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"LINKAGE BETWEEN CAP AND TRADE SCHEME AND PROJECT BASED MECHANISM"

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ABBREVIATIONS

AAUs	Assigned Ammount Units
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CO2	Carbon Dioxide
ERUs	Emission Reduction Units
ETS	Emission Trading Scheme
EU	European Union
EU ETS	European Union's Emission Trading Scheme
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implemantation
MS	Member States
RGGI	Regional Greenhouse Gas Initiative
UNFCCC	United Nations Framework Convention on Climate Change
CO2-e(q)	Carbon Dioxide equivalent

1. INTRODUCTION

The international environmental treaty Kyoto Protocol was signed in 1997 and came into force in 2005, which aims at reducing green house gases (GHG) emissions and its impact in Global Warming. The Protocol introduced two policy instruments in order to achieve these targets cost effectively; project based mechanism and cap-and-trade. While these mechanisms can be used separately to achieve the environmental goal of the Kyoto Protocol cost effectively, a possible linkage between them may provide even more cost effective GHG reduction.

This study investigates the possible linkages of these two instruments. While the economic benefits of linkage makes it desirable in terms of businesses, the possible negative issues, such as design and environmental issues, creates an opposing arguments. In order to analyze the positive and negative sides of the linkage, this paper first elaborates the theoretical background of these two mechanisms. Moreover, this study takes advantage of the current linkage implications to study the significant benefits and disadvantages of the linkage.

The first policy instrument introduced by Kyoto Protocol is International Emissions Trading, which is also called cap-and-trade. International emission trading (Article 17) is a market based instrument. While an administration caps the total emission allowances and distribute to participants, they are allowed to trade their emission allowances. In case the participants do not exceed their total allowances, the mechanism reaches its environmental target.

Other policy instrument is called project based mechanism. Clean Development Mechanism (CDM) and Joint Implementation (JI) are the project based mechanisms introduced by the Kyoto Protocol. These mechanisms allow polluters to implement emission reduction project activities outside of their installations as an alternative to more expensive reductions in their own sources. These three mechanisms are also known as “flexibility mechanisms” (flexible mechanisms or Kyoto mechanisms).

This paper is divided into six sections. After this Introduction part in second section, the theoretical background of cap and trade scheme and project based mechanisms are

explained. In section three, the current major cap and trade schemes and project based mechanisms are investigated. Section 4 includes the definition of linkage, types of linkage, the benefits of linkage between cap and trade scheme and project based mechanisms. In the rest part of this section, the significant issues related with linkage is shown. In section 5, the linkage is examined practically. The current largest cap and trade scheme, European Union Emissions Trading Scheme (EU ETS), and its linking to Clean Development Mechanism and Joint Implementation is studied. Last section is considered as a summarize of all topics explained through this study.

"Carbon, the currency of a new world order" (Paul Kelly, *The Australian*, 21 March 2007)

2. CATEGORIES OF EMISSIONS TRADING SYSTEMS

Generally there are three different methods to reduce the effects of negative externalities. These methods are i) Command and Control or Direct Regulations, ii) Emissions Trading and iii) Emission tax. First method, Command and Control, can be applied by an authority. The last two methods are market based approaches. In theory, emissions trading and emission tax methods are considered as cost effective approaches to reduce environmental pollution.

Although Emissions Trading is usually used in order to define cap and trade system, this term refers to three different types of trading programs; Emission Reductions, Cap and Trade, and Emission Rate Averaging (see table 1). As this paper aims to investigate the issues on linkage between cap and trade schemes and emission reduction system, I only introduce these two approaches.

Definitions of Various Emissions Trading Schemes

	Cap and Trade	Rate-based trading	Project-based credit
Application	Applies to all emissions	Applies to emission relative to some defined standard (e.g. emission per unit of output)	Applies to emission reductions below defined baseline
Allocation method	Allowances are allocated by the regulatory authority	Credits are generated when a source reduces its emissions below the standard	Credits are generated when a source reduces its emissions below an agreed baseline
Market dynamic	Participants (and possibly outsiders) can buy and sell allowances	Participation (and possibly outsiders) can buy and sell allowances	Project hosts sell to those participants obliged to purchase external reductions

Coverage/participation	Participation in the program is mandatory although trading is not	Participation in the program is usually mandatory- sources must meet existing standards	Participation in the program is voluntary for project hosts
Examples	Article 17 of the Kyoto Protocol; US SO_2 allowances program	US phase-out of lead in gasoline	Clean Development Mechanism Joint Implementation

Table 1: Definitions of Various Emissions Trading Schemes[1]

A. CAP AND TRADE SCHEME

In economics, externality of an economic activity (spillover) is an impact on a third party. If this impact provides an advantage for the third party, it is called positive externality (external benefit), on the other hand, if it is a cost that is imposed on the third parties, it is called negative externality. Environmental pollution is one of the most important example of the negative externalities. Negative externalities can be created through either the consumption or production of a good.

The British economist Arthur Cecil Pigou, who developed the concept of economic externalities, recommended a tax to correct the negative externalities, in "The Economics of Welfare" (1920). In this paper Pigou first describes "the marginal social net product" and "the marginal private net product" as follows;

> *"The marginal social net product* is the total net product of physical things or objective services due to the marginal increment of resources in any given use or place, no matter to whom any part of this product may accrue. It might happen, for example, …, that costs are thrown upon people not directly concerned, through, say, uncompensated damage done to surrounding woods by

[1] Adopted from "Act Locally Trade Globally", 2005 OECD/IEA

> sparks from railway engines. All such effects must be included-some of them positive, others negative elements-in reckoning up the social net product of the marginal increment of any volume of resources turned into any use or place. . . . *The marginal private net product* is that part of the total net product of physical things or objective services due to the marginal increment of resources in any given use or place which accrues in the first instance-i.e. prior to sale-to the person responsible for investing resources there. In some conditions this is equal to, in some it is greater than, in others it is less than the marginal social net product (Pigou 1962, pp. 134-35)"

Further Pigou explains that in case these two concepts are not equal a tax or subsidy, depending on the sign of the difference, can be implemented to minimize the difference. This tax, which is levied on a market activity that generates negative externalities, internalizes the externalities inside the market (Groosman, 1999).

Later in 1960, Nobel laureate English economist Ronald Coase argues in his paper, "The Problem of Social Cost", that the Pigou's approach is narrow and should be changed in order to achieve a cost effective pollution reduction. While Pigou sees the environmental externalities as the consequence of market failures, Coase thinks that they rather depend on the failure of regulation. And he proposes an approach involved refocusing on property rights:

> "If factors of production are thought of as rights, it becomes easier to understand that the right to do something which has a harmful effect (such as the creation of smoke, noise, smells, etc.) is also a factor of production...The cost of exercising a right (of using a factor of production) is always the loss which is suffered elsewhere in consequence of the exercise of that right-the inability to cross land to park a car, to build a house, to

enjoy a view, to have peace and quiet, or to breathe clean air (Coase 1960, p.22-23) ."

Basically, Coase argues that by making these property rights explicit and transferable, the market could play a substantial role in emissions reduction (Tietenberg 2006;p.3). After introduction of these main concepts, Professor John H. Dales popularized the concept of cap and trade, which is in practice called emissions trading scheme, through showing applicability of the theory on water pollution in 1968. Finally in 1972, Professor Montgomery formulized the cap and trade concept.

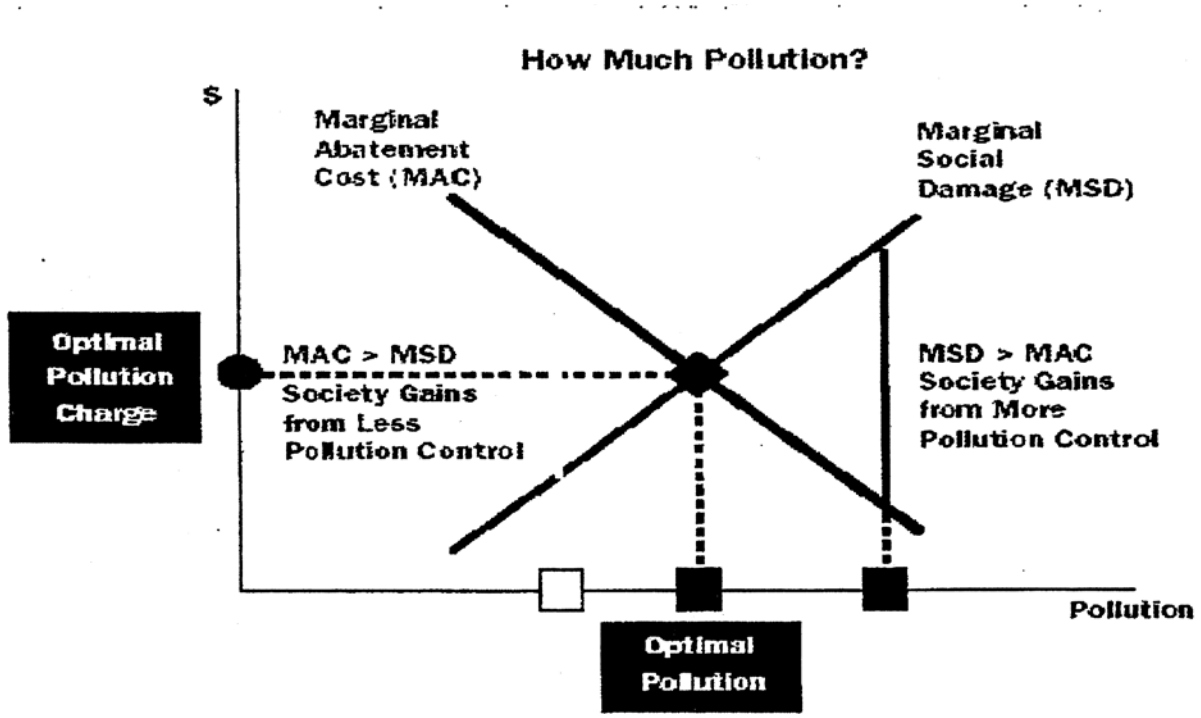
Cap and Trade Scheme is a cost effective system, in which there is an upper limit (cap) for aggregate emissions and this aggregate emissions is distributed to participants. Participants are allowed to trade their own emissions allowances. Main idea behind allowing trade is that a participant, which can reduce its one unit emission under the carbon price of one unit determined in carbon markets, can sell its over allowances to another participant, which has a higher marginal abatement cost. Seller can make profit by doing so and buyer can avoid paying higher abatement cost. In doing so, the system allows participants to sell and buy (trade) allowances under an upper limit (cap).

Tietenberg states that the appeal of emissions trading comes from its ability to achieve a prespecified target at minimum cost even in the absence of any regulator information on control costs. As long as marginal abatement costs (MAC) differ, incentives for trade exist. High marginal abatement cost firms buy permits from low marginal cost firms until the market clears and the demand for permits equals the fixed supply (Tietenberg 2008, The Evolution of Emissions Trading).

In order to achieve an efficient (a cost effective) emissions trading system there should be a strong and a good defined pollution allowance market. This market is based on the idea that participants of the market have different marginal abatement costs[2] (MAC). Some participants have rather low marginal abatement cost, some have rather high MAC. Entities (pollutants) pollute the environment during their production activities. While compensating for polluting the environment is more cost effective for some entities (entities

[2] Pollution abatement (control) cost represent direct monetary expenditures by a society for the purpose of procuring resources to improve environmental quality or to control pollution (Hussen 2000).

with high MAC), reducing pollution is more cost effective for others (entities with low MAC). Emissions trading is an efficient method in reducing environmental pollution considering these different structures of the entities. From society's prospect, the optimal level of pollution emission is attained when the marginal damage cost[3] (MDC) is equal to the marginal abatement cost, and hence the total disposal cost is minimized when this condition is met (Hussen 2000).

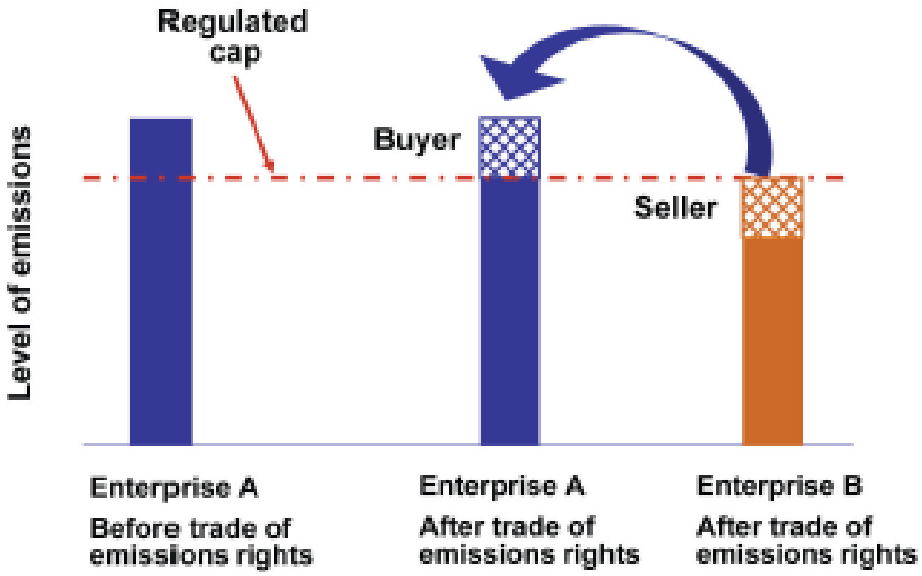


Graph 1: Optimal Level of Pollution

In a cap and trade system, every participant is allowed to emit a limited value of emission. This is simply pollution right for participants. A pollution right under a cap and trade system may consist of a unit (pound, ton, etc.) of a specific pollutant. The authority of cap and trade system determines the total allowable permits and decides the distribution mechanism (auction, grandfathering, update). As I stated above the ideal limit of total allowable permits should be set by considering both the abatement and damage costs. In practice, however, accurate estimates of damage and abatement costs may not be readily available because they may involve astronomically high transaction costs (Hussen 2000). Hence, the authorities determine number of total allowable permits with the best available information on both abatement cost and damage cost they have. The success of this type of

[3] The total monetary value of all the various damages resulting from the discharge of untreated waste into the environment is referred to as pollution damage (external) cost (Hussen 2000).

systems depend on the total amount of pollution. Therefore, the authorities should be very careful while they are deciding the total allowable permits and should update with every new available information.



Graph 2:Illustration of Cap and Trade Scheme

This is a simple illustration of how cap and trade scheme works. Basically, cap and trade scheme takes advantage of different MAC levels among installations. Blue line represents regulated cap in scheme. Let's assume there are simply two enterprises under cap and trade scheme and they both have equal air pollution allowances. Enterprise A has a over emission level than permitted by scheme before trade of emissions right and abating its air pollution costs to enterprise A higher than allowance price. Enterprise B has a lower amount of emissions than permitted by scheme and it can reduce its air pollution with a low cost. In this case, enterprise B sells its over allowances to enterprise A. At the end of this transaction, both enterprises are within their caps.

The success of the cap and trade systems depends on the design and implementation issues. The system can achieve its potential cost-reduction and environmental compliance targets, in case of a proper designed process. First step of this process is, as mentioned above, determining the total allowable permit number. After determining the total permit number the design issues should be specified properly. Design and implementation issues, which are explained below, can be ordered as follows; Emissions and sectors covered, allocation of initial allowances, banking/borrowing, monitoring, accounting and reporting, offsets, linkages to other cap and trade systems, enforcement and compliance.

I. COVERED EMISSION GASES AND SECTORS

Initially a cap and trade system should decide which GHGs are capped under the system as well as which sectors are covered by the scheme. Measuring emissions in some sectors are harder than others and consequently, it may require a higher monitoring cost for these sectors. Typically, cap and trade schemes cover energy sectors and carbon intensive sectors. The more sector and gas covered by scheme, the more liquidity of the allowances on market. Hence, firms can comply with the scheme's emission reduction target cost effectively. Authority should also define the threshold of the firm's size included in cap and trade system. Buchner et al. state "the inclusion of small installations was not worth it" (Buchner et al. 2006). They explain that while a very larger number of small installations have a very small contribution to the system's total reduction, they have a great transaction cost[4]. While cap and trade systems can define the threshold of the firm size and covered sectors, it may allow to *opt in* to other installations to encourage emission reductions and by allowing opt in system can provide more liquidity on permit market. Some systems also may leave open the option *opt-out* for participants.

II. ALLOCATION OF INITIAL ALLOWANCES

Once the total permit is defined, there are three main methods to allocate initial allowances; Grandfathering, Auction, and Update. Allowance process is very important for a cap trade system in context of program's success and it should be fair. While participants can gain unfair profits through over allowances, this can also affect the environmental effect of the system. While systems can use only one of the following approaches, it may use also a hybrid distribution.

Grandfathering method is based on the past emission information of relevant installation. Authority collects historical emissions levels, output levels, or carbon intensity information on all installations and give to relevant installation a calculated amount of allowance without a charge. This method, basically favors the existing major polluters. Implementing this method can give incentive to the entities, which are unwilling to attend the system or have concerns about system. While this method favors participants,

[4] for further reading see Buchner et. al. (2006) and Schleich and Betz (2004)

implementing this method costs to authority an additional amount and also time and effort in making the allocation.

In *Auction* method authority sells the available allowances to the highest bidder. First advantage of this method is that with this method authority can avoid the cost of developing and implementing a method for allocation of allowances. Another advantage is that allowances are at the same distance to all participants, all participants can attend to auctions. And the most important advantage is that authority can make profit through auctions, which can be used for other public purposes; to reduce other taxes, cut the deficit, fund R&D programs, and/or compensate industries, workers, and consumers who bear a disproportionate share of regulatory costs[5]. In the economics literature there is a strong agreement that implementing auction method instead of grandfathering is more profitable and useful.

Updating method is based on arranging allocation allowances according to new information over time. Allocations are not fixed for all time based on some historic period but changed periodically as old units are shut down and new ones brought into service (Harrison and Radov 2002).

III. BANKING AND BORROWING

The *banking* component of the cap and trade system establishes procedures that allow firms to store emission reduction credits or allowances for later use in the system (Tietenberg 1985). As Ellerman et al. state "The experience with the programs indicates that inter-temporal trading has been important. The form that inter-temporal trading most often takes is credit or allowance banking, i.e., reducing emissions early and accumulating credits or allowances that can be used for compliance in future periods. Banking improves environmental performance and reduces cumulative compliance costs" (Ellerman and Harrison 2003).

Borrowing is another option to lower the cap and trade system's short term cost for participants. Participants may emit more than they are allowed in a given year and they can borrow their allowances from future years to comply with the system's target.

[5] Allocation Allowances in a Greenhouse Gas Trading System, National Commission on Energy Policy

IV. MONITORING, ACCOUNTING AND REPORTING

Monitoring consists of two main steps. In first step, actual emissions of entities (participants) should be measured (at least to be estimated) by techniques, devices, instruments, and methods. Then these measured (or estimated) emissions have to be reported to authority.

The process under term *accounting* defined is that the distributed allowances are traded between participants, and in order to detect non-compliance these allowances should be registered and the authority has to make sure that each participant's emissions does not exceed allowed allowances.

Reporting includes monitoring and accounting processes. A loose monitoring, accounting and reporting assessment risks the cap and trade system's economic and environmental effect.

The crucial issues on reliable cap and trade system are these monitoring, accounting and reporting processes. In order to achieve a confidential cap and trade system both for public and business there should be a thorough monitoring and reporting assessment. As a cumulative inference from all cap and trade systems established till today, the requirements are as follows in order to design a successful cap and trade system;

- registration of the ultimate owner of allowances or credits
- independent monitoring of emissions from a facility
- reporting of emissions to a central authority over a given period
- verification of the level of emissions and confirmation of reductions (King, 2008).

V. ENFORCEMENT AND COMPLIANCE

Cap and Trade systems has to define the targets (i.e. fixed, indexed) of the scheme as well as the penalty in case non-compliance to make a reliable system and to force the participants to comply with system's target. The authority must be able to enforce compliance and thus to penalize or sanction participants for misreporting or emitting in excess of their permit holding (Peterson 2003). The penalty can be a defined amount per

over emitted emissions, or paying back subsidies, or even can be prison sentence for authorities of participant entity's. In order to express the significance of this process Tietenberg (2004) puts it; "regardless of how well any tradable permit system is designed, non-compliance can prevent attainment of its economic, social and environmental objectives".

VI. OFFSETS

An offset is a reduction in air pollution from sources that are not subject to the cap and trade system's border. Most of the cap and trade systems include offset option to their system, which provides many sources of low cost reductions and hence significantly reducing the overall cost of achieving an emissions reduction target. Although it can provide many opportunities to participants there are discussions about offset programs in the context of measure difficulties. Emission reduction credit system is explained in more detail in the following topic (Project-based Mechanism).

VII. LINKING TO OTHER EMISSION REDUCTION SYSTEMS

Linkages among different cap and trade systems may provide participants more low-cost reduction options. Also cap and trade systems can be linked with project based mechanisms. Essentially, linking can provide low-cost opportunity, more allowances on market, and more efficient market structure. Establishing an efficient linking between different designed systems requires a preliminary study. Different types of linkages, their benefits and issues are discussed in Section 4.

This design issues has to be clearly defined by regulatory authorities of cap and trade programs in order to instruct a reliable, environmentally and economically effective system. There are two main approaches while designing cap and trade systems; Upstream and Downstream regulations. *Upstream cap and trade system* implies a cap and trade , which is implemented where carbon dioxide enters the economy. This implementation could enhance economic efficiency and reduce the associated administrative burdens. *Downstream cap and trade* implies a cap and trade system, which is implemented where carbon dioxide emitted. While regulatory authority may decide to implement only one of these regulations, it can also implement a hybrid model.

How do companies benefit from emissions trading?

Let's say that companies A and B both emit 100,000 tonnes of CO_2 per year. The government gives each of them 95,000 emission allowances. One allowance represents the right to emit 1 tonne of CO_2. So, neither company is fully covered for its emissions. At the end of each year, the companies have to surrender a number of allowances corresponding to their actual emissions during the year. Companies A and B both have to cover 5,000 tonnes of CO_2, and they have two ways of doing this. They can either reduce their emissions by 5,000 tonnes, or purchase 5,000 allowances in the market. In order to decide which option to pursue, they will compare the costs of reducing their emissions by 5,000 tonnes with the market price for allowances. For the sake of the example, let's say that the allowance market price is € 10 per tonne of CO_2. Company A's reduction costs are € 5 (i.e. lower than the market price). Company A will reduce its emissions, because it is cheaper than buying allowances. Company A may even reduce its emissions by more than 5,000 tonnes, say 10,000 tonnes. For Company B, the situation may be the opposite: its reduction costs are € 15 (i.e. higher than the market price) so it will prefer to buy allowances instead of reducing emissions. Company A spends € 50,000 on reducing 10,000 tonnes at a cost of € 5 per tonne and receives € 50,000 from selling 5,000 tonnes at a price of € 10. So Company A fully offsets its emission reduction costs by selling allowances, whereas without the Emissions Trading Scheme it would have had a net cost of € 25,000 to bear. Company B spends € 50,000 on buying 5,000 tonnes at a price of € 10. In the absence of the flexibility provided by the Emissions Trading Scheme, company B would have had to spend € 75,000. Since only a company that has low reduction costs and therefore has chosen to reduce its emissions, like Company A, is able to sell, the allowances that Company B buys represent a reduction of emissions, even if Company B did not reduce emissions itself.

Figure 1: Benefit of Cap and Trade Scheme[6]

B. PROJECT BASED MECHANISM

A widely used instrument in reducing GHG emissions is emission reduction credit system, which is also called as project-based mechanism (PBM) (Egan and Seidenberg 2009). Project-based mechanism refers to a low-cost method to reduce emissions below an agreed baseline in order to generate tradable emission credits. Typically, project-based mechanism is implemented voluntarily and only contribute to the rise of the supply of credits. A key difference between project-based mechanism and cap and trade scheme is that the latter

[6] EU Commission MEMO/06/452, Questions and Answers on Emissions Trading and National Allocation Plans for 2008 to 2012, Brussels 29 November 2006

generate both a demand and supply for emission units, whereas project-based mechanism generate only a supply of credits (Bosi and Bygrave, 2004). Hence, project-based mechanism has to be linked to another emission reduction instrument.

The effect of GHG's in atmosphere is same regardless of where they are. Considering this fact, project-based mechanism has a significant impact in favor of environment. Beside this, a well defined and healthy operating PBM has many potential to increase; the economic efficiency of meeting participants of project's emissions targets, stimulate to technology transfer, and sustainable development in the developing countries/regions.

While a project is occurring, there are mainly two sides of the project. The country, where emission reduction project is carried out, is called as "host-country", and the other participant, which supports project financially, is called as "investor country or party". The number of investor country/party in a single project can be more than one. Broadly, the types of projects can be categorized into five groups as follows; bio-sequestration, industrial gases, methane, energy efficiency, and renewable energy projects.

In case a project is verified as better than the baseline, and certified, the corresponding emission reduction credits of this project's performance will be issued and can be traded. The success of PBM depends highly on clear technical and methodological rules and administrative process that ensures emission credits are awarded to projects in a fair, consistent, and transparent manner (Kartha et al. 2002). Especially two concepts should be well defined by regulatory authority in order to ensure a successful (fair and reliable) emission reduction, baseline and additionality. Baseline is one of the biggest challenge for a PBM. Emission baselines are the best estimates (calculated levels with the best information accessible) or convention for the situation what would have occurred in the absence of a project. To avoid a misjudgment, which can reduce the potential positive environmental and economic impact of PBM, the baseline has to be defined clearly and accurately.

In comparison with cap and trade scheme, PBM activities have greater transaction costs for entities. In a PBM process, high transaction costs emerge in processes, information requirements for project, preparation of project as well as approval of project before a tradable emission reduction credit can take place. These transaction costs, however, can be reduced through a well pre-defined baseline, and increased experience. Project-based

mechanism also requires administrative cost, because projects has to be approved by a regulatory authority and total costs of this approval issue relies on how many project-based activities are implemented (Blyth and Bygrave, 2004). Another difference with cap and trade scheme is that while including medium and small installations under a cap and trade scheme is not feasible, project based activities can be implemented to these installations easily.

While PBM activities can be implemented to earn tradable emission credits, they may also be implemented without any tradable credits earning concern. Organizations or companies, which have environmental concerns or want to create a socially responsible company/organization image, may buy the credits from PBM activities an equivalent level to their emissions and hence, they may neutralize their carbon footprints through a PBM activity. This process is called as carbon neutrality or having a net zero carbon footprint.

As stated above PBM activities should be supplementary to another emission reduction instrument, hence there are two main application methods for governments. Governments either can buy directly international emission reduction credits in order to comply with its GHG target or can choose to allow entities to use the international emission reduction credits to meet their GHG obligations.

In order to comprehend clearly the aim of this study , which explains issues associated with linking project-based mechanism with cap and trade scheme, the most important concepts related to project based mechanism should be elaborated, namely baseline, additionality, permanence, leakage, and project boundaries.

I. BASELINE

During monitoring process of a PBM activity, the biggest challenge is baseline issue. In order to earn tradable credits as a result of a PBM activity, the activity should satisfy the necessary requirements. To prove a project's emission reduction, emission baselines should be determined. The hypothetical case -what would happen if the project has not been implemented- is compared against the actual case, which is the case project is implemented, and if the actual emissions from project is lower than the baseline, the project is considered to contribute additionally and can be used to generate tradable emission credits. Difficulty of determining baseline arises from the uncertainties about future. GHG emissions hinge especially on economic growth, population growth, international fuel prices, technological

innovation, the development of lifestyle patterns, and so forth. Therefore, for the future data using past trends of GHG emissions is not a sufficient method.

Kartha and Lazarus state that systematic error in baseline estimation could result in a variety of undesirable economic and environmental outcomes. First one is that high (lax) baselines will increase global emissions, since excess credits will enable increased emissions without truly compensating emissions reductions and also this might cause undermining the credibility of credit trading and secondly, low (stringently) baselines will reduce crediting and the economic incentive for GHG mitigation projects, and also reduce the positive impacts of PBM activities (Kartha and Lazarus, 2002).

Broadly, there are three main baseline approaches, project-specific, multi-project and hybrid. Despite they are distinct in theory, in practice it can be difficult to label. First approach, Project specific baselines, is a bottom-up approach and relatively data intensive. Baselines are determined on a case-by-case basis, with project-specific measurements or assumptions for all key parameters (Laurikka, 2002). Admittedly, this method is relatively costly and time consuming, because of the difficulty of gathering information. The alternative approach is called as multi-project baselines[7], which is a top-down approach. This method uses the aggregated data from the region the project is undertaken to determine a baseline. The combination of the two approaches is called a hybrid baseline, which is designed for the projects that neither fit project specific baseline approach nor multi-project baseline approach. As this method has characteristics from both approaches, it is more aggregate than project specific baselines and less aggregate than multi-project baselines. Because these methods' results differ, Ellis and Bosi emphasizes "the choice of a baseline methodology can significantly affect the size of the emissions benefits that are derived from a project (Ellis and Bosi, 2000)".

[7] This method is also called as performance-standard, benchmarking or regional baseline.

Baseline Approach	Description	Calculation of annual Credits
Project Specific	Baseline determined on a case-by-case basis, with project specific measurements or assumptions for key parameters	Difference between measured project emissions and estimated baseline emissions
Multi Project (various designs)		
-technology level	Baseline emissions are specified per technology, e.g. on a rate basis such as t CO_2/GWh.	Difference between measured project emissions and inferred baseline emissions.
-(sub-)sector level	Baseline is equivalent to a "performance standard" (or intensity indicator) that is aggregated at a certain level (e.g. sub-sector X in country Y, or sector P in country region Q).	Projects/activities would only qualify for credits if emissions (per unit activity or output) were under the performance between project emissions and the performance standard
Hybrid	Baseline determined in a hybrid fashion, with some key parameters project-specific, and others standardized (the number and level of the standardized parameters will vary for each different project category)	Difference between measured project emissions and estimated baseline emissions

Table 2: Types of Emission Baseline Approaches

To build a fair, consistent and good working mechanism emission baselines should be standardized. One issue considering baseline standardization is that whether baseline should be fixed at the beginning of the project or re-estimated over the life of the project. If emission baselines are fixed at the beginning of the project for the lifetime of project, it is called as static, if it is revised during the project, than it is called as dynamic. Static baseline is more predictable, hence it has less uncertainty about the number of credits can be generated through project and it gives great incentives for investors with this feature. Also, this method has a lower transaction, monitoring and reporting costs comparatively to dynamic method, because static baseline requires only one estimate of a baseline. On the other hand, dynamic method can give more accurate results. At certain intervals during the project's lifetime, dynamic baseline should be re-estimated, also re-reported and therefore, the expected credits should be re-estimated. Despite it can ensure better results than static baseline, its inherent structure causes higher transaction costs.

Emission reductions from a project for each period *j* during the baseline lifetime can be obtained from:

$$\_E_{net} = \_E_{gross} - E_{leakage} = (E_b - E_p) - E_{leakage} = (e_b x_b - e_p x_p) - E_{leakage} \quad (1)$$

where $\_E_{net}$ is the net reduction of GHG emissions (in tCO_2 equivalent) taking into account the gross emission reduction within the project boundary ($\_E_{gross}$) and the leakage of emissions outside of the project boundary as a result of the project activities ($E_{leakage}$). E_b is the baseline emission level (in tCO_2 equivalent) within the project boundary, E_p the project emissions within the project boundary, e_b the emission intensity (e.g. in tCO_2 equivalent/GWh) and x_b is the activity level (e.g. in GWh) in the baseline case. Correspondingly, e_p is the project emission intensity and x_p is the project activity level after the project implementation.

In Eq. (1), the unit of the baseline (E_b) is tonnes of GHG emissions, and the baseline is therefore called *absolute*. If it is assumed that the baseline activity level is always equal to the project activity level (i.e. $x_b = x_p$), then $\_E_{gross}$ reduces to:

$$\_E_{gross} = E_b - E_p = (e_b - e_p)x_p \quad (2)$$

In Eq. (2), the baseline-case is only reflected by the baseline emission intensity, and the baseline is therefore called relative or rate.

Figure 2: Emission Reduction Calculation[8]

Another issue on baselines standardization is using whether absolute baseline (given in tCO_2 equivalent, also: emission levels) or relative (rate-based) (given, e.g. in tCO_2 equivalent/MWh) baseline. Willems (2000) emphasizes the difficulty of using baselines expressed in terms of absolute tonnes of CO_2 equivalent that they need assumptions about the activity level in case business as usual (BAU) and thus make the development of baselines and the process of project crediting more difficult. Ellis et al. (2001) state that absolute baseline would also allow credits to be generated if the production lagged with a slowed economy or the plant was simply closed down. On the contrary Baumert (1999) notes this type of baseline might prevent crediting from taking place while GHG emissions rapidly increase, because the focus is on "verified actual emission reduction". On the contrary, relative baseline would allow projects where absolute emissions might increase due to a higher output to generate emission credits from "avoided future emissions" (Laurikka, 2002). Ellis et al. (2001) put it forward that relative baselines might also present challenges to countries' and companies' compliance with an absolute emission target. Rates

[8] Taken from H. Laurikka / Climate Policy 2 (2002) 19–33

would thus be desirable for greenfield projects in growing economies in order to take into account the development objectives and needs of developing countries.

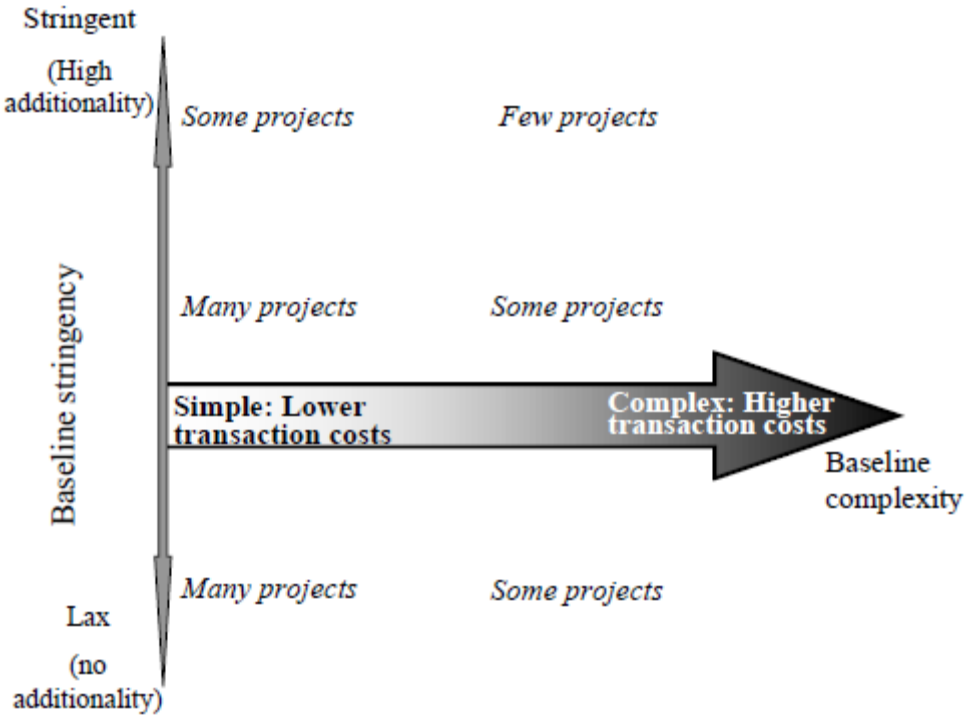
Emission baseline is very important regarding the success of the project based mechanism and its priori targets, which are environmental additionality and cost effective emission reduction. In literature an ideal emission baseline is described with the following requirements to achieve a reliable mechanism in terms of environment and economics;

- be environmentally credible (to ensure long-term benefits greater than what would happen otherwise)
- be transparent and verifiable by a third Party
- be simple and inexpensive to draw up (low transaction costs) and
- provide a reasonable level of crediting certainty for investors (Ellis and Bosi, 2000).

II. ADDITIONALITY

Although there is not a generally accepted definition for the term "additionality", it refers, basically, to the net additional carbon sequestered by a carbon project. Once the baseline for a project is determined, the project should be assessed additional in order to be approved. The additionality criteria is assessed in respect to baseline, therefore determining baseline accurately is very important. As Graph 3 displays there is a important relationship between baseline stringency, transaction cost, and environmental additionality. While stringent baseline can ensure a high additionality and vice versa, the transaction cost has a inverse relationship with the number of the projects. Additionality is the most fundamental and contentious issue for project based mechanisms. Additionality criteria searches the answer of the following question, "would the project have happened anyway?". If the answer of this question is “yes”, then the project cannot be assessed as additional (WWF 2008).

Because it is very hard to determine additionality in practice, different types of tests have been developed to maximize accuracy of additional testing and also to minimize the administrative burden for the project developer. There are two approaches to test additionality of activities, project based additionality testing and performance standards.



Graph 3: Possible effect of baseline stringency and complexity on project numbers and a project's environmental additionality[9]

Project based additionality testing investigates each individual project on a case-by-case basis. It contains, mainly, legal and regulatory additionality test (regulatory surplus), investment test, barriers test, and common practice test[10]. Legal and regulatory additionality test investigates that whether the project is implemented to fulfill any compliance (official policies, regulations, or industry standards) or to make an additional emission reduction compared to case BAU. In case the test result shows the second option, the project can be additional, but the project needs to be confirmed by other tests as well. Investment test judge a project as additional if the project is not implemented because it is a profitable project. Barrier test is designed to test implementation barriers, such as local resistance, lack of know-how, institutional barriers, etc. The project is considered additional according to this test, if the project succeeds in overcoming significant non-financial barriers that the business-as-usual alternative would not have had to face (WWF 2008). Common practice test assess a project non-additional if the technology used in project is a commonly used

[9] Taken from Ellis and Bosi (1999)

[10] These are common used tests to investigate the additionality of activities. While some project based mechanisms are demanding more tests to assess the activities, some mechanisms look for just some of these tests.

technology. It is expected that while emission reduction is undertaken, the project should also serve as an urge to find new emission reduction technology. The main issue with project based approach is that the determination whether a project is additional can be quite subjective.

Instead of investigating each individual project case-by-case to determine additionality, performance standards approach establishes a threshold for technologies or processes. In contrast to the first approach, this approach has a lower transaction cost for project developers and contains simpler procedures. Standards are developed and/or approved by international organizations. Establishing a standard for projects requires comprehensive data collection and verification, and also regular updates. As a result of establishing threshold procedure, another contrast to project based approach is that in this approach much of the administrative burden shifts from project developers to international organizations. Performance standards contain benchmark approaches and positive technology lists. Benchmark approaches establish a generic baseline scenario –referred to as benchmark- against which all projects of a given type are assessed (WWF 2008). If a project's emission is lower than the pre-defined baseline it is presumed additional and offsets are awarded based on the difference between the project emission rate and the benchmark emission rate. Positive technology lists simply define which technologies can be considered additional in a certain region. Although performance standards approach is more transparent and reduces the administrative burden of project developer's, the main problem related to this approach is that it may be too simple and broad (WWF 2008).

III. PROJECT BOUNDARIES, LEAKAGE, AND PERMANENCE

In order to calculate the emission reduction of a project accurately, every project has to define its "monitoring plan", which implies *project boundaries*, including physical, legal, and organizational boundaries. This boundaries restrict what needs to be monitored and also it is a crucial point to determine which baseline suits to the project. Furthermore, how a project boundary is defined is also important, because it influences the environmental credibility of credits generated by the project and the costs of monitoring (through the effect of project boundary definitions on the number of sources that need monitoring) (Ellis 2002).

While projects achieve primary emission reduction targets, they may cause unintentionally emission increases out of the project's boundaries. This effect, *Leakage*, is of particular concern in LULUCF (Land Use, Land-Use Change, and Forestry) projects, which is a biological sequestration project type. Another issue particularly related with LULUCF is *permanence*, which refers to the length of time that carbon will remain stored after being sequestered in vegetation. Forests can easily be destroyed by natural events such as fire, pests, or disease, or by illegal logging or burning. LULUCF projects can therefore only temporarily sequester carbon from the atmosphere (WWF 2008).

3. IMPLICATIONS OF EMISSIONS TRADING PROGRAMS

In 1990 U.S. Clean Air Act introduced an approach to reducing acid pollution. United States decided to use a market based cap and trade approach to reduce acid rain by reducing emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) emissions. The program launched in 1995 (Phase I) and in 2000 started second phase. The success of this program stipulated policy-makers considering trading-based instruments as part of the solution address other environmental problems (Bosi and Bygrave 2004). After adaptation of Kyoto Protocol, emission trading schemes became one of the widely used instrument among emission reduction methods as well as project based mechanisms. In this section I elaborate the most important emission trading schemes and also project based mechanisms. Among all emission trading schemes and project based mechanisms, this section particularly studies the Kyoto Protocol's three "flexibility mechanisms".

A. CURRENTLY OPERATING CAP AND TRADE SYSTEMS

I. EUROPEAN UNION'S EMISSION TRADING SCHEME

PHASE I 2005-2007

First phase of the European Union's emission trading scheme (EU ETS) commenced operation on 1 January 2005 and expired on 31 December 2007. The EU ETS is the largest multi-country, multi-sector Greenhouse Gas Emission Trading Scheme worldwide since it has been established[11]. During Phase I more than 10,500 industrial installations were covered by the EU ETS, representing approximately 40 percent of the EU's CO_2 emissions, in 25 European countries[12]. On 1 January 2007, Bulgaria and Romania became European Union's new members and these countries were included in EU ETS. Therefore, EU ETS completed first phase with 27 participant countries.

The EU Directive applied on combustion of fuels in installations with a total rated thermal input exceeding 20 megawatt (except in installations for the incineration of

[11] European Commission (2005)

[12] Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, the United Kingdom.

hazardous or municipal waste), such as industrial power stations, furnaces and other plants in the chemical industry, the ceramics industry, oil refineries, steel smeltering in the manufacturing industry, and the cellulose, paper and board manufacturing industries (Wagner 2004).

First Phase, covered only CO_2, is often called as “learning phase”, “warm up phase” or “pilot phase” and was considered as a pilot project for Phase II, in which Kyoto Parties should reduce their emissions according to their Kyoto commitments. From 2005, Member States were allowed to opt-in installations that are carrying out activities listed in the Directive, but which are below the threshold size for automatic entry to the scheme. Conversely, the EU-ETS allowed Member States (MS) to opt-out installations for the first trading period, up to the end of 2007 (Blyth and Bosi 2004).

Saving unused emission allowances for future (banking) and using emission allowances from future allocations in current period (borrowing) were only allowed intra-period for pilot phase and companies were prohibited, therefore, from transferring their unused first phase emission allowances to the second phase (2008-2012). Through European Union’s Linking Directive, EU ETS participants were allowed to use the credits from Clean Development Mechanism, Certified Emission Reductions (CERs), in meeting their compliance obligations. European Commission also specified non-compliance penalty as 40€ per one metric tonne of CO_2-equivalent emitted over the allowance.

PHASE II 2008-2012

On 1 January 2008 started the second phase of the EU ETS and it will end on 31 December 2012. This phase corresponds to the first commitment period of the Kyoto Protocol. The European Commission has tightened the regulations of this period in order to meet Kyoto Protocol reduction targets. On 1 January 2008, three non-European Union countries were included in the EU ETS, Liechtenstein, Iceland, and Norway.

Beside CER credits, in the second phase, Kyoto parties are allowed to use Emission Reduction Units (ERUs), which are generated via Joint Implementation (JI) projects, in order to comply with their emission reduction targets. Another different approach in Phase II in comparison with Phase I is on banking. Beginning with Phase II, the unused CERs and ERUs issued before 2013 will be valid for exchange with Phase III allowances until March 31, 2015.

The EU ETS allows Member States (MS) to opt-in, from 2008, activities, installations, and greenhouse gases which are not listed in the Directive, but there is no opt-out allowed for the second period (Blyth and Bosi 2004). Starting in 2008, the EU Trading Directive does allow Member States to include other installations and Greenhouse Gases, which are not covered by EU ETS, provided these have been approved by the Commission (Blyth and Bosi 2004). Also Commission increased the penalty of non-compliance so that participants try harder to comply with directive requirements. The excess emissions penalty was increased to 100€ for each tonne of CO_2-equivalent emitted over the allowance.

Norwegian Emission Trading System was launched at the same time as the EU ETS. This system linked to the EU ETS in Phase II and Norway ETS adopted the EU ETS Directive with a few adaptations.

Table 3: EU ETS at a Glance Volumes & Values 2005-2008

European Union' Emission Trading Scheme at a Glance Volumes & Values 2005-2009

	Volume ($MtCO_2e$)	year to year growth rate	Value MUS $	year to year growth rate
2005	322,01	—	8.220	—
2006	1.104	243%	24.436	197%
2007	2.060	87%	49.065	105%
2008	3.093	50%	91.910	87%

II. CHICAGO CLIMATE EXCHANGE

The Chicago Climate Exchange (CCX) launched in 2003. The CCX operates in North America and it covers all six GHGs. Members make a voluntary but legally binding commitment to meet annual GHG emission reduction targets. As stated in the CCX directive, in Phase I (2003-2006) members committed to reducing emissions a minimum of 1% per year, for a total reduction of 4% below average of annual emissions from 1998-2001. In Phase II (2007-2010), CCX members commit to a reduction schedule that requires year 2010 emission reductions of 6% below baseline, average of annual emissions from 1998-2001 or the single year 2000, at minimum[13]. The CCX allows participants to use credits generated

[13] Chicago Climate Exchange (2008)

from offset projects, but only in countries and sectors specified by Chicago Climate Exchange Directive and also CER credits. This cap and trade system covers many different sectors such as transportation, aerospace, automotive, chemicals, technology, electric power generation and also universities, states, and municipalities.

III. REGIONAL GREENHOUSE GAS INITIATIVE

In 2005, Regional Greenhouse Gas Initiative (RGGI) is established by seven northeastern U.S. states[14] as the first mandatory cap and trade program in the United States to reduce GHG emissions. Subsequently three more states[15] joined to this initiative. The RGGI covers CO_2 emissions from power sector, and the target is a 10% reduction in these ten states' emissions by 2018. The first three year compliance period had begun on January 2009. Although banking of unused allowances is allowed with no restrictions, borrowing is not allowed. Initiative also approve project based emission reductions outside the capped sector. The following types of projects are eligible there under[16]:

• Landfill methane capture and destruction;

• Reduction in emissions of sulphur hexafluoride (SF6);

• Sequestration of carbon due to afforestation;

• Reduction or avoidance of CO_2 emissions from natural gas, oil or propane end-use combustion due to end-use energy efficiency; and

• Avoided methane emissions from agricultural manure management operations.

IV. NEW SOUTH WALES GREENHOUSE GAS REDUCTION SCHEME

Initially New South Wales Greenhouse Gas Abatement Scheme is established by Australian Government as a voluntary scheme which launched in 1997. The scheme's name later is changed to New South Wales Greenhouse Gas Reduction Scheme (NSW GGAS) and it

[14] Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont

[15] Maryland, Massachusetts, and Rhode Island

[16] RGGI (October 2007; p.9)

became mandatory on 1 January 2003. It covers state's electricity sector. The NSW GGAS establishes an annual state-wide per capita GHG emission target for the electricity sector to meet Kyoto Protocol GHG emission reduction targets. The scheme's initial target was 8.65 metric tonne of CO_2 equivalent per capita in 2003 and the target was reduced steadily each year to 7.27 tonne of CO_2 equivalent per capita in 2007 and this target will remain at this level till 2012. This target is also 5% below the Kyoto Protocol baseline year 1989-1990. Participants are electricity retailers but also include some generators who sell electricity directly to customers (IPART 2007). Two types of offset are allowed; NSW GHG Abatement Certificates (NGACs) and Renewable Energy Certificates (RECs). The penalty of non-compliance is specified as 12.50 AU$ per tonne of carbon dioxide equivalent (tCO_2-e).

V. SWISS EMISSION TRADING SCHEME

The Swiss Federal Council introduced a tax on carbon dioxide emissions, which became mandatory in 2008 and also Swiss Emission Trading Scheme (Schweizer Emissionshandelssystem, Swiss ETS) entered into force on 1 January 2008. The scheme enables participants to avoid the CO_2 tax. The Swiss Emission Trading Scheme covers energy intensive sectors such as cement, paper and pulp, glass and ceramics industries. The project based flexibility mechanisms of the Kyoto Protocol, CDM and JI, are allowed to be used as supplemental to national regulations. Swiss government aims at linking the scheme to EU ETS in a later date. There is a substantial difference between these two Emission Trading Schemes concerning the penalization of non-compliance. In the event of non-compliance, participants in Swiss ETS have to pay the CO_2 tax, which ranges from Swiss Frank 12 to 36 per tonne of CO_2 emitted beyond the allowance. The penalty in case of non-compliance in EU ETS is 100€ per tonne of CO_2 emitted beyond the allowance.

VI. JAPAN'S VOLUNTARY EMISSION TRADING SCHEME

As of May 2005, first Japanese "cap and trade" scheme, Japan's Voluntary Emission Trading Scheme (JVETS), promoted by the Ministry of the Environment, Japan (MOEJ). Voluntary participants commit to emission reductions (annual basis/CO_2 only). The first commitment period started in April 2006 and concluded in March 2007. Corporations may receive subsidies within the scheme to help fund investment in energy efficiency improvements or other equipment to meet reduction targets (Subsidy rate is up 1/3 of

installation costs, max. 200 million yen per site)[17]. In case the reduction target cannot be met, participant has to pay received subsidies back. The JVETS allows participants to use CERs from CDM projects and ERUs from JI projects in order to comply with their obligations[18]. The fourth Phase of the JVETS started in April 2009 and will end in March 2010.

Table 4: Current Cap and Trade Programs at a Glance, Volumes & Values in 2007-08

	Allowances Markets			
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
EU ETS	2.060	49.065	3093	91910
Chicago Climate Exchange	23	72	69	309
New South Wales	25	224	31	183
RGGI	NA	NA	65	246
AAUs	NA	NA	18	211
TOTAL	2.108	49.361	3.276	92.859

VII. PROPOSED EMISSION TRADING SCHEMES

The Government of Canada released a framework for regulating air emissions on 26 April 2007. In this framework a proposed emission trading scheme was outlined for GHG emissions and air pollutants[19]. The Government plans to launch the ETS in 2010, which would be a baseline-and-credit system[20], not cap and trade system. According to this plan, the system would target GHG emissions from Canada's major industrial sectors, which together account for about half of Canada's GHG emissions (Jaffe and Stavins 2007).

[17] UNDP, Human Development Report 2007 – mitigation country studies, Japan – Country Study

[18] SUDO, Tomonori, US-Japan Workshop on Climate actions and Co-benefit March 22-23, 2006

[19] The report can be downloaded at: http://www.ec.gc.ca/doc/media/m_124/report_eng.pdf.

[20] In a baseline-and-credit emissions trading system, a baseline is set. In this case, the baseline would be the emissions-intensity target. Facilities that reduced emissions below their target would be allocated tradable credits that they could either bank for a future compliance obligation

or sell to another facility. Facilities that emitted above their target would have to buy credits from other facilities or use their own banked credits to meet their regulatory obligation (King 2007).

Carbon Pollution Reduction Scheme (CPRS) will come into force in 2011 as the primary mechanism for reducing GHG emissions of Australia. The Scheme will cover only domestic emission sources and sinks that are counted in Australia's Kyoto Protocol emissions account. Agriculture emissions will be excluded. In addition, the Australian Government will stipulate voluntary market offsets.

In North America, Iowa, Illinois, Kansas, Manitoba, Michigan, Minnesota, and Wisconsin agreed to establishing Western Climate Initiative and Midwestern Greenhouse Gas Reduction Accord (MGGA) on 15 November 2007. This system will cover all six GHGs. The first compliance period will begin on 1 January 2012. Another proposed program is Western Climate Initiative (WCI), which includes some states of U.S. and Canada[21]. The scheme will come into force fully in 2015, and it will cover almost 90% of GHG emissions in WCI Partner states and provinces, including those from electricity, industry, transportation, and residential and commercial fuel use.

The U.S. Senate approved the American Clean Energy and Security Act of 2009 (ACES) on 26 June 2009. It is an energy bill to establish variant cap and trade systems. This legislation will cover over the period 2012-2050.

[21] Arizona (USA), California (USA), New Mexico (USA), Oregon(USA), Washington (USA), Utah (USA), Montana (USA), British Columbia (Can), Manitoba (Can), Ontario (Can), and Quebec (Can)

Table 5: Key Characteristics of Current Cap and Trade Schemes (1)

	Eligible Gases	Sources	Voluntary (V) or Mandatory (M)?	Participants	Target: Fixed (F) or Indexed (I)?	Time Scale	Non-compliance Penalty	Use of offsets	Banking	Unit
EU ETS Phase I	CO_2	*Combustion plants, oil refineries, coke ovens, I&S, cement, glass, lime, brick, ceramics, pulp and paper*	*M*	*Emitters*	*F*	*2005-2007*	*40€*	*CDM (excluding forestry)*	*Intra-period*	*1 metric tonne of CO_2- eq*
EU ETS Phase II	*CO_2+ opt in*	*Phase I+ possible opt in for some sectors/gases*	*M*	*Emitters*	*F*	*2008-2012*	*100€*	*CDM (excluding forestry) and JI*	*Yes*	*1 metric tonne of CO_2- eq*
Chicago Climate Exchange	*6 GHG*	*Electricity generation, manufacturing industry*	*V*	*Emitters and offset providers*	*F*	*Phase I: 2003-2006 Phase II: 2007-2012*	*No defined penalty*[22]	*CDM and projects in countries and sectors specified by Scheme*	*Yes*	*100 metric tonnes of CO_2- eq*

[22] Although there are no defined penalties yet in CCX, there are some penalty propositions.

Table 6: Key Characteristics of Current Cap and Trade Schemes (2)

Regional Greenhouse Gas Initiative	***CO_2***	***Power Sector Only***	***M***	***Emitters***	***F***	***2009-2018***	***Will be enforced according to each State's prevailing enforcement methods***	***Yes (specified projects)***	***Yes***	***1 short tonne CO_2- eq***
New South Wales Greenhouse Gas Scheme	*6 GHG*	*Production and use of electricity*	*M*	*Electricity retailers, large electricity users*	*I*	*2003-2020*	*12.50 AU$ per tonne of CO_2-eq*	*Yes (specified project types[23])*	*Yes*	*1 metric tonne of CO_2- eq*
Swiss Emission Trading Scheme	*CO_2*	*Cement, I&S, aluminium,pulp and paper, glass, ceramics, other industry*	*V (but legally binding)*	*Emitters*	*F*	*2008-2012*	*CO_2 tax since exemption+ interest*	*CDM and JI*	*Yes*	*1 metric tonne of CO_2- eq*
Japan's Voluntary Emissions Trading Scheme	*CO_2*	*Industry: food, breweries, pulp chemicals*	*V*	*Emitters*	*F*	*Phase I: 2006-2007 II:2007-2008 III:2008-2009 IV:2009-2010*	*Return of subsidy , "naming and shaming[24]"*	*CDM and JI*	*Yes*	*1 metric tonne of CO_2- eq*

[23] NSW GHG Abatement Certificates (NGACs) and Renewable Energy Certificates (RECs)

[24] Ellis and Tirpak, 2006

"Offsets are an imaginary commodity created by deducting what you hope happens from what you guess would have happened." (Dan Welch quoted in The Guardian, June 16 2007)

B. EXISTING PROJECT-BASED MECHANISMS

Table 7: Project-Based Transactions at a Glance Volumes & Values 2004-2008

Project Based Transactions at a Glance Volumes & Values 2004-2008[25]

	2004		2005		2006	
	Volume ($MtCO_2e$)	Value MUS $	Volume ($MtCO_2e$)	Value MUS $	Volume ($MtCO_2e$)	Value MUS $
CDM	97	485,01	346,15	2.544,30	537	5.804
JI	9,10	54,19	17,78	82,41	16	141
Other Compliance & Voluntary Transactions	2,92	5,57	6,05	43,03	33	146
TOTAL	109,99	549,16	374,34	2.708,34	586	6.091

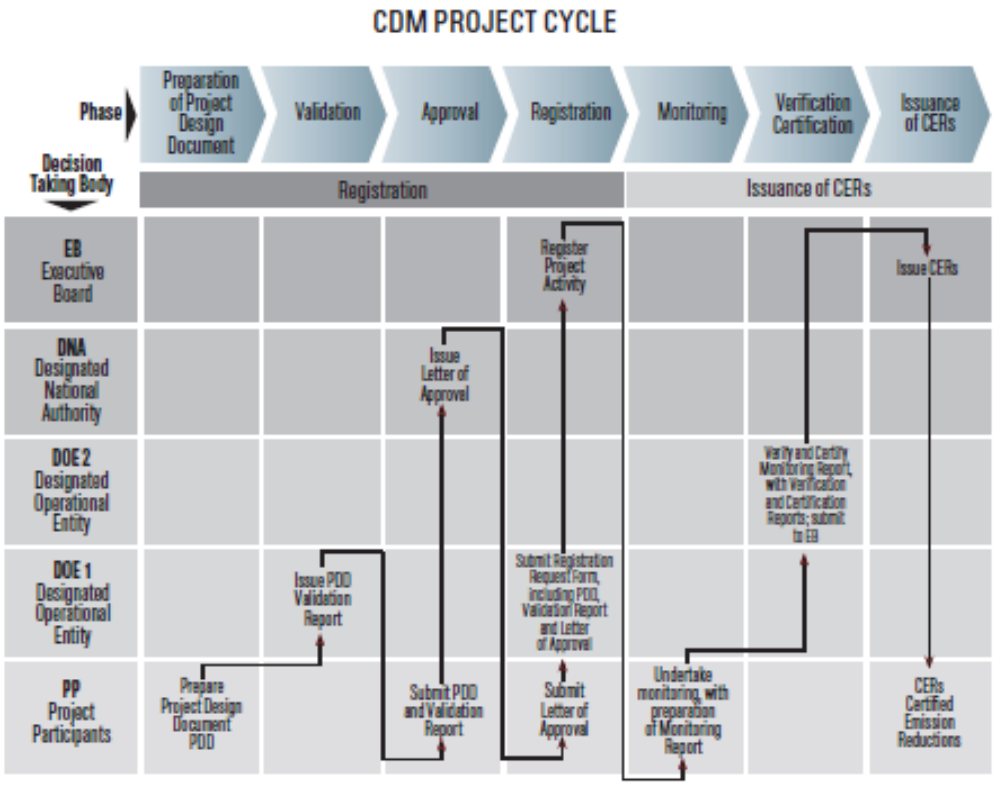
	2007		2008	
	Volume ($MtCO_2e$)	Value MUS $	Volume ($MtCO_2e$)	Value MUS $
CDM	551	7.426	389	6.519
JI	41	499	20	294
Other Compliance & Voluntary Transactions	42	265	54	397
TOTAL	634	8.190	463	7.210

I. CLEAN DEVELOPMENT MECHANISM

The Clean Development Mechanism (CDM) is one of the Kyoto Protocol's three "flexibility mechanism" and also widely used project-based mechanism. This mechanism enables Parties to use credits generated from the projects in developing countries that ratified the Protocol, but are not among the Annex I countries subject to the Protocol's emission limitation commitments (IETA 2007). The CDM credits may be generated from

[25] "M" refers to million.

emission reduction projects or from afforestation and reforestation projects. The credits generated via the CDM projects are called Certified Emission Reductions (CERs). One CER credit is equivalent to one tonne of CO_2-e emission reductions. As Protocol introduced the CDM under the Article 12, the purpose of CDM is; i) to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and ii) to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments[26]. While the developing countries continue to develop in a sustainable manner, combating poverty and, at the same time, through the CDM projects contribute to the global effort to mitigate the greenhouse effect[27].



Graph 4: CDM Project Cycle[28]

The CDM projects can be implemented in the scopes as follows; end-use energy efficiency improvement, supply-side energy efficiency improvement, renewable energy, fuel

[26] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Article 12/2.

[27] UNCTAD Climate Change Programme, The Clean Development Mechanism Guide- 2009.

[28] taken from UNCTAD Climate Change Programme, The Clean Development Mechanism Guide- 2009.

switching, agriculture, industrial processes, solvent and other product use, waste management, sinks (only afforestation and reforestation). In order to earn the CERs credits, a CDM project must satisfy the conditions specified by Protocol;

- (Protocol Article 12/ 3a) The project activity be undertaken in a non-Annex I country (i.e. a developing country) that is a Party to the Kyoto Protocol.

- (Protocol Article 12/5a) Participation should be voluntarily and should be approved by the non-Annex I Host Country and any Annex I Party involved in the project.

- (Protocol Article 12/5b) The result of the emission reduction should be real, measurable, and long-term benefits related to the mitigation of climate change.

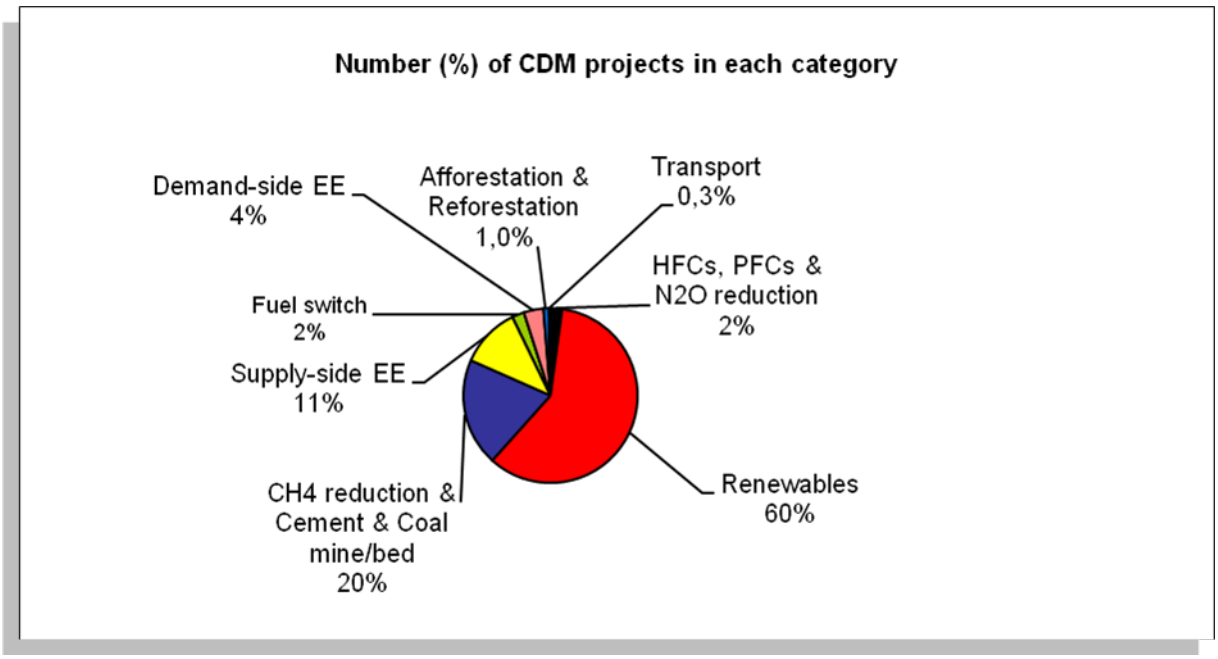
- (Protocol Article 12/5c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

There are four institutions to be mentioned in the process of generating a CER credit, which begins with preparation of the Project Design Document (PDD) addressed to Designed National Authority. The PDD contains the title of the Project, aim of the Project, description and details of the Project, and Project Participants. The Institutions authorized on this process are COP/MOP (Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol), CDM Executive Board, Designated National Authorities (DNAs), and Designated Operational Entities (DOEs). Each Party involved in a CDM project has to establish the Designated National Authority (DNA), which should justify the voluntary nature of the involvement of the project participants and in the case of the host Party, attest that the project activities contribute to that country's sustainable development[29]. The Designated Operational Entity validates and subsequently requests registration of a proposed CDM project activity which will be considered valid after 8 weeks if no request for review was made. Also the DOE verifies emission reduction of a registered CDM project activity[30]. The CDM Executive Board, which operates under the authority of the Parties and guidance of COP/MOP, is responsible for supervising the functioning of the CDM as well as for approving new methodologies, for the accreditation of the DOEs, for registration of the CDM projects,

[29] UNCTAD Climate Change Programme, The Clean Development Mechanism Guide- 2009.

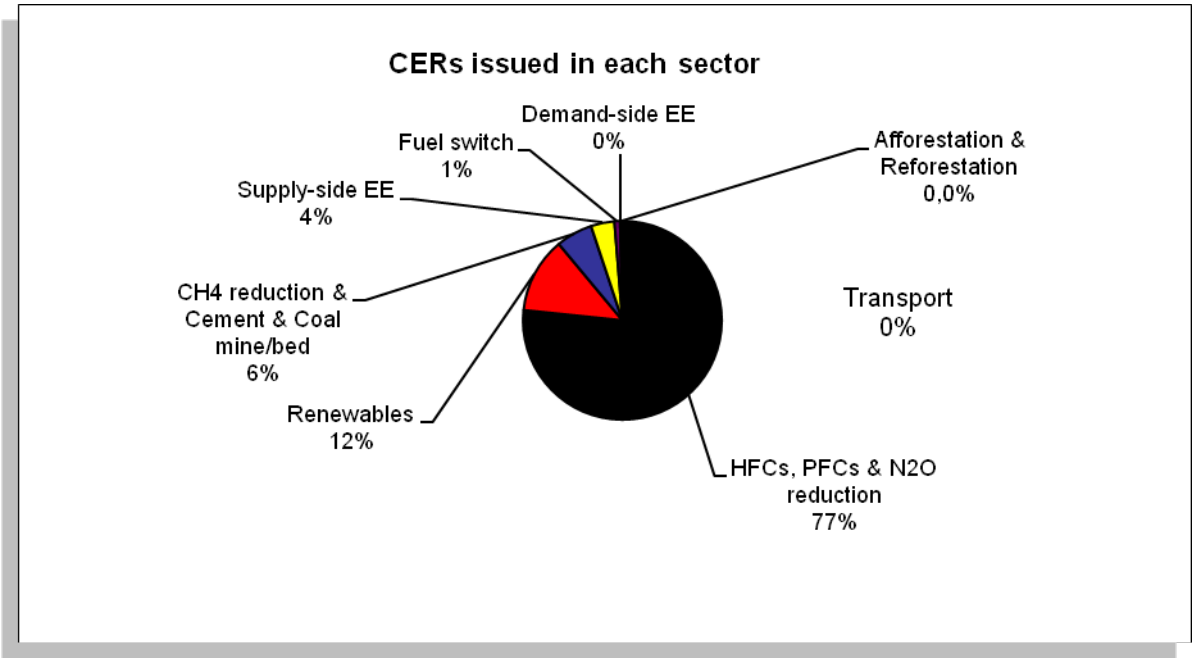
[30] UNFCCC website; http://cdm.unfccc.int/DOE/index.html viewed on 08.12.2009

and for issuing CERs. Issuing CER credit means that the Project has implemented the requirements mentioned above. The COP/MOP is the institution with authority over CDM and its guidelines.



Graph 5: Percentage of CDM projects in each category (UNEP RISOE 2009)

While CERs can be used by Annex I countries to meet their Kyoto reduction target, they might also be used by Parties under different emission trading schemes. To date China has the biggest share as the host country for registered CDM projects with 35%, projects in India account for 25% and Brazil hosted 9% of all registered CDM projects (UNFCCC 2009). These statistics indicates that the CDM projects does not spread uniformly. It intensifies especially in Asian countries (75%) and Latin America countries (23%). Renewable energy rank first among all applied CDM project types with 60%. Although HFCs, PFCs and N_2O reduction has just two percent among all applied CDM projects, these projects has earned 77% of all generated CERs (UNEP RISOE 2009). It is based on the properties of HFC gases. HFC-22, a gas widely used as a refrigerant, emits HFC-23. HFC-23 has 11,700 times the global warming potential (GWP) of CO_2. Subject to this fact, one tonne of HFC-23 reduction is equal to 11,700 tonne of CO_2-e reduction (Cosbey et al. 2007). Also N_2O has 310 times the GWP of CO_2.



Graph 6: CERs issued in each sector (UNEP RISOE 2009)

II. JOINT IMPLEMENTATION

The second project-based mechanism of the Kyoto Protocol, which aims at reducing anthropogenic GHGs, is the Joint Implementation. As defined in Article 6 of the Kyoto Protocol, it allows to Annex B countries (Parties committed to limit or reduce their emission under the Kyoto Protocol) to earn credits from an emission reduction project or emission removal project in another Annex B country. The credits earned from the Joint Implementation projects called as "Emission Reduction Units" (ERUs). Each ERU is equivalent to one tonne of CO_2 and can be used in achieving the Kyoto commitments.

Participants might carry out projects to acquire CERs in following scopes; energy industries (renewable/non-renewable sources), energy distribution, energy demand, manufacturing industries, chemical industry, construction, transport, mining/mineral production, metal production, fugitive emissions from fuels (solid, oil, and gas), fugitive emissions from production and consumption of halocarbons and sulphur, hexafluoride, solvents use, waste handling and disposal, land-use, land-use change and forestry, and agriculture. Land-use, land-use change and forestry is the only different scope from CDM's sectoral scope list.

To illustrate, suppose the Kyoto Protocol only had three Annex I parties, countries A, B and C, each having 100 AAUs for the whole first commitment period. This would mean that the total amount of credits at the beginning of the first commitment period would be equal to 300. Now suppose that A hosted a JI project for B, resulting in 10 credits-worth of emissions reductions. A would have to convert 10 of its AAUs to ERUs and transfer them to B. So in the end, A would have ten less credits, or 90 AAUs (100 AAUs minus 10 converted ERUs); B would have ten more credits (100 AAUs plus 10 ERUs from the project), and country C would remain with its 100 AAUs. The total number of credits at the end of the first commitment period would be the same -- 300.

Figure 3: Illustration of Joint Implemenatation Procedure

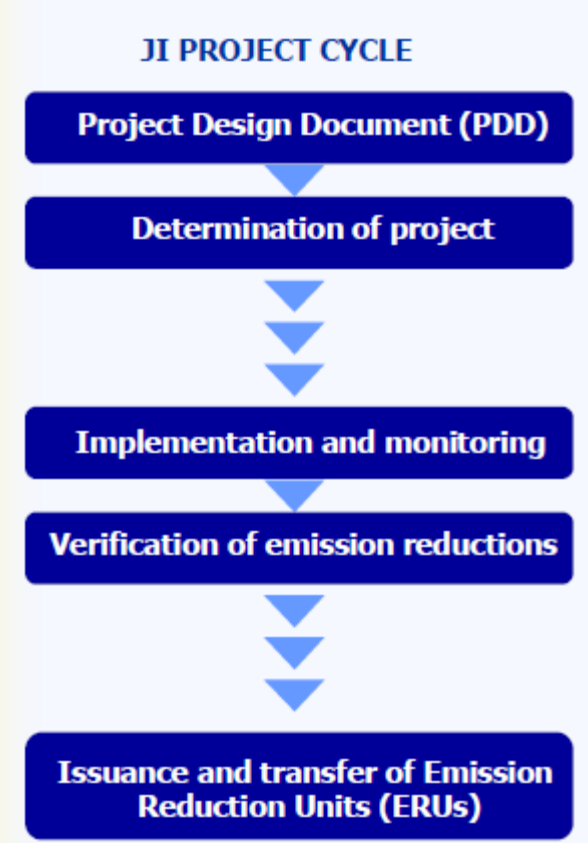
Joint Implementation, like CDM, requires establishing of Institutions in national level as well as international level (under UNFCCC). The COP/MOP is the institution over the JI and its guidelines. Joint Implementation Supervisory Committee (JISC) was established Under the authority and guidance of the COP/MOP. The JISC supervises the verification procedure of ERUs. In pursuant with the guidelines of the implementation of Article 6 of the Kyoto Protocol, the JISC accredits independent entities (IE) responsible for making determinations regarding project design documents (PDDs) and determinations of reported greenhouse gas emission reductions or enhancements of removals regarding JI projects that are processed in accordance with the verification[31]. One of the requirements for a party involved in a JI project is designing Designated Focal Point (DFP). DFP is the authorized entity from Joint Implementation projects on national level. The DFP is responsible for guiding and for preparing the necessary requirements for installations involved projects.

There are two different verification procedure according to the host country's compliance with requirements. The JI project is assessed under Track 1, in case it fulfills the following requirements (eligibility requirements);

- It is ratified to the Kyoto Protocol and its assigned amount has been calculated and recorded

[31] UNFCCC/CCNUCC Joint Implementation Supervisory Committee P-JI-ACCR-02

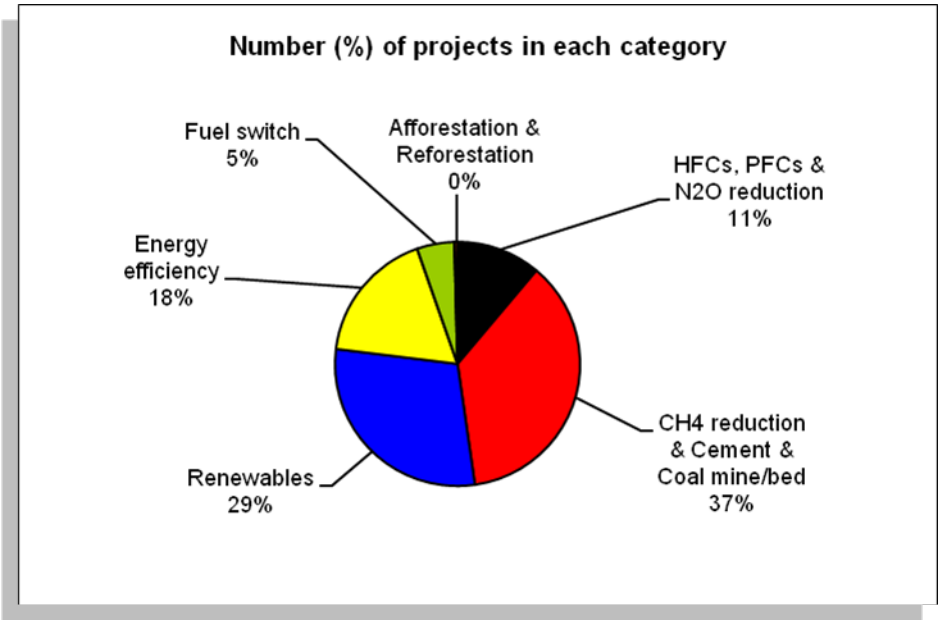
- It has in place a national system for the estimation of anthropogenic emissions by sources and anthropogenic removals by sinks of all greenhouse gases not controlled by the Montreal Protocol
- It has a national registry system for estimating emissions/removals
- It has submitted annually the most recent required inventory
- It submits the supplementary information on assigned amount in accordance



Graph 7: Joint Implementation Project Cycle

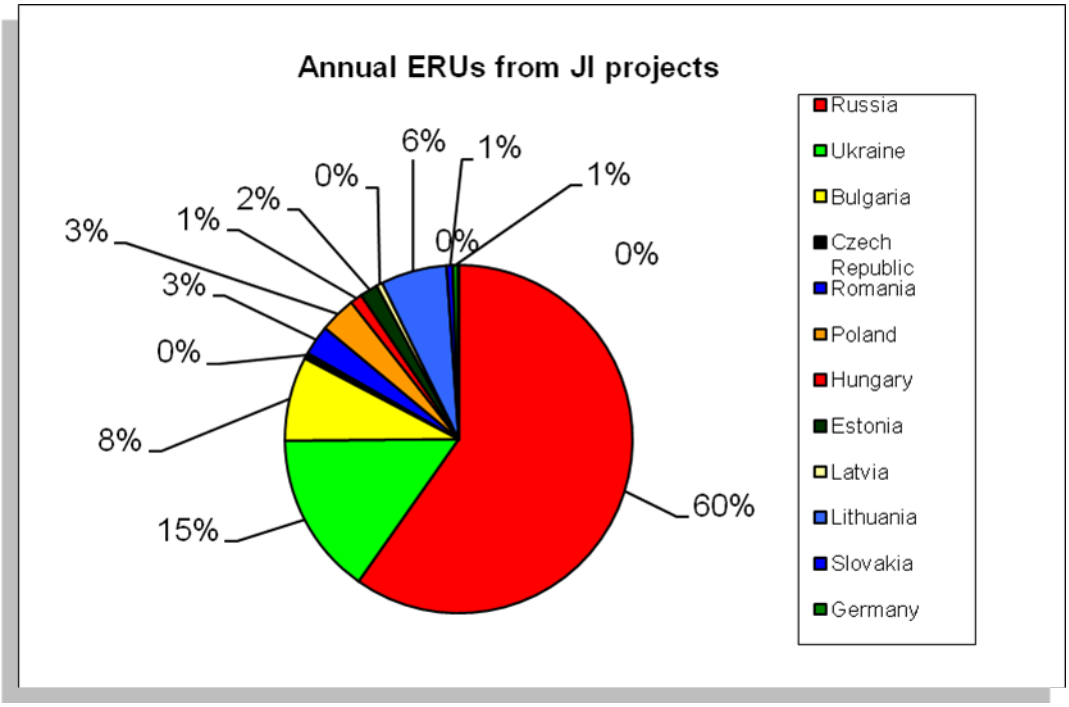
According to Article 23 of the JI Guidelines, if the host country meets all requirements above, it may verify reductions in GHGs and may also issue the appropriate ERUs. If the host country fulfills only the first two requirements, Track 2 procedure is followed. This procedure is similar to CDM procedure, it needs approval and monitoring of international institutes. Under Track 2 process the JISC assesses projects. After projects are approved according to JI Guidelines, the host country may issue and transfer ERUs to non host country (investor country).

After verification of ERUs, verification reports are submitted to the host and investor country's DFP. The host country converts a specified amount AAUs (assigned amount units) into ERUs. Finally, the host country transfers ERUs from its national registry to investor country's national registry.



Graph 8: Number (%) of Joint Implementation Projects in each category (UNEP RISOE 2009)

Joint Implementation mechanism covers less country than Clean Development Mechanism, as a result so far there are less projects implemented in JI and also less one metric tonne of CO_2-e credits earned compared to CDM. Another reason is that the credits generated via JI projects can be used only since 2008 in complying with Protocol reduction targets. Graph 4 indicates most used project type as CH_4, cement, coal mine/bed project types (37%). Renewable energy is the second widely used project type (29%) and most used renewable energy project types are; wind, biomass energy, new hydro power plants. After renewable energy, energy efficiency (18%) and HFCs, PFCs and N_2O reductions (11%) have important shares among all project types. In comparing with CDM, projects in HFCs, PFCs and N_2O reduction or removals by sinks generate one less metric tonne of CO_2-equivalent than CDM does. Eastern Europe countries are the most preferred host countries. Russia and Ukraine host 75% of all JI projects. Up to now 73% of applied JI projects assessed under Track 2. This issue arises from Russia, which is not in compliance with the institutional requirements of the Kyoto Protocol.



Graph 9: Annual ERUs from Joint Implementation projects

III. DOMESTIC OFFSET PROGRAMS

Beside mostly used CDM and JI, there are some offset programs generating credits, which can be used in a supplemental manner to commit emission reduction targets under different market based emission trading schemes. Under NSW GGAS, participants can use NSW Greenhouse Abatement Certificates, and Renewable Energy Certificates. RGGI and other cap and trade systems, which allow to use emission reduction credits to meet the target of the program, has established a set of project types. The scopes, sectors and the areas, where can the project could be implemented, determined by the Directives.

IV. VERIFIED (VOLUNTARY) EMISSION REDUCTION

The credits generated from the voluntary projects accrued in a country outside the Kyoto Protocol compliance regime are called Verified (voluntary) Emission Reduction Credits (VERs). The main drivers of such projects can be ordered as follows;

- Entities anticipate being included in Kyoto Protocol in a future time and therefore want to gain experience before compliance period began.

- Entities, who buy the credits, may want to be carbon neutral. This implementation can also be to show the buyer entity's socially-responsible image (e.g. BBC, HSBC, Marks&Spencer, Tesco).

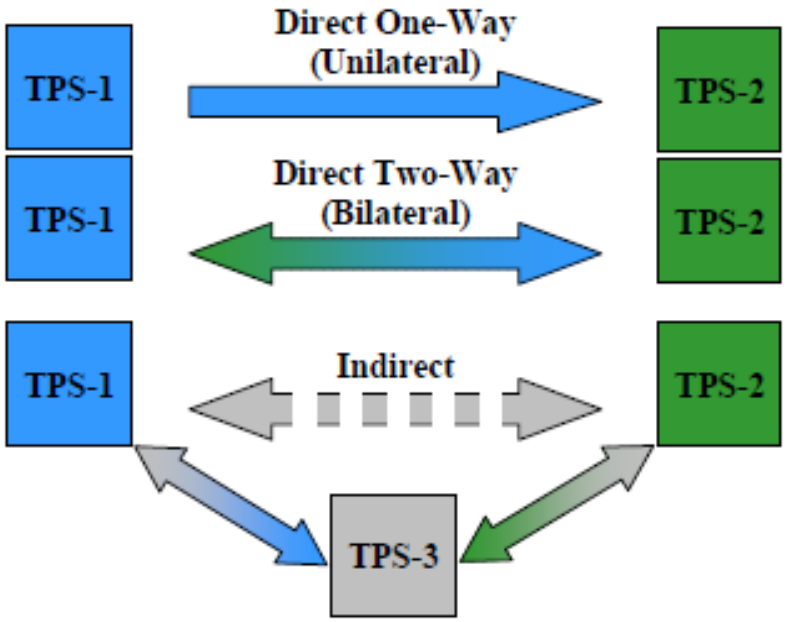
Some big organizations, like FIFA 2006 World Cup also 2010 FIFA World Cup, either buy VER credits to offset their total carbon footprints during organization (including the emission of travel of the participants) or invest emission reduction projects, which supply VER credits.

4. LINKING CAP AND TRADE SCHEME WITH PROJECT BASED MECHANISM

A. WHAT IS LINKING?

The situation, when the regulatory authority of an cap and trade scheme allows participants to use allowances from another cap and trade scheme or credits generated from project based mechanism to meet compliance obligations of a system, is called linking. Linking emissions trading systems can satisfy a market with a larger number of participants, enhance abatement options, provide market liquidity, diversify control costs, which should reduce the total compliance cost and so improve economic efficiency (Haites and Mullins 2001, Jaffe and Stavins 2007). The latter potential benefit of linking meets with the main idea of emissions trading: to reduce the cost of achieving a given emissions target.

B. TYPES OF LINKAGE



Graph 10: Types of Linkages

Type of linkage can take variety of forms regarding the nature of the link. Basically, linkages could be examined under two groups, direct and indirect linkages. Also direct linkage can be examined under one-way (unilateral) and two-way (bilateral or multilateral) approaches. Direct linkage occurs when at least one of the two or more tradable permit systems accept to use other system's (or systems') units in compliance in its own system.

Even if neither system recognizes other system's allowance unit and these systems link to each other with a third mutual system, this linkage is called indirect linkage.

Direct linkage is divided into three different types.

Direct one-way linkage; it occurs when participants of system A can purchase and use allowances from system B for compliance but not vice versa. The linking Clean Development Mechanism to EU ETS is an significant example for such a linkage. The credits generated via CDM or JI projects can be used in compliance with EU's ETS targets.

Direct two-way (bilateral or multilateral) linkage; if the tradable permit systems recognize each other's allowances in order to comply with its own target, such linkages are called direct two way linkage. Such a linkage can contain more than two systems. Several national cap and trade schemes under the EU ETS have this type of linkage.

Direct bilateral or multilateral link channeled through an intermediary; Markets could be linked via an intermediary (e.g. government). In such a case, if a firm (X) under system A wants to sell allowances to a firm (Y) under system B, that firm (X) should give a respective amount of allowances to its government, and government will convert this amount to assigned amount allowances (AAU) and will deliver this AAUs to the government of scheme B. After converting this AAUs to its national allowance unit, the government of scheme B will deliver the allowances to firm (Y).

One restriction on linking can be that regulatory authority can limit the amount of transferable unit between different schemes. Another restriction can be in unit of allowances. Participants in a system may be allowed unrestricted use of another system's allowances, but an "exchange rate" might be applied to their use. That is, participants could be required to surrender a different number of another system's allowances to cover each tonne of their emissions than would be the case if they used their own system's allowances (Jaffe and Stavins 2007).

Indirect linkage occurs even if neither system recognizes the other system's allowance unit, in this situation these systems can be still linked indirectly through a direct link that each system recognizes a third common system. Most of the cap and trade schemes

allow participants to use offset credits earned from CDM projects. This kind of linkage make the schemes indirectly linked.

C. BENEFITS OF LINKING CAP AND TRADE SCHEME WITH PROJECT BASED MECHANISM

Credits generated via project based mechanism could be used under cap and trade scheme in compliance with scheme's air pollution reduction target, but not vice versa. Such a linking is an example to direct one way linkage. This type of linkage can offer participants opportunities to comply with reduction targets and also satisfy sustainable development for host countries. The implementation of project based mechanism can be seen in the sense that in the atmosphere a tonne of carbon dioxide emission has same effect wherever it is. It does not matter the emission reduction project has been carried out in a country under scheme or outside of the scheme's scope considering air pollution.

The very first benefit of such a linking is that it may stimulate the entities to use project based mechanism more often and to develop project activities, as in the case EU ETS, including CDM and JI will provide an important boost to the use of these instruments (No.5, Emissions Trading Policy Briefs, 2003). In doing so, the entities related to cap and trade scheme may take advantages from the benefits explained below;

More Compliance Options and Lower Cost for Companies;

Linking between cap and trade scheme and project based mechanism may satisfy lower cost compliance. Project based mechanism, basically, takes advantage of different marginal abatement costs across countries/regions by broadening range of the emission reduction options. If private entities (project developers) under a cap and trade scheme are allowed to use project based mechanisms, these entities may find countries/regions with lower marginal abatement costs and earn some credits from implemented projects in that country/region.

Rising Liquidity and Reducing Prices;

Credits generated from project based mechanism rise the liquidity of allowances in a cap and trade scheme's market. Larger markets are more effective. The increasing

allowances reduce the price of emission allowance unit and entities, therefore, could maintain emission reduction obligations with a lower cost.

Stimulus to New Sectors and Mitigation Methods;

Implemented emissions reduction projects could provide valuable information about non-capped sectors by a cap and trade scheme. Some sectors may be suitable for cap and trade scheme in the near future, or can be used as offsets in a cap and trade scheme (Government of Canada 2003). Also through projects, firms could implement new mitigation methods, which could encourage technological improvements.

In case, cap and trade scheme only covers CO_2, project based activities can provide to non-CO_2 GHG emissions reductions (Sorrell and Smith 2002). Project based mechanism could also identify other potential areas for emission reductions that are currently not well known (Government of Canada 2003).

Enabling Technology Transfer[32];

The projects like CDM, which can be implemented in developing countries or in under-developed countries, introduce high emission reduction technologies to the host countries from advanced countries. The host countries, which will undergo Kyoto obligations in near future, gain also experiences via high technology including projects and by virtue of the new mitigation technology they will meet relatively easier with reduction targets in case they are included under any scheme in near future.

Contribution to Host Countries' Sustainable Development[33]

The developing countries emit in high volumes of emissions while they are trying to have a rapid economic development, and it is not easy to control the national emission level for a country struggling with immediate development concerns. The installations with low

[32] In its Special Report on Methodological and Technological Issues in Technology Transfer, the Intergovernmental Panel on Climate Change (IPCC) defines technology transfer "as a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions". (IPCC, 2000, p. 3.)

[33] Sustainable Development; development that meets the needs for the present without compromising the ability of future generations to meet their own needs'.

mitigation technologies can mitigate their emissions via project based mechanism. By doing this, this projects serve to country's economic, environmental, and social dimensional development. Well designed CDM projects can thus offer attractive opportunities for supporting development priorities of host countries as reflected in e.g. general national development plans, in sectoral or local environmental plans, and in social development strategies (UNEP RISOE, CDM Sustainable Development Impacts) .

Stimulating Foreign Investment;

The concept of project based mechanism, bringing together an investor under the emission reduction obligation and a country with low marginal abatement cost, may ensure an opportunity to introduce local investors to foreign investors and foreign investors may investigate the host country according to their interest fields.

D. ISSUES ON LINKING CAP AND TRADE SCHEME WITH PROJECT BASED MECHANISM

A well designed linkage between cap and trade scheme and project based mechanism could lead to many benefits in economic, technological and environmental terms. But these effects could be reversed if the required regulations are not implemented clearly to avoid issues rising from linking two systems.

I. DOUBLE COUNTING

The key issue that the regulatory authority has to deal with while implementing linkage between project based mechanism and cap and trade scheme is double counting. Both environmental and financial benefits of emissions trading systems may be compromised by double counting issue. It occurs, basically, when an emission reduction project's mitigation effort is assessed twice unintentionally. The project based activities are implemented in order to gain tradable emission reduction credits. But there is a risk that the project will also be used to fulfill other regulatory obligations, such as counting towards increases in renewable energy capacity. Such situations can lead to the double counting of emission reductions (Sorrell and Smith, 2002). It can also occur when two entities "earn tradable credit" for a single emission reduction or sequestration project, or when same entity claims an emission reduction or removal twice. There are two types of double

counting, direct and indirect. Briefly, direct double counting occurs if it arises from project activities which reduce or limit directly the emissions of an installation falling within the scope of the scheme and indirect double counting occurs if it arises from project activities which reduce or limit indirectly the emission level of installations falling within the scope of the scheme. Double counting may lead to increase liquidity in supply of credits, which causes to reduce of market prices and compliance cost, consequently these conditions lead to cause losing economical and environmental gains of cap and trade scheme.

Considering the fact that avoiding double counting is very crucial for a cap and trade scheme in terms of maintaining economical and environmental targets and benefits, sustaining these benefits of system requires clear rules and very careful monitoring processes. There are four main concepts which should be considered to avoid double counting issue; set-aside, determining appropriate project boundaries, differentiating capped sectors for project based mechanism from cap and trade scheme, and global registry tracking system.

Not well defined project boundaries may bring on double counting issue. For instance, a project may overlap two or more sectors and it is possible in this case that the emission reductions are claimed separately in each sector. Also projects may contain more than one installation, and in case of not well defined boundaries, each installation may claim the same emissions reduction credits. Moreover, some projects have inherent difficulties in monitoring the project data and this might result in double counting issue. The regulatory authority should determine the appropriate project boundaries to avoid double counting in such situations. Determining appropriate boundaries requires clearly identifying the ownership of the particular project that the entities who can claim emission credits from project, and the quantity of reduced emissions that can be attributable to the particular project. Project boundaries, therefore, are very crucial in terms of determination of the reduced emissions (direct/indirect) through a particular project, not clearly defined project boundaries may lead to double counting or generating inadequate credits for that particular project. Those key sectors/projects where double counting issue is a potential problem should be identified by regulatory authority and new methodologies should be developed to identify and eliminate the issue. Ownership, controlling, calculation, estimation and

accounting issues should be considered in detail and determined clearly. Also if all entities use the same reporting approach this may help avoiding from double counting issue.

To date some institutes related with climate change and project based mechanisms guided project boundaries with their assessment reports and propositions. The United Nations Framework Convention on Climate Change (UNFCCC) defines project boundary for CDM and JI activities as "the project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the CDM (or JI) project activity" (FCCC/CP/2001/13/Add.2, appendix B.para.4 and Annex G, para.52). Another proposal came from a collective work of the World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), which proposes that a project boundary encompasses "all relevant primary and secondary effects that will be taken into account in the project calculation...(and) can include both direct and indirect effects" (draft WBCSD/WRI 2003). Primary effects refers to the specific GHG reducing activities intended to be achieved through the project and secondary effects refers to all other GHG emissions changes occurring as a result of activity, including leakage. WRI/WBCSD notes that if all reporting entities use the same approach there will be no double counting of direct emissions between two or more organizations.

Some cap and trade schemes can be linked indirectly, as mentioned earlier, via a project based mechanism. In such a situation, credits generated from a specific offset activity can be sold in each scheme. Obviously in the absence of proper regulations this brings on double counting issue. Such a situation can be avoided with a global registry system that tracks emission reductions. Each traded emissions reduction credit has to be tracked with a specific serial number ensuring that the serial numbers are retired once they are used.

Bosi and Bygrave (2004) elaborate double counting issue on a domestic basis and they state that separating the covered sectors by project based mechanism and cap and trade scheme and not allowing participants to generate project-based credits from activities covered by the trading scheme is an efficient way for avoiding double counting. They also stress that it does not mean that participants in a domestic trading scheme could not be involved in project based activities. Participants in a cap and trade scheme may be involved

in activities which are not covered by the scheme, yet still could be eligible for crediting projects. Sorrell and Smith (2002) exemplify this situation in their work, which studied the UK trading scheme. Retail chains may want to propose project-based activities associated with transport, which was not covered by the UK trading scheme. Considering the statement of Bosi and Bygrave, the relation between covered sectors by cap and trade scheme and project based mechanism implies that while the scope of the cap and trade scheme expands, the scope of project based mechanism reduces. Sorrel and Smith propose in order to eliminate double counting concerns that "Projects that affect emissions from sources that are covered by the cap and trade program are ineligible for crediting" (Sorrell and Smith, 2002). This proposal can be illustrated with power generation sector. If we assume power generation sector is capped by a cap and trade scheme, the proposal implies that not only power generation sector but also greenhouse gas emitting power generation sectors, such as renewable energy projects, should be excluded from project based mechanism's scope (Bosi and Bygrave, 2004).

While separating the scopes is an easy and efficient way to avoid double counting issue, cap and trade scheme and project based mechanism could include same scopes with appropriate regulations. A regulatory authority or government could keep a certain volume of the allowances and this helps avoiding double counting greenhouse gas emission reductions. Once the total allowance limit for a given sector, which is capped by cap and trade scheme, is defined (i.e. the total allowed greenhouse gas emission level for that sector) authority or government may assess the predicted or desired project activities and emission reductions related to the given sector. The assessment of the project activities may be adjusted according to approved and planned activities. By doing so, the total contribution of project based mechanism is subtracted from the total allowances for that sector and the double counting issue arising from linking two different schemes could be avoided. In theory, the quantity of credits earned through project based mechanism can reach up to the level of allowances set-aside for the project based mechanism. However, there could be flexibility to add project based credits to domestic allowances for a country with an overall greenhouse gas emission obligation (Bosi and Bygrave, 2004). This points out that the allowances set aside and credits achieved through project based activities may not be corresponding. In such a case, for example, if the credits earned from projects end up with greater volume than the allowances set aside for the projects, then other mitigation

measures and emissions purchases would be needed. On the other hand, if the allowances set aside for the project based activities are greater than the achieved emission reductions, then the extra allowances could be supplied to the trading market or banked for the future.

Even though linking two systems is technically possible, there are issues regulatory authorities should consider while implementing linkage. The relationship between project based mechanism and foreign investment has an important effect on that kind of a decision. Economic, political costs and benefits, design issues, and administrative costs are the issues which should be considered in detail before deciding the linkage. Bosi and Bygrave also concludes that combing a domestic cap and trade scheme and a project based mechanism in the same sector would likely involve more complexities and perhaps efficiency losses compared to a stand-alone domestic cap and trade scheme (Bosi and Bygrave, 2004).

II. CREDITING ISSUE

A project activity should be certified in order to generate tradable credit. The volume of credits as a consequence of a project activity relies especially on determination of the terms; baseline, leakage, permanence, project boundary. How these terms are defined, calculated or estimated affect the environmental and economic impacts of the activity. Project credits should be issued ex-post (after reductions have been verified) in order to observe every factor (e.g. leakage, permanence) affecting quantity of credits and ex-ante crediting (forward crediting) should not be allowed. Nevertheless, some countries may want to observe the potential contribution from the projects which will be implemented within the country to comply with GHG targets. Countries may want to do this for planning purposes. Bosi and Bygrave (2002) state that there are two possible solutions. Countries, that have such an intention, could develop a separate database to track emission reductions from domestic projects, or through a special notification procedure to the national registry as a suitable check and balance of project emission reductions against the national emission inventory, as suggested by Begg et al. (2002). Although the separate database brings additional administration costs, if the expected activities are in large volumes it may be worth these costs.

In order to maintain the environmental and economic efficiency of emissions reduction system, the project owners under the countries with domestic GHG reduction

target have to surrender an equal amount of allowance generated through project activity to national registry. As an example, after certification of the project activities which are undertaken in a developed country that has an emission reduction commitment under the Kyoto Protocol, the developed country must issue in its national registry a quantity of Assigned Amount Units (AAUs) equivalent to credits generated from project activities. This type of "backing" should work to guarantee the compatibility of project based credits (JI or domestic PBM) with the issuing country's emissions commitment under the Kyoto Protocol (Bosi and Bygrave, 2004). In the absence of such a "backing" there appears more credits, which could compromise the economic efficiency of the system through reducing the credit prices.

III. DATA, MEASUREMENT, AND ADDITIONALITY

The most significant critiques on project based mechanism contain the issues; data, measurement and especially additionality. Many scientists have argued that project activities could generate tradable credits, although they have no additional contribution in terms of environment. To verify a project activity, first the baseline, what would have happened in the absence of the project activity, should be estimated. Later, the GHG emissions from the project activity site should be monitored. If the project activity is assessed to be additional relative to the baseline, the project activity can be rewarded with tradable emission credits. The number of the credits depends on the difference between the hypothetical case and actual case. These procedures expose that the wrong calculation of baseline, not having accurate data, or having wrong/biased assessment in verification procedure compromise the success of the project based mechanism.

The greatest challenge while determining the baseline and calculating project emission is uncertainty. Begg et al. (1999) state that the largest source of uncertainty in accounting for emissions reductions is the counter factuality of the baseline and within the baseline, the main sources of uncertainty tend to be the choice of technology and timing of its introduction. They further state that to a large extent such uncertainty cannot be reduced even with a detailed case by case assessment. Hence, the result of emission reduction project cannot be measured 100% accurately. Nevertheless, good data and confidence in the validity of the baseline and project emissions measurements or estimates can minimize the uncertainty of project's emission reductions result.

The accurate assessment requires good data and measurement. However, some developing countries cannot afford the necessary economic and technologic conditions for acquiring good data and measurement. The projects undertaken in such developing countries may compromise, therefore, the success of the mechanism.

Number of the credits generated through a project activity depends on how the baseline is defined. While the best possible result can be obtained if the baselines are calculated on a case-by-case basis. This can be very costly and it can reduce the cost effective benefit of the mechanism. On the other hand, general baseline methods can also not satisfy the accurate baselines, because the average factors affecting emissions could vary country to country or even region to region. The GHG Protocol for Project Accounting (by WBCSD/WRI) was developed to assist countries in estimation of baseline and accounting GHG emissions in most possible accurate, rigorous, transparent and comparable manner. To assist countries in reaching the best possible estimate of historical annual, national emissions in a consistent, transparent and comparable manner, Guidelines on National Greenhouse Gas Inventories was developed by the Intergovernmental Panel on Climate Change (IPCC). These guidelines provide reliable methods for the regions where site specific data are not available. These methods are also used for calculation of fuels used in national emission inventory and translate this into GHG emissions by using appropriate emissions factors. With help of these common guidance, the inconsistency between data sets caused by different data providers and baseline estimations can be minimized. While determining baseline and collecting data at these early years of project activities are not easy, they will become easier over time with the collected data and gained experiences.

In the report prepared for WWF (2007) the additionality of CDM projects are assessed and they conclude that a significant amount of registered projects are not additional. The main reasons of projects being not additional are as follows; lack of objective and transparent criteria for assessing additionality, guidance in the tools to demonstrate additionality mostly has not been applied correctly, most projects would be implemented without the CDM, and some projects have small economic attractiveness and barriers prevent the investment decisions. Further they assess, "Any approach to assess additionality will not be perfect. It will need to be accepted that there are some free-riding projects taking part in the CDM... In defining the requirements on additionality, a balance between the

number of acceptable free-riders and the lost opportunities of CDM projects needs to be found. Free-riders result in increased global GHG emissions because the CDM is an offset mechanism..., lost opportunities for CDM projects result in higher global GHG mitigation costs and ... to less benefits for sustainable development in the host countries. In this regard, the acceptable level of free-riding in the CDM is a policy decision which needs to balance the amount of “hot air” in the CDM against lost opportunities for CDM projects."

The main reason of linkage between project based mechanism and cap and trade scheme is providing cost effective abatement options for participants. If the projects do not realize their environmental objectives, the linkage may compromise the environmental and economic objectives. The more rigorous regulations (having sufficient confidence in monitoring, verification, and reporting) and experiences to be gained would reduce concerns in this regard.

IV. SHOULD THE PROJECT BASED CREDITS BE RESTRICTED?

Level of the complementarily use of credits generated through project based mechanisms to meet GHG reduction targets and restrictions on usable project based credits are important issues associated with linkage between cap and trade scheme and project based mechanism. Because project based mechanism could only generate supply of tradable emission credits, it should be linked to another emissions trading system. Regulatory authority could restrict the total usable project based credits in order to comply with GHG reduction target or it could even allow participants to achieve all targeted GHG reductions through project based mechanism. Policymakers have to take account the issues related with project based mechanism, and also should weigh the advantages and disadvantages of restricting before implementing any restriction. The question, whether it should be supplemental to domestic reduction targets or may it be used without any restriction, should be elaborated by policy designers very carefully.

One reason of limiting project based credits is based on the environmental integrity concerns of project based mechanism. While cap and trade schemes realize additional and real reductions, the reductions implemented through project based mechanisms are in most cases contentious. Another reason is that if the use of offset credits are not limited, while in a cap and trade scheme the reductions are undertaken in installations under the scheme,

the linkage with a project based mechanism, which may allow participants to implement projects outside of the scheme (e.g. CDM), may allow participants to implement all required emissions reduction outside of their installations. For the purpose of long term emission reduction achievement, the emission reductions in installations under the cap and trade scheme should be primary targets. Also, allowing to use large amounts of offset credits may cause to lose incentives to develop abatement technologies in capped sectors. One last reason is that limiting use of offset credits may result in ensuring that only credits with a certain quality enter the system.

There are different types of restrictions to limit usage of offset credits. Authorities could limit the type of projects or amount of credits or they may also limit the geographies in which the projects are allowed to be undertaken. Authorities may prevent use of offset credits to meet GHG reduction targets from some certain type of projects. In doing so, authorities could promote the projects that have more benefits for sustainable development and are additional. However, the question of which project types should be excluded or included is difficult to answer. In the report prepared for WWF (2007), author states that the basic problems in the CDM has to do with the way in which DOEs (Designated Operational Entities) are working and the way additionality is assessed. Another restriction could be on the quantity of offset credits (WWF 2007). Policymakers could limit the quantity of offset credits that are eligible for use in meeting emission-reduction targets. This limit is most commonly declared as a percentage of the total emission reduction or entity-level emission reduction requirements that can be met through offsets. There could be also supply limits, which establish a predetermined amount of offset credits that are issued in a given compliance period. Regardless of the number and type of offset projects available in the larger market, only those that were able to obtain credit through the regulatory supply program would be eligible for compliance use (Ensuring Offset Quality, 2008). One other restriction option under discussion is discounting the credits earned from project based mechanism against cap and trade allowances. By discounting offset projects against cap and trade allowances, the environmental concerns related with project based mechanisms can be reduced. For example, two offset credits may be exchanged for one cap and trade allowance or countries may retire a certain percentage of their earned offset credits. The retired amount may represent an atmospheric benefit, as proposed by Environmental Defense (2007).

There are also economic and environmental arguments against limiting usage of offset credits to meet GHG emission reduction commitments. The most significant argument is that climate change is not an issue related with a specific location, but rather any emission reduction actualized in World contributes in achievement of long term targets. Offset Quality Initiative (OQI) proposes not restricting the usage of offset credits. Further the OQI state that by lowering the cost of the total system, the use of offsets could allow for the implementation of a more stringent cap, which would result in even greater emission reductions in both near- and long-term (Ensuring Offset Quality, 2008).

V. RAISING CONCERNS RELATED WITH DEVELOPING COUNTRIES

To achieve a long term emission reduction target, not only developed countries should take action, but also developing countries. Some project based mechanisms, such as CDM, include the projects taken place in developing countries, which may also be seen as a pilot period for developing countries to get used to reduction activities. Considering climate change as a long term issue, the project activities undertaken in developing countries will assist these countries to meet with their emission reduction targets to be taken in near future. Beside this objective, another objective of the project based mechanism undertaken in developing countries is to assist developing countries in achieving sustainable development. Linking such a project based mechanism with a cap and trade scheme may increase the number of the projects undertaken in developing countries.

To generate CERs from a CDM project, project has to meet with sustainable development goal, which should be assessed by host country. To date, many papers state that the contribution of the CDM to sustainable development is very low[34]. Although the project's contribution to sustainable development is very hard to determine, most countries define their criteria, which consist of many different aspects, including environmental, social, economic and technological criteria. Generally, countries accept the projects complied with at least one of the criteria. Therefore, most of the countries are not too ambitious about searching for a high contribution to sustainable development. This case suggests that expecting high sustainable development contributions from projects is not possible, if there

[34] Sutter and Parreño (2007) state that only 1-2% of the CERs come from projects contribute to sustainable development, see also Michaelowa and Michaelowa, 2007.

is not any consensus among developing countries to resist against the projects with low (or no) contribution to sustainable development. Any country's resistance may cause the possible projects to move another country, which is willing to host projects. If all host countries would reject projects with few benefits for sustainable development, the global CDM portfolio would be impacted, as investors and project developers would have to focus on projects with high benefits for sustainable development (WWF, 2007).

Linking project based mechanism to cap and trade scheme, basically, provide opportunities to implement cost effective projects in different countries for participants. Countries or firms benefits from the differences in MACs. Although competitively determined price is a key feature of market, it is not valid for CDM. Thus, unlike a tradable permit market where infra-marginal units of abatement are also sold at the prevailing market price, this may not always be the case under CDM and division of gains (the difference between MACs) could be an important issue for CDM projects (Gupta, 2004)[35]. Chander (2003) suggests that rather than receiving a competitive market price for emission reductions, developing countries may simply be paid the actual cost of abatement, perhaps with some markup.

Another issue associated with developing countries is related with near future. While developed countries has been implementing the low cost abatement projects in developing countries, in case the developing countries commit to emission reduction in emissions, the projects undertaken till that date will only leave them with higher cost options. However, Karp and Liu (2000) point out that the main problem with CDM is not that the most profitable projects would be taken up first, which is a normal consequence, but the possibility that the host country receives inadequate compensation. Gupta (2004) suggests that this can be solved if host countries could create and bank their own CERs. If the developing countries assess the price of offset credits very low, they can hold the credits till they can take the price they desired.

[35] Greenhouse Gas Emissions Trading and Project-based Mechanisms, 2004, OECD

5. CASE STUDY: EU ETS

This section studies the EU ETS case, as an example for the technical issues addressed by the previous sections. As the current biggest cap and trade scheme, EU ETS is linked to project based mechanisms defined by Kyoto Protocol, Clean Development Mechanism (Article 12) and Joint Implementation (Article 6). Linkage between these three mechanisms was established with the so called "Linking Directive"[36]. Linking Directive allows EU ETS' participants to use certified emission reductions (CERs) and emission reduction units (ERUs) generated through CDM/JI to meet EU ETS obligations. The goals of the Linkage and the benefits of JI and CDM are defined by the Directive's 3. article;

> "Linking the Kyoto project-based mechanisms to the Community scheme (EU's ETS), while safeguarding the latter's environmental integrity, gives the opportunity to use emission credits generated through project activities eligible pursuant to Articles 6 and 12 of the Kyoto Protocol in order to fulfil Member States' obligations in accordance with Article 12(3) of Directive 2003/87/EC. As a result, this will increase the diversity of low-cost compliance options within the Community scheme leading to a reduction of the overall costs of compliance with the Kyoto Protocol while improving the liquidity of the Community market in greenhouse gas emission allowances. By stimulating demand for JI credits, Community companies will invest in the development and transfer of advanced environmentally sound technologies and know-how. The demand for CDM credits will also be stimulated and thus developing countries hosting CDM projects will be assisted in achieving their sustainable development goals."

The European Commission established a Working Group under the European Climate Change Programme to examine the possible flexible mechanisms in meeting GHG targets. A Sub-Group on JI and CDM was further established in 2001 to study the linkage between the EU ETS and project based mechanisms (Bosi and Bygrave, 2004). From various authors, a number of reasons have been identified to justify pursuing the linkage of JI and CDM to the EU ETS (ECCP 2002, Wemaere 2003, EC 2003a, Runge-Metzger 2003). Mainly, the reasons can be ordered as follows;

[36] The European Parliament and Council issued Directive 2004/101/EC on 27 October 2004 to cover the text of the Kyoto Protocol with relevance to the EEA. This Directive effectively amended the original Directive 2003/87/EC which set up the EU ETS.

Linking of the EU ETS to CDM/JI

• increases compliance options for entities, reduces overall compliance costs, and improves liquidity of the emissions trading market within the EU,

• contributes to the sustainable development objectives of host countries, and promotes the transfer of environmentally sound technologies to third countries,

• drives environmental policy integration in EU external policies and contributes to the EU Strategy on Sustainable Development,

• fosters international cooperation on common policies and a multilateral approach to climate change.

Before going any further, there should be four answers, which are given to the following questions by the Linking Directive, to better understand the Directive.

- When should a link be established?
- What projects should be linked?
- How should the regimes be linked?
- How much should the regimes be linked?

The concerns, associated with project based mechanisms' environmental integrity or the fear that a massive import of JI and CDM credits into the EU ETS would significantly lower the market price of the CO2 allowances and lead to little or no domestic abatement, arose the objections of many environmental non-governmental organizations (NGO) to the linkage (Lefevere, 2005). Considering these concerns, Linking Directive introduced some restrictions on projects and quantities.

Member States are allowed to use the credits generated through CDM projects as of 2005, and to use the credits generated through JI projects as of 2008. As a consequence of the significant concerns about the environmental effects of projects, some project types are excluded from recognition. Land use, land use change and forestry (LULUCF) activities are excluded from the EU ETS, because the Commission concluded that including LULUCF

activities could undermine the environmental integrity of the EU ETS, for the following reasons;

- LULUCF projects cannot physically deliver permanent emissions reductions. Insufficient solutions have been developed to deal with the uncertainties, non-permanence of carbon storage and potential emissions 'leakage' problems arising from such projects. The temporary and reversible nature of such activities would pose considerable risks in a company-based trading system and impose great liability risks on Member States.

- The inclusion of LULUCF projects in the ETS would require a quality of monitoring and reporting comparable to the monitoring and reporting of emissions from installations currently covered by the system. This is not available at present and is likely to incur costs which would substantially reduce the attractiveness of including such projects.

- The simplicity, transparency and predictability of the ETS would be considerably reduced. Moreover, the sheer quantity of potential credits entering the system could undermine the functioning of the carbon market unless their role were limited, in which case their potential benefits would become marginal.[37]

Another project type excluded from EU ETS is projects in nuclear facilities. This type of projects are excluded directly by the Marrakesh Accords, which refer to the a set of agreements reached at the Conference of the Parties 7 (COP7)[38] meeting in 2001 on the rules of meeting the targets set out in the Kyoto Protocol. Except these types of projects, Linking Directive stipulates Member States to decide which CERs and ERUs can be used. In addition, another project type addressed by Linking Directive is Hydroelectric power project activities. World Commission on Dams (WCD) identified the Criteria and guidelines that are relevant to considering whether hydroelectric power production projects have negative

[37] http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/35, page was seen on 23.02.2010.

[38] Since 1995, the parties to the convention have met annually in Conferences of the Parties (COP) to progress in combating climate change. In 1997, the Kyoto Protocol was adopted and the detailed rules for the implementation of the Protocol were adopted at COP7, in 2001.

environmental or social impact in its report[39], 2000. Article 11b (6) of the Directive defines the requirements for the hydro electric power project activities that when Member States approve such project activities, they shall ensure that relevant international criteria and guidelines will be respected during the development of such project activities.

To answer the question "how should the regimes be linked?", the values of the Kyoto units should be addressed. Units traded under the EU ETS are fully "fungible" (all units are fully interchangeable and thus one CER or ERU corresponds to one EUA) and that Member States are required to accept all EU allowances for compliance, irrespective of the company that the allowance was originally allocated to and the country it was originally allocated by (Emissions Trading Policy Brief, Vol.5, 2003).

Taking into consideration the primary targets of the scheme, the environmental impact and economic effectiveness, the Commission has tried to prevent the possible issues arising from linkage by applying the principal "supplementarity". The Marrakesh Accords state that "the use of the mechanisms (i.e. International emissions trading, JI and CDM) shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments". However, the Marrakesh Accords do not define exactly how this "supplementarity" should be, and the Accords leave the decisions on this issue to Parties. In the first period (2005-2007), EU ETS Directive (Criterion 12 of Annex III) states that "Member States shall specify the maximum amount of CERs and ERUs which may be used by operators in the Community scheme as a percentage of the allocation of the allowances to each installation. The percentage shall be consistent with the Member State's supplementarity obligations under the Kyoto Protocol and decisions adopted pursuant to the UNFCCC or the Kyoto Protocol". Although these definitions were made by Marrakesh Accords and EU ETS Directive, no precise information was provided with respect to the "supplemental" character of the flexible mechanisms.

[39] World Commission on Dams November 2000 Report "Dams and Development — A New Framework for Decision-Making"

European Commission became more assertive with the guidance[40], the third guidance on the criteria of Annex III published in November 2006, on the principle "supplementarity" with respect to the second phase, which represents Kyoto commitment period, 2008-2012. This report announced that the Commission would assess the National Allocation Plans[41] in a manner which would allow the EU ETS " to unfold its full environmental and economic potential in terms of environmental and economic benefits". In addition, the Commission introduced a three-step process to calculate the percentage of usable Kyoto units consistent with the supplementary principle. In first step, Commission introduced a formula allowing the calculation of the overall amount of JI and CDM credits to which a Member State can have recourse in second phase. Second step indicated which rules Member States have to observe when fixing the limit for the use of Kyoto units for the covered sectors. Moreover, the Commission defined a minimum threshold for the use of Kyoto units.

The Commission stated that the "reduction effort", that Member States had to make to meet their Kyoto targets, will be taken as the basis for the maximum overall amount of JI/CDM credits that Member States are allowed to demand. The calculation of "reduction effort" requires three different years' emissions results, the base year of the Kyoto Protocol[42] (in general 1990), greenhouse gas emissions in 2010, and projected emissions in 2010. Among these "reduction effort", half of the figure representing the highest effort is calculated and it is considered to be the maximum overall amount of JI/CDM credits that a Member State can make use of in addition to domestic action. Sépibus (2008) state that the Commission was able to take into account the large diversity of Member States' emission paths since 1990 without penalizing one over the other, by allowing Member States to rely

[40] European Communication (2006). Communication from the Commission to the Council and to the European Parliament on the assessment of national allocation plans for the allocation of greenhouse gas emission allowances in the second period of the EU Emissions Trading Scheme accompanying Commission Decisions of 29 November 2006 on the national allocation plans of Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, Slovakia, Sweden and the United Kingdom in accordance with Directive 2003/87/EC

[41] The National Allocation Plan defines the basis on which allocations of free greenhouse gas emission allowances to individual installations covered by the Emissions Trading Scheme will be made.

[42] Although in general "1990" is the base year for the desired emissions reduction in Kyoto Protocol, the base years vary from 1985 to 1995 according to the Parties. Kyoto Protocol base year data; http://unfccc.int/ghg_data/kp_data_unfccc/base_year_data/items/4354.php

on the highest figure resulting from these calculations. And this calculation method reduced significantly the conflicts arising from its different interpretations by Member States of the "supplementarity" principle.

The EU ETS Directive declared the specific sectors covered and non-covered by the scheme. The Commission declared that there is no restriction on which sectors should undertake the burden of the domestic "reduction effort" in Member States. They are, therefore, free to choose the sectors. A Member State may allow its operators covered by the EU ETS to make use Kyoto units to the full amount of the limit, in case this Member State did not intend to purchase any CDM/JI units with government funds[43]. On the contrary, if the Member States had purchased Kyoto units, or intended to do so, they have to reduce the amount of JI/CDM credits, which can be used by installations in the Community scheme, by the annual average amount of intended or substantiated government purchases[44].

***In practical terms* the Commission assesses consistency with supplementary obligations based**
on the following formulae:

A = base year emissions – emissions allowed under Kyoto target
B = greenhouse gas emissions in 2004 – emissions allowed under Kyoto target
C = projected emissions in 2010 – emissions allowed under Kyoto target
D = 50 % of Max (A, B, C) – annual average government purchase of Kyoto units

Maximum allowed limit (in %) = (D / annual average cap) or 10 %

Table 8:Calculation of Maximum amount of JI/CDM credits Member States were allowed to have recourse between 2008-2012%[45]

[43] Point 2.3 reads: "In respect of Member States which do not intend to purchase any Kyoto units with government funds, a Member State may allow its operators covered by the Community scheme to make use of CDM/JI credits to the full amount of this limit. This limit is to be understood as a percentage figure specified as a share of the approved cap for the trading sector. If Member States allowed a higher level of usage, criterion (12) is considered to be violated." See European Commission, COM (2006) 725.

[44] "In respect of Member States which intend to purchase Kyoto units with government funds, these purchases are taken into account. The amount of JI/CDM credits that can be used by installations in the Community scheme in that Member State is reduced by the annual average amount of intended or substantiated government purchases." See European Commission, COM (2006) 725

[45] European Communication (2006). Communication from the Commission to the Council and to the European Parliament on the assessment of national allocation plans for the allocation of greenhouse gas emission allowances in the second period of the EU Emissions Trading Scheme accompanying Commission Decisions of 29 November 2006 on the national allocation plans of Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, Slovakia, Sweden and the United Kingdom in accordance with Directive 2003/87/EC

While the European Commission set the overall maximum allowed limit to use CDM/JI credits to meet Kyoto GHG reduction obligations with a formula based on each Parties' self reduction effort, the Commission defined the minimum threshold to use credits generated through Kyoto flexibility mechanisms as 10%[46]. According to the Commission's statement to endorse this decision "This reflects a reasonable balance between domestic reductions and giving operators of installations an incentive to invest in projects in developing countries".

A. LINKING DIRECTIVE WITH RESPECT TO DOUBLE COUNTING

As mentioned before, the double counting affects the success of the emissions trading systems both in economic and environmental terms. From the economic point of view, the double counting is not desirable, because the more allowances in market results in lower allowance prices and from the environmental point of view, double counting results in more allowances in market than there should be otherwise, due to the verification of reductions, which are not genuine.

Double Counting may occur, if the emission reductions are undertaken in the installations covered by the cap and trade scheme. As stated in Section 4, the best option to avoid such a double counting is separating the sectors, in which the projects can take place and the sectors covered by the scheme. As the CER credits are generated through CDM projects, which are undertaken in developing countries, this credits does not imply a risk in this context. Therefore, this option should be considered in the EU ETS in terms of JI projects. The Directive states that "no ERUs are allowed to be issued for reductions or limitations of GHG that take place in installations under the EU ETS". The Commission also considered the possibility that Member States might have allowed such projects before the decision. The Commission, therefore, further states that if the Member States have committed themselves before the declaration of the decision to issuing such credits from

[46] "Where assessment in accordance with these approaches would result in a situation that EU ETS installations in that Member State would only be able to use JI/CDM credits up to a level of less than 10%, the Commission considers that as a minimum threshold installations should be allowed to use JI/CDM credits up to a level of 10%." See European Commission, COM (2006) 725

direct reductions[47] or limitations that result in double counting, it allows ERUs to be issued until 31 December 2012 provided that the Member States cancel an equal number of allowances. And the national authorities are responsible for cancelling these allowances in the national registry of the Member State that issues the ERUs from indirect reductions or limitations[48]. In addition, the EU ETS requires establishment of two different set-asides in the national allocation plan (NAP) of Member States for the period 2008-2012, one for approved projects and another for planned projects. If a Member State will host approved projects, which will take place in its installations covered by the emissions trading scheme and may cause double counting, that Member State has to list such approved project activities and their anticipated reductions or limitations. In the same way, if a Member State intend to host project activities, which may take place in its installations covered by the emissions trading scheme and may cause double counting, that Member State has to list planned project activities and its anticipated reductions or limitations. In the event of the quantity of allowances in the set-aside for approved projects not converted to ERUs they may be sold, whereas allowances in the set-aside for planned projects not issued as ERUs are cancelled.

B. ACQUIS COMMUNAUTAIRE AND BASELINE

With regard to baseline establishment, Linking Directive states that (Article 11b) Member States has to take into account the *Acquis Communautaire* (EU legislation) in the establishment of baselines for project activities undertaken in member and candidate countries. The Acquis Communautaire relevant to climate change, under the environment[49]

[47] Definition of "Direct Reduction"; " 'direct emission reduction or limitation' means a reduction or limitation of emissions occurring due to a project activity which causes reductions or limitations of emissions in installations that are individually identified in the project activity's baseline established pursuant to decisions of the United Nations Framework Conference on Climate Change (UNFCCC)" ., European Commission, 2006/780/EC

[48] Definition of Indirect Reduction: 'indirect emission reduction or limitation' means any reductions or limitations of emissions in installations falling under the scope of Directive 2003/87/EC that is not a direct emission reduction or limitation", European Commission, 2006/780/EC

[49] Chapter 27: Environment: EU environment policy aims to promote sustainable development and protect the environment for present and future generations. It is based on preventive action, the polluter pays principle, fighting environmental damage at source, shared responsibility and the integration of environmental protection into other EU policies. The acquis comprises over 200 major legal acts covering horizontal legislation, water and air quality, waste management, nature protection, industrial pollution control and risk

chapter, includes minimum environmental standards (such as emission limit values for large combustion plants), and market based instruments (i.e. the EU ETS). There are directives under the Acquis Communautaire which affect the baselines directly and indirectly. Integrated Pollution Prevention Control (IPPC) Directive[50] and Landfill Directive[51] have direct effect on the baseline establishment of the projects undertaken in Member States (Joint Implementation Projects). Directives on fuel quality and vehicle emissions, and the Large Combustion Plant Directive have indirect effects on the baseline establishment of the JI projects. There may be different implementations of Acquis Communautaire among Member States owing to two main reasons. First reason is that transition measures can be negotiated with the Commission for some reasons, e.g. when a substantial adaptation of infrastructure is needed and secondly, EU environmental legislation is often defined in terms of Best Available Technologies (BAT). Development level of each country varies and therefore BAT may vary among countries, or even within a country and it can be subject to negotiations. Through the constant update of Best Available Technique Reference Documents (BREF), IPPC does not leave a wide room for negotiations, and it narrows considerable room for movement in respect of setting the baseline (Javier de Cendra de Larragan, 2006).

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management, chemicals and genetically modified organisms (GMOs), noise and forestry. Compliance with the acquis requires significant investment. A strong and well-equipped administration at national and local level is imperative for the application and enforcement of the environment acquis.

http://ec.europa.eu/enlargement/enlargement_process/accession_process/how_does_a_country_join_the_eu/negotiations_croatia_turkey/index_en.htm

[50] The objectives and principles of the Community's environment policy, as set out in Article 174 of the Treaty, consist in particular of preventing, reducing and as far as possible eliminating pollution by giving priority to intervention at source and ensuring prudent management of natural resources, in compliance with the 'polluter pays' principle and the principle of pollution prevention., European Commission Directive 2008/1/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:024:0008:0029:EN:PDF

[51] The Directive's overall aim is "to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from the landfilling of waste, during the whole life-cycle of the landfill", European Commission Directive 1999/31/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:182:0001:0019:EN:PDF

6. CONCLUSIONS

The two of the most important policy instruments to reduce GHG emissions and so its impacts in climate change are cap and trade scheme and project based mechanism. Cap and trade scheme covers the biggest emitters in a region and determines a total emission for the scheme. Participants may sell or buy emission allowances in order to comply with their own emission limits. Because of the reasons, such as administration and ease of measurement, the scheme could not cover all installations in a region. On the other hand, project based mechanisms provide participants to undertake emission reduction activities out of their sources, which may be more cost effective. Because the project based mechanisms include voluntary activities, these mechanisms should be linked to another emissions trading system. The costly structure of the emission reduction activities discourages a substantial part of the businesses to take action against climate change. Therefore, the idea, the discouraged firms may be persuaded to commit emission reductions with the help of the cost effective methods like project based mechanisms, has an important role to build an action with a great support from all possible sources.

To establish a linkage between these two different mechanisms, first of all, these mechanisms should have same unit of emission or emission reductions, namely one emission allowance from cap and trade scheme and emission credit from project based mechanism should correspond to one specific unit (e.g. a tonne of CO_2 equivalent). Linkage between these mechanisms is a desired situation considering its emergent advantages. The most prominent advantage of linkage is that it may provide more cost effective greenhouse gas mitigation possibilities for participants. While providing such a big economical advantage for participants, it may increase the market liquidity which also may reduce the allowance price in the market and consequently linkage may lower compliance costs of meeting environmental targets. Because of some administrative and measurement issues, cap and trade scheme could not cover all sources, hence, the desired scope expansion of the sources may be achieved through linkage between cap and trade scheme and project based mechanism. Beside these advantages, linkage may provide experiences for new mitigation methods and new sectors. This is also very important considering that in future the scope of the cap and trade scheme should be expanded in order to ensure a greater emission

reduction and the appropriate sectors could be discovered through project based mechanisms activities. Projects like CDM, which are implemented in developing countries, contribute the countries' sustainable development, so that these countries meet with new technologies via these activities and also they find the possibility to attract foreign investment.

Beside these economic advantages, there are some issues which should be elaborated carefully in order to not compromise the advantages of the linkage. While designing a linkage between these two schemes, the rules should be defined in accordance with avoiding double counting. Double counting issue occurs when an emission reduction is assessed and credited twice. It leads to an increase in allowances in market and collapses the prices. Separating the scopes of two mechanisms is the most effective method to avoid double counting. While it is the most straightforward method, it is also possible allowing participants to undertake emission reduction activities in installations covered by the cap and trade scheme, but this requires careful ex-ante monitoring and planning and also it could increase administration costs. If the authority allows participants to implement project activities in sources covered by the cap and trade scheme, this may require a set-aside of allowances equal to the credits which will be generated through the approved or planned activities. Defining project boundaries clearly is also very crucial point. Another option is global registry system. Giving to each emission reduction a serial number and retiring the serial number once it is traded may help avoiding double counting.

Another design issue is supplementarity. The rising environmental concerns with regard to project based mechanisms affect this issue. Generally the schemes restricts the use of the credits generated through project based mechanisms. The Kyoto Protocol states that these credits should be supplemental to domestic reductions. The participants should reduce their own emissions in the first place to achieve a long term emission reduction target. Also there are concerns which push policy makers to restrict credits from project based mechanisms whether or not the projects materialize into real and additional emission reductions. The counter assertion is that the use of credits should not be restricted because the impact of reduction in the air is independent of its location.

A project activity should be certified in order to generate tradable credit. The volume of credits as a consequence of a project activity relies especially on determination of the

terms; baseline, leakage, permanence, project boundary. How these terms are defined, calculated or estimated affect the environmental and economic impacts of the activity. An accurate assessment of the project requires good data and measurement. The result of emission reduction project cannot be measured 100% accurately. Nevertheless, good data and confidence in the validity of the baseline and project emissions measurements or estimates can minimize the uncertainty of project's emission reductions result. Satisfying good data and measurement is very important to gain confidence with regard to additionality of project based activities. To build a more reliable mechanism the projects should measure and calculate their results according to widely accepted guidance.

Clean Development Mechanism is defined by the Article 12 of the Kyoto Protocol, which allows countries to implement emission reduction projects in developing countries. While developed countries are benefiting from the cost effective projects in developing countries, these projects also contribute to developing countries' sustainable development. But also there are rising concerns with regard to these projects. First concern is that most of the projects are awarded although they do not contribute their sustainable development. This is a very big challenge to solve if there is no consensus among developing countries to resist against the projects with low (or no) contribution to sustainable development. Second concern is that in case the developing countries commit to emission reduction in emissions in future, the projects undertaken till that date will only leave them with higher cost options. This can be solved if host countries could create and bank their own CERs.

European Union Emission Trading Scheme is the biggest cap and trade scheme. It covers 27 countries and almost 11,500 installations. The EU ETS allows participants to use credits generated through Joint Implementation or Clean Development Mechanism to comply with their emission reduction goals. The Linking Directive allows to use credits from CDM as of 2005 and from JI as of 2008. Credits generated via LULUCF projects and nuclear facilities are not allowed to use. In the first phase the EU ETS allowed each Party to decide its maximum usable credits, in the second period the European Union determined a formula to calculate the country's maximum usable credits earned from project based mechanisms. While this formula defines the minimum threshold as 10% of total allowances, the maximum threshold is calculated according to each country's "reduction effort".

Linking Directive was established in 2003. In an amendment the EU ETS decided to separate the scopes of the cap and trade scheme and project based mechanisms to avoid double counting. However, there are some projects which are approved, planned or undertaken before this decision. Therefore, the EU Commission decided considering this situation that;

- EU ETS allows ERUs and CERs to be issued until 31 December 2012, even if the reductions or limitations of the project activities indirectly or directly reduce or limit the emissions of installations that fall under the Community emissions trading scheme, provided that an equal number of allowances is cancelled.

In addition, the EU ETS requires establishment of two different set-asides in the national allocation plan (NAP) of Member States for the period 2008-2012, one for approved projects and another for planned projects. With regard to baseline establishment, Linking Directive states that Member States has to take into account the *Acquis Communautaire* in the establishment of baselines for project activities undertaken in member and candidate countries.

GLOSSARY

Additionality: Emissions reductions achieved through a given project (or class of projects) over and above those that would otherwise have occurred in the absence of the project(s) under a business-as-usual scenario. Additionality is a criterion for approval of project-based activities (offsets) under the Clean Development Mechanism of the Kyoto Protocol as well as offset projects allowed for credit under other emissions trading programs.

Allowance: A government-issued authorization to emit a certain amount. In greenhouse gas markets, an allowance is commonly denominated as one ton of CO2e per year. See also "permit" and "credits (a.k.a. carbon credits)." The total number of allowances distributed to all entities in a cap and trade system is determined by the size of the overall cap on emissions.

Allowance distribution: The process by which emissions allowances are initially distributed under an emissions cap and trade system. Authorizations to emit can initially be distributed in a number of ways, either through some form of auction, free allocation, or some of both.

Afforestation: The process of establishing and growing forests on bare or cultivated land, which has not been forested in recent history.

Assigned Amount Unit (AAU): Annex I Parties are issued AAUs up to the level of their assigned amount, corresponding to the quantity of greenhouse gases they can release in accordance with the Kyoto Protocol (Art. 3), during the first commitment period of that protocol (2008-12). AAUs equal one tCO2e.

Auctioning: A method for distributing emission allowances in a cap and trade system whereby allowances are sold to the highest bidder. This method of distribution may be combined with other forms of allowance distribution.

Banking: The carry-over of unused allowances or offset credits from one compliance period to the next.

Baseline: The target, often the historical emissions from a designated past year, against which emission reduction goals are measured.

Benchmarking: An allowance allocation method in which allowances are distributed by setting a level of permitted emissions per unit of input or output.

Borrowing: A mechanism under a cap-and-trade program that allows covered entities to use allowances designated for a future compliance period to meet the requirements of the current compliance period. Borrowing may entail penalties to reflect a programmatic preference for near-term emissions reductions.

Cap and Trade: A cap-and-trade system sets an overall limit on emissions, requires entities subject to the system to hold sufficient allowances to cover their emissions, and provides broad flexibility in the means of compliance. Entities can comply by undertaking emission reduction projects at their covered facilities and/or by purchasing emission allowances (or credits) from the government or from other entities that have generated emission reductions in excess of their compliance obligations.

Carbon Tax: A surcharge on the carbon content of fossil fuels that aims to discourage their use and thereby reduce carbon dioxide emissions.

Carbon Dioxide Equivalent (CO2e): The universal unit of measurement used to indicate the global warming potential of each of the six greenhouse gases. Carbon dioxide — a naturally occurring gas that is a byproduct of burning fossil fuels and biomass, land-use changes, and other industrial processes — is the reference gas against which the other greenhouse gases are measured.

Certified Emission Reductions (CERs): A unit of greenhouse gas emission reductions issued pursuant to the Clean Development Mechanism of the Kyoto Protocol, and measured in metric tonnes of carbon dioxide equivalent. One CER represents a reduction of greenhouse gas emissions of one tCO2e.

Clean Development Mechanism (CDM): The mechanism provided by Article 12 of the Kyoto Protocol, designed to assist developing countries in achieving sustainable development by permitting industrialized countries to finance projects for reducing greenhouse gas emission in developing countries and receive credit for doing so.

Command and Control: A system of regulation that prescribes emission limits and compliance methods on a facility-by-facility or source-by-source basis and that has been the traditional approach to reducing air pollution.

Credits: Credits can be distributed by the government for emission reductions achieved by offset projects or by achieving environmental performance beyond a regulatory standard.

Conference of Parties (COP): The Meeting of Parties to the United Nations Framework Convention on Climate Change. Eligibility Requirements: There are six Eligibility Requirements for Participating in Emissions Trading (Art. 17) for Annex I Parties. Those are: (i) being a Party to the Kyoto Protocol, (ii) having calculated and recorded one's Assigned Amount, (iii) having in place a national system for inventory, (iv) having in place a national registry, (v) having submitted an annual inventory and (vi) submit supplementary information on assigned amount. An Annex I party will automatically become eligible after 16 months have elapsed since the submission of its report on calculation of its assigned amount. Then, this Party and any entity having opened an account in the registry can participate in Emissions Trading. However, a Party could lose its eligibility if the Enforcement Branch of the Compliance Committee has determined the Party is non-compliant with the eligibility requirements.

Downstream (source-based) System: Also known as a source-based system, a downstream cap-and-trade system is one in which the point of regulation coincides with the point of emission of covered greenhouse gases. Examples of this approach include the Regional Greenhouse Gas Initiative's cap on power plant CO2 emissions or the cap on large industrial and utility sources in the European Union's Emissions Trading Scheme.

Emissions Cap: A mandated constraint in a scheduled timeframe that puts a "ceiling" on the total amount of anthropogenic

greenhouse gas emissions that can be released into the atmosphere.

Emission Reductions (ERs): The measurable reduction of release of greenhouse gases into the atmosphere from a specified activity or over a specified area, and a specified period of time.

Emission Reduction Units (ERUs): A unit of emission reductions issued pursuant to Joint Implementation. This unit is equal to one metric ton of carbon dioxide equivalent.

Emissions Trading: The process or policy that allows the buying and selling of credits or allowances created under an emissions cap.

European Union Allowances (EUAs): the allowances in use under the EU ETS. An EUA unit is equal to one metric ton of carbon dioxide equivalent.

Grandfathering: A method by which emission allowances are freely distributed to entities covered under an emissions trading program based on historic emissions.

Greenhouse Gases (GHGs): Greenhouse gases include a wide variety of gases that trap heat near the Earth's surface, slowing its escape into space. Greenhouse gases include carbon dioxide, methane, nitrous oxide and water vapor and other gases. While greenhouse gases occur naturally in the atmosphere, human activities also result in additional greenhouse gas emissions. Humans have also manufactured some GHGs not found in nature (e.g., hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) that slow the release of radiant energy into space.

Joint Implementation (JI): Mechanism provided by Article 6 of the Kyoto Protocol, whereby a country included in Annex I of the UNFCCC and the Kyoto Protocol may acquire Emission Reduction Units when it helps to finance projects that reduce net emissions in another industrialized country (including countries with economies in transition).

Kyoto Mechanisms (KMs): the three flexibility mechanisms that may be used by Annex I Parties to the Kyoto Protocol to fulfill their commitments through emissions trading (Art. 17). Those are the Joint Implementation (JI, Art. 6), Clean Development Mechanism (CDM, Art. 12) and trading of Assigned Amount Units (AAUs).

Kyoto Protocol: Adopted at the Third Conference of the Parties to the United Nations Convention on Climate Change held in Kyoto, Japan in December 1997, the Kyoto Protocol commits industrialized country signatories to reduce their greenhouse gas (or "carbon") emissions by an average of 5.2% compared with 1990 emissions, in the period 2008-2012.

Land Use, Land-Use Change and Forestry (LULUCF): A greenhouse gas inventory sector that covers emissions and removal of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities. Expanding forests reduce atmospheric carbon dioxide; deforestation releases additional carbon dioxide; various agricultural activities may

add to atmospheric levels of methane and nitrous oxide.

Leakage: Process by which emitters relocate activities to avoid regulation.

Monitoring Plan (MP): A set of requirements for monitoring and verification of emission reductions achieved by a project.

National Allocation Plans (NAPs): The documents, established by each Member State and reviewed by the European Commission, that specify the list of installations under the EU ETS and their absolute emissions caps, the amount of CERs and ERUs that may be used by these installations as well as other features such as the size of the new entrants reserve and the treatment of exiting installations or the process of allocation (free allocation or auctioning).

Linking: Authorization by the regulator for entities covered under a cap and trade program to use allowances or offsets from a different jurisdiction's regulatory regime (such as another cap and trade program) for compliance purposes. Linking may expand opportunities for low-cost emission reductions, resulting in lower compliance costs.

Offset: Projects undertaken outside the coverage of a mandatory emissions reduction system for which the ownership of verifiable GHG emission reductions can be transferred and used by a regulated source to meet its emissions reduction obligation. If offsets are allowed in a cap and trade program, credits would be granted to an uncapped source for the net emissions reductions a project achieves. A capped source could then acquire these credits as a method of compliance under a cap.

Project-Based Emission Reductions: Emission reductions that occur from projects pursuant to JI or CDM (as opposed to "emissions trading" or transfer of assigned amount units under Article 17 of the Kyoto Protocol).

Project Design Document (PDD): A project specific document required under the CDM rules which will enable the Operational Entity to determine whether the project (i) has been approved by the parties involved in a project, (ii) would result in reductions of greenhouse gas emissions that are additional, (iii) has an appropriate baseline and monitoring plan.

Reducing Emissions from Deforestation and Forest Degradation (REDD): A set of strategies and incentives (including performance-based) for reducing emissions from deforestation and degradation.

Reforestation: This process increases the capacity of the land to sequester carbon by replanting forest biomass in areas where forests have been previously harvested.

Registration: The formal acceptance by the CDM Executive Board of a validated project as a CDM project activity.

Scope: The coverage of a cap and trade system, i.e., which sectors or emissions sources will be included.

Sequestration: Sequestration refers to capture of carbon dioxide in a manner that prevents it from being released into

the atmosphere for a specified period of time.

Source: Any process or activity that results in the net release of greenhouse gases, aerosols, or precursors of greenhouse gases into the atmosphere.

Supplementarity: Following the Marrakesh Accords, the use of the Kyoto mechanisms shall be supplemental to domestic action, which shall thus constitute a significant element of the effort made by each Party to meet its commitment under the Kyoto Protocol. However there is no quantitative limit to the utilization of such mechanisms. While assessing the NAPs, the European Commission considered that the use of CDM and JI credits could not exceeded 50% of the effort by each Member State to achieve its commitment. Supplementarity limits may thus affect demand for some categories of offsets.

United Nations Framework Convention on Climate Change (UNFCCC): The international legal framework adopted in June 1992 at the Rio Earth Summit to address climate change. It commits the Parties to the UNFCCC to stabilize human induced greenhouse gas emissions at levels that would prevent dangerous manmade interference with the climate system.

Updating: A form of allowance allocation in which allocations are reviewed and changed over time and/or awarded on the basis of changing circumstances rather than historical data. For example, updating can be based on megawatt-hours generated or tons of a product manufactured.

Upstream system: An upstream approach to a cap-and-trade system places the point of regulation with the point of entry of fossil fuels into commerce within the covered region.

Accounting Units		Each one equals one tonne of CO2 equivalent
AAU	Assigned Amount Unit	Emission allowance allocated to a country under the Kyoto Protocol
C E R	Certified Emission Reduction	Emission reduction expected from a Clean Development Mechanism (CDM) project
RMU	Removal Unit	Emission reduction from land use, land-use change and forestry activities resulting from a CDM or a Joint Implementation (JI) project
ERU	Emission Reduction Unit	Emission reduction from a JI project
VER	Voluntary Emission Reduction	Emission reduction from a voluntary project not bound to any legal framework or standard
(VER also means "Verified Emission Reduction", an acceptable unit for Chicago Climate Exchange contracts, but not Kyoto)		

Table 9: Table of Accounting Units

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SUMMARY

The international environmental treaty Kyoto Protocol was signed in 1997 and came into force in 2005, which aims at reducing GHG emissions and its impact in Global Warming. The Protocol introduced two policy instruments in order to achieve these targets cost effectively, project based mechanism and cap-and-trade. While these mechanisms can be used separately, a possible linkage between them may provide more low-cost mitigation option for polluters.

In order to show the advantages of disadvantages of linkage between these mechanisms this study investigates the mechanisms' theoretical background and provides examples with the current significant programs. In its fourth section, the study analyzes the benefits of linkage, which are typically economic; lowering the cost of achieving emission reduction targets, broadening markets for emission allowances and market, increasing market liquidity, reducing price volatility, stimulating low carbon technology investment, contributing to sustainable development. And also the issues on linkage are analyzed which can be ordered as follows; double counting of the same emission reduction effort -this issue can be avoided through strict monitoring and regulation-, environmental concerns raising from project based activities –whether or not the activities realize a real and additional emission reduction-, supplementarity issue –should the credit use be restricted- and the raising concerns regarding developing countries –whether or not the project activities contribute to the developing countries' sustainable development-.

The biggest multi-national and multi-sectoral cap and trade, European Union's Emission Trading Scheme, is also studied in terms of its linkage with the two project based mechanisms which are introduced by the Kyoto Protocol, Clean Development Mechanism and Joint Implementation. The main rules of linkage and the rules to avoid possible issues arising from linkage are elaborated.

This study also concludes that the environmental concerns could be minimized very strict data collection, measurement and monitoring. These concerns can be minimized through gained experiences and new methods and technologies over years. And although it may bring on some environmental and design issues, the linkage is necessary and useful in terms of its economic benefits.

ZUSAMMENFASSUNG

Als internationales Umweltabkommen trat das Kyoto Protokoll nach Unterzeichnung im Jahr 1997 letztendlich 2005 in Kraft. Ziel des Protokolls ist es, den Ausstoß an Treibhausgasen und damit ihren Einfluss auf die globale Erwärmung zu reduzieren.

Um die gesetzten Ziele kosteneffizient zu erreichen, wurden in diesem Rahmen zwei Politikinstrumente eingeführt, projektbasierte Mechanismen sowie ein „cap-and-trade“ System.

Während diese Mechanismen eigentlich getrennt voneinander eingesetzt werden, könnte eine mögliche Verknüpfung hingegen eine Möglichkeit zur kostengünstigen Verringerung für die Emittenten darstellen.

Diese Arbeit untersucht die theoretischen Hintergründe der genannten Mechanismen und zeigt Beispiele derzeit wesentlicher Programme auf, mit dem Ziel die Vor- und Nachteile einer solchen Verbindung herauszustellen. Im weiteren Verlauf der Forschungsarbeit werden Nutzenaspekte einer Verknüpfung analysiert, die üblicherweise ökonomischer Natur sind: eine Senkung der Kosten für eine Erreichung der Reduktionsziele, ein Ausweiten der Märkte für Emissionsrechte, eine Erhöhung der Marktliquidität, eine Reduktion der Preisvolatilität, die Schaffung von Investitionsanreizen für CO_2 effiziente Technologien, sowie das Leisten eines Beitrages zur nachhaltigen Entwicklung.

Des Weiteren werden die Kernpunkte einer Verknüpfung problematisiert. Hierzu gehört die doppelte Berechnung der selben Leistung zur Reduktion von Emissionen, welche durch strenge Überwachung und Regulation vermieden werden kann. Einen weiteren Aspekt stellen ökologische Bedenken resultierend aus projektbasierten Aktivitäten dar, die mit der Frage verbunden sind, ob die Aktivitäten überhaupt zu einer realen zusätzlichen Reduktion der Emissionen führen. Zusätzlich werden ergänzende Problemstellungen angeführt, wie die Überlegung, ob die Möglichkeiten zu Kreditnutzung begrenzt werden sollten, sowie wachsende Bedenken hinsichtlich der Entwicklungsländer thematisiert. Hier steht die Frage im Mittelpunkt, in wie weit, wenn überhaupt, die Projektaktivitäten zur nachhaltigen Entwicklung der Entwicklungsländer beitragen.

Das größte multi-nationale und multi-sektorale „cap-and-trade“ System, das Emission Trading Scheme (ETS) der europäischen Union, wird außerdem hinsichtlich der Verbindung der zwei projektbasierten Mechanismen, welche durch das Kyoto Protokoll eingeführt worden sind, untersucht. Diese sind die gemeinsamen Umsetzung sowie der Mechanismus zur umweltverträglichen Entwicklung. Die grundlegenden Richtlinien der Verknüpfung und die Regeln zur Verhinderung möglicher Probleme, die hierdurch entstehen können, werden in der Folge ausgearbeitet.

Die vorliegende Arbeit kommt zu dem Schluss, dass die ökologischen Bedenken nur durch eine Kombination aus strenger Datenerhebung und Bemessung, sowie lückenloser Überwachung ausgeräumt werden können. Neue Technologien und Methoden und vor allem die wachsende Erfahrung werden weiters unterstützend hierzu beitragen. Und obwohl Verknüpfungen sicherlich auch Herausforderungen an Art und Aufbau der jetzigen Rahmenbedingungen des Emissionshandels stellen werden, sind sie aufgrund ihres ökonomischen Nutzens als notwendig zu erachten.

Curriculum Vitae

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