Clean Development Mechanism (CDM) in India
A National Prospective

A
Presentation By

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THE WORLD UNITES TO TACKLE CLIMATE CHANGE

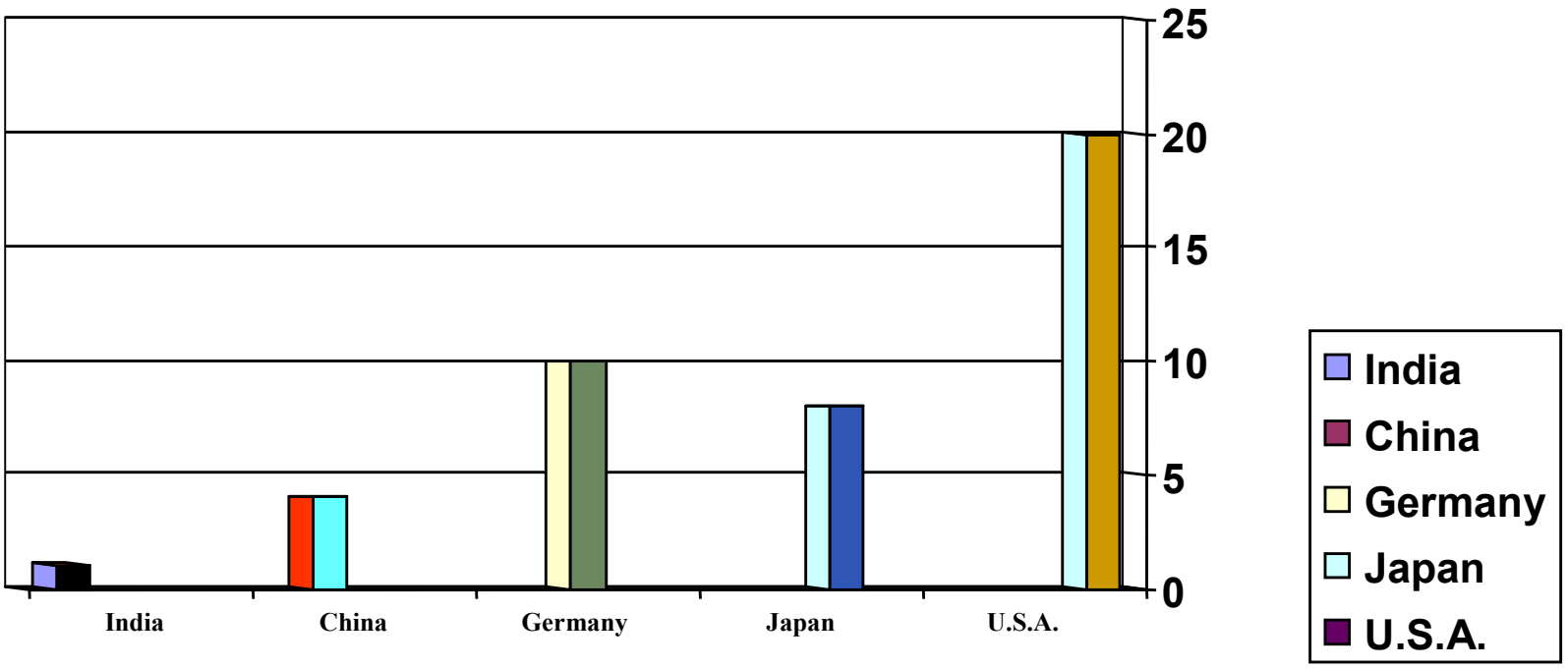
- *United Nations Conference On Human Environment (1972)*
- *Vienna Convention For Protection Of Ozone Layer (1985)*
- *Montreal Protocol (1987)*
- *Intergovernmental Panel on Climate Change (1988)*
- *United Nations Conference on Environment And Development (1992) at Rio*
- *Conference Of The Parties To The UNFCCC (from 1995)*
- *Kyoto Protocol (1997)*
- *Marrakesh Accord (2001)*
- *World Summit on Sustainable Development (WSSD), 2002*
- *Global Environment Facility (GEF)*
- *Prototype Carbon Fund (PCF), World Bank, 2002*

The total GHG Emission, 1994

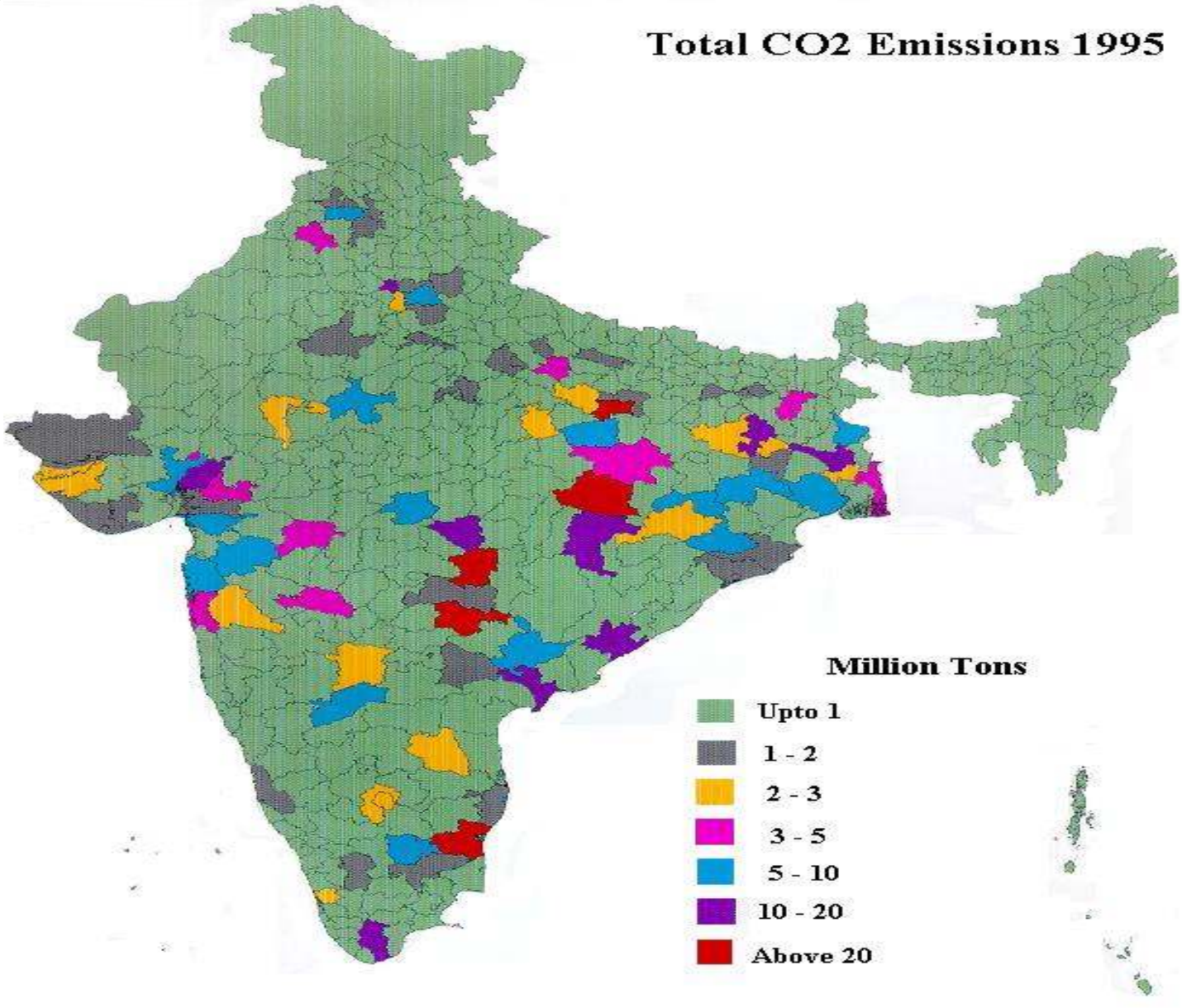
- In 1994, the aggregate GHG emissions from human activities in India amounted to 793 million tons of carbon dioxide; 18 million tons of methane and 0.178 million tons of Nitrous oxide; which constitutes about 3% of global GHG emissions.

- The contributions of the USA, Japan, Germany and UK to the global emissions in 1994 were 20%, 5%, 4% and 2% respectively. However, India's per capita CO_2e emissions were 0.87% tons of CO_2 in 1994, amounting to 4% of US per capita emissions, 8% of Germany, 9% of UK, 10% of Japan and 23% of Global average.

Per Capita CO_2 Emissions



District-wise CO_2 Emission in India (1995)



Some Basic Facts on Kyoto Protocol

- There are Six Green House Gases:

  (Carbon Dioxide, Methane, Nitrous Oxide, Hydro-Fluoro-Carbons, Per-Fluoro-Carbons and Sulphur-Hexa-Floride)

  which are Responsible for Global Warming

- During 1992 Rio Earth Summit – the United Nations Framework Convention on Climate Change (UNFCCC), to which India is also a party, who signed this multi-lateral agreement on 10 June 1992 and was the 38th country to ratify the Convention on 1st November 1993.

- A protocol to the UNFCCC, known as Kyoto Protocol, was adopted during COP-3, in Dec 1997, which enjoins upon the developed country parties to reduce their GHG emissions by a global average of 5.2% below the 1990 levels during 2008-12; which India acceded in August, 2002 and come into force from 16th February, 2005.

The Clean Development Mechanism

- **The Kyoto Protocol has brought out three mechanisms for GHG emission abatement. They are :**
- **1) Joint Implementation (JI),**

  (which allows countries to claim credit for emission reduction that arise form investment in other industrialized countries, which result in a transfer of 'emission reduction units' between countries)
- **2) Clean Development Mechanism (CDM),**

  (through which industrialized countries can finance mitigation projects in developing countries contributing to their sustainable development)
- **3) International Emissions Trading (ET)**

  (which permits countries to transfer parts of their 'allowed emissions' - assigned amount units)

The CDM Process

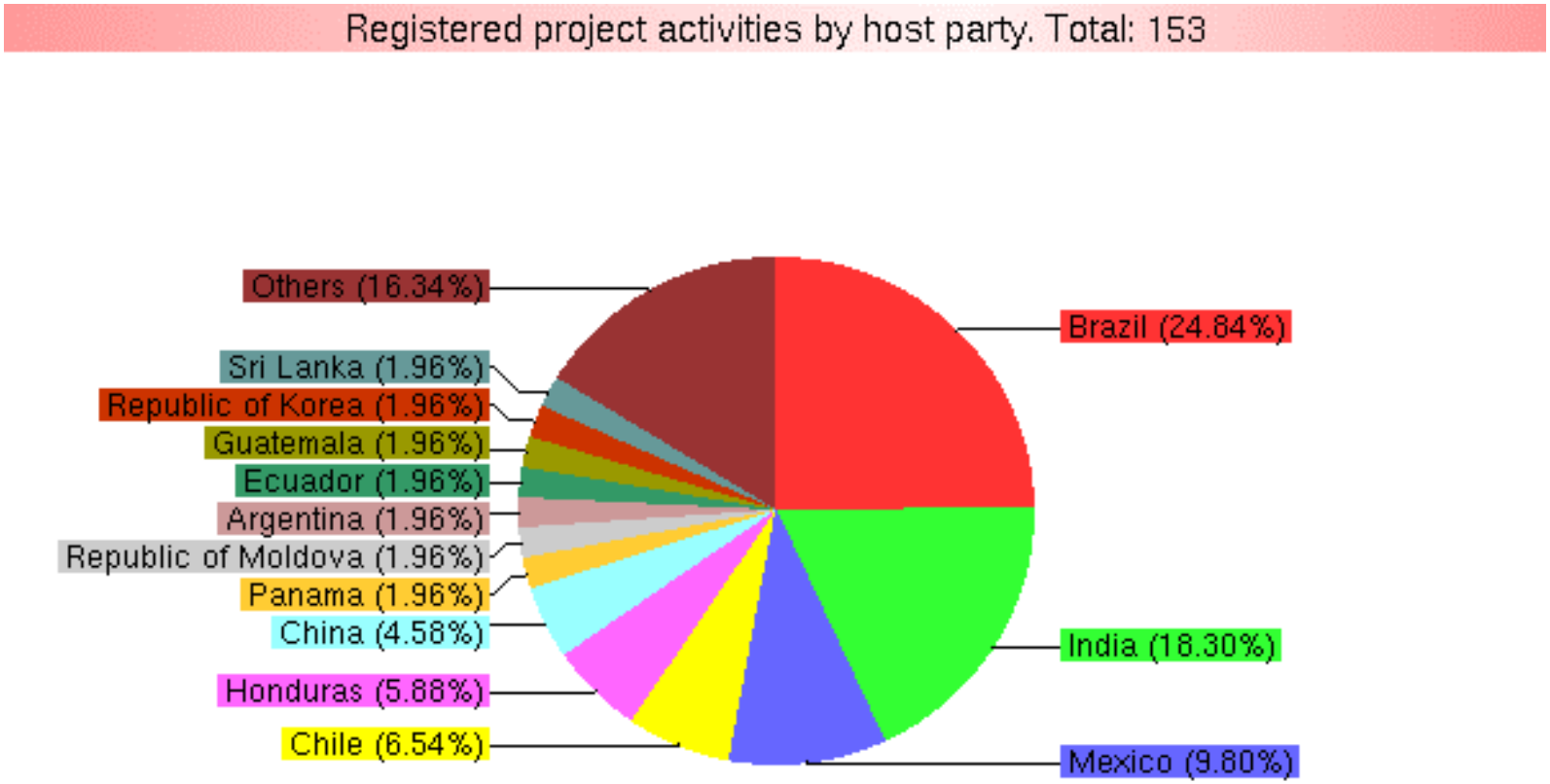
- **All these mechanisms are market-based ones; the first two are project based, where as the third one allows the developed countries to sell surplus emission of one country to another developed country.**

- **CDM works between those countries who have agreed emissions reduction targets, under UNFCCC (Annex-1) and those who have not I.e *non-annex countries or* the bulk of developing world.**

- **Out of the 3 Kyoto mechanism, CDM is the only for the developing world, which encourages cleaner development and bring infusion of investments and technologies; which thus provides them an opportunity to adopt cleaner technologies and be paid for emission reductions.**

- **CDM undergoes through a project cycle involving 4 stages such as (1) Project Development (2) Validation and Registration (3) Project Monitoring (4) Verification, Certification and Issuance of CERs.**

India is a CDM Global Leader



CDM Project Registration

By 31st March 2006		
Countries	Projects Registration	% Of total registration
BRAZIL	37	24 %
INDIA	28	19 %
CHINA	7	4.7 %
MAXICO	15	10 %
Chile	10	7 %

Source : CDM Executive Board, Bonn, Germany

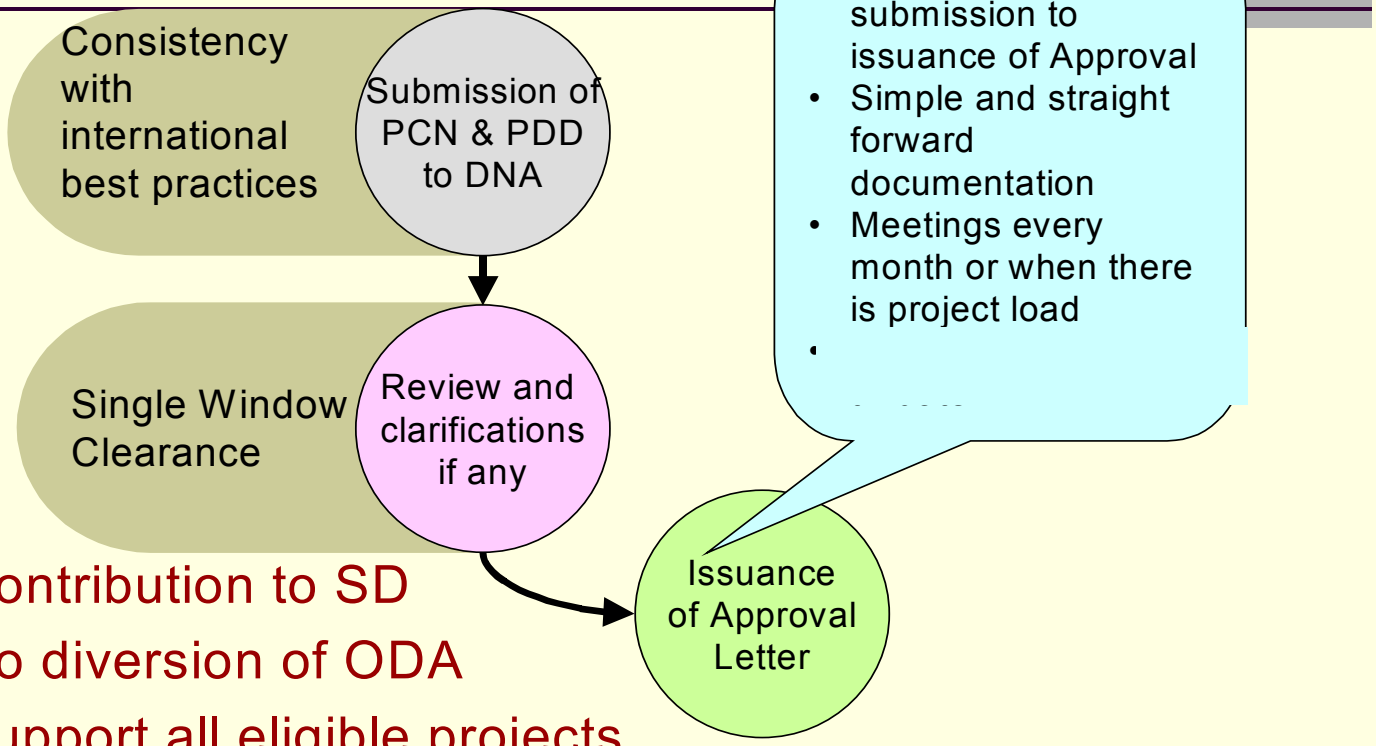
CDM Eligibility

For a project to be considered for CDM, should fulfill following eligibility criteria:

- **The project contributes to the Sustainable Development of the host country**
- **The project results in real, measurable and long term benefits in terms of climate change mitigation, and**
- **The reductions must be *additional* to any that would have occurred without the project**

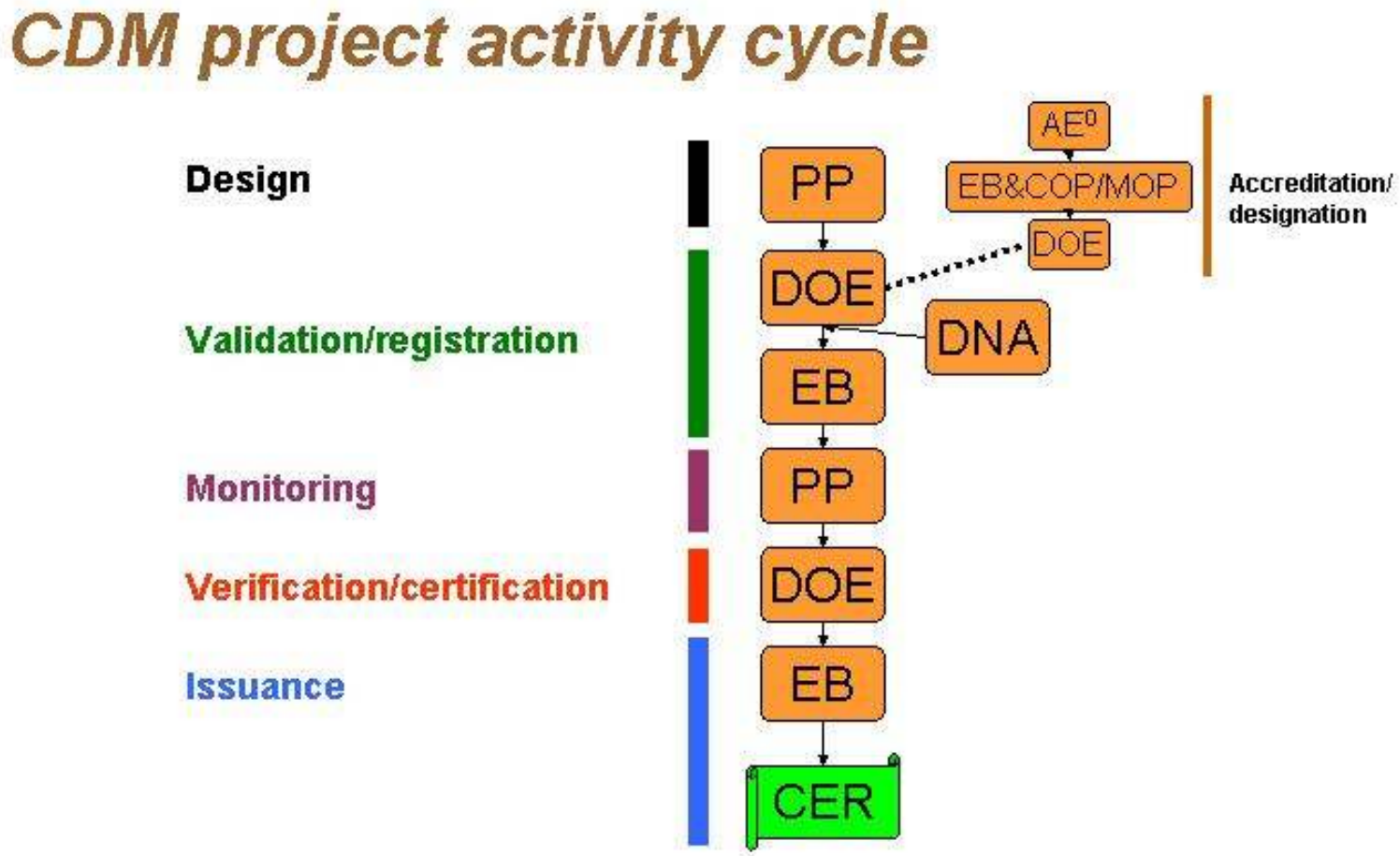
Host Country Approval Process

NCA approval process



- Contribution to SD
- No diversion of ODA
- Support all eligible projects
- Interim approval criteria

CDM Project Activity Cycle



India's CDM Potentials

- **Potential Areas**
  - **Emission reduction of HFCs, Nox, SF6, CH4, CO2**
  - **Renewable Energy,**
  - **Fuel Switch from fossils, Alternate Fuel Source Adoption (LPG, CNG), Bio Fuel**
  - **Energy Efficiency,**
  - **Waste Management,**
  - **Transport Sector,**
  - **Oil & Gas,**
  - **Industrial Processes**
  - **Sink / Carbon Sequestration / LULUCF Sector**
  - **Agriculture (Methane Emission Abetment)**

The Baseline for the Project

- **The Unit has been traditionally using open logoons and storage systems to treat it's high strength (COD) Waste Water with negligible methane Capture on account of chronic failure to operate an existing digester system.**

- **Baseline Methodology**

- **Methane Recovery – *Type III.D***
- **Avoidance of Methane production from Biomass decay through controlled Combustion – *Type III.E***
- **Use of Methane and Bio-solids for the generation of Renewable Energy – *Type – I.C***

Project generates

7,60,906 CERs ag a Baseline & Project emission, to be credited over last 10 years.

Contribution to Sustainable Development

- **Project's Contribution to Sustainable Development**
  - **Social Well Being -**
  - **Economic Well Being** – CDM Benefit from the Project encourage other Distillery Units in the region for investing into Waste to Energy Projects, contributing to the Energy Security of the nation.
  - **Environment Well Being** – Project leads to direct and indirect saving the fossil fuel and reduction in pollution. It also avoids Methane emission from open lagoon system
  - **Technological Well Being** – Project encourage other similar facilities irrespective of sector, to adopt technologies for high strength waste water treatment that have a triple benefit of avoidance Methane emission, Avoidance of fossil fuels and reduction in adverse environmental impact.

Barrier Analysis

- **Investment Barriers**

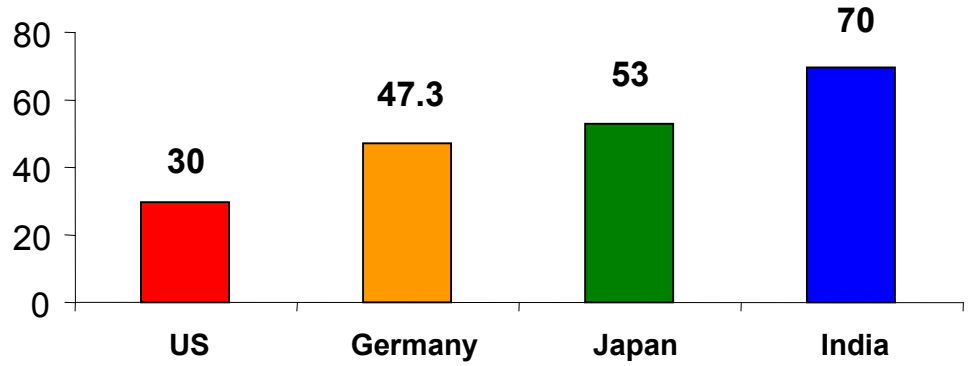
- To execute all the measure the project need to invest..
- The total cost of co-genation system will be
- The Annual operating cost of the Project
- IRR with and without CDM Benefits

- **Technological Barriers**

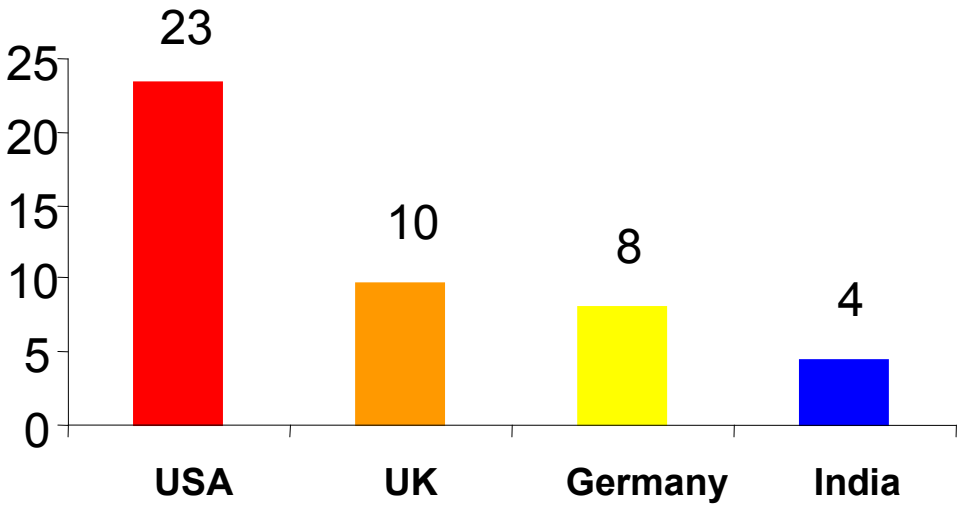
- First Unit in the region to implement evaporation and spray drying Unit
- There is no ready to buy and operate available Technology in national market

Municipal Solid Waste

Average rate of recycling (%);excludes Reuse



GHG emissions from waste (gm/'000$GDPppp)



India and Carbon Tenders - Present / Future Buyers

- India is participating in the following Carbon Tenders:
  - Carbon Emission Reduction Unit Procurement Tender (CERUPT) programme of the Dutch Government,
  - CDM Pilot Programme of the Government of Finland.
  - Austrian Tender, Government of Austria (EU)
  - Bio-Carbon Fund of World Bank
  - Prototype Carbon Fund of World Bank
  - Community Development Carbon Fund (CDCF), of World Bank
  - *Kfw Carbon Fund , Germany*
  - *Italian Carbon Fund / Japan Carbon Fund*
  - *Climate Change Capital UK*

Cost of CERs

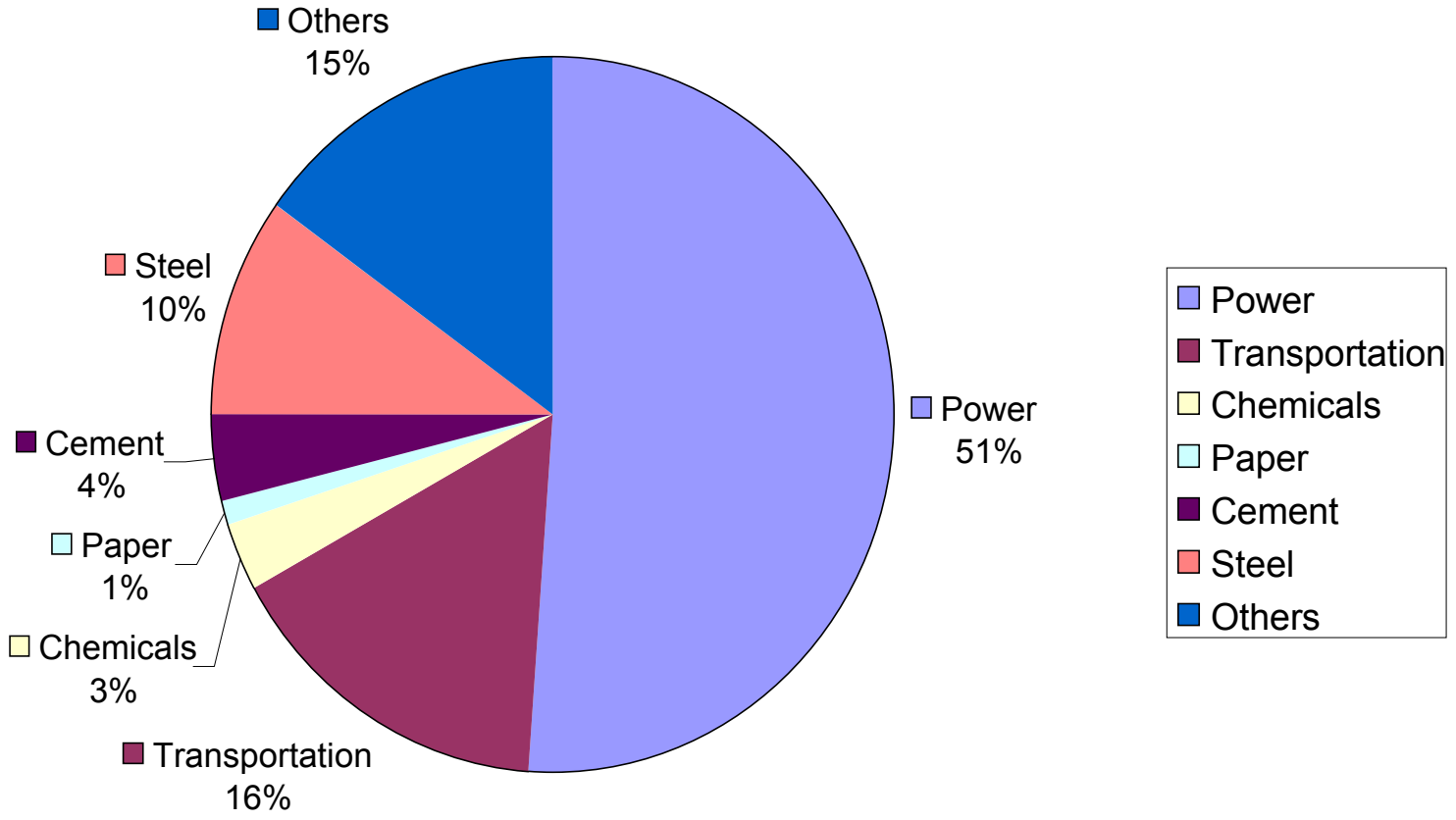
- The average price per CER for the ***2000 Tender*** by the Dutch Government (CERUPT) was ***$ 8.3***, the average in the ***2001 Tender being $ 4.8***. (Kalpataru Power of India was a part of this tender)

- Now the Cost of the CER varies between 25-30 Euro, which may likely to rise up to 3 times more by Oct-Nov, 2006, as projected by Point Carbon.

Average Specific Energy Consumption in Indian Industries

Sector	1990 -91	1994 -1995	1999 -2000 Best
Steel (G.cal/ton)	11.27	8.93	**7.48**
Aluminum (kWh/ ton)	16763	16606	**15217**
Cement (kWh/ton)	132	120.5	**69**
Caustic Soda (kWh/ton)	3351	3130	**2196**
Paper (MWh/ton)	1.255	1.003	**0.985**
Urea (kWh/ton)	425.6	390	**-**

Carbon Dioxide emissions in Indian Industrial Sectors



Carbon Dioxide emission as of the year 1995

SOURCE : HANDBOOK OF STATISTICS 1998

Sectoral GHG Mitigation Potential for India

GHG Mitigation Options	***Abatement Cost Range[1]***	***National Mitigation Potential (000 tons of CO2)***
Power generation		
Pulverized fluidized bed combustion	Low	8166
Integrated gasification combined cycle	High	14610
Renewable energy		
Wind power (grid-connected	High	526
Wind-based water pumps	Medium	<1
Solar thermal power (grid-connected)	High	300
Industrial efficiency		
iron and steel - dry coke quenching	Low	950
Pulp and paper – continuous digestor	Medium	904
Replacement of industrial motors	Medium	36

Source:- Tata Energy Research Institute, 2002

Renewable Potential of India

Technology	*Potential*	*Cum. Installation upto March 31, 2002*
Wind Power	45,000 MW	1,617 MW
Small Hydropower (< 25 MW)	15,000 MW	1,437 MW
Biomass	19,500 MW	432 MW
Energy from Waste	1,700 MW	22 MW
Solar photovoltaic	-	1.9 MW

Source: MNES, GOI, 2004

Impact of CDM Revenue on the Renewable Energy Project Cost

Technology	*IRR*
Energy efficiency (heating by solar panels)	**<1.0**
Wind	**0.9-1.3**
Hydro	**1.2-2.6**
Bagasse	**0.5-3.5**
Biomass	**<5.2**
Solid Waste Management (Methane Recovery)	**>5.0**

Source: Prototype Carbon Fund, World Bank 2005

Carbon Mitigation Potential in Power generation and Industry in India

Project type	*Size of Mitigation Opportunity*	*Investment Potential (billion US$)*	*Expected carbon reduction (MT / Yr)*
Coal washing	5,000-6,000 MW	**1.8**	**11**
Fuel switching	3,800 MW	**3.1**	**4**
Conventional efficiency	6,500 MW	**0.15**	**4**
Integrated gasification combined cycle	10,000 MW	**10**	**5**
Renewable Energy	35,000 MW annually	**25**	**60**
Conversion of Mercury Cell process to membrane Cell process in caustic soda production	0.9 Mt of capacity	**8.4**	**0.12**
Upgradation from wet to dry process in cement production	45 Mt of capacity	**4**	**1.1**
Upgradation to Hall-Herault process in aluminum production	BALCO & INDAL plants	**8.4**	**NA**

Mitigation Potentials in Carbon, Methane and Nitrous Oxide

Greenhouse Gas	*Mitigation Options*	*Mitigation Potential 2002-12 in MT*	*Long-term Marginal Cost ($/ton of CO2e)*
Carbon	**Demand-side energy efficiency**	**45**	**0-15**
	Supply-side Energy efficiency	**32**	**0-12**
	Electricity transmission and distribution	**12**	**5-30**
	Renewable electricity technologies	**23**	**3-15**
	Fuel switching (gas for coal)	**8**	**5-20**
	Forestry	**18**	**5-10**
Methane	**Enhanced cattle feed**	**0.66**	**5-30**
	Anaerobic manure digesters	**0.38**	**3-10**
	Low methane rice varieties	**Marginal**	**5-20**
	Cultivation practices	**Marginal**	**0-20**
Nitrous Oxide	**Improved fertilizer application**	**Marginal**	**0-20**
	Nitrification inhibitors	**marginal**	**20-40**

India offers a vast Untapped Market for Carbon Trading

- India today manufactures 25 million tons of steel.
- Each having an installed capacity of electrical power generation of 110,000 MW
- Produces over 200 million tons of food-grains
- With GDP growth of 6.5% against the energy consumption growth rate of 5.5%
- Leading sectors, having GHG Mitigation potential include energy efficiency (45%), renewable energy (35%), methane emissions abatement (15%), and improvements in the thermal energy generation sector (5%).
- In India, total $C0_2$-e emissions in 1990 were 10,01,352 Gg, which was approx. 3% of global emissions. The Power sector was the largest emitter of $C0_2$, contributing 55% of national emissions.
- India would be requiring an additional 100,000 MW of power by 2012.

Present Risks in CDM Promotion in India

- Clarity on *Taxation Issues*
- *Necessity of a Green Carbon Fund*
- Establishment of an Indian *Operational Entity* (OE)
- *Non-acceptance of Agro-Forestry* under LULUCF
- *Insurance Sector* in India – yet to gear up
- *Lack of Resources* for adequate *Capacity Building*
- Will really *CDM share* be substantial *compared to JI & ET* ?
- *Non-Ratification of USA and Australia*