Clean Development Mechanism

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27th September 2022

Scientific Evidence of Climate Change/Global Warming

The 4th Assessment Report of **IPCC** (2007) indicate that

Global temperature rises of 2 – 4.5 ^{0}C are almost inevitable due to increased concentration of GHG as caused by human activities (fossil fuel use, land use changes etc.).

The above global warming (or in broader term Climate Change) is expected to have serious consequences for:

- Agricultural production
- Biodiversity
- Health
- Sea Level rise

Poor will be most affected by the Climate Change.

United Nations Framework Convention on Climate Change (UNFCC)

Objective of the Convention

"*Stabilization of greenhouse gas concentrations* in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that *food production is not threatened*, and to enable *economic development to proceed in a sustainable man*ner."

Kyoto Protocol

- A global legal instrument (international agreement) to protect the climate system and stabilize GHG emissions
- Adopted in 1992, entered into force in 1994
- Status of participation: 192 Parties
- Contains 2 annexes:
  - Annex 1: countries with obligations to take measures to mitigate the effects of climate change
  - Annex 2: countries with obligations to provide financing to developing countries for their obligations under UNFCCC

Principles of UNFCCC

Based on the principle of common but differentiated roles

On one hand it recognises the

Primary Responsibility of developed Countries for higher emissions, and therefore,

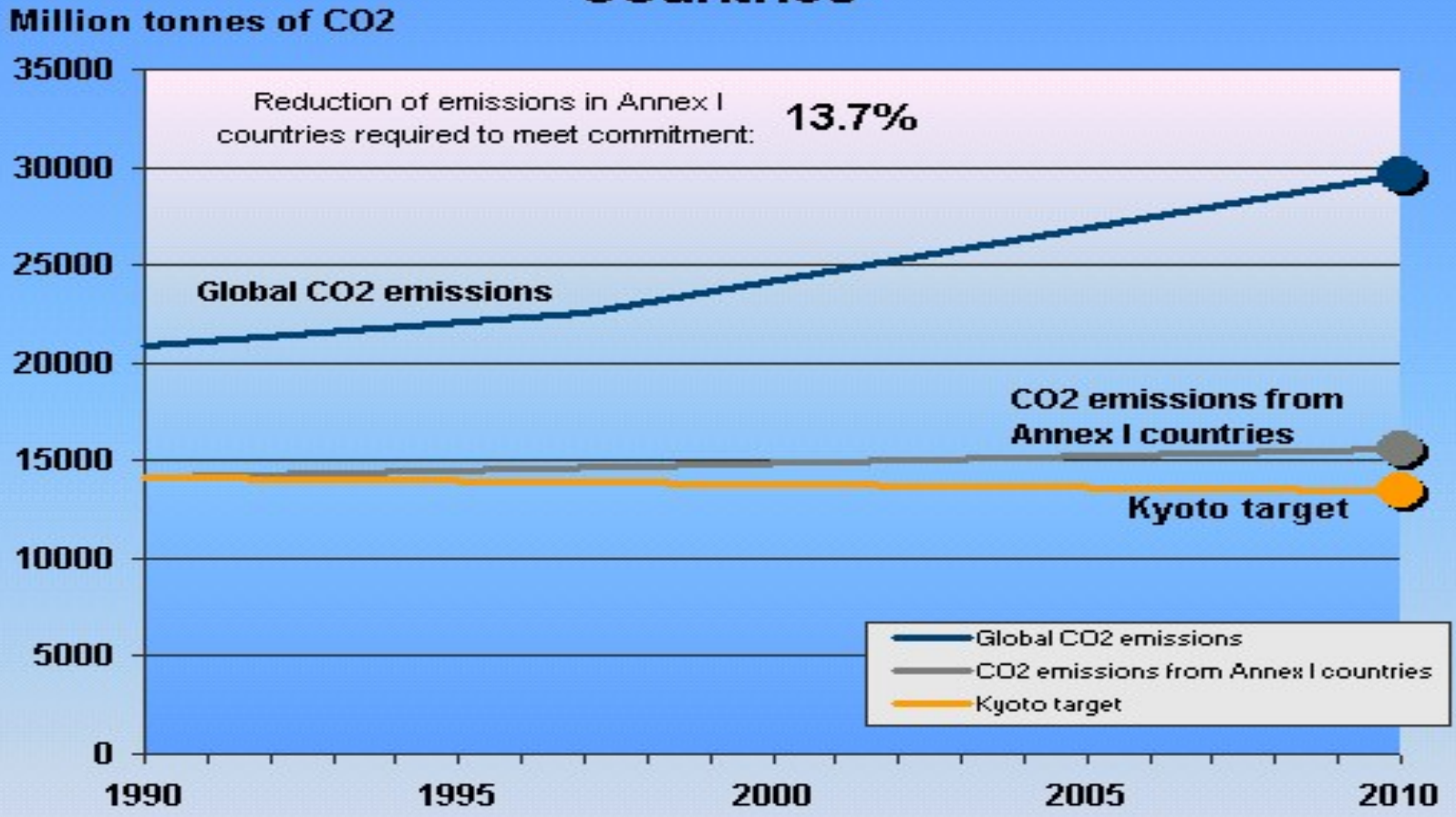
Asks Developed Countries to take a Leading Role

On other hand it establishes

Social and Economic Development as the Rightful Priority of the developing Countries, and

The need to assist developing countries that are vulnerable to climate change

Carbon Dioxide Emissions Globally and from Annex I Countries



The Annex I countries must reduce their CO2-emissions by 13.7% to fullfill their commitments according to the Kyoto protocol. To achieve a stabilasation of the CO2 contents in the atmosphere at 550 ppmv, the IPCC reccomends a global reduction in GHG emissions of more than 50%.

Source: International Energy Agency, World Energy Outlook 2000

The Kyoto Protocol of UNFCCC

The Kyoto Protocol was adopted at COP-3 in December, 1997 (Japan), in accordance with "Berlin Mandate" of COP-1 and ratified in February 2005

The Kyoto Protocol is an international treaty that commits State Parties to reduce greenhouse gas emissions, based on the premise that (a) global warming exists and (b) human-made CO2 emissions have caused it

The Kyoto Protocol: Aims to reduce GHG emissions by 2012 and distinguish two types of countries:

Annex-I countries: With binding emission targets (industrialised countries):

Western and Eastern Europe, Canada, Japan, New Zealand, Russia, Ukraine etc.

Non-Annex I countries: With voluntary participation (developing countries):

China, India, Pakistan, South Africa, Philippines, Uruguay, Brazil, and other developing countries.

The Kyoto Protocol Mitigation Options

Source oriented measures

Energy conservation and efficiency improvement
Fossils fuel switching
Renewable energy

Sink enhancement measures

Capture and disposal of CO_2 (under discussion)
Enhancement of forest sinks (limited options)

Mechanisms Under the Kyoto Protocol

The Kyoto Protocol introduces three market based flexible mechanisms for the emissions reduction:

- ET - Emissions Trading (ET),
- JI - Joint Implementation (JI), and
- Clean Development Mechanism (CDM).

Clean Development Mechanism (CDM)

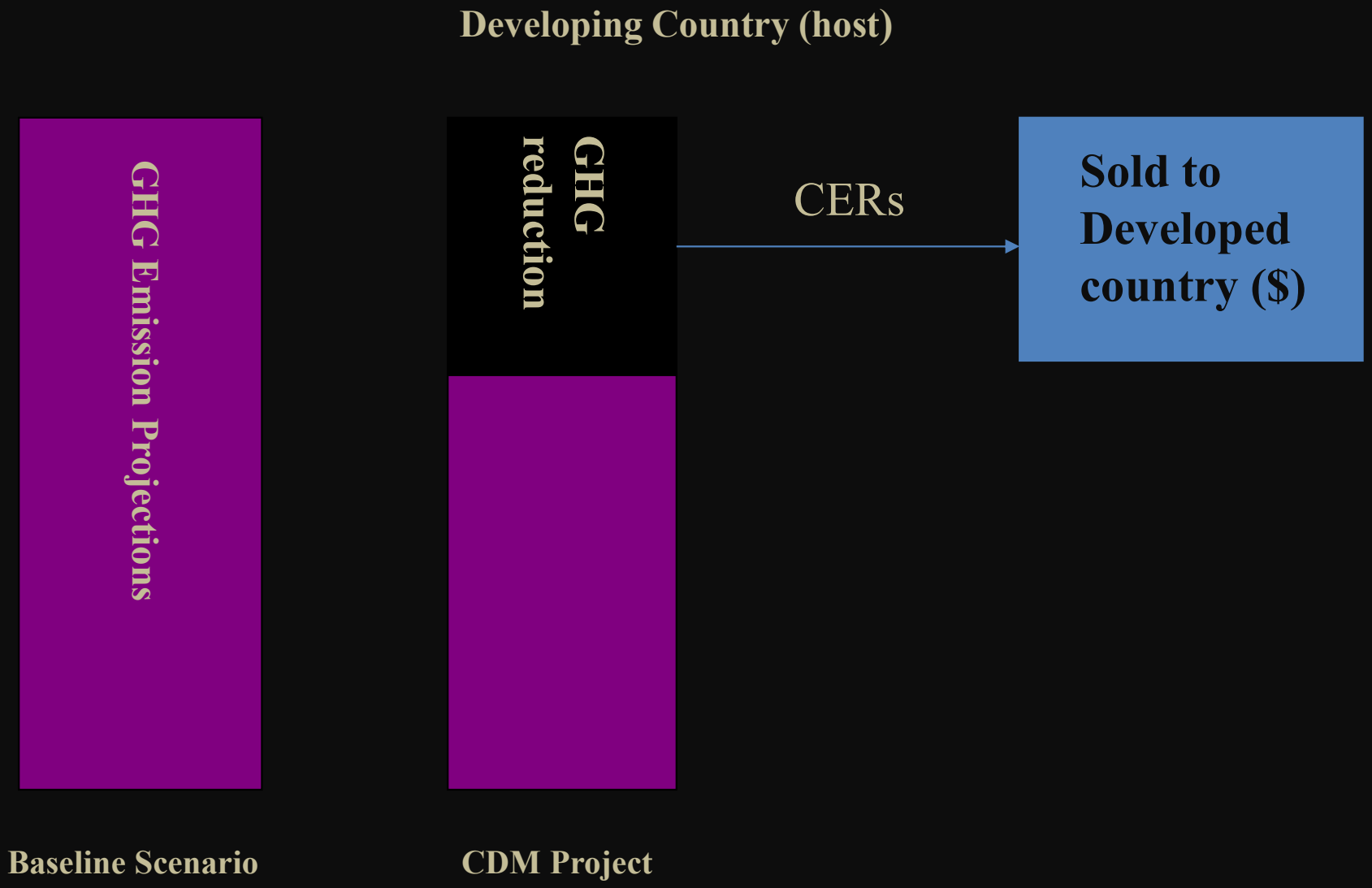
CDM is a market based instrument under the Kyoto Protocol of UNFCCC:

Assists developing countries in sustainable development while at the same time contributing to the ultimate objective of the Convention.

Developed countries to support project activities that reduce GHG emissions in the developing countries in return for Certified Emission Reductions (CERs)/ Carbon Credits.

The CERs generated by such project activities can be used by developed countries as credits to meet their emissions targets under the Protocol.

Concept of CERs/ Carbon Credits



Areas addressed by Kyoto Protocol

The KPs emissions targets cover the six main GHGs:

Name	Formula	GWP (CO2 eq.)
1. Carbon- dioxide	(CO2)	1
2. Methane	(CH4)	21
3. Nitrous oxide	(N2O)	310
5. Per- fluorocarbons	(PFCs)	92,00
4. Hydro- fluorocarbons	(HFCs)	11,700
6. Sulphur hexafluoride	(SF6)	23,900

Sinks (carbon sequestration)

Kyoto Protocol Targets

Decrease avg. emissions **2008-2012** compared to 1990

USA	-7%
EU	-8%
Japan	-6%
Russian Federation	0%
all developed countries	**-5%**

CDM Incentive for Developed Countries

*Developed countries have been subjected to legally binding emission targets.....**2008/12**.*

*Due to **un-localized** nature of CO_2...it does not matter for environment where reduction occurs.*

Costs of abatement or reduction of emissions :

Developed Countries : U$ 50-100/ton

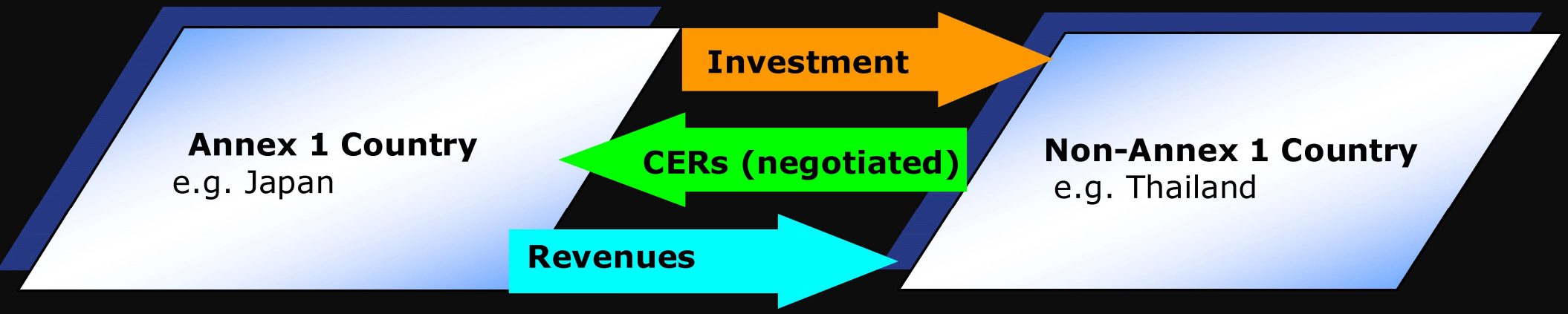
Developing Countries : U$ 1-10/ton

Reductions of GHG is much cheaper in developing countries.

Kyoto Protocol and CDM at a glance

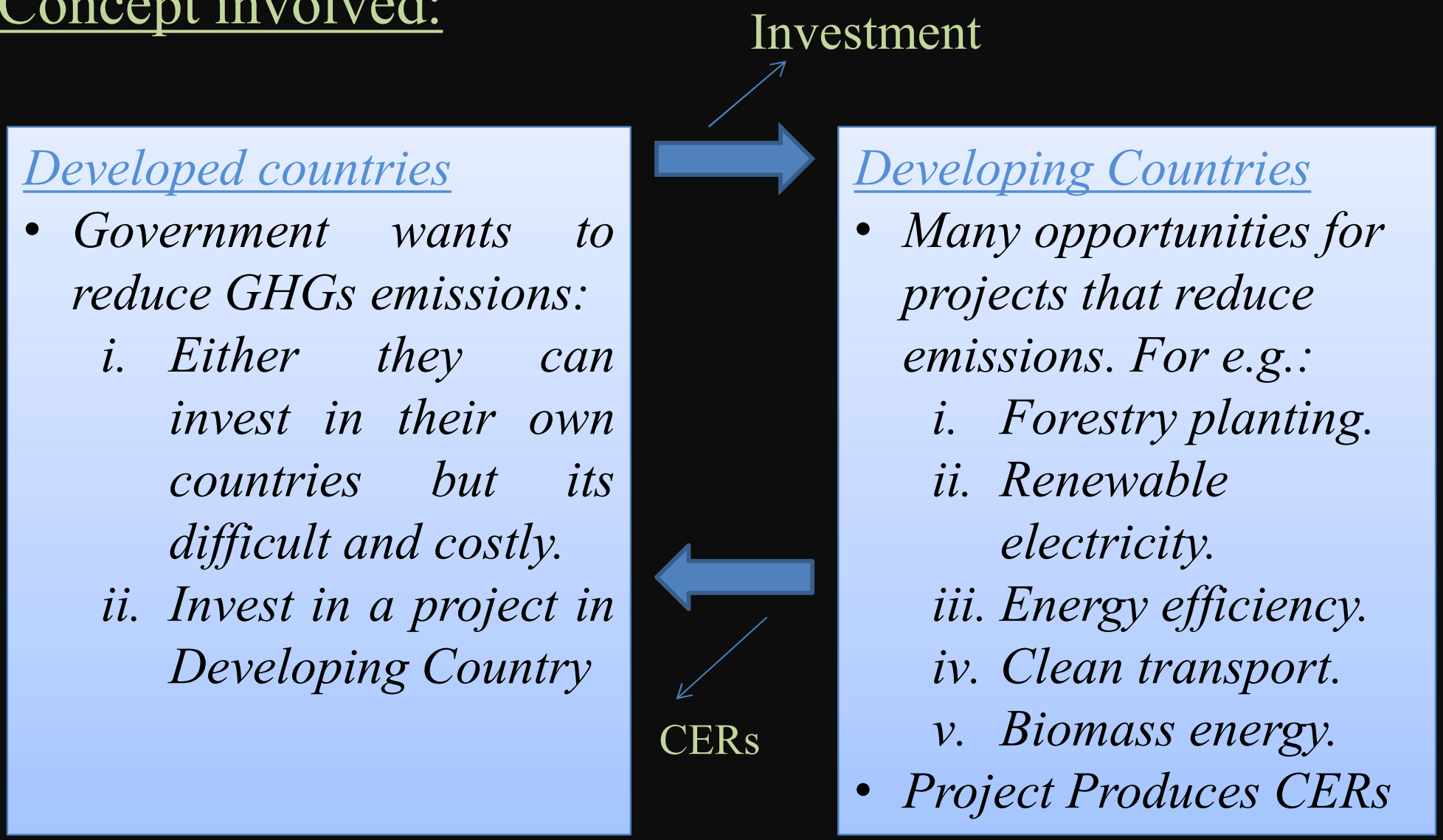
How the CDM Works

- Annex I country invests in GHG reduction project in non-Annex I country
- Annex I country receives CERs
- Non-Annex I country receives revenues from CERs



Clean Development Mechanism

Concept involved:

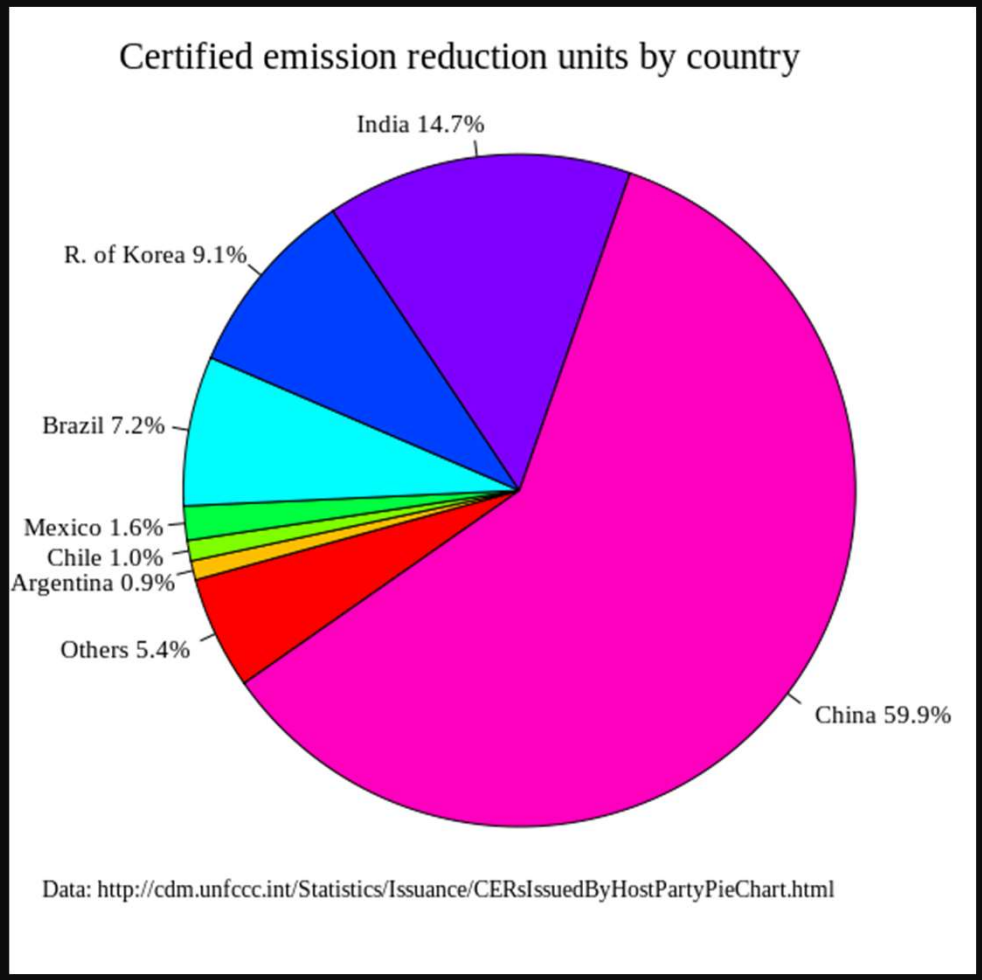


Clean Development Mechanism

Purpose of CDM:

1. *To support developing countries in achieving sustainable development through the implementation of project activities that reduce GHG emissions .*

2. *To assist developed countries in achieving compliance with part of their quantified emission reduction commitments.*



Certified emission reduction units (CERs) by country, October 2012

Clean Development Mechanism

Basic Rules for CDM:

- Emission reductions from CDM project must be additional in developing country.
- Use of CERs can only supplement emission reduction at home in developed countries.
- CDM projects must:-
  - > Be approved by the host country.
  - > Lead to sustainable development in host country.
  - > Result in real, measurable and long-term benefits in terms of climate change.
- Nuclear power projects are not eligible.
- Only afforestation and reforestation allowed.

Clean Development Mechanism

Where CDM is applicable?

Meaning what all kinds of projects are available:

- Energy efficiency
  - End use improvements
  - Supply-side improvements
- Renewable energy
  - > Like wind, solar energy, etc.
- Methane reduction e.g. landfill gas capture
  - > Capturing of landfill methane emissions to generate power

- Fuel switching
  - > From fossil fuel to green fuel like biomass…
- Agriculture (CH_4 and N_2O)
- Industrial processes
- Sequestration/sinks – only afforestation and reforestation

Renewable energy

- Solar power , Hydro power, Wind power, Geothermal
- Biomass, Tidal / Wave power

Renewable energy for the grid

For electricity generation by households or commercial users

- E.g., Solar home systems, solar water pumps, photovoltaics, wind battery chargers

- For mechanical energy by households or commercial users
  - E.g. wind-powered pumps, solar water pumps, water mills, wind mills

Thermal energy for households or commercial users

- E.g., solar thermal water heaters and dryers, solar cookers, energy derived from biomass for water heating.

Fuel switching

- For industrial facilities
  - From steam or compressed air to electricity
- For buildings
  - From oil to gas
- For vehicles
  - From diesel to LPG or to CNG

End-use energy efficiency improvements

Energy efficiency equipment

- Motors, Lamps , Ballasts, Refrigerators, Fans
- Air conditioners, Appliances, Etc …

Agriculture

- Reducing emissions from agricultural soils
  - Use of ammonium sulfate instead of urea
  - Use of Phosphogypsum in combination with urea instead of urea
- Reducing methane emissions from livestock
- Conservation agricultural tillage
- Agricultural land management practices
  - Use of composted rice straw instead of fresh rice straw

Industrial processes

- Methane (CH_4) recovery and avoidance from landfills, coal mines, agro-industries, waste water treatment facilities
  - CH_4 has global warming intensity 21-times that of CO_2
- Cement production (CO_2)
- Electric equipment manufacturing (SF_6)
- PFC emissions from aluminum production
  - PFC gases have global warming intensity over 6000-times that of CO_2
- PFC and SF_6 emissions from semiconductor manufacturing
- Nitrous Oxide (N_2O) emissions from adipic acid and nitric acid manufacturing
  - N_2O has global warming intensity of 310-times that of CO_2

Sink projects

- Afforestation
  - Planting trees on agricultural land
- Reforestation
  - Planting trees on denuded forest land

Jul 20, 2004

Indian villages in global carbon trading

Powerguda Village in Adilabad District, Andhra Pradesh became the first village in India to sell carbon credits directly to the World Bank

The CO2 emission reduction comes from the substitution of about 51 tonnes of diesel oil by bio fuel produced from Pongamia pinnata, a native tree species found in the local forest.

President of the village's Jangubai Self-Help Group, signed an agreement October 16, 2003 to sell the equivalent of 147 tons of carbon dioxide in emission reduction over 10 years and collected a check for $645 from Mr B. Nagnath, Additional Project Director, of the World Bank-funded DPIP project

https://www.downtoearth.org.in/coverage/pongamia-power-enables-adilabad-villagers-to-export-carbon-credits-to-germany-13165

The KP was the first of its kind when it was established in 1997. The primary goal was to mitigate climate change. The protocol established concrete and binding efforts to target the GHG. The Kyoto protocol entered into force in 2005 and expired in 2020 (**The Doha Amendment Extended Kyoto Protocol to 2020)**

The major weakness of the KP was that developing countries did not commit themselves to climate targets. The economies of countries such as China, India and Indonesia grew rapidly in the following years — and so did their greenhouse gas emissions.

In 2015, at the sustainable development summit held in Paris, all UNFCCC participants signed yet another pact, the Paris Climate Agreement, which effectively replaced the KP

Unlike the KP, which established top-down legally binding emissions reduction targets (as well as penalties for noncompliance) for developed nations only, the Paris Agreement **requires that all countries—rich, poor, developed, and developing—do their part and slash greenhouse gas emissions**.

The KP required only developed countries to reduce emissions, while **the Paris Agreement recognized that climate change is a shared problem and called on all countries to set emissions targets**.