th Feb, 2013)

unwanted byproduct of manufacturing the refrigerant gas HCFC-22. Under the UNFCCC's CDM, the destruction of HFC- 23 generates emission reduction credits that are used to fulfill commitments to reduce greenhouse gases. While all 2236 currently registered projects are estimated to generate about 1 billion credits by 2012, only 19 registered CDM HFC-23 projects would be accountable for about half of the issued credits under current rules (Press release of CDM Watch[8]). Such projects have been characterized as an inefficient means to address the climate change issue (Wara, M. 2008).

There is a perverse incentive associated with this type of projects. It is interesting to note that the revenues generated by mitigating the byproduct i.e., HFC-23 are far much larger than the value of the original product i.e., HFC-22. Due to the involvement of the extra CDM revenue, more HCFC-22 is produced and far more HFC-23 generated than would occur without the CDM. The case of these projects has witnessed the frauds like manipulating the baselines and use of inefficient technologies that would emit more HFC-23 into the atmosphere with examples from China and India. The industrialists especially in China have availed this venture to the fullest and the loophole of HFC-23 CDM projects has led industrialists to invest the CER money from these HFC projects in more polluting industries (Smith, 2007).

2.1.5) Race to the bottom

Skeptics have argued that the CDM does not only fail at its two pillars; mitigating climate change and bringing sustainable development in the South but it

[8] http://www.noe21.org/site/images/stories/Noe21/pdf/press_release_CDMWatch_21.5.09.pdf (Accessed on 3rd January, 2013)

also engages the South in different foul games. The CDM has a healthy financial appeal for the South. The countries in the South take it as an opportunity to attract the CDM investment and generate side profits. (Sutter & Parreano, 2007) believe that the absence of international sustainable development standards provide countries engaged in CDM with a loophole to develop their own sustainable development parameters and they could deliberately delay or weaken the environmental legislation to attract the CDM benefits. If the focus of these projects is just about the CDM revenues then it could be said that strong environmental legislations and strict sustainable development parameters are neither in favor of North nor the South because ultimate objective of the CDM is to provide North with the cost efficient emission reduction mechanism and on the other hand one who proves himself to be a better "service-sector" for North would automatically attract its attention. If a country sets its sustainable development criteria too high, it might lose the market shares of the CDM as compared to a country that has set its sustainable development criteria comparably lower. The race to attract the CDM revenues by making a compromise on the implementation of the environmental legislations is like engaging in a race to the bottom.

2.1.6) Hot air

The Kyoto negotiations on limiting and stabilizing the GHG concentration in the atmosphere were based on the CDR (Common but Differentiated Responsibilities) principle that recognizes the historical differences between developed and developing countries in creating the climate crisis. In the Kyoto protocol, the developed nations

(Annex-1) countries commit themselves to the legal binding targets to reduce their GHG emissions. Collectively Annex-1 countries agreed to reduce their GHG emissions in the period 2008-12 by an average factor of 5.2% from the levels of the 1990. The emission levels of the year 1990 are taken as the base year. This average of 5.2% also includes positive emission allowances and zero emission reduction targets. A few countries like Russia, New Zealand, Ukraine, France and Finland had zero emission reduction legal bindings. Other countries like Greece, Finland, Ireland, Iceland, Portugal and Spain etc. were given emission quotas i.e., they were allowed to increase their emissions to certain levels. Other Annex-1 countries were supposed to reduce their emissions and overall average of the Annex-1 including all the three types of countries mentioned becomes 5.2%. Since this is not easy for the Annex-1 countries to bring a structural change in the industry in such a short time, so Kyoto Protocol gave them the few flexibility mechanisms i.e., Cap and Trade, Joint Implementation and Clean Development Mechanism. Clean Development Mechanism (CDM) is the only mechanism that involves the developing countries (Non Annex-1). These flexibility mechanisms provide North the facility to reduce the GHG emissions wherever it is easier and cheaper for them. In the CDM, a country in the North would invest in an emission reduction project in the South and would acquire the resulting emission reduction credits in the form of CERs (Certified Emission Reductions). The CDM being a cheap way to reduce emissions became very attractive for the Industries in the North and it is the reason more than 5000 CDM projects have been registered till December, 2012.

There is an inherent problem in CDM of the surplus emissions that affects the CER market. The surplus emissions factor is also called “hot air”. These are basically Assigned Amount Units (AAUs) that were assigned to those industrialized countries who were given emission quotas. This hot air in the first Kyoto commitment period (2008-2012) originates from the economic downfall in the so-called ‘Economies in transition’; the nations that emanated from the dissolution of the Soviet Union in the 1990s, and former Eastern-Bloc states that now are part of the European Union. All of these nations experienced a major economic decline after the breakup of Soviet Union. As a result of this decline, these Economies in Transition easily will meet their Kyoto target of zero emission growth by the end of the 1990-2012 period, even without having to install specific emission reduction policies. In some of these countries (such as the Ukraine), emissions even declined by as much as 60%, when compared with 1990 levels. For Russia, the maximum decline was about 40%. (Den et al., 2010)

In the present structure of the Kyoto Protocol, countries with surplus emissions can sell these AAUs to other Annex I countries through International Emission Trading (EUETS), which is one of the major market-based mechanisms that constitute the carbon market. The countries with surplus emissions can also bank these surplus AAUs which they can then use for the compliance purposes in a following commitment period if agreed in the negotiations, after 2012, or to sell them, possibly at a higher price than could be obtained in the present scenario. Partly due to the current economic crisis, which also hit hard in the Economies in Transition, the existing surpluses are likely to continue to exist for a long time beyond the 2012

Kyoto period because these are emission reduction units in bulk but with no good buyers for them.

In such a scenario, fate of CDM projects and CERs are completely dependent upon tightening the caps on the industries in the North that would enhance the demand for CERs in the carbon market. CDM will only function if the price of CERs does not fall drastically. Hot air threatens the viability of CDM.

The legal binding targets that North commits to create a demand for more CERs in the carbon market but due to the uncertain future of the Kyoto Protocol after 2012 and withdrawal of the countries like Canada in 2011, the demand for CERs has reduced which has also resulted in the reduction of the prices of CERs. Moreover the economic crisis and resulting reduction in the industrial activity in the Europe where most of the Annex-1 countries are present has also resulted in the low demand and lower prices for CERs. Now as the countries in the North find it difficult to take their emission levels below that of 1990, they demand changes to the already existing framework of the CDM which also is a threat to the future of the Kyoto Protocol. This is why there is a low demand for CERs as countries like Canada are backing off and also countries like Japan and Russia also plan to withdraw from the Protocol.

In fact the CERs market emerged from the demand for CERs in the carbon market and it is the legal binding targets of the North that create a demand for CERs and CER supply in turn is dependent on this demand.

2.1.7) CDM is in favor of big polluters

There are a lot of transactions involved in the CDM. The project cycle is so entangled and there are many intermediaries involved in the project cycle. The higher transaction costs involved in the CDM make it biased in favor of large polluters. Those who pollute more can earn more through CDM. A small polluter cannot afford the transaction costs involved in the CDM project so small polluters are alienated in this regard and they enjoy no right to "mitigate" climate. This biased character of CDM in favor of large polluters has received considerable attention in the research literature (Governance of Clean Development Project, 2011)

2.1.8) Carbon debt

The overuse of atmosphere by industrialized nations from the consumption of fossil fuels has hampered the carbon dioxide absorption capacity of the world's oceans, vegetation and soil, and the concentration of greenhouse gases in the atmosphere continues to increase. The result is the climate change that we see today. The assessment of impacts of the climate change has shown that industrialized countries are responsible for the changes that are a result of massive burning of fossil fuels. Now as the North has overused the atmosphere which is a global common so it owes South an ecological debt. Though North has made an adaptation fund and devised CDM as a mechanism that also claims to address the issue of climate debt but the revenues from the CDM in no way seem to balance the free usage of ecological

space that North has been enjoying for more than 250 years. CDM is nothing more than a peanut offered in remuneration of the free ride to fossil fuel based development. The magnitude of this debt is hard to quantify but efforts have been made to quantify it by different authors like (Khor, 2010).

Here it has been tried to highlight a few controversial issues about CDM that undermine the claims of CDM as a mechanism to mitigate the climate change as well as bring sustainable development. A few other related issues are discussed in the next chapters in relation to their relevancy in case of Pakistan.

3. Methodology

The thesis builds its argument on the disconnect present between what is experienced in reality and what is described in the official CDM literature. Primary data in the Project Design Documents (PDDs) and the secondary literature comprising policy review and research publications has been read to identify the differences in functioning and claims of the Clean Development Mechanism (CDM). Interviews have been conducted with the actors in the project cycle of the CDM. Site visits have been done for three CDM project sites to meet the CDM actors and learn about the situation on the ground. The study comprises of the theoretical perspectives and empirical data and most of the resources are of secondary nature.

3.1) Making of Pakistan's CDM profile

The CDM profile in Pakistan is made from the data available on the websites of the UNFCCC and the UNEP Risoe Centre. The websites provide data on many aspects of the CDM project cycle worldwide as well as country specific data. It also makes available the individual Project Design Documents (PDDs) for all those CDM projects that are registered or are under the process of validation. PDDs of the CDM projects in the pipeline have been studied and useful information has been extracted out of the PDDs that helps us analyzing a few aspects of the CDM. This useful information is extracted in the form of CDM Project Description that keeps a brief detail about the CDM project.

3.1.1) What are Project Design Documents and what information do they provide us?

PDDs are the project design documents and provide a comprehensive detail on the CDM project. It shows that how the project can reduce greenhouse gas (GHG) emissions below the levels that would otherwise have been emitted in the non CDM scenario. In the PDDs, the project developers also demonstrate that the projects meets the various CDM requirements in the PDD. Each and every CDM project has to have a PDD. It gives an account of information from the project design to the application of the baseline methodology. PDDs are key documents of a CDM project. They provide details on some aspects of the CDM project. Some critics say that that the PDDs tell you a plausible story and the main information is presented in a complex form. A number of plausible scenarios are presented and one of the plausible scenario that is the unique counterfactual is selected. Important features of a PDD document are discussed in detail as under;

3.1.1.1) Description of the CDM project

This feature of the PDD gives a brief on the stakeholders/developers involved and the introduction of the industry or organization involved in the CDM project. It also shows a general description of how the project involves the reducing of emissions. It gives a background of the project and shows how the project contributes to the sustainable development and how many emission reductions the CDM project would result in.

3.1.1.2) Description of a unique Baseline Project

This is one of the most important aspects of the CDM project. A baseline for a CDM project activity is a hypothetical and supposed reference case that represents the amount of greenhouse gases that would have been emitted if the project were not implemented i.e. hypothetical emissions in the absence of the CDM project. The development of a baseline helps to determine the other important parts of a CDM project such as additionality. It is an important aspect of the CDM project as it enables the calculation of the emission reductions from the difference between the executed project and the real and baseline project scenarios. Each baseline has has its own set of circumstances and so for each scenario a different methodology appropriate to the project can be selected. A number of plausible scenarios or hypothetical baselines are developed and one among many counterfactuals is selected and taken as unique baseline scenario.

3.1.1.3) Factory process/product

It gives information on the basic process or the main product of the factory. It tells us about the type of GHGs originating from the industrial process or activity involved. The annual production and energy consumption is also given. The information about the fuel mix is used in the fulfilling energy needs of the industrial process are given.

3.1.1.4) Business As Usual (BAU)

A variety of BAU projects exist. They can differ in terms of GHGs. The carbon offset project should be distinguishable from all the BAU projects. The CDM projects should not be a BAU project. The business-as-usual case is the continuation of current emission levels as if there was no CDM project activity.

3.1.1.5) Size of the Project (In terms of kCERs)

This section of the PDD gives the number of estimated Certified Emission Reductions that the project aims to achieve. The relative difference of the two scenarios i.e., the project and the unique baseline scenario gives the size of the emission reductions that is given in the PDDs. The estimate of annual as well as cumulative CERs over the project's lifespan is given in the PDD.

3.1.1.6) Additionality demonstration

The additionality is another most important part of a CDM project. Every CDM project should be additional in character that means that it should reduce the GHG emissions below those that would have occurred in the absence of the CDM project activity i.e., the project should make the emissions lower than the baseline scenario then it can be said to be additional. In principle, non additional projects cannot avail the CDM benefits but they do get successful in getting themselves registered this violates the integrity of the CDM as carbon offset projects.

3.1.1.7) Emission Factors

Emission factor are ratios of amount of GHG released per unit of energy consumed. For estimating emission reductions, the emission factors are very important. Emission factors for the fuels used in CDM project are given in the PDD that is needed in making estimations of the emission reductions. These emission factors can be locally determined or PDDs can also take up the default IPCC emission factor in their calculations. Emission factors should be expected to be variable from season to season and from locality to locality. So a single universal value for the emission factors might not give realistic calculations.

3.1.1.8) Calorific values of fuels

Heating values of fuels or calorific values are given in the PDD as well. Calorific value is the amount of heat produced as a result of complete combustion of a unit amount of fuel. As many of the CDM projects involve a fossil fuel switch so calorific values are important in calculating the respective heating values that would in turn help the project developer to estimate the amount of alternate fuel required to displace or substitute the already existing fuel. In case of these calorific values, it should be noted again that different fuels at different times and places would have different calorific values. The characteristics of fuels are heavily dependent on how, where and when a particular fuels is burnt so a single universal value for everywhere might not give true calculations.

3.1.1.9) Global Warming Potentials (GWPs)

CERs are issued according to the GWPs of the particular gases reduced. Methane has a GWP of 23 so reducing a tonne of methane would have the same effect as reducing 23 tonnes of carbon dioxide over a 100-year period. Carbon dioxide has a global warming potential of one unit.Greenhouse gases such as HFC-23 have much larger global warming potential. One tonne of HFC-23 in the atmosphere is equivalent to 11,700 tonnes of carbon dioxide in the atmosphere over a 100-year period. So the HFC-23 and N_2O (GWP=310) can earn a lot of CERs with a reduction of just one tonne. GWP are important in making estimates of the emission reductions from the CDM project. The issue of one value fits all appears in case of the GWP as well. There are uncertainties in the values. IPCC gives the global warming potentials of the greenhouse gases over different time periods. The GWP related to case of Pakistani CDM projects are those of N_2O and CH_4.

3.1.1.10) Leakages

There has to be a boundary drawn over emissions in order to be able to calculate the emission reductions emerging from the CDM project. As a result of the processes inside the boundary of a CDM project, emissions may result at another place outside the boundary. The emissions could be direct emerging from the process or they could be indirect emissions. This refers to the idea of leakages i.e., the increase in emissions outside the project boundary that occurs as a consequence of the project activity's implementation. The PDD gives an account of the emissions that are included in the project boundary and others that are not. The emissions not included

in the project boundary are important as well and cannot be avoided. If certain leakages are identified, there are some measures suggested and planned to mitigate the impacts of that leakage on the environment so it is important as far as the environmental impacts of the CDM project activity are concerned. The idea of boundary and leakages are contrasted with the perspective of framing and overflows where leakages may be quite substantial due to socially mediated indirect emissions (Callon, 2008).

3.1.1.11) Monitoring and Project technology

If the CDM project uses a different and new technology that is either imported or fabricated locally it is described in this section. The details on monitoring and the detailed plan along with the responsible authorities and personnel is stated in this part of the PDD. The methodology of monitoring and the instruments involved to monitor the emission reductions and frequency of measurements etc.

3.1.1.12) Sustainable development features of the CDM project

One of the two goals of CDM is to contribute to sustainable development in the South. This section of the PDD briefs on how the project activity is contributing to the sustainable development. However in spite of being a major part of the CDM project, the indicators of sustainable development i.e., economic benefits, environmental and social aspects and their positive impacts are discussed in quite general terms in this section.

3.1.1.13) Other information

Besides all the above major details about the CDM project, a few PDDs also give information on the environmental legislation related to this project. Most PDDs describe the environmental impacts, carbon consultants and DOEs involved, start and end of the crediting period, stakeholders meetings records etc.

3.2) Analyzing Pakistan's CDM Profile

The CDM profile of Pakistan reveals the biggest CDM projects and sectors in Pakistan in terms of their annual CERs as well as the types of projects present in Pakistan. Most of the critical literature about CDM recognizes that CDM is biased towards the big polluters. We try to find out that which large contributors in the country's GHG profile are not present in the CDM profile. Information on the GHG profile of Pakistan reveal which are the biggest polluting sectors in the country's economy that are not present in the CDM.

3.3) Interviews

The interviews were conducted to find out and highlight the relevance of the critique on the CDM in Pakistani CDM projects. The aim of the interviews was also to explore that if CDM in Pakistan has some individual characteristics or it just follows the UNFCCC guidelines. There are a few countries like China who have indigenized the CDM project cycle. A few other countries like Malaysia have their different sustainable development parameters that they use to evaluate the CDM project and then give the National approval to CDM project. We have tried to ascertain if

Pakistan has some individual sustainable development parameters of its own that it uses for approving the CDM project nationally. The CDM project cycle is a complex cycle that seems to be a simple set of actors where there are just the buyers and sellers of the carbon credits but in reality there are a lot of intermediaries involved in the CDM project at different stages of the project cycle. In the case of Pakistan, some intermediaries were identified in the study. These intermediaries were then approached and interviewed with the help of unstructured questionnaire to get the inside view of the CDM bureaucracy in Pakistan. Interviews were conducted with individuals engaged in different stages of the project cycle that include carbon consultants, project developers, project owners, Designated National Authority (DNA) and governmental institutions engaged in environmental protection and monitoring.

4. Results and Discussion

CDM, as defined in Article 12 of the Protocol, allows a country with an emission-reduction commitment under the Kyoto Protocol to initiate and implement an emission-reduction project in developing countries. Such projects can earn tradable certified emission reduction (CER) credits. One CER is equivalent to reduction of one tonne of CO_2. CDM is also supposed to stimulate sustainable development in the South as well. These CDM projects are called carbon offset projects.

4.1) CDM in the developing World

As of April 2012, 3962 projects have been registered and 4044 projects are in the global CDM pipeline i.e., a few of them are requesting registration, a few requesting for a review of the project activity after its validation has been rejected by the UNFCCC Executive Board. Table-1 shows the status of the pipeline CDM projects in the World on 1st April, 2012.

Table-1: Pipeline CDM projects in Numbers : The Table gives the distribution of Pipeline CDM projects in the World
Source: (UNEP Risoe Centre Statistics, April 2012)

Status of CDM projects	**Number of CDM projects**
At validation	4044
Total in the process of registration	122
Total registered	**3962**

If we explore the case of the registered CDM projects, we will find that the region of Asia and Pacific is home to more than three fourth of the registered CDM projects. The regional distribution of the CDM also reveals that the region of Europe

and Central Asia owns the least number of CDM projects in the World. Table-2 further elaborates the share of Asia and Pacific and we find that there are two big players of CDM in this profile i.e., India and China with 805 and 1879 registered projects respectively. These two countries are host to 2684 registered CDM projects that is 83.5% of the Asia and Pacific region and 67.7% of CDM World till April 1, 2012. Pakistan with 13 registered Projects is host to just 0.32% of all the registered projects till the date mentioned[9].

[9] The data was collected on 1st April 2012 from the www.cdmpipeline.com. The analysis and data refer to this date until mentioned otherwise.

Table-2:Distribution of registered CDM Projects in the World (In focus: Asia and Pacific region) highlighting the share of Pakistan i.e., 13 Projects Others in the Chart include countries of Bangladesh, Bhutan, Cambodia, Fiji, Lao PDR, Mongolia, Nepal, Papua New Guinea, Singapore and Sri Lanka

Source: Adapted from the data available on the UNEP Risoe Centre website on 1st April, 2012 (http://www.cdmpipeline.org/)

Continent	Number of registered CDM Projects
Asia & Pacific	3213
Latin America	584
Africa	83
Middle East	42
Europe and Central Asia	40
Total	3962

Country	Number of registered CDM Projects
China	1879
India	805
Indonesia	75
Malaysia	106
Pakistan	13
Philippines	57
South Korea	67
Thailand	67
Vietnam	108
Others	36
Total	**3213**

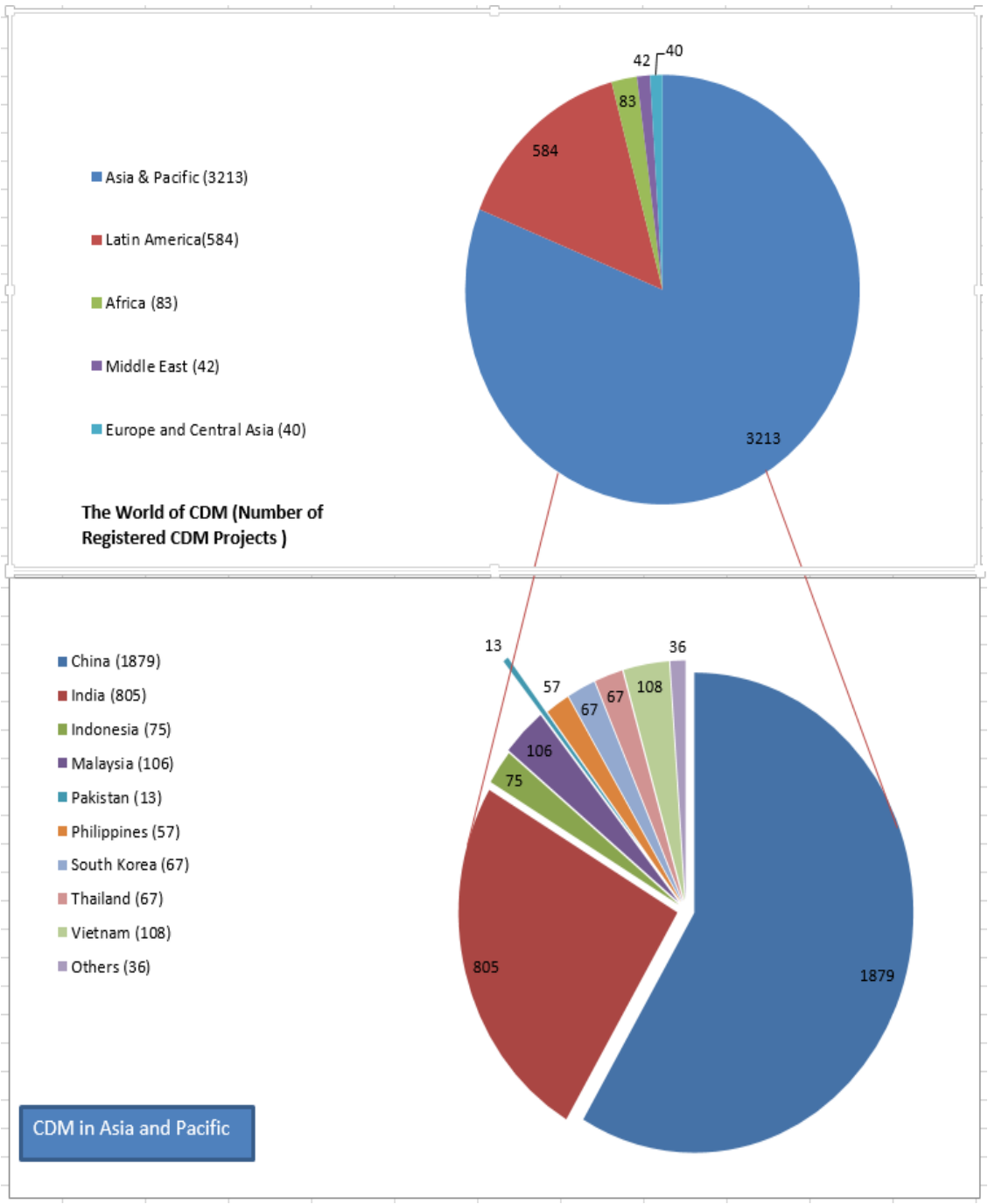

Chart-2: Distribution of registered CDM Projects in the World (In focus: Asia and Pacific region) highlighting the share of Pakistan i.e., 13 Projects. Others in the Chart include countries of Bangladesh, Bhutan, Cambodia, Fiji, Lao PDR, Mongolia, Nepal, Papua New Guinea, Singapore and Sri Lanka

Source: Adapted from the data available on the UNEP Risoe Centre website on 1st April, 2012(http://www.cdmpipeline.org/)

4.1.1) Big and Small Players of CDM

The UNFCCC has divided the CDM projects into small and large scale projects. The small scale projects have been categorized as Types A, B and C;

- **Type A** is the project activity in the area of renewable energy with a maximum output capacity equivalent to up to 15 megawatts per year (or an appropriate equivalent)
- **Type B** is the project activity in the area of energy efficiency improvement which reduces energy consumption, on the supply and/or demand side, by up to 60 gigawatt hours per year (or an appropriate equivalent);
- **Type C** includes the other project activities that result in emission reductions of less than or equal to 60 kilotonnes of carbon dioxide equivalent annually. (CDM FAQs)

Any CDM project activity that does not possess the above mentioned characteristics is considered a large-scale CDM project activity. Besides this characterization of CDM projects, the CDM world can be characterized in a number of other ways.

4.1.2) Another distribution of the CDM World

We have differentiated the CDM World into small, intermediate and big players in terms of the number of CDM projects in the pipeline. We may characterize countries with CDM projects (projects in pipeline i.e., registered, requested registration and those that are at validation stage of the Project cycle) less than 100 projects as small “players”, countries with 100 projects or more than 100 CDM

projects but less than 400 projects as "intermediate players" and countries with 400 or more than 400 CDM projects as "large players" of CDM.

Big players (≥400) as shown in Table-3

Intermediate Players (≥100 <400) as shown in Table-4

Small players (<100 CDM projects) shown in Table-5

Table-3: Big players of CDM in the World showing projects in the pipeline till 1st April, 2012
Source: Adapted from the data available on the UNEP Risoe Centre website on 1st April, 2012(http://www.cdmpipeline.org/)

No.	Big Players		
	Countries	**No. of CDM**	**Annual kCERs**
1	China	3548	580003
2	India	1942	197793
3	Brazil	416	46481
	Total	**5906**	**824278**

The Big players as shown in the Table-3 host 5906 CDM projects that are 73% of the total projects in the pipeline till date. The individual shares of the countries included in the "Big Players" category of the CDM World have been given in the Chart-3. It shows that China with 3548 CDM projects hosts 44% of all the CDM projects in the pipeline, India with 1942 CDM projects in the pipeline ranks second to China and Brazil with a 5% share of all the CDM projects in the World is third biggest country in terms of the number of CDM projects in the pipeline. The three "Big Players" of CDM World collectively make 74% i.e., 824278 annual kCERs of the total annual CERs generated worldwide from the CDM projects. The expected CERs produced by these Big Players till the end of 2012 comes out to be 2040660 i.e., 76% of the expected CERs till 2012 generated in the CDM World. The annual CERs means the CERs produced by the project annually whereas the

cumulative CERs are estimated amount of emission reductions that may be produced by the end of first and second commitment period of the Protocol.

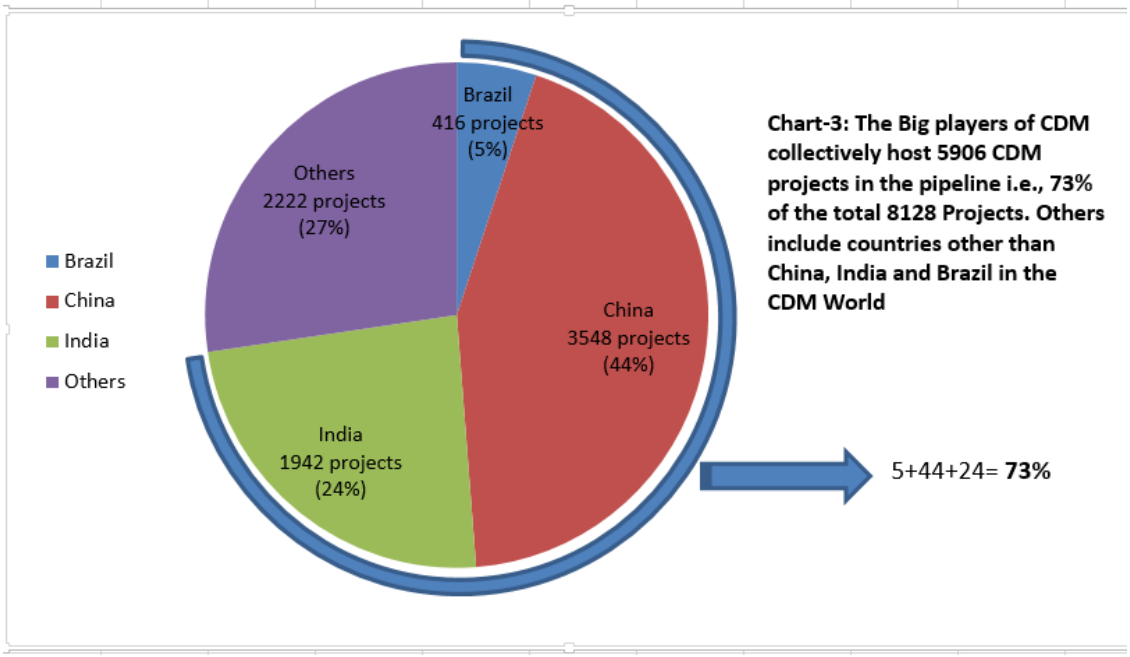

Chart-3: Dominating Big Players in the CDM World
Chart shows the annual CERs expected from each country with share in parenthesis
Source: Adapted from the data available on the UNEP Risoe Centre website on 1st April, 2012(http://www.cdmpipeline.org/)

The countries that host no less than 100 and not more than 399 projects have been put into the "Intermediate Players" category. Table-4 gives a list of such countries. The seven countries in this category collectively host 14% i.e., 1169 projects of all the CDM projects in the pipeline. The countries such as Mexico and Vietnam with 203 and 253 projects respectively are the leaders in the "Intermediate Player" category in terms of number of projects. The "Intermediate Players" as shown in the Table-4 make 10% i.e., 115639 kCERs annually of all the CERs generated worldwide.

Table-4: Intermediate players of CDM in the World showing projects in the pipeline till 1st April, 2012

No.	Intermediate Players		
	Countries	**No. of CDM Projects**	**Annual kCERs**
1	South Korea	100	22233
2	Vietnam	253	21357
3	Mexico	203	19565
4	Indonesia	164	19549
5	Chile	109	13245
6	Malaysia	164	10316
7	Thailand	176	9374
	Total	**1169**	**115639**

There are 87 such countries who are host to less than 100 projects. Table-5 enlists such countries. We can see that a few countries like Argentina; 56 projects, Colombia; 82, Pakistan; 49, Peru; 62, Philippines; 90 and South Africa with 71 projects are significant contributors to the list of "Small Players". The small players of CDM together are host to 1053 projects i.e., 13% of the pipeline projects. They generate 16% of the CERs annually worldwide.

Table-5: Small players of CDM in the World showing projects in the pipeline till 1st April, 2012 (Others Include countries with less than 20 projects; Albania, Algeria, Angola, Armenia, Azerbaijan, Bahamas, Bangladesh, Bhutan, Bolivia, Bosnia and Herzegovina, Cambodia, Cameroon, Cape Verde, Congo DR, Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Dominican Republic, El Salvador, Ethiopia, Fiji, Georgia, Ghana, Guyana, Iran, Jamaica, Jordan, Lao PDR, Lebanon, Lesotho, Liberia, Libya, Macedonia, Madagascar, Mali, Malta, Mauritius, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Korea, Oman, Papua New Guinea, Paraguay, Qatar, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Sudan, Swaziland, Syria, Tanzania, Togo, Tunisia, Uganda, United Arab Emirates, Uzbekistan, Yemen, Zambia and Zimbabwe)

No.	Small Players of CDM		
	Countries	**No. of CDM**	**Annual kCERs**
1	South Africa	71	14872
2	Peru	62	11923
3	Argentina	56	9221
4	Colombia	82	8600
5	Pakistan	49	5972
6	Philippines	90	4713
7	Egypt	22	4559
8	Ecuador	33	4432
9	Israel	35	4003
10	Panama	32	3301
11	Uruguay	27	2121
12	Guatemala	24	2058
13	Kenya	24	1935
14	Honduras	33	1330
15	Sri Lanka	24	613
16	Others	389	93240
	Total	**1053**	**172893**

4.1.3) Contrast between Big and small players

We can see in the Chart-3 that there are a few countries like India and China that possess a big share of the CDM projects as well as of CERs. The concentration of CDM in the developing countries like India, China and Brazil might have many reasons. One of the major reasons of such concentration is the scale of industries in these countries. In addition to that, all of these Big Players are growing economies and environmental legislation and implementation is not as much efficient and of

concern as in the case of the developed and industrialized countries. The Kyoto Protocol "facilitates" the Annex-I countries to reduce their emissions where it is cheaper to reduce. In this way Annex-I countries are allowed to continue to use the atmosphere for GHG emissions by meeting their emission reduction commitments not by emission reductions in the North but by emission reduction projects in the South. In this context, the case of Big Players is ideal for the Annex-I countries to reduce their emissions in these countries. We see that in the case of Big Players, more projects the country owns, more are the annual and accumulated kCERs in that country.

The statistics provided in the Table-4 and Table-5 though show some irregularity of this trend e.g. in the statistics of the Intermediate Players category, South Korea with number of projects being just 100 which is minimum number of CDM projects in the category leads the Intermediate Players in terms of annual accumulated kCERs. Most of the South Korean CDM projects belong to the Hydro, Solar, Wind and SF_6 abatement projects which are all high scoring CER projects.

Vietnam is another anomaly in the list of Intermediate players. Although it has the maximum number of CDM projects in the list as given in Table-4 and its annual kCERs are also an appreciable amount but its accumulated kCERs till the end of 2012 are second to the lowest in the list. Vietnam has 79% CDM projects in the Hydro sector.

In case of the Small Players of the CDM World, we can again note that an African country, Angola with just 5 CDM projects in the pipeline leads the Small

Players in terms of the annual kCERs generated. One big project of LNG capture brings much of the country's total CERs.

4.2) CDM in Pakistan

Pakistan too adopted the Protocol in 1997 and acceded to it on January 11th 2005. In Pakistan, Kyoto Protocol came into force on April 11th 2005. (UNFCCC website)

Pakistan's initial communication to the Kyoto Protocol was made in November 2003 under the supervision of then Minister of State for Environment, Major (Retd.) Tahir Iqbal. The initial communication report was submitted to UNFCCC on 15 November 2003. It documents the steps taken by Pakistan to implement the Protocol. GHG inventory of the country has also been submitted in this document.

Pakistan too like other countries in the South took CDM as an opportunity not only to reduce GHG emissions but also attain economic benefits so Pakistan Government gave approval to ratify the Protocol in 2002 but the decision kept pending and could not move forward until 2005 when Kyoto Protocol was officially ratified and enforced in Pakistan. Pakistan ratified the protocol in COP 10 that was held on 6-17 December 2004, Buenos Aires, Argentina under the supervision of then Minister of State for Environment, Malik Amin Aslam.

The Minister in an interview says that the basic motivation behind ratifying Kyoto was to attain financing for supporting sustainable development especially in prioritized areas such as forestry and energy (renewable promotion/energy

efficiency/industrial efficiency) as well as acting as a responsible international partner for tackling a global crisis.

After the Government/ Cabinet's approval of the Kyoto Protocol, it was ratified in 2005. Clean Development Mechanism being a source of the economic gains for a developing country like Pakistan became a focus of the country's strategy towards mitigating the climate change. Subsequently, Ministry of Environment was declared as the Designated National Authority for Pakistan that would handle all the CDM projects in the country. It is mandatory for every developing country to make the DNA (Designated National Authority) that communicates and checks for the compliance of the country's environmental laws and regulations in case of every CDM project.

In the year 2005, a CDM Cell was established in the Ministry of the Environment for the Clean Development Mechanism training, handling, awareness and capacity building. Thereafter a National Operational strategy for CDM was approved by the Prime Minister of Pakistan in February 2006 that provides guidelines and procedures to the CDM developers, consultants or stakeholders in Pakistan. The CDM Cell then was given a grant for a period of three years (July 2006- June 2009) through Public Sector Development Programme (PSDP) Fund with a total cost of Rs. 38.93 million. The aim was to strengthen CDM Secretariat in Ministry of Environment and enhancing the capacity of CDM staff and project proponents in developing, managing and approval of the CDM projects. (Pakistan Economics Survey 2007-08). A few workshops, seminars and other awareness raising efforts have also been done by the CDM Cell of Pakistan and a few MoUs have been signed

among Ministry of Environment Pakistan and Government of Federal Republic of Germany, Japan bank and CAMCO International to strengthen the structure of CDM in Pakistan. (http://www.cdmpakistan.gov.pk/cdm_coop.html)

Despite these efforts of the CDM Cell, a few CDM project owners in Pakistan when interviewed revealed that they did not receive any guidance, awareness material or capacity building trainings by the Ministry or CDM Secretariat.

The first CDM project registered from Pakistan was Catalytic N_2O Abatement project by Pakarab Fertilizer Ltd (PVT) in Multan. It is also by far the biggest CDM project from Pakistan with expected 14,398 kCERs till the end of 2020. It was registered on 5th November 2006 (cdmpipeline statistics). As of 10th April, 2012, if we look at the CDM profile of Pakistan, we will find that there are 49 projects in pipeline of which 13 projects have been registered and one has requested registration. The rest of the projects are in the phase of validation (UNEP Risoe Centre Statistics). The 49 projects in pipeline are an estimated 0.5% share of the total annual CERs generated at the global level.

4.3) A profile of Clean Development Mechanism (CDM) projects of Pakistan

The United Nations Framework Convention on Climate Change (UNFCCC) puts Pakistan in the Non-Annex I countries category[10]. The parties to the UNFCCC agreed on the Kyoto Protocol to the United Nations Framework on Climate Change and the Protocol was adopted by parties to the UNFCCC initially on 11th December, 1997. Adoption means that the text and content of the convention is established. By just adopting the convention or a protocol, it does not come into force. A Protocol comes into force when it meets the provisions of the Protocol to come into force. The provisions of the Protocol as given in Article 25 states that it would come into force on ninetieth day of the date on which at least 55 parties to the Convention (UNFCCC) submit their instruments of accession, ratification, acceptance or approval. Kyoto Protocol then finally came into force on February 16th 2005 when Russia ratified the Protocol. Ratification in this context means that a State signifies itself to be legally bound by the terms and conditions of a particular Treaty or Convention. It has the same legal effect as accession but the only difference is that ratification is preceded by an act of signature. As a signatory to the UNFCCC, Pakistan too adopted the

[10] In context of the principle of common but differentiated responsibilities, UNFCCC divides the countries of the World in three categories i.e.,

- Annex-I-- These are those industrialized countries that are also Economies in transition that means the economies of these countries are transforming from a centrally planned economy to a free market. These were members of the Organization for Economic Co-operation and Development (OECD) in 1992
- Annex-II--It may be said a subgroup of the Annex-I countries. It includes those Annex-I countries that are members of the OECD but are not Economies in Transition. The Annex-II are developed countries that are required to provide financial assistance to developing countries to undertake emission reduction activities
- Non Annex- I—These are developing countries
(There are also 49 countries classified by UNFCCC as Least Developed Countries (LDC))(http://unfccc.int/parties_and_observers/items/2704.php accessed on 12-11-12).

Protocol in 1997 and acceded (submitted its instrument of accession which is an official document signed by the State's responsible authority) to it on January 11th 2005. In Pakistan, Kyoto Protocol came into force on April 11th, 2005 (UNFCCC website accessed on 11th November, 2012). Since Pakistan is a Non Annex-I country so it is not obliged to reduce the GHG emissions under the Kyoto Protocol.

Pakistan's initial communication to the Kyoto Protocol was made in November 2003 under the supervision of then Minister of State for Environment, Major (Retd.) Tahir Iqbal. The initial communication report was submitted to UNFCCC on 15 November 2003. It documents the steps taken by Pakistan to implement the Protocol. The country's GHG inventory for the year 1994 was also provided in the Report. The Kyoto Protocol puts the legal bindings on the Annex-I countries to reduce their overall GHG emissions by an average factor of 5.2% of the level of overall Annex-I emissions in 1992 till the end of 2012. Kyoto Protocol has three flexibility mechanisms for the industrialized countries to meet these legal bindings. These mechanisms are Emission Trading, Joint implementation and Clean Development Mechanism. Clean Development Mechanism (CDM) is the only mechanism of the Kyoto Protocol that involves the developing world under the framework of GHG emission reductions. Under the CDM, a country with legal bindings of emission reductions can implement an emission reduction project in the Non Annex-I countries to meet their legal emission reduction targets. This helps the Non Annex-I countries to achieve sustainable development and gain economic benefits in the form of CERs (Certified Emission Reductions[11]) which are sold or

[11] CERs are carbon credits that are the units issued for emission reductions from CDM project activities and are equal to one tonne of CO_2 equivalent (CDM Glossary UNFCCC website)

purchased in the carbon markets worldwide as tradable permits to pollute. CDM principally is supposed to provide North the facility of cheap way to meet their legal bindings and help the Non Annex-I countries to achieve sustainable development. CDM has been an attraction for developing countries as they can get the economic benefits associated with the CDM. Pakistan being a Non Annex-I country and a signatory to the Kyoto Protocol is also trying to avail benefits from the CDM projects. By April 2012, 49 projects from Pakistan are in the pipeline (projects that are registered or have requested for registration and others that are at validation stage[12]) and 13 of these projects in the pipeline have been registered with the UNFCCC Executive Board (UNEP Risoe Centre Statistics, April 2012)[13]. A CDM project enters into the pipeline when it appears in the form of PDD (Project Design Document[14]) on the UNFCCC website (http://cdm.unfccc.int/) for public comments for 30 days. This is called the stage of validation as elaborated in the Chapter-1.

Pakistan when compared to Big Players like India or China has not hosted a large number of CDM projects so far. The number of CDM projects in pipeline being 49 makes Pakistan a small player of CDM projects. Among these 49, 13 CDM projects have been registered, 35 projects are under validation and one project has requested for its registration to the UNFCCC Executive Board. These 49 projects in pipeline are an estimated 0.5% of the annual kCERs generated in the CDM World. In

[12] The projects at validation stage are under a process of independent evaluation of the project activity by the International auditors (Designated Operational Entities) while the registered projects are the ones that are formally accepted by the UNFCCC Executive Board after the validation.

[13] www.cdmpipeline.org/publications/CDMPipeline.xlsx (Accessed on 10th April, 2012)

[14] Project Design Document is the detailed document that includes the details of the project activity

Pakistan the biggest sector of the CDM projects in terms of the CERs generated is the abatement of the Nitrous oxide (N_2O) and the reason is not a larger number of N_2O abatement projects but the amount of CERs generated from these projects. The large amount of CERs produced from these projects is because of the high GWP (Global warming potential) of N_2O that is 310 over 100 years as compared to methane (21) and CO_2 is the measure of GWP and has the value of one as the GWPs of the GHGs are measured in comparison with the radiative effect of the addition of a ton of CO_2 in the atmosphere. The N_2O sector under the CDM may be further divided into industries producing Adipic Acid, Nitric Acid and Caprolactam. If an industry is manufacturing these organic products and emitting the N2O which is a byproduct of the processes, it can claim for the CDM benefits if it reduces the N_2O coming out of the process. There are just two projects of such type among 49 total numbers of projects in pipeline that are emitting the N_2O in the process of manufacturing the Nitric acid. They will be discussed in detail in the next section.

Though a small player of CDM, CDM in Pakistan still shows an increasing trend of the CDM projects in the country. Figure-1 shows the annual growth of CDM projects of Pakistan against years. It shows that 38 CDM projects have been entered into pipeline in the 7 years (2004-2011). The curve reveals the increasing number of CDMs every year in the country. In the year 2012, 11 projects have entered into the pipeline till 1st April, 2012 and the number goes on increasing.

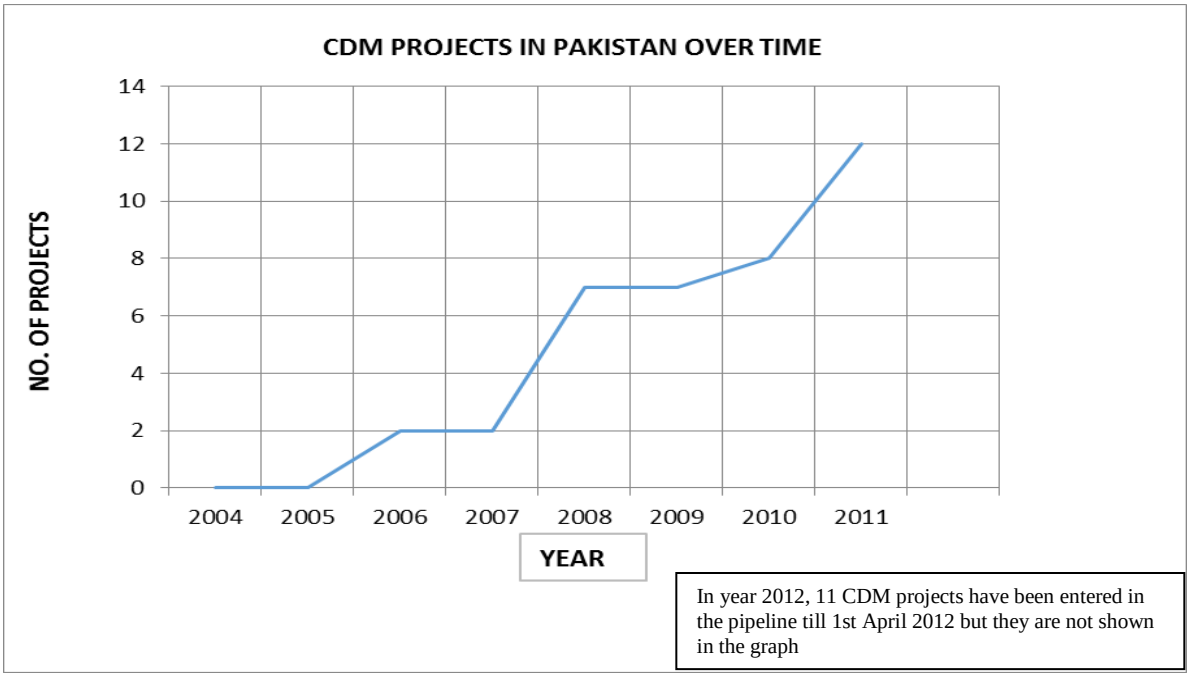

Figure 1- CDM projects in Pakistan 2004-2011[15]. Figure shows the increasing number of CDM projects in the country with time.
Source: (Adapted from the data provided on the cdmpipeline.org)

4.3.1) CDM Projects in Pakistan

The number of the CDM projects entering in the pipeline has been increasing each year since the first project got registered in the country in 2006. The status of the CDM projects in the country is given as under in Table-6;

Table-6: Status of the CDM Projects in Pakistan till 1st April, 2012(Adapted from the data available on www.cdmpipeline.com till 1st April, 2012)

Sr. No.	Status of CDM projects	Number	Annual kCERs
1	At validation	35	4134
2	Total in the process of registration	1	30
3	Total registered	13	1808
	Total	**49**	**5972**[16]

[15] The data includes the projects in the pipeline

It can be seen in the Table-6 that Pakistan has been host to 49 alive CDM projects in total; 49 of them are active CDM projects and are at the different stages of the project cycle of the CDM. At validation shows the total number of CDM projects that are at the validation stage or have just finished it but have not moved to the next stage in the Project cycle. Out of the total 49 active projects, 35 projects are at the stage of validation. There is just one project that is in the process of registration. This project has requested for the registration but has not yet been registered. There are a few CDM projects in the country whose validation was terminated by DOE and they are no more active in any form. Such projects are three in number. Replaced CDM projects are not a part of this Table but there are four other projects whose validation had been terminated by the DOE but they have been resubmitted and are replaced into the CDM pipeline[17] after making some changes. Two of these 4 projects are now at the stages of validation, one has requested for registration and one has been registered. It is noteworthy that out of the 13 registered CDM projects in Pakistan; just one project has been issued with CERs (Certified Emission Reductions). Collectively the CDM projects in pipeline are expected to generate 5972 kCERs annually in the country.

There is just one project till date[18] that has requested for registration, rest are either at validation stage or have been registered. The registered number of projects as

[16] (5972 k CERs is the exact figure without round off, 5974 kCERs mentioned otherwise in the data represents the round off figure.)
[17] Projects in the Pipeline refer to active projects i.e., projects at validation stage, projects that have requested for registration and ones that are registered.
[18] The data was collected on 10th April, 2012 from the www.cdmpipeline.org website so all the data represents to the date 1st April, 2012. i.e. the date mentioned on the document

the Table-6 shows is 13 and 35 projects are at validation stage so the projects in the pipeline comes out to be 49 projects. The rejected projects have gone out of the pipeline so they contribute no CERs. The column Annual CERs shows the sum of CERs from the CDM projects in the pipeline. The annual expected CERs from these 49 projects comes out to be 5972 kCERs without round off.

Chart-4 here represents the CDM project in the pipeline. We can see that 71% of the CDM projects are at validation stage and just 27% projects have been registered till date in a span of 6 years.

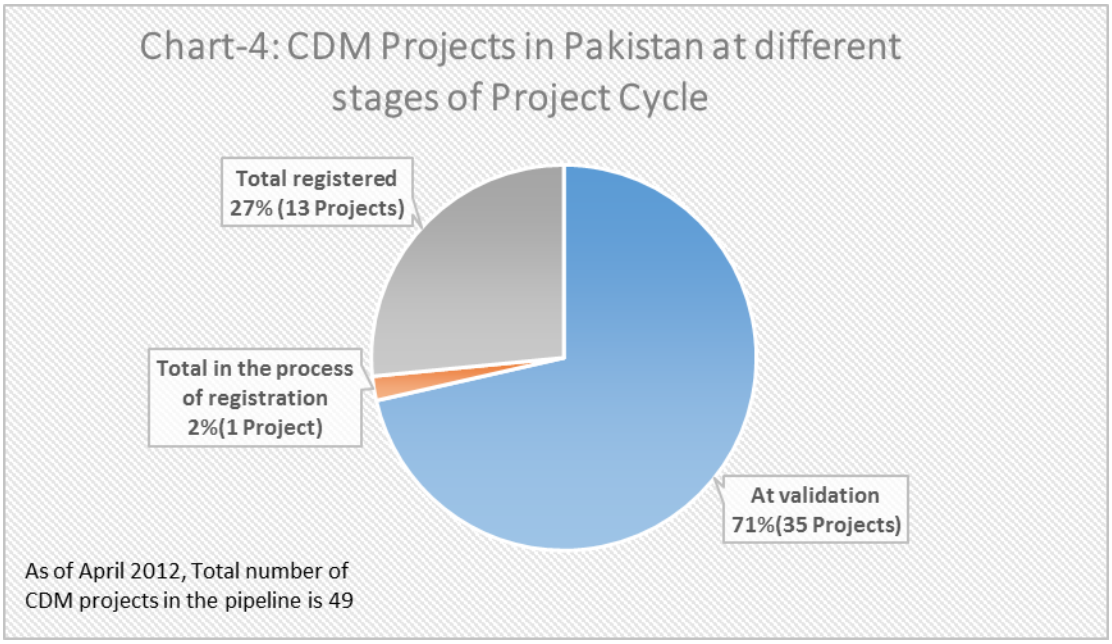

Chart-4: CDM Projects in Pakistan at different stages of Project cycle
Source: (Adapted from the data available on www.cdmpipeline.com till 1st April, 2012)

Again we see here in Chart-5 that many of the calculated CERs in the share of Pakistan come from the projects that are at validation stage and have not yet been registered. On the other hand it is worth noting that among the thirteen registered

projects in Pakistan, just one project has been issued with CERs. Other registered projects have not yet been issued with CERs.

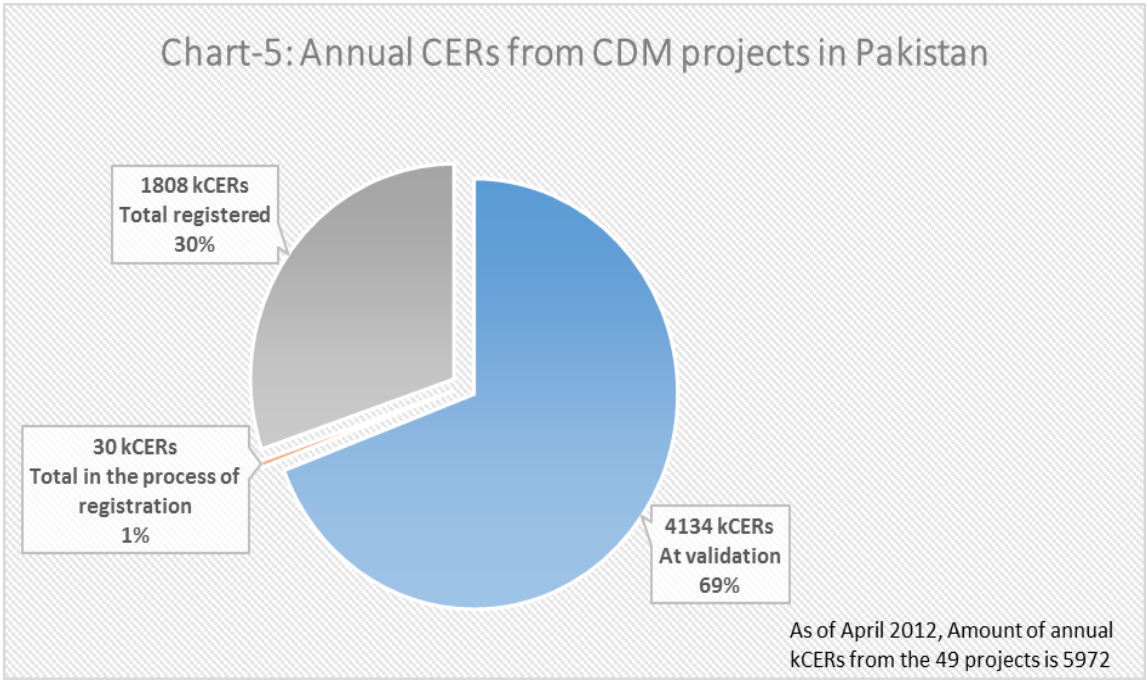

Chart-5: Annual CERs from CDM Projects in Pakistan; Chart shows the amount of annual expected CERs generated from the CDM projects in the country
Source: (Adapted from the data available on www.cdmpipeline.com till 1st April, 2012)

4.3.2) CDM projects distribution according to their types

4.3.2.1) EE (Energy Efficiency) own generation

These types of projects involve the usage of waste heat or waste gas for the purpose of electricity production in the industry. This waste heat may come from the chemical industries or cement industries.

Table-7: **EE (Energy Efficiency) own generation CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Chemicals heat			
	1	DHCL Gas Turbine based Cogeneration Project	Registered	32
	2	ICI Polyester Co-generation Project	Registered	21
2	Cement Heat			
	1	Waste Heat Recovery and Utilization for Power Generation at Maple Leaf Cement Factory Limited, Iskanderabad, Pakistan	At Validation	50
	2	Waste Heat Recovery based 15 MW Power Generation Project at Bestway Cement Limited, Chakwal, Pakistan	Registered	48
	3	Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant	At Validation	43
	4	Waste Heat Recovery CDM Project at Attock Cement Pakistan Ltd.	At Validation	38
	5	DGKCC Waste Heat Recovery and Utilization for 10.4 MW Power Generation at Dera Ghazi Khan Plant	Registered	34
	6	Waste Heat Recovery and Utilization for Power Generation at Cherat Cement Company Limited, Nowshera, Pakistan	At Validation	32
	7	Waste heat recovery and utilization for power generation at DG Cement Khairpur Plant	At Validation	32
	8	Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited Pezu Plant	Requested Registration	30
	9	Waste Heat Recovery and Utilization for Power Generation at Cherat Cement Company Limited, Nowshera, Pakistan	At Validation	26
	10	Waste Heat Recovery Power Plant at Fecto Cement Limited	At Validation	20
	Total			**406**

Bestway Cement Limited waste heat recovery project is one of the sample project from the Table above. The Project focuses on the recovery and utilization of

waste heat to generate electricity at the Bestway Cement Limited (BCL). The industry has two dry clinker production lines with a capacity of 5,700 tons/day for each line. To utilize the recovered waste heat, the Project activity has installed a 15 MW power generator. The electricity generated by the Project activity will displace the electricity currently imported from the local (WAPDA) electricity grid.

The project imports approximately 370,000 MWh of electricity from WAPDA grid that consumed by Bestway annually. The Project activity will generate 108,000 MWh of gross electricity annually and displace 100,080 MWh of net electricity that would otherwise be imported from WAPDA grid in the absence of the Project activity, achieving average CO2 emission reduction of approx 48,060 tCO2/annum.

At present, a portion of waste energy is utilized in the cement plant for heating raw materials and coal but most of the waste energy is released to the atmosphere because the amount of the waste energy generated far exceeds the energy need for raw materials and coal heating.

Even when the Project activity has been implemented, the required energy for raw material and coal heating is supposed to be acquired from the waste heat. The only difference is that such energy will be acquired from the waste heat coming out from the waste heat recovery system. Therefore, as a result of the Project activity, electricity will be additionally generated while keeping the energy requirement for raw materials and coal heating.

4.3.2.2) N_2O

This sector of CDM projects include all such projects that are involved in reduction of N_2O emissions resulting from production of nitric acid, adipic acid, caprolactam. There are two projects in Pakistan that come under this project type.

Table-8: **N_2O destruction CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	N_2O			
	1	Catalytic N_2O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Pakarab Fertilizer Ltd (PVT) in Multan, Pakistan	Registered	1050
	2	Fatima N_2O Abatement Project	At Validation	446
	Total			**1496**

One of the projects as an example from the Table is described hereunder;

Pakarab Fertilizer Ltd (PVT) produces nitrogenous fertilizer. Ammonia is an important intermediate for the production of the nitric acid. The project has installed $DeNO_X$ equipment and reduces most of the NO_X emissions. These N_2O emissions would have come out of the facility if there was no economics incentive in reducing it. In addition to reduce N_2O emissions, the project transfers a clean technology which is not yet widely commercialized even in industrialized countries. The two projects in this category have the same processes and same methodology is used to reduce the emissions.

4.3.2.3) Hydro

The projects that come under this category are actually new hydro power plants as well as a few small dam projects that focus on providing the local communities with the energy and water storage capacities. Pakistan has four projects of such type.

Table-9: **Hydropower generation CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Run of river			
	1	Azad Pattan Hydropower Project	At Validation	1462
	2	Patrind Hydropower Project	At Validation	282
	3	The 84 MW New Bong Escape Hydropower Project, Azad Jammu and Kashmir (AJK), Pakistan	Registered	219
	4	Community-Based Renewable Energy Development in the Northern Areas and Chitral (NAC), Pakistan	Registered	87
	Total			**2050**

Azad Pattan Hydropower project is taken as an example project to describe this category. The Project comprises a run-of-the river scheme with small live storage of 14.3 million m3 that provides an option for 4 hours daily peaking. The final optimized capacity of the Project is 640MW producing net energy of 3064 GWh for delivery to the Grid at a plant factor of about 54%. Constructed over a period of 72 months, including mobilization of the contractor and commissioning of the complex, the electricity generated has to be sold to the Central Power Purchasing Authority (CPPA) under a power purchase agreement with a term of 30 years. A water use charge presently PKR 0.15 per kWh is planned to be paid to the Government of AJ&K providing them a valuable source of revenue. The project activity uses hydropower turbines, driven by flowing water, to rotate an alternator and generate electricity.

The Project activity demands the development, design, construction, operation and transfer to the Government of a 640MW hydropower project. The project aims to tap the hydropower potential derived from the water flow of the Jhelum River which

traverses the deep valley and gorges of Azad Jammu & Kashmir into the Mangla reservoir. The electricity will be sold to the national grid under a 30-year power purchase agreement.

The project technology and knowhow covers the turbine-generator units, governing/excitation systems, automation, protection and control equipment and other balance of plant which will be sourced from leading international suppliers from Europe, United States of America and China offering well proven, mature, safe and reliable technology. Francis hydropower turbine-generators considered suitable for the given hydraulic net head of about 61 metres have been proposed. The efficient and robust units will operate at a relatively slow 120 rpm and are expected to have a long operating life; they are considered to be low-maintenance, environmentally safe and reliable.

4.3.2.4) EE (Energy Efficiency) Supply side

There are total 3 projects of this type in Pakistan and they are at the same stage of the CDM project cycle.

Table-10: **EE (Energy Efficiency) supply side CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Power plant rehabilitation			
	1	Construction of additional cooling tower cells at AES LalPir (Pvt.) Limited. MuzaffarGarh, Pakistan.	Registered	11
2	Cogeneration			
	1	PakarabFertiliser Co-generation Power Project	Registered	119
	2	Gul Ahmed Combined Cycle Gas Turbine Project	Registered	36
	Total			**166**

Gul Ahmad has been taken as an example from this type. The Project is located in unit 1 of Gul Ahmed Textiles Mills Limited, which provides steam and electricity to units 1, 2 and 3, consisting of textile manufacturing, covering, spinning and wet processing of fabric. The process requires a significant amount of electricity and steam. Steam is currently supplied by three boilers running on natural gas, and electricity is supplied by a mix of gas-fired and oil-fired engines. This system will be replaced by a combined cycle gas turbine (CCGT) system. A 10 MW gas turbine will be installed. Its exhaust gases under the CDM project activity will be fed into a waste heat recovery boiler to generate steam for the process, and for a steam turbine that will generate additional electricity (therefore bringing total electrical capacity above 10 MW). Steam for the process will also be extracted from the steam turbine.

4.3.2.5) Methane avoidance

The projects that by their project activities produce biogas from waste water or avoid CH_4 by composting or by aerobic treatment are included in this type.

Table-11: **Methane avoidance CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Manure			
	1	Biogas-based Cogeneration Project at Shakarganj Mills Ltd., Jhang, Pakistan	Registered	19
2	Wastewater			
	1	Methane avoidance project at Colony Sugar Mills Ltd.	At Validation	61
	2	Methane avoidance project at Habib Sugar Mills Ltd.	At Validation	58
	Total			**138**

This Methane avoidance project is supposed to be physically implemented by Colony Sugar Mills Ltd. at the Phalia facility (Colony), located 150 km North from the city of Lahore in Pakistan. Colony is currently generating nearly 1,600 m3/day of wastewater related to ethanol production (at the distillery) which is supplied to existing bio-digesters. The wastewater exiting the existing bio-digesters then enters the existing anaerobic open lagoon treatment system. The COD content of the wastewater stream when entering the anaerobic open lagoon treatment system is approximately 45,000 mg O2/l. The anaerobic nature of the existing open lagoon system and the high COD load of the wastewater, leads to direct emissions of CH_4 into the atmosphere. The Project Activity will replace the existing anaerobic open lagoon treatment system with a combined anaerobic-aerobic treatment system. The anaerobic sections will consist of an UASB (Up flow anaerobic sludge blanket) treatment system with biogas recovery. The recovered biogas will be used for energy generation.

4.3.2.6) Biomass Energy

The project activities that install new plants using biomass or others already existing if change from fossil fuel to biomass or produce biofuels would be a part of this category. The projects of this type are enlisted hereunder in the Table-12;

Table-12: **Biomass energy CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Bagasse power			
	1	Biomass based high pressure cogeneration project at Shakarganj Mills Limited, Bhone, Pakistan	At Validation	31
	2	Biomass Fuel Switch Project at Sapphire Finishing Mills Ltd, Pakistan	At Validation	34
	3	Biomass based Cogeneration project for Madina Enterprise Limited (MEL)	At Validation	29
	4	Almoiz Bagasse Cogeneration Project	Registered	23
2	Agricultural residues: other kinds			
	1	Substitution of coal with alternate fuels at Lucky Cement Limited, Karachi Plant	At Validation	208
	2	Substitution of coal with alternate fuels at DG Khan Cement Company Limited, Khairpur Plant	At Validation	149
	3	Partial substitution of coal with alternate fuels at DG Cement, Khofli Sattai Dera Ghazi Khan Plant	At Validation	159
	4	Attock Cement partial substitution of fossil fuels with alternate fuels in cement manufacture project	At Validation	68
3	Agricultural residues: rice husk			
	1	Biomass based cogeneration in Engro foods Supply Chain (Pvt.) Ltd. IRPC (Integrated Rice Processing Complex), Muridke, Pakistan	At Validation	47
	2	Biomass based Energy Generation at Master Textile Mills Ltd.	At Validation	24
	3	Biomass based Energy Generation at Kohinoor Mills Ltd.	At Validation	24
	Total			**796**

In Biomass based cogeneration in Engro foods Supply Chain (Pvt.) Ltd., the project scenario is steam production with a 30 tonnes per hours (TPH) boiler running on biomass. The baseline scenario is steam production with a 30 tonnes per hours (TPH) boiler running on Natural gas.

Greenhouse gas emissions is claimed be reduced by producing steam/thermal energy with a 30 TPH biomass boiler instead with a 30 TPH natural gas boiler. The annual GHG emission reduction is supposed to be 47,170 t CO2e.

4.3.2.7) Landfill gas

This type includes the solid waste projects that involve either collection of landfill gas, composting of MSW (Municipal Solid Waste), or incineration of the waste instead of landfilling it.

Table-13: **Landfill gas CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Combustion of MSW			
	1	Composting of Organic Content of Municipal Solid Waste in Lahore	Registered	109
2	Landfill composting			
	1	Compost from Municipal Solid Waste in Peshawar, Pakistan	At Validation	144
3	Integrated solid waste management			
	1	MSW project in Quetta	At Validation	74
	Total			**327**

Compost from Municipal Solid Waste in Peshawar is the type of these CDM projects. As an alternative to the planned sanitary landfill, a modern waste treatment

facility is to be made under the project with support from private investment. The proposed project will include processes of waste sorting, compost generation from organic substances, removal of residues from the compost, landfilling of residues in sanitary conditions, direct landfilling of MSW in sanitary conditions and power generation from biogas for onsite consumption.

Under the project activity, there will be no combustion of MSW on the project site. The plant will provide in its first phase capacity to treat 1000t of MSW per day with the option for future expansion in the case of continuous growth of population and economic activities.

4.3.2.8) Fossil Fuel Switch

The project activities that involve switching from one fossil fuel to another fossil fuel along with the new natural gas power plants may come under this sectoral type of the CDM projects.

Table-14: Fossil fuel switch CDM projects along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Oil to Natural gas			
	1	Fuel Switch and energy efficiency project at PWML, Pakistan	At Validation	17
	2	Reduction of Heavy Fuel Oil usage for Power Generation at Lucky Cement, Pezu, Pakistan	At Validation	34
	Total			**51**

As an example, we are describing the Lucky Cement project. The CDM project of Lucky Cement's Pezu plant, is in the process of retrofitting its existing

heavy fuel oil (HFO) based Wartsila generators to operate in dual fuel mode, with natural gas (NG) as the primary fuel and an option to use HFO in case of gas unavailability. The electricity generated, from the generators, is likely to be used to meet the electricity demand for in house cement manufacturing process. Diesel is consumed as a support fuel during both NG and HFO operation.

The purpose of the project activity is to reduce greenhouse gas emissions for electricity generation, by replacement of a higher carbon intensive fossil fuel mix with a lower carbon intensive fossil fuel mix. In the baseline scenario, it is claimed that the generators were based on approximately 100% HFO (~0.04% Diesel oil consumption). Under the project scenario the generators would be based on an average fuel mix of approximately 35% HFO and 65% NG. Thus, the project results in lower emissions for generation of equivalent amount of power during the project scenario as compared to the baseline.

4.3.2.9) Fugitive

There is only one project of such type in the country. These are the projects that recover CH_4 from oil wells instead of flaring it.

Table-15: **Fugitive CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual kCERs
1	Oil field flaring reduction			
	1	Grid connected combined cycle power plant project in Qadirpur utilizing permeate gas, previously flared	At Validation	163
	Total			**163**

Grid connected combined cycle power plant project in Qadirpur is the only project of this type in Pakistan. Engro Chemical Pakistan Limited (ECPL) proposes to set up a new combined cycle power plant (CCPP) at Qadirpur in the Ghotki district of Sindh, Pakistan, thus providing new additional electricity generation capacity to the national grid. The purpose of the proposed project activity is to generate 228.3 MWel (gross) of electricity utilizing the permeate gas from the nearby located Qadirpur gas field, which is owned by the Pakistan Oil & Gas Development Company Limited (OGDCL).

4.3.2.10) Wind

Wind power production comes under this project type. They are acclaimed renewable energy projects that aim to make energy through the means of renewable resources.

Table-16: **Wind power CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual CERs
1	Wind			
	1	Zorlu Enerji Wind Project	At Validation	91
	2	Sapphire 49.5 MW Wind Farm Project	At Validation	73
	Total			**164**

The Zorlu Enerji Wind Project is a grid-connected renewable energy project in Jhampir, approximately 100 km east of Karachi. The Project comprises the proposed installation of 33 wind turbines in two phases: In the first phase 5 Vensys 1.2 MW turbines will be installed; and in the second phase 28 Vestas 1.8 MW turbines will be installed. These will provide a total installed capacity of 56.4 MW,

with a predicted power supply to the grid of 159,010 MWh per annum1. The wind turbine provider for the first Project phase is Vensys CKD of the Czech Republic, whereas Vestas of Denmark is the second Project phase hardware provider.

The purpose of the Project is to utilize a wind power facility to generate zero greenhouse gas (GHG) emission electricity for the Pakistan National Grid thereby displacing electricity that is relatively carbon intensive. The Project is therefore expected to reduce emissions of GHGs by an estimated 90,636 tCO2e per year during the first crediting period by displacing electricity from the Grid. The baseline scenario is the same as the scenario existing prior to the start of the implementation of the Project: Electricity delivered to the Grid by the Project would have otherwise been generated by the operation of grid-connected power plants, and by the addition of new generation sources. In the case of these wind power projects, it is noteworthy that the embodied energy content of the wind turbines manufactured is not considered as within the project boundary that refers to the leakage effect of these CDM projects.

4.3.2.11) EE (Energy Efficiency) households

Energy Efficiency improvements in houses and domestic appliances may become CDM projects under this type. Most of these projects focus on providing fuel efficient cooking stoves to the local households.

Table-17: **EE (Energy Efficiency) households CDM projects** along with Annual CERs

Sr. No	Sub type	Project name	Status	Annual CERs
1	Appliances			
	1	Installation of Energy Efficient Products and Technologies for CO2 Emission Reduction in Gilgit and Ghizer Districts of Northern Pakistan	At Validation	27
2	Stoves			
	1	EES Project in Jaranwala	At Validation	38
	2	Red Whale CDM Project	At Validation	38
	3	Clean Energy Project in Pakistan	At Validation	38
	4	Energy Efficiency Project in Jaranwala, Pakistan	At Validation	38
	5	Efficient Cooking Stove project	At Validation	38
	Total			**217**

Cooking stoves projects by the same developer dominate this type of CDM projects. Red Whale General Trading Limited Liability Cooperation (Red Whale) is a United Arab Emirates (UAE) based company engaged in promotion of renewable energy and energy efficient products. The proposed project activity involves replacement of conventional cooking stoves with Energy Efficient Stoves (EES) in Jaranwala sub district of Punjab province in Pakistan.

The conventional cooking stoves used in the region are either three stone fire stoves or stoves without improved combustion air supply or flue gas ventilation systems i.e. without a grate or a chimney and have an efficiency of about 10%. Whereas the EES is based on rocket stove technology having an efficiency of 35%. This replacement would result in reducing the consumption of non-renewable fuel wood in cooking and reduction in associated GHG Emissions. The project would be

implemented in the sub district Jaranwala of Faisalabad province in Pakistan. These stoves will be supplied to the households free of cost by Red Whale.

The Table-18 gives a distribution of the CDM projects according to the types of the CDM project activities as distributed by the UNEP Risoe Centre. The detailed section above has been summarized in the following Table-18. The details of the categories have already been discussed in the above section.

Table-18: Types of CDM projects (distribution in Pakistan) (Adapted from the data available on www.cdmpipeline.com till 1st April, 2012)

Sr. No.	Type	Sub-type	Projects				Annual kCERs
			Regd.	RR	AV	Total	
1	EE Own generation					**12**	**406**
		chemicals heat	2			2	53
		cement heat	2	1	7	10	353
2	N2O	Nitric Acid	1		1	**2**	**1496**
3	Hydro	Run of River	2		2	**4**	**2050**
4	EE Supply side					**3**	**166**
		Power plant rehabilitation	1			1	11
		Cogeneration	2			2	155
5	Methane avoidance					**3**	**138**
		Manure	1			1	19
		Waste water			2	2	119
6	Biomass energy					**11**	**796**
		Bagasse power	1		2	3	83
		Switch from fossil fuel to piped biogas			2	2	193
		Agricultural residues: other kinds			3	3	425
		Agricultural residues: rice husk			3	3	95
7	Landfill gas					**3**	**327**
		Combustion of MSW	1			1	109
		Landfill composting			1	1	144
		Integrated solid waste management			1	1	74
8	Fossil fuel switch	Oil to natural gas			2	**2**	**51**
9	Fugitive	Oil field flaring reduction			1	**1**	**163**
10	Wind	Wind			2	**2**	**164**
11	EE households					**6**	**217**
		Appliances			1	1	27
		Stoves			5	5	190
	Total		13	1	35	49	**5974**

[19]

[19] Regd. In the Table refers to the Registered Projects, RR stands for Requesting Registration and AV stands for At Validation

4.3.3) Outlook of CDM in Pakistan's industrial sector

The outlook of Pakistan's Industrial sector reveals that major industries of the country include cement, fertilizer, edible oil, sugar, steel, tobacco, chemicals, machinery and food processing. The 49 alive or active CDM projects (Excluding terminated or replaced projects) in Pakistan have been distributed with respect to the industrial sector involved in the Table-19;

Table-19: CDM project distribution in the Industrial Sector of Pakistan
Source: (Adapted from the data available on www.cdmpipeline.com till 1st April, 2012)

Sr. No.	Industrial Sector	Projects At Validation	Projects Registered	Projects Requesting Registration	Total
1	Cement	12	2	1	**15**
2	Energy Efficiency Products	6	-	-	**6**
3	Textile	5	1	-	**6**
4	Sugar	3	2	-	**5**
5	Waste management	2	1	-	**3**
6	Hydropower	2	1	-	**3**
7	Chemicals	2	1	-	**3**
8	Fertilizer manufacturing	1	3	-	**4**
9	Renewable Energy	1	1	-	**2**
10	Steel	1	-	-	**1**
11	Thermal	-	1	-	**1**
	Total	**35**	**13**	**1**	**49**

The Cement Sector of Pakistan's economy clearly invites more CDM investment than any other industrial sector. Among its 15 projects as shown in the above Table-19, 12 projects are at validation, 2 have got registered and one has requested for validation. Any of the cement sector projects in CDM are energy efficiency projects and few of them are fuel switch projects. Other significant contribution to the CDM comes from the Energy Efficiency Products, Textile and Sugar sectors of the Pakistan's economy. The types of energy Efficiency own

generation and Biomass sector with combined 23 projects in the pipeline clearly dominate the distribution.

4.4) What are the drivers and barriers of the CDM in Pakistan?

In the light of the interviews and Climate policy documents of GOP (TFCC & Pakistan's CDM Strategy), it is deduced that the basic driver in attracting CDM to the country is just CDM finance and commitment to mitigate the climate change seems to be a secondary focus of the climate policy of the country. Although the country does not put any taxes on the sale/transfer of CERs and offers CDM a pretty supportive environment but the factors responsible for the small number of CDM projects in Pakistan are lack of awareness about CDM among the industrialists of Pakistan and small industrial scale as compared to Big players of the CDM World. Pakistan has a relatively smaller scale of industries as compared to India and China and moreover there are energy shortages in the country that has already driven many industries away from the country. This seems to be the biggest barrier in attracting CDM here. Many industrialists are not ready to go through the CDM documentation and are also concerned about the uncertain future of the CDM.

4.5) Fertilizer Manufacturing And N_2O Abatement CDM Projects In Pakistan

The target six greenhouse gases of Kyoto protocol are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). A country that is a party to the Kyoto Protocol should work on reducing these target GHGs. In Pakistan the biggest sector of the CDM projects are the abatement of the Nitrous oxide (N_2O) and the reason is not the larger number of N_2O abatement projects but the CERs generated from these

projects. The large amount of CERs produced from these projects is because of the high GWP (Global warming potential) of N_2O is 310 over 100 years as compared to methane that has 21 and CO_2 that has its GWP standardized to one. The types of N_2O projects used in the CDM are Adipic Acid, Nitric Acid and Caprolactam. If an industry is manufacturing these organic products, it can claim CDM benefits if it reduces the N_2O coming out of the process. In Pakistan there are just two projects of such type among 49 total numbers of projects in pipeline. The estimated share of CERs from the two N_2O abatement projects till the end of 2012 (the end of first commitment period of Kyoto Protocol) would be 56% of the total CERs generated in Pakistan. The two N_2O abatement projects in Pakistan are Catalytic N_2O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Pakarab Fertilizer Ltd (PVT) in Multan, Pakistan and Fatima N_2O Abatement Project. The total numbers of CERs that these projects generate annually are 1,050,000 tons and 446,236 respectively. The project proponent for both of these projects is the same i.e. Fatima Group of companies. Among the two CDM projects, Pak Arab project has been registered and was the first project registered in Pakistan. Other CDM N_2O abatement project is at the stage of validation. The industrial gas destruction projects like this have not much to offer in regard of sustainable development but they earn a lot of CERs. In fact these types of projects might subsidize the fertilizer manufacturing sector that has caused great environmental impacts. Here we look at the process of fertilizer manufacturing and how this process results in the emission of N_2O and its abatement in the specific cases of CDM.

The case of industrial gas destruction projects are important as there has been a lot of manipulation in these projects. As these projects make a lot of CERs due to the high GWP of N_2O so industrialists tend to increase the production of ammonia that emits more N_2O and in the process of the destruction of this N_2O, industrialists can earn more revenues as compared to the revenues that can be earned from the production of ammonia so it leads to the perverse incentives linked to the CDM. It is why CDM Executive Board excluded these projects out of the CDM for some time up till a new methodology was not devised. In case of Pakistani N_2O projects, it is noted that they too do not generate appreciable sustainable benefits but earn a lot of CERs so their integrity to mitigate climate change and bring sustainable development to the South could be questioned[20].

The process of fertilizer manufacturing varies as per the products of the industry and types of fertilizers. Pakarab Fertilizers Limited produces Calcium Ammonium Nitrate (CAN), Nitro Phosphate (NP) and Urea. Here we look into how these industries are involved in the abatement of N_2O.

4.5.1) How N_2O comes from the process and how the project deserves the CDM benefits?

Nitrous Oxide (N_2O) is an undesired by-product of the nitric acid (HNO3) production process at the synthetic fertilizer production facility. In order to produce nitric acid, ammonia (NH_3) is oxidized into NO—desired product (because At later stage, NO will be oxidized into NO_2 which is absorbed in water to form nitric acid (HNO_3))—with air on precious metal catalyst gauzes (usually platinum-rhodium

[20] http://www.sei-international.org/index.php/news-and-media/1888-no-evidence-of-gaming-in-cdm-nitric-acid-projects (accessed on 23th Feb, 2013)

alloys) in the ammonia burner of the nitric acid plants. Through this process, some amount of undesired N2 and N2O are formed as the gauzes, selective capability drop over time. N2O is not a toxic substance and is not regulated in Pakistan. Therefore, it is released to atmosphere without any recovery or any specific treatment at the targeted facility of the Pakarab Fertilizer Ltd (PVT).

N2O is reduced if non-selective catalytic reduction (NSCR) equipment is introduced in order to reduce NO_X emissions. However, the NO_X emissions level at the targeted facility is and expected to be below the local regulatory level. Therefore, it does not currently install or has no plan to install NSCR in the foreseeable future. So the project owner claims the project to be additional.

As Pakistan has no legal and regulatory framework for reduction of N_2O in exhaust, the N_2O is released to the atmosphere as a part of exhaust gas. The N_2O abatement technology intends to introduce a catalytic decomposition equipment at the tail gas downstream after the HNO_3 absorber and before the stack. There is no economic incentive to recover and utilize or sell N_2O as a product, technically and economically, except for CERs. In addition, the project does not result in increasing the HNO_3 production. Therefore, without CERs, the facility is going to release N_2O emissions under its normal operation i.e., continuation of the current practice. It is expected that the equipment can decompose more than 90% of the N_2O, which would be emitted otherwise. In addition to N_2O emissions reduction, the project transfer a clean technology which is not yet widely commercialized even in industrialized countries. The project claims to provide local employment through the direct/indirect economic effects through the project activity.

By introducing this technology, Pakarab Fertilizer Ltd. Claims to obtain a clean technology which is not yet widely commercialized even in industrialized countries. The DeN_2O equipment does not affect NOX emissions, while the project installs high-efficient DeNOX equipment additionally, which is expected to reduce around 90% of NOX emissions, simultaneously.

Similarly Fatima Fertilizer Pvt. Ltd is a fertilizer company in Pakistan that has the same project activity that is described above. The project activity aims to reduce N2O emissions in the tail gas by installing a tertiary catalyst after the absorption unit. It is expected that the N2O abatement catalyst decomposes about 98% of the N2O with estimated annual emission reductions of approximately 1,050,000 tCO2e/year. As the project proponent for both of the industrial gas destruction projects is same and moreover the processes are not different as well so same equipment and methodology is adopted to abate the N2O coming out of the processes.

4.6) Exploring the relevancy of CDM critique in Pakistan

Many controversies were discussed in the last chapter and are depicted in the literature with examples from different developing countries. The CDM might be implemented differently and a few countries might have indigenized the CDM according to the needs and demands of the country but the structural and functional flaws are present in many cases and wherever implemented. This chapter gives a brief on the controversial issues in relation to the CDM in Pakistan and tries to understand how the controversies about the CDM are relevant to Pakistan. The interviews conducted during the research work have helped in understanding the CDM structure and associated controversies in Pakistan.

4.6.1) Is CDM biased towards large polluters?

The CDM either globally or locally is skewed in character. More than 73% of the CDM projects are located in just three BRIC countries i.e., Brazil, India and China. These three countries are in the process of massive and rapid industrialization that makes them an economic heaven for CDM investors. Evans (2009) demonstrates how a significant bias exists in CDM in favor of the host nations who are already more industrialized and attract a lot of FDI. Rest of the developing countries who are not even big polluters cannot enjoy the right to "mitigate" climate change through CDM.

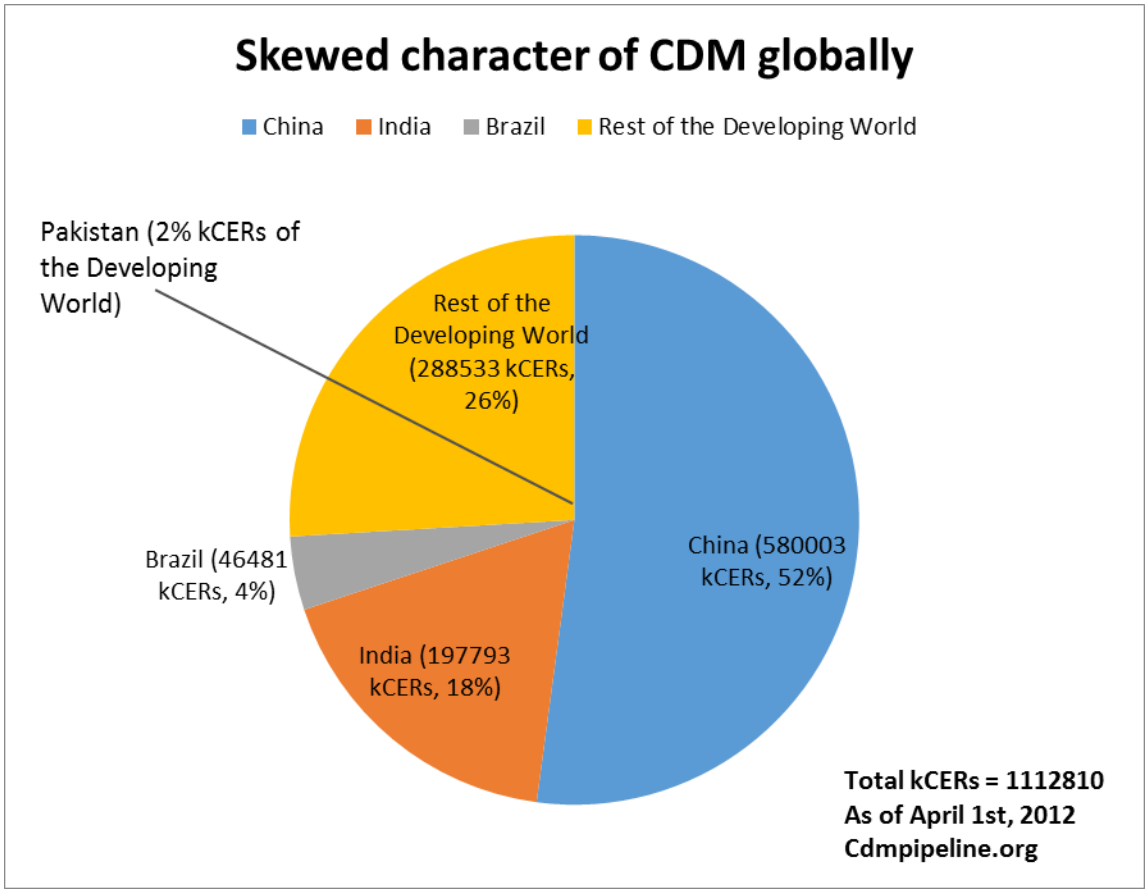

Chart-6: Skewed character of CDM in the Developing World: Chart shows the skewed character of CDM where 3 major countries of the developing World have most of the share of CERs

Moreover there are a lot of transaction costs involved in the CDM. The project cycle is so entangled and there are many intermediaries involved in the project cycle. The higher transaction costs involved in the CDM make it biased in favor of large polluters. Those who pollute more can earn more through CDM. A small polluter cannot afford the transaction costs involved in the CDM project so small polluters are alienated in this regard and they enjoy no right to "mitigate" climate change.

4.6.2) Skewed nature of CDM in Pakistan

If we analyze the CDM projects of Pakistan, we will see that all of the projects in pipeline belong to six major types according to the type of the project activity. The distribution has been done in the Table-20. The industrial gas destruction projects are N_2O destruction projects. N_2O is a GHG gas with a high GWP so its abatement pays off well under CDM. Big renewable energy projects in Pakistan profile are big hydropower project activities. Since it is renewable and does not depend on fossil fuels so it can be a potential CDM project. Small renewable projects on the other hand are renewable energy projects but they are relatively of a smaller scale and a few come up with some significant sustainable development benefits unlike big hydropower projects. This category not only includes small hydropower projects but also wind energy projects. Energy efficiency projects tend to save energy through different means either by improving the project technology, capturing the waste heat or by cogeneration. A lot of industries in Pakistan have started the energy efficiency projects. The additionality of these projects remains questionable as these projects are not motivated by the CDM but by the energy crisis in the country. The case of fuel

switch projects is not different as well. These projects are also driven by the insecure and expensive fuel supply prevalent in the country. The industries have started switching from fossil fuels to biomass and other sources of energy thus creating other metabolic rifts. The waste management projects tend to avoid the emissions of methane from municipal as well as industrial waste.

Table-20 CDM project distribution according to the project activity: The Table gives a distribution of CDM projects in Pakistan according to the type of the project activity

S. No	Type of project activity	No. of projects	Annual kCERs
1	Industrial gas destruction projects	2	1496
2	Big renewable energy projects	1	1462
5	Energy efficiency projects	28	1135
3	Small renewable energy projects	5	752
4	Fuel switch projects	8	683
6	Waste management	5	446
	Total	**49**	**5974**[21]

The skewed nature of CDM is not only represented globally but we can see it locally as well in case of Pakistan. In Pakistan, just 3 projects dominate the whole CDM profile. One large hydroelectric project and two industrial gas destruction projects contribute for 52% of annual kCERs in the country. Due to the uncertain future of the Kyoto Protocol, there is a growing concern among industrialists who want their investments to be secure so they are happier in investing in the early pay off gas destruction projects (like the two N_2O gas destruction projects in Pakistan) rather than in the late pay off projects like renewable energy projects.

[21] 5974 kCERs are non-approximate kCERs calculated manually. Approximate number of kCERs is 5972 kCERs

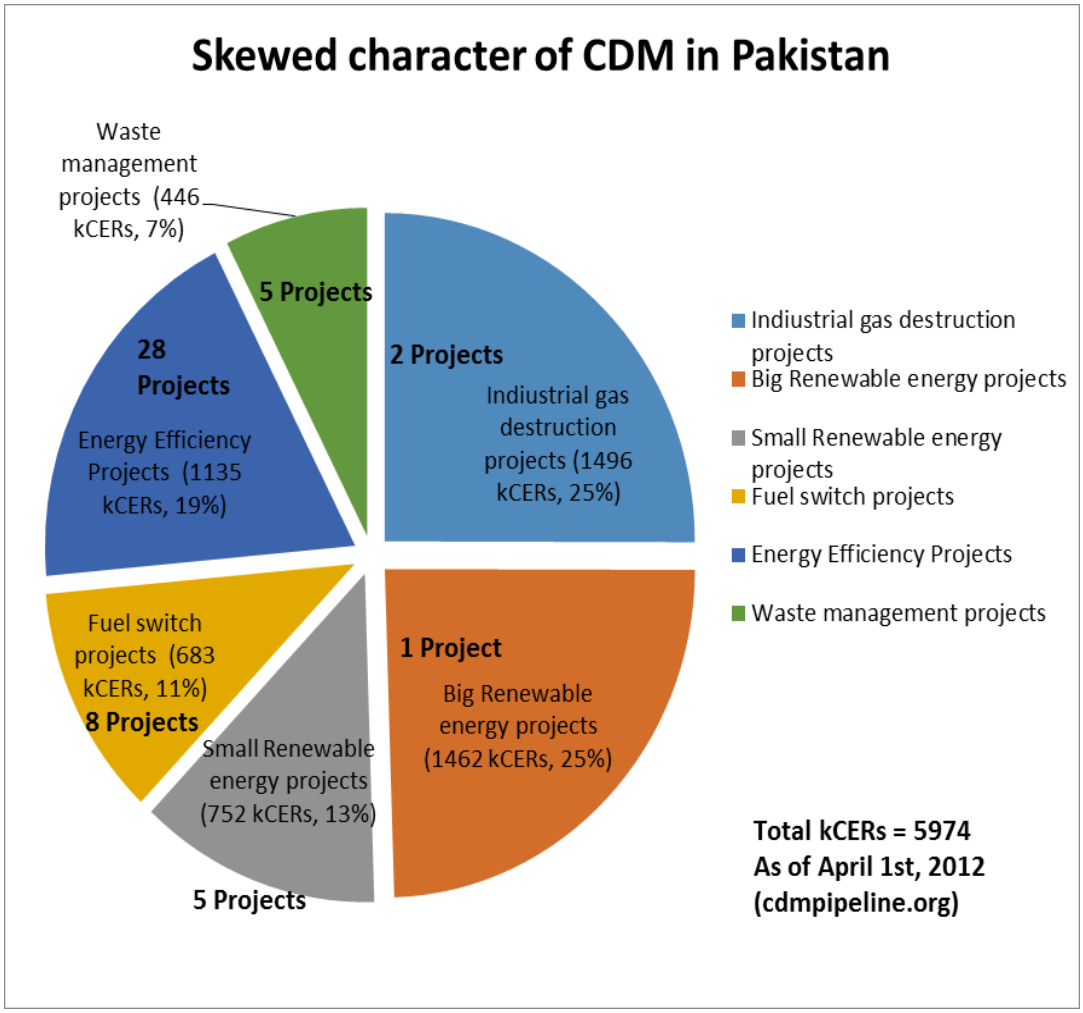

Chart-7: Skewed Character of CDM in Pakistan: The Chart shows the distribution of CDM projects among five categories

Due to large amounts of investments or transaction costs involved in the CDM, a small polluter cannot afford the transactions involved in the CDM. The monitoring of the CDM project requires significant monitoring equipment to be used which increases the operating costs. Moreover a small polluter does not want to engage in a long process that does not generate much revenue in return whereas on the other hand the revenue coming from CDM is like an extra revenue stream. A CDM project takes 467 days on average desirable but not essential to go from first

comment period to registration so it's a time seeking tedious process that only those can afford who could wait and hire the consultant for making the PDDs etc. As compared to global average of 467 days, in Pakistan the same process takes an average of 605 days. This is why small industrialists are not even ready to invest in such a project that makes CDM favorite for big polluters in Pakistan as well. The interviews revealed this sort of aspect as well. The project proponents are not happy with the lengthy process of the CDM and they revealed that the reason that they are in the CDM is just because of the side incomes from CDM and they do not just rely on this income. However a small industrialist on the other hand is not ready for the CDM documentation and transaction pains just to get the "Side incomes".

4.6.3) Are the CDM projects additional in Pakistan?

As mentioned earlier, the CDM projects should provide for real and measurable emission reductions. They have to be additional in character. They should show that the project would not have been possible without the CDM finance. Project developers are good at story telling so they can manipulate the baseline and state one of the barriers either investment, technological or prevailing practice barrier to prove the additionality. Interviews revealed that many projects in Pakistan were already going before they started entering the CDM pipeline and there could be no way that without the CDM finance the project would not have started. Consultants when interviewed also narrated that additionality is somewhat less than necessary for a project so they help the project developer in demonstrating additionality.

As the energy crisis remains one of the critical issues for the industries in Pakistan, industries are exploring other means to meet the energy demands. Many

industries have started using the biomass for the energy purposes, RDF (Refused Derived Fuel), TDF (Tire Derived Fuel) are also being used because of their high calorific value. The shift from the conventional fuels to other fuels as mentioned is self-driven in the country as the prices of the fossil fuels are rising day by day and the gas and electricity supply is irregular and insecure. Moreover the industrialists particularly those engaged in the export industries such as textiles etc. now a days are worried about their green environmental image as the international clients are more attracted towards environmental aware industries for their own climate friendly image in the North. Many CDM projects hence in the country are not CDM finance driven and their additionality could be questioned i.e., many projects are not entirely dependent on the CDM finance to run the project. Interviews have revealed that acquiring the status of a CDM is an extra profit and their production process is not dependent on it. In case of waste heat recovery and fuel switch projects in the country, it can be noted that if there was no CDM investment, the projects would have even then have taken these measures to conserve energy or switch from the increasingly costly fossil fuels to cheaper sources f energy. These then are Business as usual projects and do not fulfill the requirement of additionality. Many of these projects would have happened irrespective of the CDM investment.

Interviews revealed that projects were developed as a response to power shortages and were not intended to mitigate the climate change or bring sustainable development. One of the project developer said that these CDM projects are not going to give them much financial return but this is just a side investment that brings some profits. If it was a standalone project just based on the CDM finance, they would have

never attempted it. Hence CDM is just a response to power shortages that have prompted industrialists here to use the alternative available source of energy.

4.6.4) Are the stakeholder meetings adequate?

One of the two goals of the CDM is to bring sustainable development in the South. The CDM project should address the sustainable development indicators i.e., economic, social and environmental. For the assessment of these indicators as positive or negative, on-site environmental monitoring is done and stakeholder meetings are held. The community issues should be addressed properly and there should be a healthy involvement and representation of the community in such meetings. These meetings do not involve communities in making the decisions to engage in CDM but are frequently seen as rubber stamping decisions already made. The issue of stakeholder meetings has also been raised in the literature. It has been argued that real stakeholder participation is necessary for the project design and implementation but the crucial aspect is that it is just present in the PDD and has no significance. Our interviews raised such questions as well and project developers and consultants revealed that these meetings and stakeholder participation is nothing but a PDD filler that they have to show in the PDD and on the ground, local people and other stakeholders have no practical role in decision making. The interviews revealed that locals are not involved or encouraged to play an active role in the decision making process and these meetings do not represent any public ownership of the project. Down to Earth (2005) indicates this aspect in a study in India. It highlights the gaming involved in the stakeholder meetings. Same questions are asked and more or less same comments are repeated in the PDDs. The stakeholder comments are

repeated in many documents and even the spelling mistakes are found to be the same that shows how minutes are manipulated in the stakeholder meetings.

4.6.5) Is there any trade off present in the CDM projects in the country?

The CDM should not only mitigate the climate change but also help South in sustainable development. The two aspects are not synergetic in character with growth in climate mitigation aspects resulting in growth in sustainable development aspects. But rather the reverse happens which can be described as a trade-off between the two aspects. It has been seen that there is a tradeoff present among both of these objectives of the CDM. Sutter & Parreano (2007) in a study of CDM projects highlight this sort of trade-off between two main goals of CDM. Increase or the introduction of one aspect declines or displaces the other. A project that destroys a lot of GHGs might not contribute to other indicators of the sustainable development like providing locals with the jobs, enhancing equity over the use of natural resources, reducing poverty and livelihoods of the locals. This tradeoff is present in CDM projects in Pakistan as well. The industrial gas destruction projects like Catalytic N_2O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Pakarab Fertilizer Ltd (PVT) in Multan and Fatima N_2O Abatement Project generate annually 1,050,000 and 446,236 CERs respectively. They are very big projects when we compare them with other projects in Pakistan's profile but they offer very little sustainable development benefits. These projects do not create many jobs and besides reducing the industrial gas involved, they do not contribute in any other sustainable development activity. While on the other hand we also see a few projects like Community-Based Renewable Energy Development in the Northern Areas and

Chitral(NAC), Pakistan (kCERs=87), EES Project in Jaranwala (kCERS=38) and Installation of Energy Efficient Products and Technologies for CO_2 Emission Reduction in Gilgit and Ghizer Districts of Northern Pakistan (kCERs=27) might not contribute to reducing a lot of GHGs but they have quite healthy aspects of sustainable development to offer. This undermines the claim of the CDM to offer sustainable development and contribute to climate mitigation at the same time.

4.6.6) Is CDM project cycle indigenized in Pakistan?

CDM has the main goal of mitigating the climate change and also supporting the sustainable development activities in the host countries. The approach of host countries to mitigate the climate change might not be different in the entire CDM World but the path to achieve the sustainable development could be promoted or indigenized in the developing world according to the specific needs, priorities and legal issues in a particular country and accordingly the CDM project cycle as presented in the Chapter-1 can be changed and many countries have made changes to it. Most of such changes are made in the DNA part of the project cycle that is responsible for the country's approval of the CDM project. Curnow, P., & Hodes, G. (2009) give a few such examples on the localization of the CDM project cycle. One of such examples is Brazil which is one of the first countries to make a DNA. Brazil has made an Inter-Ministerial Committee on Global Climate Change to act as the country's DNA. The committee approves CDM projects and also defines the additional eligibility criteria (beyond the criteria defined by the Kyoto Protocol) for the CDM projects in the country. China also has indigenized the CDM project cycle. China has introduced some laws and regulations under which any entity that is going

to implement a CDM a project in China must be fully controlled by a Chinese enterprise or by an entity the majority of which is Chinese owned. Moreover foreign investors seeking to enter the CDM market are just allowed under an equity joint venture in which a maximum stake of 49% is foreign-owned. Wholly-owned foreign enterprises and contractual joint ventures are not permitted under the CDM laws in China. China also has set control measures over the floor price of the CERs. CERs are not allowed to be sold below the floor price approved by the Chinese government. Chinese government also puts taxes on the CERs according to the sustainable development impacts that projects deliver. The Chinese Government taxes CER revenue in varying amounts depending on the sustainable development benefits of the particular project. The projects that do not offer substantial sustainable development benefits like HFC and N_2O projects are taxed up to 65%. On the other hand renewable energy projects that result in comparatively more sustainable development benefits are taxed up to just 2%. Indonesian government also puts certain checks and certain permissions have to be sought in order to carry out an afforestation/reforestation project.

Likewise, Pakistan has also tried to make some changes according to its needs and preferences. There is a Prime Minister Committee on climate change that guides the DNA in its roles and responsibilities. The country's DNA is composed of the National CDM Steering Committee, Technical Committees and the CDM Secretariat. Pakistan has also defined a sustainable development criteria (GOP, 2006) according to which a CDM project should address the environmental, social, economic and technological indicators of the sustainable development and should be consistent with

the country's laws and regulations. DNA criteria have not been implemented in changes in regulatory policies and economic incentives and so they appear to have remained desirable aspects of CDM projects but on paper only. Also according to the National Sustainable Development criteria for the CDM projects, a project should not result in any obligation towards the investor country other than the CER authorization. In contrast to China who puts a lot of taxes on the sale of CERs, Pakistani government has given CDM projects a tax free environment for the transfer or sale of the CERs. The national policy towards CDM says,

> "No income tax or duty shall be levied on transfer/sale of CDM emissions credits (i.e., Certified Emission Reductions, Verified Emission Reductions etc). Similarly, credits shall be awarded fully to the project sponsors. Banks and other financial institutions shall also be encouraged to provide special incentives to the investors."

This has been done in an effort to attract more CDM investment in the country. Though the policy makers have tried to promote the CDM projects in Pakistan but this marginal indigenization of CDM in the country is not expected to bring any structural change to the industrial sector of Pakistan's economy. So the issues in the CDM functionality and performance even after the induction of such changes are likely to persist as in the other parts of the developing world. Many authors like Barbara et al., (2009) have argued that a sectoral package of policies and subsidies are needed in place of a focus on industrial projects.

5. Conclusion

As the first commitment period of the Kyoto Protocol ends in 2012, the role of Clean Development Mechanism (CDM) to help achieve climate change mitigation has been questioned in many ways. CDM was not only supposed to help North in complying with the emission reduction bindings set by the Kyoto Protocol but was also supposed to be a tool to bring and promote sustainable development in the South but unfortunately it has failed at both the frontiers. CDM does not contribute in reduction of the overall emissions of the globe and it has been proved a mode of incentivizing the big polluters. Some authors have described the role of carbon offsets as "accumulation by decarbonization" (Bumpus & Liverman, 2008). Moreover the sustainable development part of the CDM project is more of ideas of good intention and less of what actually is delivered on the ground. There is a lot of literature that has highlighted the contradictions in the structure and functioning of the CDM. There have been many scams reported in the literature about the CDM that highlight the contradictions in the additionality criteria of the CDM projects, manipulation of the baseline and selection of the "One" among many contrafactual baselines, leakages due to the CDM projects and gaming in the CDM projects. Pakistan being a Non Annex-1 country also aims to avail economic benefits through the CDM. There are 49 CDM projects in Pakistan. Pakistan has also set some institutions and policies to promote CDM in the country. Though Pakistan has a small industrial scale and is not a big player of CDM as India and China are but policy makers are busy in promoting

the CDM in the country. Their understanding of the CDM appears to be unaware of the critique on the CDM projects worldwide. The analysis of the Pakistan's CDM profile has revealed that the critique of the CDM worldwide also holds true in case of Pakistani CDM projects in many ways and the problems are likely to persist here as well. A trade off in climate mitigation and sustainable development has been found among big and small CDM projects and very few projects like small hydropower projects and cooking stoves projects really contribute to sustainable development. The additionality of many CDM projects in Pakistan could also be questioned as country is in the state of the energy crisis and industrialists are switching to more reliable and cheaper fuels for economic rather than environmental reasons. The skewed nature of CDM highlights itself in Pakistan as well. Policy makers and the general public should have a better understanding of this critique. A deep understanding of the issue of climate change and its mitigation is needed if Pakistan wants to be a part of a true and concrete effort to mitigate the climate change. This means taking steps on a development model involving a low carbon economy. It should be understood that climate change has not happened in a few years and is a result of the massive industrialization to which North has contributed the most and has not found itself capable of breaking with the energy intensive growth model it follows. The issue of climate change is deeply rooted in the politics of the power. The atmosphere has been used by the North as a sink for the products of fossil fuels and such development has disrupted the climate stability of the Holocene epoch. This is the reason why Kyoto protocol puts legal bindings on the North and not on the South. The principle of "Common but Differentiated responsibilities" has been devised and

still puts the North at the front in a battle to combat the climate change and puts the South in a position where they are given incentives in the form of CERs to follow the North in mitigating the climate change. But these efforts have been politicized since the day they were formulated. CDM was tailored to help North in meeting the emission reduction targets and makes South their service sector who are paid peanuts in return. Moreover the way in which these financial incentives are earned and who has the more right to accumulate these incentives is controversial as well as elaborated in the discussion earlier. Climate policy makers should understand that climate change mitigation needs a long term approach and it needs a structural change that could lead the economies to a low carbon development. CDM is a project based mechanism that has little to offer when it comes to bringing a structural change in the industries. There have been a few efforts to introduce a few sector based market mechanisms to address this issue but right now CDM lacks this sort of commitment and so is not likely to help in the efforts to mitigate climate change. A few people have also tried to make changes to the framework of CDM and they believe it could deliver if marginal changes are brought in the functioning and structure of the CDM but it should be understood that the market mechanisms are not an adequate approach for climate mitigation and its climate integrity can be questioned in many ways. This study draws attention to some of the broader issues and the more critical literature as well and highlights how the politics of power is depicted in the climate change mitigation issue. Those who have contributed creating the climate instability are given emission rights, quotas and are allocated property rights over the atmosphere which is a global common. While on the other hand, those who face the most

consequences of the climate instability are not only deprived of their rights to the atmosphere but are also engaged in the marginal efforts to mitigate the climate change which are unlikely to achieve the magnitude of required changes. In Pakistan, certain other carbon offset projects are being promoted as well that highlight the imposition of the North's agenda to bring the "Needed" changes to "mitigate" the climate changes. The policy makers should understand the broader political context of the issue and then make policies to promote a low carbon development in the country rather than follow a paradigm of development which appears to be failing in the North.

Appendices

Questionnaires

A) Consultants

1- How do you identify the Project proponent?
2- Where does a consultant's work start in a CDM project?
3- Are there any consultants registered with the UNFCCC EB as well?
4- What do you think is the capacity of Pakistan to attract the CDM investment?
5- How long does a project consultant take to make a PDD?
6- How the consultant acquires its fee and what does the amount of fee depend on?
7- When a consultant does calls for stakeholder meeting?
8- What is the benefit for the industrialists to engage in CDM?
9- In what aspects do the PDDs differ from the on ground situation?
10- For how many years project is said additional?
11- Is every new project an additional project and does it require new baseline methodology?
12- What aspects in the PDDs reflect the personal value judgments?
13- How a consultant does evaluate the sustainable development aspects of a CDM project?
14- How are the future emission calculated in a PDD?
15- What are the flaws in the CDM project cycle in Pakistan?
16- What is global carbon debt and how does the CDM addresses that?
17- Are the carbon markets a reliable approach to mitigate the climate change?
18- When do the consultants hold meeting with the stakeholders?

B) Designated National Authority

1) What is the capacity of Pakistan to earn from CDM projects and also contribute to sustainable development?
2) What does the DNA do to make aware of the CDM benefits to general public and industrialists in particular?
3) What do you think is the reason of Pakistan having a small number of CDM projects as compared to India, China and Brazil?
4) Do the DNAs charge any processing fee for national approval of the Project?
5) Do the DNAs report annually or biannually to the CDM EB?
6) Does the DNA recommend the project proponent of some DOEs to call for validation and verification?
7) Who bears the expenses of DNA in Pakistan?
8) Do the DNAs demand processing fee?
9) Do the DNAs send consultants to visit the proposed project site?
10) Are the criteria different for the National approval in case of Pakistan?
11) How effectively CDM addresses the climate change problem?
12) After the devolution of the Environment Ministry in Pakistan, who runs DNA?
13) What is the approximate FDI that CDM brings in the country?
14) In what aspects do the PDDs differ from the on ground situation?
15) What is the role of Environment Ministry in managing or monitoring the CDM projects?
16) Why the DNA in Pakistan is said to be a golden hen?
17) Does the DNA in Pakistan evaluate the project for Climate Change mitigation or sustainable development?
18) Does DNA acts as a rubber stamp for the project approval?
19) How often project gets rejected by EB after the approval of DNA?

C) DOEs (Designated Operational Entities)

1) What is the role of DOEs in the project cycle?
2) Who hires DOEs for validation and Monitoring?
3) In what form DOEs are paid and what does the fee depend on?
4) Is there any specific duration a DOE gets registered with UNFCCC EB?
5) Is there any registration fee or any specific criteria a DOE has to meet to come on the EB panel?
6) What are the major criteria that a DOE evaluates to validate a project?
7) Do the DNAs recommend the project proponents to apply for validation to certain DOEs?
8) How do the DOEs evaluate the PDDs and do they do on site monitoring?
9) If the EB rejects the project once it has been validated by the DOE, does the same DOE is called for validation of the edited project?
10) Does the description of the project differ from the project on the ground?
11) What are the common grounds of divergence from description?
12) Are the statements in PDDs ideas of good intention?
13) Are the environmental impact statements in PDDs ideas of good intention?
14) How are stakeholders identified and involved in the project activities?
15) How often project gets rejected by EB after the approval of DNA?
16) Does the DOEs charge for sending each monitoring report to the EB?
17) Are the monitoring reports submitted to governments and DOEs different?
18) How do you think CDM projects can help achieve sustainable development to countries like Pakistan?
19) How do the market mechanisms of carbon trading can address the climate debt issue?

D) Project Proponent

1- What was your motivation for starting a CDM project?

- ☐ Green image
- ☐ CDM benefits
- ☐ Commitment to reduce GHGs and mitigate climate change
- ☐ Help the local communities

2- How did you come to know about CDM?

- ☐ Other industries
- ☐ Carbon consultants
- ☐ Government
- ☐ Newspaper
- ☐ Other (Specify)

3- What benefits do you think can be extracted from CDM?

- ☐ Climate change mitigation
- ☐ Sustainable development
- ☐ Both
- ☐ None

4- What type of sustainable benefits does come from this project?

- ☐ Employment generation
- ☐ Health benefits
- ☐ Energy security
- ☐ Environmental benefits

5- How do you think your CDM project can help the country achieve sustainable development?

6- Who defines the sustainable development parameters in a CDM project in Pakistan?

- ☐ DNA
- ☐ Ministry of Environment
- ☐ UNFCCC
- ☐ Carbon consultant himself

7- At what stages of the project cycle are the transaction costs involved?

- ☐ Validation
- ☐ PDD making
- ☐ Implementation
- ☐ Monitoring
- ☐ Others(Please specify)

8- Are other industries of the same sector looking for CDM benefits?
9- Is the process of CDM an easy process to earn carbon credits?
10- What is the role of DNA in handling the project activity?
11- Does the DNA recommends or make suggestions on how to go ahead with the CDM project?
12- What is the benefit for the industrialists to engage in CDM?
13- How do you think the CDMs address the issue of climate change worldwide and in Pakistan in particular?
14- How your project is reducing the GHG emissions?
15- Are industrialists in Pakistan are aware of the CDM benefits?
16- Does the DNA holds seminars and workshops to make aware the industrialists about the benefits of CDM?
17- How is the project additional?

Bibliography

- Bachram, H. (2004). Climate fraud and carbon colonialism: the new trade in greenhouse gases. *Capitalism Nature Socialism,* 15 *(*4), 5-20.
- Barbara, H. (2009). Measuring emissions against an alternative future: A fundamental flaw in the structure of the CDM. *Iop Conference Series: Earth and Environmental Science, 6,* (23).
- Barbara, H., Malini R., Sujit K., (2009) Barriers to sugar mill cogeneration in India: Insights into the structure of post-2012 climate financing instruments. Climate and Development *1,* 66-81
- Bubalo L. K., (2010). CDM projects experience in Macedonia. In M. Montini (Ed.), Developing CDM Projects in the Western Balkans Legal and technical issues compared. (Part 2, 157-162). Dordrecht: Springer.
- Bumpus, A. G., (2011). The Matter of Carbon: Understanding the Materiality of tCOe in Carbon Offsets. *Antipode, 43* (3), 612-638.
- Bumpus A.G. and Liverman D.M., (2008). Accumulation by decarbonisation and the governance of carbon offsets. Economic Geography 84(2), 127-156.
- Burian, M. (2006). The Clean Development Mechanism, sustainable development and its assessment. Hamburg, Hamburgisches Welt-Wirtschafts-Archiv (HWWA). http://www.econstor.eu/dspace/handle/10419/32886.
- Callon, M. (2008). *Civilizing markets: Carbon trading between in vitro and in vivo experiments*. Accounting, Organizations and Society. http://hal-ensmp.archives-ouvertes.fr/hal-00422094.

- Callon, M. (1998) 'An Essay on Framing and Overflowing: Economic Externalities Revisited by Sociology', in M. Callon (ed) The Laws of the Markets. Oxford: Blackwell: 244–269.
- CDM FAQ: http://cdm.unfccc.int/faq/index.html, Accessed on 15th November, 2012
- Curnow, P., & Hodes, G. (2009). *Implementing CDM projects a guidebook to host country legal issues*. Roskilde, Denmark, UNEP Risoe Centre. http://www.cd4cdm.org/Publications/ImplementingCDM_GuidebookHostCountryLegalIssues.pdf.
- De, L. T., Tin, P., Iyadomi, K., Santos, S., & McIntosh, B. (2009). Clean Development Mechanism and Least Developed Countries: Changing the Rules for Greater Participation. *Journal of Environment & Development,* 18 *(*4), 436-452.
- Den, E. M., Roelfsema, M., Slingerland, S. (2010). Dealing with surplus emissions in the climate negotiations after Copenhagen: What are the options for compromise?.*Energy Policy, 38 (*11), 6615-6628.
- Docena, H. (2010). Costly dirty money-making schemes: The clean development mechanism projects in the Philippines: Focus on the Global South, Philippines.
- Down to Earth, Newest Biggest Deal. CSE, 15 Nov 2005
- Drew, J. M., & Drew, M. E. (2010). Establishing additionality: Fraud vulnerabilities in the clean development mechanism. *Accounting Research Journal, 23* (3), 243-253.

- Ellis, J., Winkler, H., Corfee-Morlot, J., & Gagnon-Lebrun, F. (2007). CDM: Taking stock and looking forward. *Energy Policy,* 35 *(*1), 15.
- Evans, B. J. (2009). North-south relations under the clean development mechanism: bridging the divide or widening the gap? Thesis (M.A.)--Dalhousie University, 2009.
- Fenhann, J. (2004). *CDM information and guidebook*. Roskilde, Denmark: UNEP Risoe Centre on Energy, Climate, and Sustainable Development.
- Figueres, C., & Streck, C. (2009). The Evolution of the CDM in a Post-2012 Climate Agreement. *Journal of Environment & Development,* 18 *(*3), 227-247.
- Friberg, L. (2009). Varieties of carbon governance: The clean development mechanism in Brazil-a success story challenged. *Journal of Environment and Development, 18 (*4), 395-424.
- Ghosh S. (2007). Aid, the Clean Development Mechanism and Some Open Questions, *Development Today* (Oslo)
- GOP, (2006). National Operational Strategy, Government of Pakistan, Ministry of Environment.
- Governance of Clean Development Project. (2011). Governing Clean Development: What Have We Learnt? Norwich and Brighton, UK: University of East Anglia and University of Sussex.
- Gupta, S. (2003). India, CDM and Kyoto Protocol. *Economic and Political Weekly, 38*(41), 4292–4298.

- Huang, Y., & Barker, T. (2012). The Clean Development Mechanism and low carbon development: A panel data analysis. *Energy Economics, 34 (*4), 1033-1040.

- Huber, M. (2009). Energizing historical materialism: Fossil fuels, space and the capitalist mode of production. *Geoforum.* 40, 105-115.
- Intergovernmental Panel on Climate Change. (2007). *IPCC fourth assessment report: Climate change 2007*. Geneva: Intergovernmental Panel on Climate Change.
- IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Karp, L., & Liu, X. (2001). The clean development mechanism and its controversies. *Advances in the Economics of Environmental Resources.* 3, 265.
- Khor, M, (2010). The equitable sharing of atmospheric and development space: some critical aspects, South Centre.
- Lohmann, L. (2008). Chronicle of a disaster foretold: REDD with carbon trading. *The Corner House.* Retrieved Nov 18, 2011, from www.thecornerhouse.org.uk/sites/thecornerhouse.../Chronicle2.pdf (Accessed on 12th December, 2012)

- Lohmann, L., (2006). Carbon trading: A critical conversation on climate change, privatisation and power / Uppsala, Sweden: Dag Hammarskjöld Foundation.
- McGee W. R. & Block E. W. (1994). Pollution Trading Permits as a Form of Market Socialism and the Search for a Real Market Solution to Environmental Pollution, 6 Fordham Envtl. L.J. 51-77.
- Mendelsohn, Robert, Dinar, Ariel, & Williams, Larry. (2006). The distributional impact of climate change on rich and poor countries. *Environment and Development Economics, 11*(2), 159-178.
- Nygard, J. (2006). Clean development mechanism in China: Taking a proactive and sustainable approach. Washington, D.C: World Bank.
- Olsen, K. R., & Painuly, J. P. (2002). The Clean Development Mechanism: A Bane or a Boon for Developing Countries? *International Environmental Agreements: Politics, Law and Economics,* 2 *(*3), 237-260.
- Pakistan economic survey 2007 – 08, (2007). Islamabad, Pakistan: Economic Adviser's Wing.
- Paulsson, E. (2009). A Review of the CDM Literature: From Fine-Tuning to Critical Scrutiny? *International Environmental Agreements: Politics, Law and Economics, 9* (1), 63-80.
- Pedersen, A. (2008). Exploring the clean development mechanism: Malaysian case study. *Waste Management and Research,* 26 *(*1), 111-114.

- Press release of CDM Watch, UN Under Pressure to Halt Gaming and Abuse of CDM (www.cdm-watch.org/.../hfc-23_press-release_gaming-and-abuse-of-c**..**) retrieved on 28th August, 2012

- Repetto R., (2001). The Clean Development Mechanism: Institutional Breakthrough or Institutional Nightmare?, Policy Sciences, 34, 303-327
- Rindefjèall, T., Lund, E., &Stripple, J. (2011). Wine, fruit, and emission reductions: the CDM as development strategy in Chile. *International Environmental Agreements: Politics, Law and Economics,* 11 *(*1), 7-22.

- Rosendahl, K. E., & Strand, J. (2009). *Carbon leakage from the clean development mechanism*. Oslo, Statistics Norway, Research Dep. http://www.ssb.no/publikasjoner/DP/pdf/dp591.pdf.

- Rowlands, I. (2001). The Kyoto Protocol's 'Clean Development Mechanism': a sustainability assessment. *Third World Quarterly,* 22 *(*5), 795-811.
- Schroeder, M. (2009). Varieties of Carbon Governance: Utilizing the Clean Development Mechanism for Chinese Priorities. *The Journal of Environment & Development*, 18 *(*4), 371-394.
- Schneider, L.; Lazarus, M., & Kollmuss, A (2010). "Industrial N2O Projects Under the CDM: Adipic Acid - A Case of Carbon Leakage?". *Stockholm Environment Institute Working Paper WP-US-1006*.
- Sirohi, S. (2007). CDM: Is it a win win strategy for rural poverty alleviation in India?,*Climatic Change,* 84 *(*1), 91-110.

- Smith, K. (2007). *The carbon neutral myth: Offset indulgences for your climate sins*. Amsterdam, the Netherlands: Carbon Trade Watch.

- Streck, C. (2004). New Partnerships in Global Environmental Policy: The Clean Development Mechanism. *The Journal of Environment & Development*, 13 *(*3), 295-322.

- Sutter, C., & Parreano, J. (2007). Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. *Climatic Change, 84* (1), 75-90.

- *SWECO Groner, (*2007*), CDM in Brazil*. A *SWOT study* of the *Clean Development Mechanism in Brazil*. Strengths, Weaknesses, Opportunities and Threats, Retrieved Nov 18, 2011, from (www.ieila.org/documents/CDMinBrazil_SWOT.pdf)

- UNEP Risoe Centre Statistics, April 2012, www.cdmpipeline.org/publications/CDMPipeline.xlsx, Accessed on 1st April, 2012

- United Nations Framework Convention on Climate Change. (2002). *A guide to the Climate Change Convention process*. Bonn: United Nations Framework Convention on Climate Change, Climate Change Secretariat.

- Vlachou, A., & Konstantinidis, C. (2010). Climate change: The political economy of Kyoto flexible mechanisms. *Review of Radical Political Economics*, 42 *(*1), 32-49.

- Wang Q., Zheng X., (2010), A Critical Study Of Carbon Emission Trading Market In China", Business And Management 2010, Selected papers. Vilnius, 2010, http://www.vgtu.lt/en/editions/proceedings

- Wara, M., (2008). Measuring the Clean Development Mechanism's Performance and Potential. *UCLA. Law Review*, *55(*6), 1759-1803.

- Wara, M., and Victor, D., (2008). A Realistic Policy on International Carbon Offsets, *Working Paper #74*, Program on Energy and Sustainable Development, Stanford University.

- www.cdmpipeline.org/publications/CDMPipeline.xlsx (Accessed on 10th April, 2012)

- Yan, K., (2011). WikiLeaks Cable Highlights High Level CDM Scam in India, International Rivers