UNIT 12 INTRODUCTION TO CLEAN DEVELOPMENT MECHANISM

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12.0 OBJECTIVES

After going through this Unit, you will be:

- discuss the concept and significance of the Clean Development Mechanism (CDM);
- identify the structure and roles of key institutions involved in CDM;

- explore the goals and dual objectives of CDM in promoting emission reductions and sustainable development;
- evaluate how CDM supports climate change mitigation and facilitates green investments in developing countries; and
- examine the fundamental rules, conditions, and limitations that govern CDM projects and eligibility.

12.1 INTRODUCTION

To address the challenge of climate change, countries around the world came together and signed international agreements like the Kyoto Protocol. These agreements help regulate and reduce the greenhouse gases (GHGs) that cause global warming. But here's the interesting part – developed countries, which are historically responsible for a large share of emissions, are allowed to invest in clean, eco-friendly projects in developing countries to meet part of their own emission reduction targets. This system is known as the Clean Development Mechanism (CDM).

In simple terms, CDM is like a global partnership. A developed country supports a project - like a wind power plant or a solar lighting system – in a developing country. That project reduces emissions, and in return, the developed country earns Certified Emission Reductions (CERs), which it can use to meet its own emission goals. At the same time, the host country gets technology, investment, and development benefits.

In this Unit, we will explore what CDM is, how it works, and why it matters for sustainable development. You'll learn about the different institutions involved, the rules and procedures CDM follows, and the benefits it offers not only to the environment but also to businesses and economies. By the end of this Unit, you will have a clearer understanding of how environmental responsibility and business opportunities can go hand in hand– something that every future manager should know.

12.2 CONCEPT OF CLEAN DEVELOPMENT MECHANISM (CDM)

International concern over the environmental impacts of the world's uncontrolled use of coal, oil, and gas has grown in the second half of the twentieth century. The damage caused to plants, animals, and buildings by acid rain and the effects on human health of poor air quality and smog have led to a raft of national, regional, and international agreements aimed at controlling these problems by cutting emissions of the gases that cause them.

In the mid-1980s, awareness began to increase of yet another problem caused by fossil fuels– climate change, also known as global warming or the greenhouse effect. The warming gases (known as greenhouse gases) are given off when fossil fuels are burnt. These gases increaze in the atmosphere, leading to rises in global temperature and sea levels. The most important greenhouse gas is carbon dioxide (CO_2). Concentrations of carbon dioxide in the atmosphere today are already 30 per cent higher than the levels that existed before the Industrial Revolution.

The Clean Development Mechanism (CDM) is a key tool in the Kyoto Protocol, allowing countries with emission reduction targets (Annex I countries) to undertake and benefit from reductions in greenhouse gas emissions in other (non-Annex. I) countries. Under the Kyoto Protocol, the developed countries took on binding quantitative commitments to limit their greenhouse gas emissions for the period 2008-2012. Each country with a binding emission commitment has been allocated an emission quota called its assigned amount. The quota is divided into assigned amount units (AAU), which can be traded with other developed countries. This type of arrangement is called a cap-and-trade system. In addition to taking part in emissions trading, the developed countries can meet their commitments through domestic abatement, projects in other developed countries (Joint Implementation projects), and finally, through the Clean Development Mechanism (CDM).

The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one ton of CO_2, which can be counted towards meeting Kyoto targets.

According to the Kyoto Protocol, the purpose of the CDM is to assist the developed countries in meeting their commitments and to assist developing countries in achieving sustainable development (see Article 12 of the Protocol). One could argue that CDM projects facilitate the transfer of new environmentally sound technology to developing countries. However, significant transfers of new technology are unlikely in developing countries if there are no costs (tax or carbon price) associated with emissions, especially if those transfers lead to higher production costs. Moreover, the CDM may encourage the introduction of new technology, even though the most cost-effective measure would be to reduce production. This is because emission credits can be earned by introducing new technology, whereas it is difficult to define reductions in production as CDM activities.

The CDM allows developed countries to earn certified emission reduction units (CERs) through emission-reduction or emission-removal projects in developing countries. *Examples* include afforestation (*i.e.,* planting *new* forests), switching to less polluting fuels or energy sources, and energy efficiency measures. Since emissions reductions achieved through the CDM may be used in their entirety to offset emissions in developed countries, the mechanism is not designed to bring about an overall decrease in global emissions.

The CDM is intended to meet two objectives:

1) to assist parties not included in Annex. I in achieving sustainable development and in contributing to the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), which is to prevent dangerous climate change; and

2) to assist parties included in Annex. I in achieving compliance with their quantified emission limitation and reduction commitments (greenhouse gas (GHG) emission caps). "Annex. I" parties are those countries that are listed in Annex. I of the treaty and are the industrialized countries. Non-Annex. I parties are developing countries.

Fig. 12.1: Shows a Block Diagram Elaborating the Working of CDM.

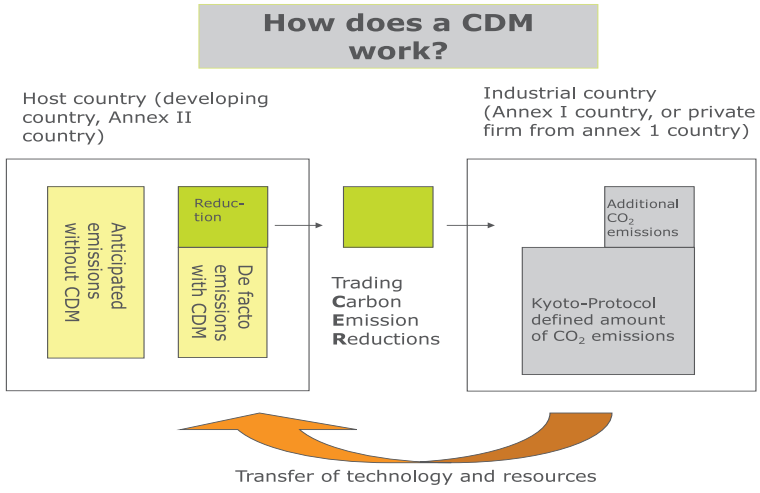

Fig. 12.1: Working of CDM

Annex. I refers to the UNFCCC and is a list of countries that are committed to supporting developing countries to address climate change. These are more or less identical with the developed countries and economies in transition (former Soviet Union bloc members).

Annex. I of the UN Framework Convention on Climate Change			
Australia	Finland	Lithuania*	Slovenia*
Austria	France	Luxembourg	Spain
Belarus*	Germany	Monaco	Sweden
Belgium	Greece	Netherlands	Switzerland
Bulgaria*	Hungary*	New Zealand	Turkey
Canada	Iceland	Norway	Ukraine*
Croatia*	Ireland	Poland*	United Kingdom of Great Britain and Northern Ireland
Czech Republic*	Italy	Portugal	
Denmark	Japan	Romania*	
European Community	Latvia*	Russian Federation*	United States of America
Estonia*	Liechtenstein	Slovakia*	

*Countries that are undergoing the process of transition to a market economy, and with Annex I as amended at COP3 (Decision 4/CP.3)

However, the CDM is important in reducing the costs of complying with the Kyoto Protocol, since it ensures that more countries cut their emissions, and there are many low-cost options for reducing emissions in developing countries. Moreover, the expectation that the CDM would result in lower costs may have made the developed countries willing to take on stricter commitments than they would otherwise have done.

The Major Advantages of CDM are as Follows:

1. An environmental advantage, on both a local and global level, from the reduction in GHG emissions resulting from the project.
2. A development advantage, both economic and social, for the host country, which benefits from the location of the project and the transfer of technologies.
3. An economic advantage due to the improved financial viability of low GHG emission technologies, which favours their application, and for entities with GHG emission reduction commitments, the possibility of satisfying these commitments at less cost.

Check Your Progress 12.1

Note: a) Write your answer in the space given below.

b) Match your answer with the answer given at the end of the unit.

1) What is the Clean Development Mechanism (CDM)?

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2) What is the main purpose of the CDM according to the Kyoto Protocol?

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3) What are Certified Emission Reductions (CERs)?

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4) How does the CDM contribute to reducing the overall cost of emission reduction?

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12.3 STRUCTURE OF CDM

The CDM Executive Board, answerable to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, is tasked with approving all CDM projects and granting CERs. Like one AAU, one CER gives the right to emit one ton of CO_2 equivalent (CO_2e). The number of emission credits issued corresponds to the calculated emissions reduction from the CDM project, which is the difference between the level of emissions without the CDM project (the business-as-usual or BaU level) and emissions after the project has been carried out. Structure of CDM is shown in Fig.12.2.

CDM Institution

- UNFCCC secretariat/ "CDM Team"
- COP/CMP
- Designated Operational Entity

- Designated National Authority
- Executive Board
- Panels and Working Groups
- Brokers/Consultants
- CER Buyers

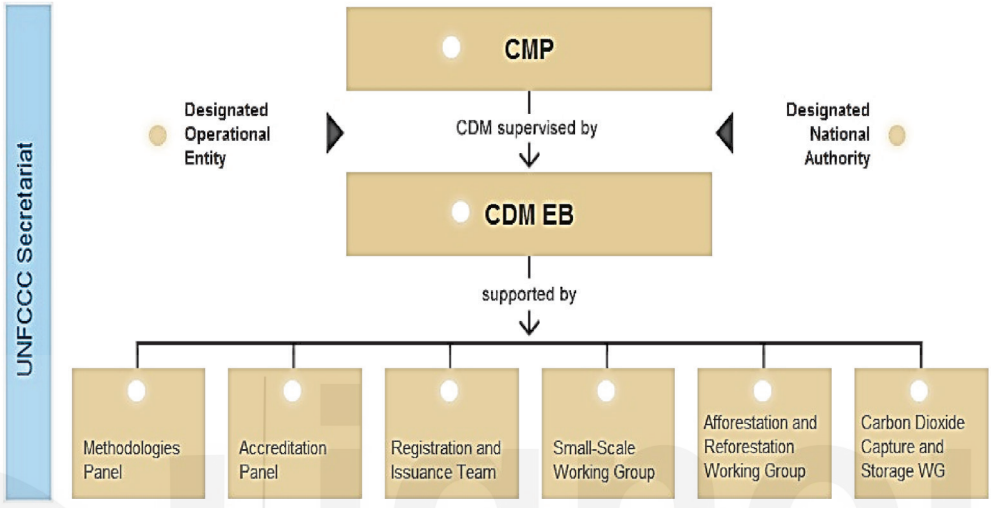

Fig. 12.2: Structure of CDM

12.3.1 UNFCCC Secretariat

The UNFCCC secretariat's sustainability efforts are part of a wider United Nations campaign to manage its sustainability performance by measuring, reducing and offsetting its impacts, particularly its carbon footprint. The UN as a whole and the UNFCCC itself have mandates to strive to increase sustainability efforts and cut carbon footprint. The UNFCCC Secretariat supports cooperative action by states to combat climate change and its impact on humanity and ecosystems. This is a contribution to a sustainable world and to realizing the vision of peace, security and human dignity on which the UN is founded.

12.3.2 Conference of Parties (COP)/CMP

The Conference of the Parties refers to the Parties to the UNFCCC. The COP serves as the Meeting of the Parties to the Kyoto Protocol (CMP). All States that are Parties to the Kyoto Protocol are represented at the CMP, while States that are not Parties participate as observers. The CMP reviews the implementation of the Kyoto Protocol and takes decisions to promote its effective implementation. The CMP meets annually during the same period as the COP. Parties to the Convention that are not Parties to the Protocol are able to participate in the CMP as observers, but without the right to take decisions. The functions of the CMP relating to the Protocol are similar to those carried out by the COP for the Convention. The CMP:

1. has authority over and makes rules for the CDM,
2. decides on the recommendations made by the Executive Board, and
3. Designates operational entities that are provisionally accredited by the Executive Board.

12.3.3 Designated Operational Entity

Private certifiers who validate projects and verify emission reductions are called a designated operational entity (DOE). A DOE under the CDM is either a domestic legal entity or an international organisation accredited and designated (on a provisional basis until confirmed by the CMP) by the CDM Executive Board. It has two key functions:

1. A DOE validates and subsequently requests registration of a proposed CDM project activity,
2. A DOE verifies emission reductions of a registered CDM project activity, certifies as appropriate and requests the Board to issue certified emission reductions accordingly.

12.3.4 Designated National Authority

Authorities who approve projects and facilitate participation are called the designated national authority (DNA). A designated national authority (DNA) is the organization granted responsibility by a Party to authorize and approve participation in CDM projects. Establishment of a DNA is one of the requirements for participation by a Party in the CDM.

The main task of the DNA is to assess potential CDM projects to determine whether they will assist the host country in achieving its sustainable development goals, and to provide a letter of approval to project participants in CDM projects. This letter of approval must confirm that the project activity contributes to sustainable development in the country, that the country has ratified the Kyoto Protocol, and that participation in CDM is voluntary. It is then submitted to the CDM Executive Board to support the registration of the project. In accordance with the CDM modalities and procedures, Parties participating in the CDM shall designate a national authority for the CDM. The registration of a proposed CDM project activity can only take place once approval letters are obtained from the designated national authority of each Party involved, including confirmation by the host Party that the project activity assists it in achieving.

12.3.5 Executive Board

The CDM Executive Board (CDM EB) supervises the Kyoto Protocol's clean development mechanism under the authority and guidance of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP). The CDM EB is fully accountable to the CMP. The CDM EB will be the ultimate point of contact for CDM Project Participants for the registration of projects and the issuance of CERs

12.3.6 Panels and Working Groups

1. **Methodologies Panel:** Established to develop recommendations to the Board on guidelines for methodologies for baseline and monitoring plans, and prepare recommendations on submitted proposals for new baseline and monitoring methodologies.
2. **Afforestation & Reforestation Working Group (A/R WG):** Established to prepare recommendations (in cooperation with the Methodologies Panel) on submitted proposals for new baseline and monitoring methodologies for CDM afforestation/reforestation project activities.

3. **Small-scale Working Group:** The SSC WG was established to develop recommendations to the CDM EB on guidelines for small-scale methodologies for baselines and monitoring plans, and prepare recommendations on submitted proposals for new baseline and monitoring methodologies for small-scale CDM project activities.

4. **Accreditation Panel:** The Accreditation Panel was established to develop recommendations and facilitate the decision-making of the CDM EB in accordance with the standards and procedures for accrediting operational entities.

5. **Registration and Issuance Team (RIT):** The CDM Registration and Issuance Team is a group of external experts that assists the CDM EB by assessing requests for registration of project activities or programmes of activities, as well as requests for issuance for which review has been requested.

6. **Carbon Dioxide Capture and Storage Working Group (CCS WG):** The CCS WG was established to prepare recommendations on submitted proposals for new baseline and monitoring methodologies. The WG is expected to work in cooperation with the Meth Panel.

12.3.7 Consultants

The CDM consultant shall confirm full understanding and commitment to the responsibilities to perform the following tasks:

1 To prepare the PDD and revise it according to instructions by the Designated Operational Entity (DOE) until the DOE agrees to submit the project for UNFCCC registration;

2 To contract the DOE and channel loan proceeds to the DOE as payment for validation services;

3 To continuously monitor the progress of actual project implementation and report to UNOPS on the status of the project with a specific focus on the chance of the project materialising as an operating asset;

4 To accept a staged milestone-based payment and a certain liability for disbursed funds in the event that PDD and validation activities continue despite lacking progress on actual project implementation.

12.3.8 CER Buyers

Certified Emission Reductions (CERs) are a type of emissions unit (or carbon credits) issued by the Clean Development Mechanism (CDM) Executive Board for emission reductions achieved by CDM projects and verified by a DOE under the rules of the Kyoto Protocol. CERs can be used by Annex 1 countries in order to comply with their emission limitation targets or by operators of installations covered by the European Union Emission Trading Scheme (EU ETS) in order to comply with their obligations to surrender EU Allowances, CERs or Emission Reduction Units (ERUs) for the CO_2 emissions of their installations. CERs can be held by governmental and private entities on electronic accounts with the UN. CERs can be purchazed from the primary market (purchazed from the original party that makes the reduction) or the secondary market (resold from a marketplace).

Check Your Progress 12.2

Note: a) Write your answer in the space given below.

b) Match your answer with the answer given at the end of the unit.

1) What is the main role of the CDM Executive Board?

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2) What are the main institutions involved in the structure of CDM?

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3) What are the responsibilities of CDM consultants?

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4) Who are CER buyers, and how can CERs be used?

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12.4 GOALS OF CDM

The clean development mechanism was designed to meet a dual objective:

1 To help Annex I countries fulfil their commitments to reduce emissions in a cost-effective way, and to offset greenhouse gases.

2 To assist developing countries/host country in achieving sustainable development.

It has been observed that a huge amount of greenhouse gases (GHG) is emitted by developed countries due to industrial activity, and it needs to be reduced. The GHG emission reductions are many times more expensive to achieve in Annex I countries than in non-Annex I countries (the opportunities for emission reduction are bigger there). Therefore, a strong link is to be formed between these countries to meet the target for reducing GHG emissions.

CDM projects earn tradable, saleable certified emission reduction (CER) credits that can be used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol. Benefits of CDM projects include investment in climate change mitigation projects in developing countries, transfer or diffusion of technology in the host countries, as well as improvement in the livelihood of communities through the creation of employment or increazed economic activity.

12.5 THE KYOTO PROTOCOL

The new protocol, known officially as the ***Kyoto Protocol to the UN Framework Convention on Climate Change,*** was adopted in Kyoto, Japan, on 11 December 1997 at the third Conference of the Parties to the UNFCCC. The Kyoto Protocol is significant because it legally binds greenhouse gas emission commitments for

the developed countries (this includes most of the developed countries listed in Annex I of the UNFCCC). The commitments agreed, according to the Protocol, lead to an overall global reduction of greenhouse gases in the coming years.

However, the Kyoto Protocol is far from a simple document. Not only the commitments themselves but also the mechanisms by which the developed country may achieve them are extremely complex. Although countries recognize the need to cut global emissions of carbon dioxide and the other GHGs to prevent dangerous global warming, many developed countries, aided by intensive public pressure from the fossil fuel industry, refused during the negotiations to agree to the kinds of cuts in their domestic greenhouse gas emissions that the science demands. The result was commitments in the Protocol which fall far short of what is really needed to protect the earth from major climatic changes.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty that sets binding obligations on industrialized countries to reduce emissions of greenhouse gases. The treaty recognizes that developed countries have contributed the most to the anthropogenic build-up of carbon dioxide in the atmosphere (around 77% of emissions between 1750 and 2004), and that carbon dioxide emissions per person in developing countries (2.9 tons in 2010) are, on average, lower than emissions per person in developed countries (10.4 tons in 2010). According to the UNFCC website, the Protocol "recognizes that developed countries are principally responsible for the current high levels of GHG (6 greenhouse gases covered: CO_2, CH_4, N_2O, HFC, PFC, SF_6) emissions in the atmosphere as a result of more than 150 years of industrial activity, and places a heavier burden on developed nations under the principle of 'common but differentiated responsibilities."

As part of the Kyoto Protocol, many developed countries have agreed to legally reduce their emissions of greenhouse gases in two commitment periods. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh, Morocco, in 2001, and are referred to as the "Marrakesh Accords." Its first commitment period started in 2008 and ended in 2012. The second commitment period applies to emissions between 2013-2020. The protocol was amended in 2012 to accommodate the second commitment period, but this amendment has (as of January 2013) not entered into legal force. Fig. 12.3 shows the sector-wise annual world greenhouse gas emissions in 2021.

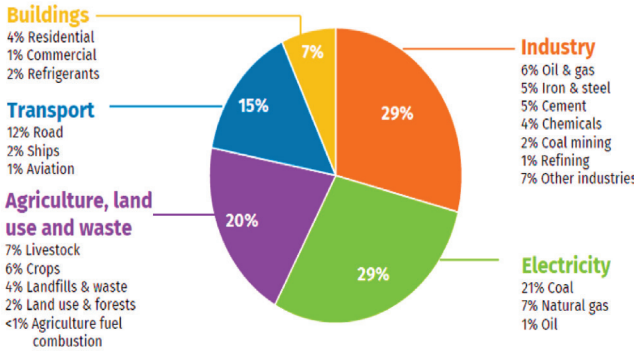

Fig. 12.3: Annual World Greenhouse Gas Emissions in 2021 (by sector)

(**Source:** *Rhodium Group*)

There are 192 parties to the convention: 191 states (including all the UN members except Andorra, Canada, South Sudan and the United States) and the European Union. The United States signed but did not endorse the Protocol, and Canada withdrew from it in 2011. The Protocol was adopted by Parties to the UNFCCC in 1997 and entered into force in 2005.

Some of the Principal Concepts of the Kyoto Protocol are:

1 Binding commitments for the Annex. I Parties. The main feature of the Protocol is that it established legally binding commitments to reduce emissions of greenhouse gases for Annex. I Parties. The commitments were based on the Berlin Mandate, which was a part of UNFCCC negotiations leading up to the Protocol.

2 Implementation. In order to meet the objectives of the Protocol, Annex I Parties are required to prepare policies and measures for the reduction of greenhouse gases in their respective countries. In addition, they are required to increaze the absorption of these gases and utilize all mechanisms available, such as joint implementation, the clean development mechanism and emissions trading, in order to be rewarded with credits that would allow more greenhouse gas emissions at home.

3 Minimizing Impacts on Developing Countries by establishing an adaptation fund for climate change.

4 Accounting, Reporting and Review in order to ensure the integrity of the Protocol.

5 Compliance Establishing a Compliance Committee to enforce compliance with the commitments under the Protocol.

Belarus, Kazakhstan and Ukraine have stated that they may withdraw from the Protocol or not put into legal force the Amendment with second round targets. Japan, New Zealand, and Russia have participated in Kyoto's first round but have not taken on new targets in the second commitment period. Other developed countries without second-round targets are Canada (which withdrew from the Kyoto Protocol in 2012) and the United States (which has not ratified the Protocol).

> *Parties to the Kyoto Protocol adopted an amendment to the Kyoto Protocol by decision 1/CMP.8 in accordance with Articles 20 and 21 of the Kyoto Protocol, at the eighth session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol held in Doha, Qatar, in December 2012.*

International emission trading allows developed countries to trade their commitments under the Kyoto Protocol. They can trade emissions quotas among themselves and can also receive credit for financing emissions reductions in developing countries. Developed countries may use emissions trading until late 2014 or 2015 to meet their first-round targets.

Developing countries do not have binding targets under the Kyoto Protocol, but are still committed to reducing their emissions. Actions taken by developed and developing countries to reduce emissions include support for renewable energy, improving energy efficiency, and reducing deforestation. Under the Protocol, emissions of developing countries are allowed to grow in accordance with their development needs.

The ultimate objective of the UNFCCC is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would stop dangerous anthropogenic interference with the climate system." For each of the different anthropogenic GHGs, different levels of emissions reductions would be required to meet the objective of stabilizing atmospheric concentrations. Carbon dioxide (CO_2) is the most important anthropogenic GHG. Stabilising the concentration of CO_2 in the atmosphere would ultimately require the effective elimination of anthropogenic CO_2 emissions.

12.5.1 Major Provisions and Commitments under the Kyoto Protocol

The Major Provisions and Commitments under the Kyoto Protocol are:

a) **Emission Commitments for the Developed Countries:** The emissions targets for the various developed countries are different - in other words, there is no single target that is the same for all developed countries. The USA, for example, has to reduce its emissions by seven per cent. The European Union and most of the Central and Eastern European countries have to reduce their emissions by eight per cent, Poland and Hungary by six per cent and Croatia by five per cent. Canada and Japan's target is a six per cent reduction. On the other hand, some countries are allowed to increaze their emissions, having argued that reductions would have an adverse impact on their national economies. These are Australia (an eight per cent increaze), Norway (one per cent) and Iceland (ten per cent). Russia, Ukraine and New Zealand argued successfully for targets that would allow their emissions to merely stabilise. The individual commitments are listed in Annex B of the Kyoto Protocol.

b) **Assigned Amounts, to be Achieved by a Fixed period/Country's Emission Budget:** Each developed country's commitment is phrased in the Protocol in terms of an *'assigned amount'*. Developed countries have to achieve their assigned amounts within the five-year period 2008-2012, this being the first *commitment period* agreed under the Protocol. So, *for example,* although the USA has to make a seven per cent reduction in its 1990 level of greenhouse gas emissions, its assigned amount is described as 93 per cent of its 1990 emissions, multiplied by the five years of the commitment period. The individual developed country commitments are listed in Annex B of the Kyoto Protocol.

c) **Commitments in 'CO_2 Equivalents':** Six greenhouse gases– carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) – are controlled under the Protocol. However, the commitments described above are not targets for each gas, but for all six gases added together in a 'basket' weighted by the relative effect of each gas. This means that a country can allow emissions of one greenhouse gas to increaze, so long as corresponding decreases are made in the emissions of other greenhouse gases, and the country's commitment is achieved.

   Assigned amounts are calculated using an estimate of the CO_2 equivalence of each gas, based on the global warming potentials (GWPs) of the six gases. GWPs are a measure of the amount of cumulative warming each gas delivers over different periods of time relative to CO_2. Methane,

nitrous oxide, HFCs, PFCs and SF_6 are all more powerful global warming gases than carbon dioxide and have higher GWPs–21 for methane, 310 for nitrous oxide, 1,300 for HFC-134a, 9,200 for perfluoroethane and 23,900 for SF_6 measured over 100 years. For the purposes of calculating assigned amounts, countries use the different GWPs to convert emissions of methane, nitrous oxide, HFCs, PFCs and SF_6 to their carbon dioxide equivalent.

One loophole written into the Protocol is that developed countries are allowed to choose either 1990 or 1995 as their base year for calculating emissions of HFCs, PFCs and SF_6. Emissions of HFCs were low in 1990 but had increased substantially in the majority of countries by 1995. Choosing 1995 allows these countries to increase their baseline emissions and thus their assigned amounts, and increases the total assigned amount for the developed countries by around 0.6-0.7 per cent.

d) **Calculation of Assigned Amounts:** The Protocol requires most developed countries to achieve their commitment using 1990 as a reference, or base year. Under the UNFCCC, countries with economies in transition (the former Soviet Union and Central and Eastern European countries) were allowed to choose a different base year because their emissions were declining by 1990, resulting in a lower emissions baseline. Emissions in the base year are calculated as the total amount of greenhouse gases resulting from the following sectors or *sources:* energy, industrial processes, solvent and other product use, agriculture and waste. These are known as 'gross' emissions.

For a Party to meet its emission commitments, its total emissions during the commitment period need to be less than its assigned amount. As a consequence of the mechanisms described above, the assigned amount can be added to or subtracted from. Below is a sample calculation of an assigned amount for the first commitment period, which includes all the provisions:

Assigned Amount = Total 'gross' greenhouse gases in the base or reference year (+/-) Emissions absorbed or released as a result of afforestation and reforestation activities since 1990 – Emissions releazed as a result of deforestation activities since 1990 (+/-) Emissions bought from or sold to other developed countries through emissions trading in 2008-2012 period (+/-)Emission reduction units transferred from host countries or to donor countries from Joint implementation projects in 2008-2012 period + Certified emission reductions resulting from CDM projects in host countries carried out from 2000-2012.

e) **Assigned Amounts which can be Achieved using 'Flexibility Mechanisms':** The Protocol allows developed countries to achieve their commitments in four ways:

Joint fulfilment, or 'bubble' agreements between developed countries (Article 4 of the Protocol), Joint Implementation (JI) between developed countries (Article 6), emissions trading between developed countries (Article 17) and through the Clean Development Mechanism (CDM) established under Article 12 (the flexibility mechanisms are described in detail later in this document). The first three all involve the developed

countries, that is, countries with legally binding commitments, and so although emissions are transferred between these countries, the overall global assigned amount (the "at least five per cent" reduction) is not changed. However, under the CDM, the developed countries can fund projects in developing countries, which bring about reductions in the greenhouse gases that would have been emitted in those countries if the project had not taken place. The developed countries can add these emissions 'credits' to their assigned amounts.

f) **Assigned Amounts which can be Achieved using 'Sinks':** Developed countries are allowed to achieve their assigned amounts using sinks in a limited form. The term '***Sinks***' refers to ***those natural processes that absorb carbon dioxide from the atmosphere***. These include oceans and forests. Growing forests absorb carbon dioxide from the atmosphere and store it, but deforestation releases stored carbon back into the atmosphere. In other words, sinks can become sources.

Under the Protocol, the emissions absorbed or emitted by certain land use, land use change and forestry (LULUCF) activities, which include afforestation, reforestation and deforestation activities caused by human activities, can be added to the developed country's assigned amount for the first commitment period. The result is an emissions total for the commitment period, which is 'net' of these emissions. Since the base year for the majority of countries is calculated in terms of 'gross' emissions from sources rather than 'net', the result is an increase in emissions to the atmosphere.

g) **'Banking' of Emissions:** If a developed country does not emit the whole of its assigned amount by the end of the commitment period, it is allowed to carry forward the unused portion to the next commitment period. This is known as **'banking'** of emissions.

h) **Ratification and Entry into Force:** The Kyoto Protocol becomes binding under international law (or 'enters into force') ninety days after 55 countries which are Parties to the UNFCCC have ratified it. It is then binding on these countries, and on any others which subsequently ratify it. These 55 countries must include Annex I Parties, which together account for 55 per cent of the carbon dioxide emitted by the Annex I countries in 1990. This means that no single country can block entry into force. Ratification can be a lengthy and time-consuming process. Every country has a different method of translating international agreements into domestic law. Getting legislative approval in many democracies can take years. Apart from the lack of specific details on key issues such as the flexibility mechanisms and sinks, the Kyoto Protocol has some serious omissions.

i) **Compliance Mechanism:** The Kyoto Protocol includes a commitment in Article 18 to develop a compliance mechanism. At present, the Protocol lacks a non-compliance mechanism with real substance or legally binding consequences if a Party fails to meet its emission commitments. A strong and effective non-compliance regime is crucial to the Protocol's ability to ensure real and measurable environmental benefits and emissions reductions and to maintain international credibility and confidence.

12.5.2 Limitations and Outstanding Issues in the Kyoto Protocol

Certain Issues are not Described in the Kyoto Protocol:

a) **Controls on International Aviation and Marine Transport Fuels (bunker fuels):** Emissions from international air and marine transport are not included in the emissions commitments under the Protocol, despite widespread recognition that these sources are growing rapidly. Since 1991, when negotiations first began on the UNFCCC, countries have been unable to agree on how to allocate these emissions between countries. As a result, emissions from these sectors are not included in the assigned amounts agreed at Kyoto. This is a significant loophole – Greenpeace estimates that if emissions from these sectors grow as predicted, at about three per cent per year.

b) **Specific Review of Emission Commitments:** The Protocol does not contain a specific review procedure for the emission commitments, despite intensive efforts by Greenpeace and other environmental groups at Kyoto. Such a review process is crucial to the success of the Protocol since, without it, there can be no assessment of its effectiveness, a procedure to strengthen the commitments in the future or adjustments made in the light of emerging science. The Protocol does provide for general reviews, linked to reviews of the UNFCCC, and these must be developed to allow specific reviews of the emissions commitments. This is another outstanding issue that must be addressed as soon as possible.

12.6 COOPERATIVE MECHANISM

Countries with commitments under the Kyoto Protocol to limit or reduce greenhouse gas emissions must meet their targets primarily through national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, thereby creating what is now known as the "carbon market".

The Kyoto Mechanisms are:

- Emissions Trading
- The Clean Development Mechanism (CDM)
- Joint Implementation (JI)

The Kyoto Mechanisms:

1 Stimulate sustainable development through technology transfer and investment

2 Help countries with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way.

3 Encourage the private sector and developing countries to contribute to emission reduction efforts.

JI and CDM are the two project-based mechanisms that feed the carbon market. JI enables industrialized countries to carry out joint implementation projects with other developed countries, while the CDM involves investment in sustainable

development projects that reduce emissions in developing countries. The carbon market is a key tool for reducing emissions worldwide. It was worth 30 billion USD in 2006 and is growing. Annex I Parties must provide information in their national communications under the Protocol to demonstrate that their use of the mechanisms is "supplemental to domestic action" to achieve their targets. This information is assessed by the facilitative branch of the Compliance Committee.

Apart from the inadequate greenhouse gas emissions commitments, the Kyoto Protocol contains a number of provisions whose details were not resolved at the final negotiating session in Kyoto. These include the so-called flexibility mechanisms (emissions trading, joint implementation and the Clean Development Mechanism) and the use of sinks by developed country Parties to achieve their emission commitments. Within these provisions is the potential for a number of sizeable 'loopholes', elements which could sanction emission levels far above what was intended in Kyoto, and which have the potential to undermine and even overwhelm the Protocol's global reduction target of at least five per cent.

12.6.1 Emission Trading

Emissions trading, as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare – emissions permitted them but not "used" – to sell this excess capacity to countries that are over their targets. The economics literature provides the following definitions of cap and trade emissions trading schemes.

A cap-and-trade system constrains the aggregate emissions of regulated sources by creating a limited number of tradable emission allowances, which emission sources must secure and surrender in numbers equal to their emissions.

In an emissions trading or cap-and-trade scheme, a limit on access to a resource (the cap) is defined and then allocated among users in the form of permits. Compliance is established by comparing actual emissions with permits surrendered, including any permits traded within the cap.

Under a tradable permit system, an allowable overall level of pollution is established and allocated among firms in the form of permits. Firms that keep their emission levels below their allotted level may sell their surplus permits to other firms or use them to offset excess emissions in other parts of their facilities.

Emissions trading, or cap and trade, is a market-based approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. A central authority (usually a governmental body) sets a limit or cap on the amount of a pollutant that may be emitted. The limit or cap is allocated or sold to firms in the form of emissions permits, which represent the right to emit or discharge a specific volume of the specified pollutant. Firms are required to hold a number of permits (or allowances or carbon credits) equivalent to their emissions. The total number of permits cannot exceed the cap, limiting total emissions to that level. Firms that need to increase their volume of emissions must buy permits from those who require fewer permits.

The transfer of permits is referred to as a trade. In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions. Thus, in theory, those who can reduce emissions most cheaply will do so, achieving the pollution reduction at the lowest cost to society.

There are active trading programmes for several air pollutants. For greenhouse gases, the largest is the European Union Emission Trading Scheme, whose purpose is to avoid dangerous climate change. In the United States, there is a national market to reduce acid rain and several regional markets for nitrogen oxides. Fig. 12.4 elaborates the carbon market. Markets for other pollutants tend to be smaller and more localized.

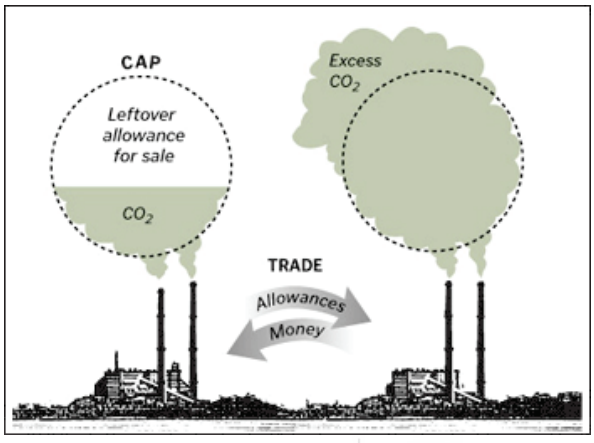

Fig. 12.4: Carbon Market

Emission Markets: For emissions trading where greenhouse gases are regulated, one emissions permit or allowance is considered equivalent to one metric ton of carbon dioxide (CO_2) emissions. Other names for emissions permits are carbon credits, Kyoto units, assigned amount units, and Certified Emission Reduction units (CER). These permits or units can be sold privately or in the international market at the prevailing market price. These trade and settle internationally, and hence allow allowances to be transferred between countries. Each international transfer is validated by the United Nations Framework Convention on Climate Change (UNFCCC). Each transfer of ownership within the European Union is additionally validated by the European Commission.

Trading exchanges have been established to provide a spot market in permits, as well as a futures and options market to help discover a market price and maintain liquidity. Carbon prices are normally quoted in euros per tonne of carbon dioxide or its equivalent (CO_2e). Other greenhouse gases can also be traded, but are quoted as standard multiples of carbon dioxide with respect to their global warming potential. These features reduce the quota's financial impact on business while ensuring that the quotas are met at a national and international level.

Currently, there are six exchanges trading in UNFCCC-related carbon credits: the Chicago Climate Exchange (until 2010), European Climate Exchange, NASDAQ OMX Commodities Europe, PowerNext, Commodity Exchange Bratislava and the European Energy Exchange. NASDAQ OMX Commodities Europe listed a contract to trade offsets generated by a CDM carbon project called Certified Emission Reductions.

Trading in emission permits is one of the fastest-growing segments in financial services in the City of London, with a market estimated to be worth about €30 billion in 2007. Louis Redshaw, head of environmental markets at Barclays Capital, predicts that "Carbon will be the world's biggest commodity market, and it could become the world's biggest market overall."

12.6.2 Clean Development Mechanism (CDM)

The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO_2, which can be counted towards meeting Kyoto targets. The mechanism is seen by many as a trailblazer. It is the first global, environmental investment and credit scheme of its kind, providing standardised emissions offset instruments, CERs.

CDM is intended to meet two objectives: (1) to assist parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), which is to prevent dangerous climate change; and (2) to assist parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

A CDM project activity might involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

Operating Details of the CDM

A CDM project must provide emission reductions that are additional to what would otherwise have occurred. The projects must qualify through a rigorous and public registration and issuance process. Approval is given by the Designated National Authorities. Public funding for CDM project activities must not result in the diversion of official development assistance. The mechanism is overseen by the CDM Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol.

Operational since the beginning of 2006, the mechanism has already registered more than 1,650 projects and is anticipated to produce CERs amounting to more than 2.9 billion tonnes of CO_2 equivalent in the first commitment period of the Kyoto Protocol, 2008-2012.

The CDM allows industrialized countries to buy CERS and to invest in emission reductions where it is cheapest globally. Between 2001, which was the first year a CDM project could be registered and 7 September 2012, the CDM issued 1 billion Certified Emission Reduction units. As of 1 June 2013, 57% of all CERS had been issued for projects based on destroying either HFC-23 (38%) or N_2O (19%). Carbon capture and storage (CCS) was included in the CDM carbon offsetting scheme in December 2011.

The purpose of the CDM is to promote clean development in developing countries, *i.e.,* the non-Annex I countries (countries that aren't listed in Annex I of the Framework Convention). The CDM is one of the Protocol's "project-based mechanism", in that the CDM is designed to promote projects that reduce emissions. The CDM is based on the idea of emission reduction production. These reductions are produced and then subtracted from a hypothetical baseline of emissions. The emissions baselines are the emissions that are predicted to

occur in the absence of a particular CDM project. CDM projects are "credited" against this baseline, in the sense that developing countries gain credit for producing these emission cuts.

12.6.3 Joint Implementation

The mechanism known as "joint implementation," defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party, each equivalent to one tonne of CO_2, which can be counted towards meeting its Kyoto target. Joint implementation offers Parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer.

JI is one of three flexibility mechanisms set out in the Kyoto Protocol to help countries with binding greenhouse gas emissions targets (so-called Annex I countries) meet their obligations. JI is described in Article 6 of the Kyoto Protocol. Under Article 6, any Annex I country can invest in an emission reduction project (referred to as a "Joint Implementation Project") in any other Annex I country as an alternative to reducing emissions domestically. In this way, countries can lower the costs of complying with their Kyoto targets by investing in projects that reduce greenhouse gas emissions in an Annex I country where reducing emissions may be cheaper, and then using the resulting Emission Reduction Units (ERUs) towards their commitment goal. The mechanism known as "joint implementation," defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party, each equivalent to one tonne of CO_2, which can be counted towards meeting its Kyoto target. Joint implementation offers Parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer.

JI is a programme under the Kyoto Protocol that allows industrialized countries to meet part of their required cuts in greenhouse-gas emissions by paying for projects that reduce emissions in other industrialized countries. Unlike the case of the Clean Development Mechanism, the JI has caused less concern of spurious emission reductions, as the JI project, in contrast to the CDM project, takes place in a country that has a commitment to reduce emissions under the Kyoto Protocol.

A JI project must provide a reduction in emissions by sources or an enhancement of removals by sinks. Projects must have approval of the host Party, and participants have to be authorized to participate by a Party involved in the project. Projects starting from the year 2000 may be eligible as JI projects if they meet the relevant requirements, but ERUs may only be issued for a crediting period starting after the beginning of 2008.

If a host Party meets all of the eligibility requirements to transfer and/or acquire ERUs, it may verify emission reductions or enhancements of removals from a JI project. Upon such verification, the host Party may issue the appropriate quantity of ERUs. This procedure is commonly referred to as the "Track 1" procedure."

If a host Party does not meet all, but only a limited set of eligibility requirements, verification of emission reductions or enhancements of removals as being additional has to be done through the verification procedure under the Joint Implementation Supervisory Committee (JISC). Under this so-called "Track 2" procedure, an independent entity accredited by the JISC has to determine whether the relevant requirements have been met before the host Party can issue and transfer ERUs. A host Party that meets all the eligibility requirements may at any time choose to use the verification procedure under the JISC (Track 2 procedure).

12.7 CDM AND SUSTAINABLE DEVELOPMENT

In addition to reducing GHG emissions and promoting technology transfer, CDM projects can help bring economic development and broader environmental benefits to poor regions of the world. *For example,* a renewable energy project in rural Africa can create employment opportunities, improve lighting and refrigeration for medicines, provide water purification, and prevent deforestation from the harvesting of fuel wood and the operation of polluting diesel generators. While there may be such co-benefits for many projects, by most accounts, explicit systems have not been established to ensure that the CDM's sustainable development goals are achieved. The UN defines sustainable development as a strategy that "meets the needs of the present without compromizing the ability of future generations to meet their own needs." However, the Kyoto Protocol does not define sustainable development explicitly, nor does it provide guidance on how it should be achieved or measured within the CDM. As such, the promotion of sustainable development under the CDM is largely delegated to host developing country governments, acting through their DNAs. To support host country governments in their decision-making process, the CDM requires that project proposals include an explanation of how they contribute to sustainable development.

Yet there are few, if any, cases of projects being rejected by host country DNAs, which could be seen as an indication that national sustainable development criteria are insufficiently ambitious or are not being rigorously applied by DNAs.

Most developing countries do not appear to favour projects with high sustainable development benefits over other projects that have few or no sustainable development benefits. Developing countries have few incentives to apply stringent criteria for sustainable development since they are effectively competing for CDM projects with other developing countries. More stringent standards could raise the cost of projects and deter potential investors. The CDM review process does include procedures to ensure projects do not cause adverse economic, social, or environmental harm. Yet, few procedures exist to ensure that projects produce social and environmental sustainable development benefits. Until more specific sustainable development criteria at the global or national level are introduced, it is difficult to objectively assess to which the CDM contributes to this goal.

Early in the CDM programme, a significant fraction of the emission reductions have come from a few large projects that reduced GHG emissions at low cost, for example, industrial HFC and N_2O abatement projects, but which delivered limited sustainable development benefits other than reduced GHGs. Although

these projects produced high-quality offsets at a low cost, they did little to introduce innovative technologies, reduce other forms of pollution, or otherwise benefit local communities. Similarly, the vast majority of CDM project investment has gone to a few relatively larger economies in the developing world, by passing the poorest countries that are arguably in greater need of assistance. The international offset market will naturally gravitate towards emission reduction opportunities with the lowest cost (including transaction costs such as those related to obtaining approval from host country DNAs), and no quotas currently exist for how many reductions can come from particular countries or geographic regions. The offset market has therefore targeted countries (see Fig. 12.5) with the greatest emission-reduction potential and favourable investment climates (*e.g.* China, India, Brazil, and Mexico).

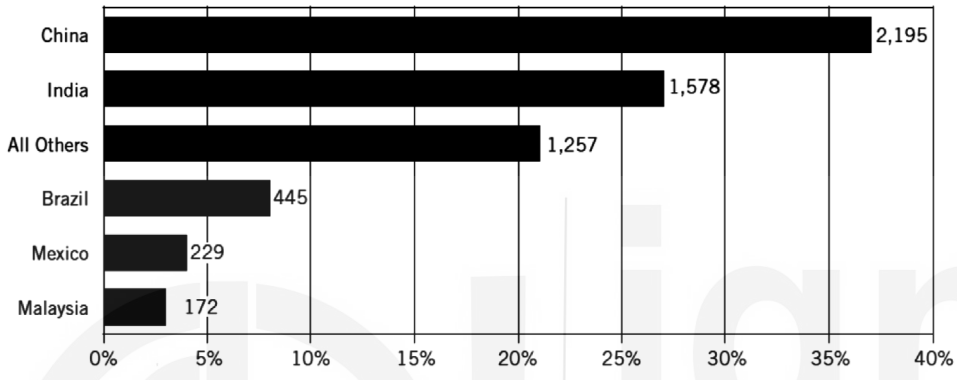

Fig. 12.5: Number of Projects by Host Country

Arguably, the limited success of the CDM in achieving its sustainable development goals can be partially attributed to the insistence of national governments on preserving sovereignty over their own domestic development decisions. The autonomy of each country's Designated National Authority (DNA) to approve or reject projects is *an example* of this. Consequently, the lack of emphasis on sustainable development should not be attributed solely to the CDM programme, nor should it be a rationale for rejecting the CDM as a source of international offsets. Furthermore, as most of the low-hanging fruit have already been picked, more investment has recently gone into energy efficiency and renewable energy projects (*i.e.,* projects with greater potential for promoting low-emission economic development) instead of the large industrial GHG capture and destruction projects. Numerous changes to the CDM are also underway that could lead to more projects that contribute to sustainable development, including the adoption of rules to allow a "programme of activities" or "programmatic CDM" (*e.g.,* multiple small-scale energy efficiency improvements).

12.8 CDM RULES AND CONDITIONS

There are several important rules of the CDM. Three examples are: 1) Nuclear facilities cannot be used to generate CERs, 2) Only afforestation and reforestation projects are allowed under the CDM. *For example,* projects that reduce deforestation are not allowed, and 3) ODA must not be diverted to fund CDM projects.

1. Annex 1 parties are to refrain from using certified emissions reductions generated from nuclear facilities to meet their quantified greenhouse gas emission reduction targets.

2. The eligibility of land use, land-use change and forestry project activities under the CDM is limited to afforestation and reforestation.

3. Public funding for CDM projects from annex I parties is not to result in the diversion of official development assistance and is to be separated from, and not counted towards, the financial obligations of Annex 1 Parties.

> Official development assistance can be, and is being, used to prepare CDM projects.
>
> *For example,* the Danish government has used its ODA in select countries to help develop CDM projects. Then, other non-ODA funds have been used by the Danish government and the private sector to actually buy the carbon credits generated by the CDM project.

Check Your Progress 12.3

Note: a) Write your answer in the space given below.

b) Match your answer with the answer given at the end of the unit.

1) What are the three market-based mechanisms introduced under the Kyoto Protocol?

.....

.....

2) What is Emissions Trading as per the Kyoto Protocol?

.....

.....

3) What is the meaning of "Banking of Emissions"?

.....

.....

4) How does CDM contribute to sustainable development in developing countries?

.....

.....

12.9 LET US SUM UP

The Clean Development Mechanism (CDM) is a unique and practical solution under the Kyoto Protocol that connects climate responsibility with global cooperation. CDM enables developed countries to meet part of their emission reduction targets by funding environmentally beneficial projects in developing countries. These projects– such as afforestation, renewable energy initiatives, or energy-efficient technologies– not only reduce greenhouse gas emissions but also bring social and economic benefits to the host nations.

The structure of the CDM includes key organizations such as the UNFCCC Secretariat, Designated Operational Entities (DOEs), and Designated National Authorities (DNAs). The CDM Executive Board supervises the process and ensures the integrity of emission reduction efforts. By aligning with the goals of

the Kyoto Protocol, the CDM supports sustainable development and promotes clean technologies and innovation in emerging economies.

12.10 KEY WORDS

Annex. I Countries : Industrialised countries with binding emission reduction targets under the Kyoto Protocol.

Certified Emission Reductions (CERs) : Carbon credits earned from CDM projects, each representing one tonne of CO_2 avoided or reduced.

Clean Development Mechanism (CDM) : A mechanism under the Kyoto Protocol allowing developed countries to invest in emission-reducing projects in developing countries and earn Certified Emission Reductions (CERs).

Designated National Authority : A national body responsible for approving CDM projects and ensuring they align with local sustainable development goals.

Designated Operational Entity : An independent third-party body that validates and verifies CDM projects.

Emission Trading : A market-based system allowing countries or companies to trade carbon credits to meet emission reduction targets.

Kyoto Protocol : An international treaty that commits developed countries to legally binding targets for reducing greenhouse gas emissions.

Sustainable Development : Development that meets present needs without compromising the ability of future generations to meet theirs.

UNFCCC : The United Nations Framework Convention on Climate Change, the umbrella treaty guiding international climate negotiations and action.

12.11 SUGGESTED FURTHER READINGS/ REFERENCES

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12.12 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 12.1

1) The Clean Development Mechanism (CDM) is a system under the Kyoto Protocol that allows developed countries (Annex I countries) to invest in emission-reduction projects in developing countries and earn Certified Emission Reductions (CERs) to meet their own emission reduction targets.

2) The main purpose of the CDM is to help developed countries meet their emission reduction commitments and to assist developing countries in achieving sustainable development.

3) Certified Emission Reductions (CERs) are tradable credits earned from CDM projects, each equivalent to one ton of CO_2 reduced, which can be used by developed countries to fulfil their emission reduction obligations.

4) The CDM lowers costs by allowing developed countries to invest in emission reductions where it is cheaper and more efficient, typically in developing countries, rather than relying solely on expensive domestic measures.

Check Your Progress 12.2

1) The CDM Executive Board is responsible for approving CDM projects, granting Certified Emission Reductions (CERs), and supervising the overall implementation of the Clean Development Mechanism under the authority of the Conference of the Parties (CMP).

2) The main institutions include the UNFCCC Secretariat, COP/CMP, Designated Operational Entity (DOE), Designated National Authority (DNA), Executive Board, Panels and Working Groups, Consultants, and CER Buyers.

3) DM consultants prepare and revise the Project Design Document (PDD), coordinate with DOEs for validation, monitor project progress, and ensure compliance with UNFCCC registration requirements.

4) CER buyers can be governments or private entities that purchase CERs to meet their emission reduction targets under the Kyoto Protocol or compliance obligations under schemes like the EU Emission Trading System (EU ETS). CERs can be traded in primary or secondary markets.

Check Your Progress 12.3

1) Emissions Trading, Clean Development Mechanism (CDM) and Joint Implementation (JI)

2) A system where countries with surplus emission allowances can sell their excess capacity to countries that are over their targets, promoting cost-effective emission reductions.

3) It allows countries to carry forward unused emission allowances from one commitment period to the next.

4) CDM promotes technology transfer, investment, and local employment, while improving livelihoods through clean energy and environmental protection.