Indian Science Congress 2012, January 3-7, KIIT, Bhubneswar

CO_2 Sequestration, Carbon Trading and Women Empowerment

Plenary Session on

Energy Sustainability for a Greener Tomorrow

07.01.2012

A presentation by Dr. (Mrs.) Malti Goel Former Adviser, Government of India

Indian Science Congress

- In 1950s
- In 1990s
- In 2010s

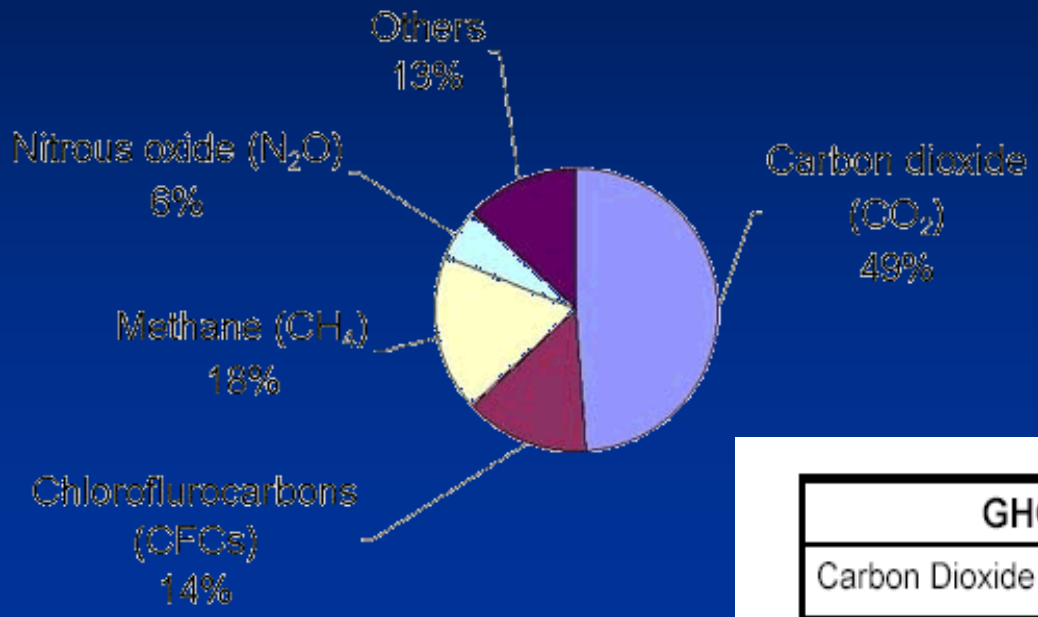
Science & Technology for Inclusive Innovation: Role of Women

Energy Sustainability for a Greener Tomorrow

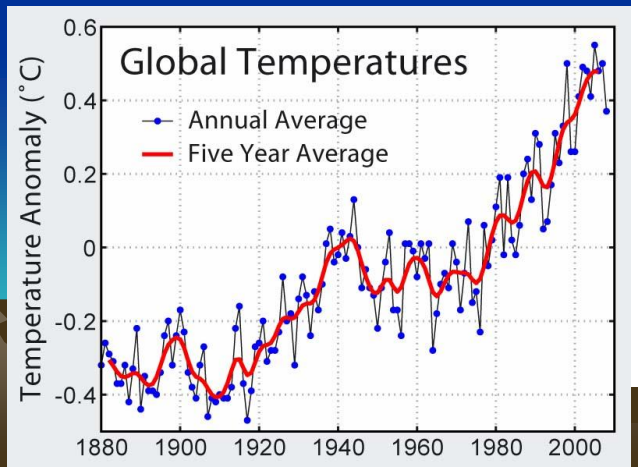
"*Climate mitigation and adaptation strategies must be developed WITH women, not FOR them, and women must be involved alongside men in every stage of climate and development policy making*"

- MR Foundation

Global Warming - Major and Minor Greenhouse Gases



Major greenhouse gas concentrations of CO2, NOx, CFCs, Methane have increased 20-30% since pre-industrial era



GHG	GWP
Carbon Dioxide (CO2)	1
Methane (CH4)	21
Nitrous Oxide (N2O)	296
Perfluorocarbons(PFCs)	5700~11900
Hydroflurocarbons (HFCs)	120~12000
Sulphur Hexafluoride (SF6)	22200

Source: IPCC Third Assessment Report

Carbon Content of Earth System

- Total carbon in the earth is estimated to be more than 27.65×10^{15} kg. Four main reservoirs of CO2 on earth system are
  - Troposphere – 7×10^{14} kg
  - Ocean - 390×10^{14} kg
  - Biota - 44×10^{14} kg
  - Soil - 30×10^{14} kg

Carbon Sinks & Sources

- Two major sinks for the CO2 are, the Oceans and the Forests.
- The biosphere changes are most frequent changing with land use pattern, making the role of biosphere uncertain.
- The capacity of oceans to store carbon is tremendous almost 50 times that of atmosphere and slow.
- The measurement of CO2 concentrations in the atmosphere plays a critical role in it.

Rising CO2 Concentrations

Greenhouse gas emission is a global problem

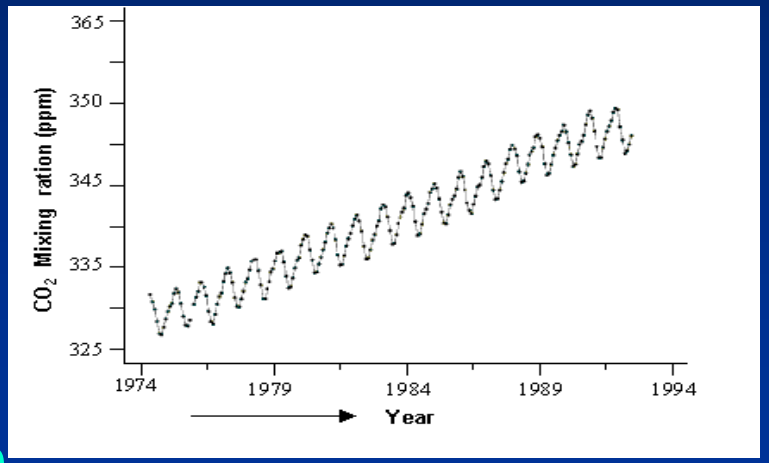
IPCC Assessment

First Report - 1990
Second Report - 1995
Third Report - 2001
Fourth Report - 2007

Average global temperature increase 1906-2005 – 0.74^{o}C

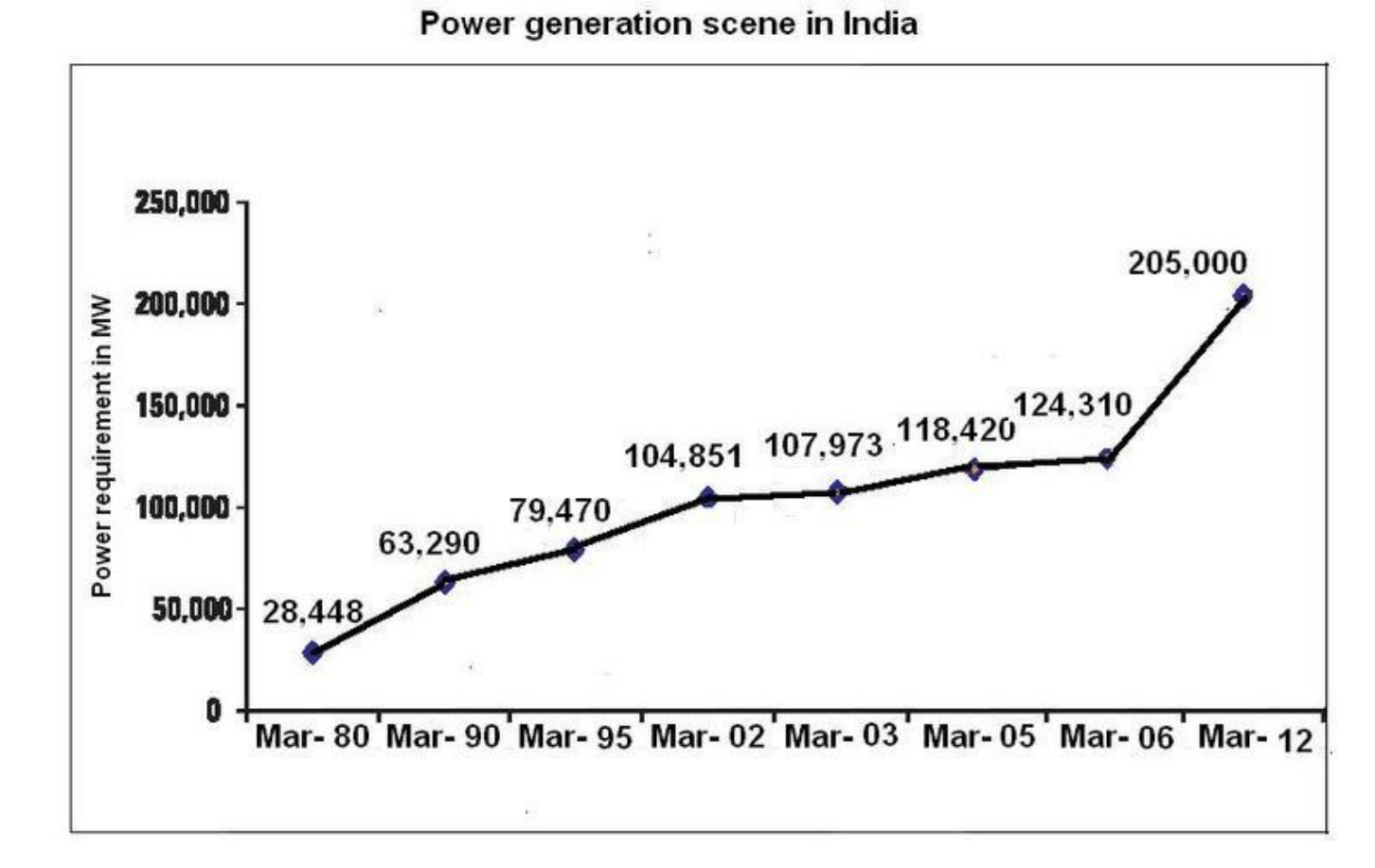
Expected Temperature rise up to the Year 2100 - 2.4 to 6.4 ^{o}C

The CO2-e concentrations risen to 374 ppm and would increase further



NEED TO CAP TO REDUCE EMISSIONS IRRESPECTIVE OF WHO HAS EMITTED

Projections for Increasing Coal Requirement in India



Technology Focus – CO2 Sequestration

- CO2 Capture from Power Plant Flue Gas
- Absorption and Compression in to Liquids
- Transportation to Appropriate Sites
- Geological / Terrestrial Permanent Fixation

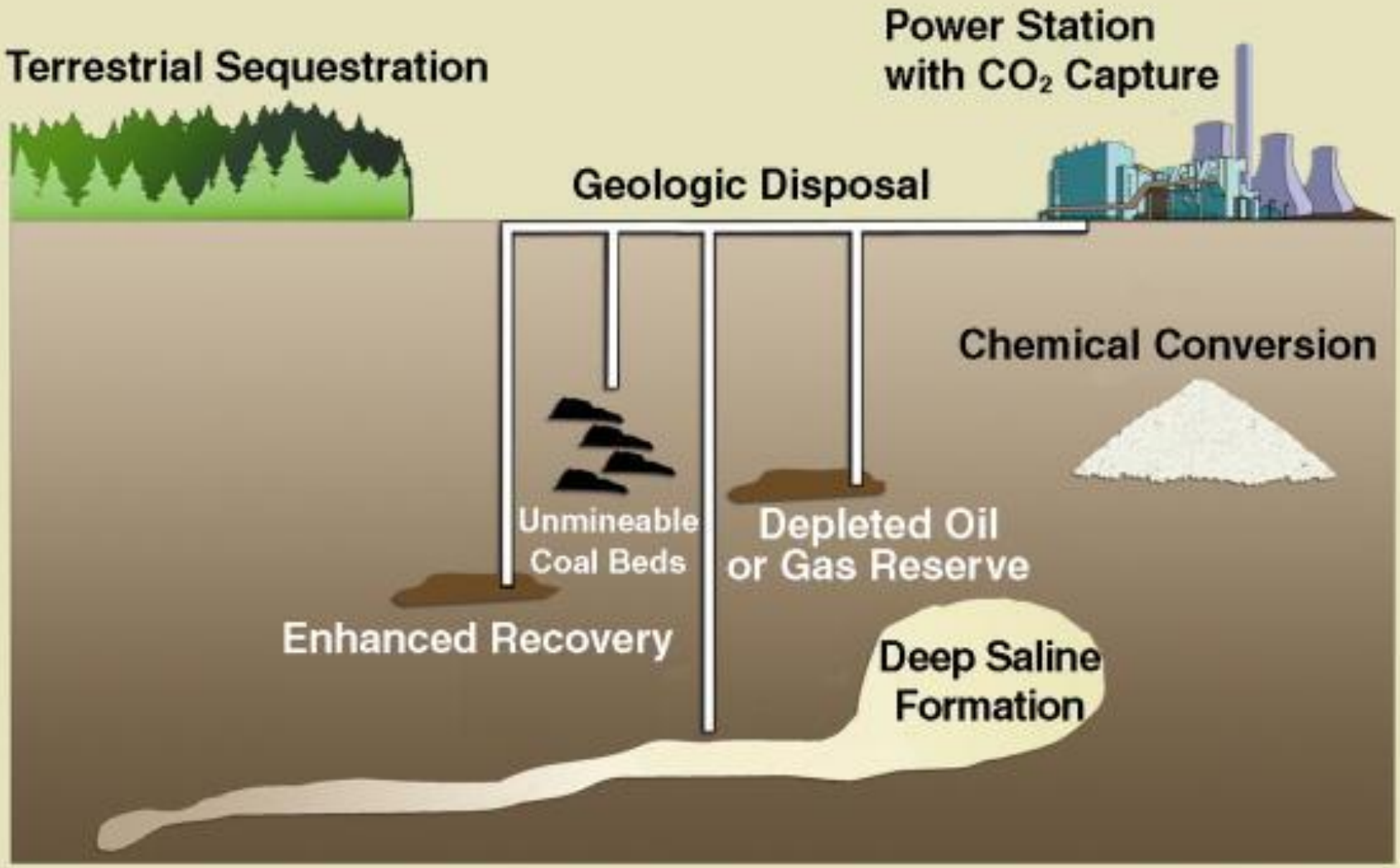
Options in Coal Based Generation

- Pre-Combustion
  - Coal gas separation
- Oxy-fuel Combustion
- Post Combustion capture
  - Solvent
  - Cryogenic
  - Absorption
  - Adsorption

Third generation of clean coal technologies

Research on Materials and Process development undertaken at R&D Laboratories and academic institutions supported by Industry and Government

Carbon Sequestration Options



Economic Focus – Market Mechanisms for Reduction of GHG Emissions

UNFCCC has created three cooperative mechanisms as under:

- **Emission Trading**: Annex-1 countries, basically, to purchase the rights to emit Green House Gases (GHG) from other Annex 1 countries
- **Joint Implementation (JI)**: Between Annex-1 countries to gain a credit by investing in another Annex-1 country in a project which reduces carbon emissions.

Clean Development Mechanism (CDM)

- The clean development mechanism (CDM) as an idea was proposed under Article 12 of Kyoto Protocol with the objective of transfer of energy efficient technology from Annex I and Non -Annex I countries.
- Under this mechanism Annex –I countries would invest in plant and equipment for participating Non Annex I countries
- The CDM was designed in such a manner, so as to lower the overall cost of reducing GHG emissions and support sustainable development in Non-Annex–I countries.

Clean Development Mechanism (CDM)

- Annex-1 countries will count certified emissions reductions (CERs) obtained from project activities in developing countries
- Once certified, these reductions can be used to meet Annex-I commitments under the Kyoto Protocol to fulfill their 2008-12 target of reducing GHG emissions, taking 1990 as base year.
- Non- Annex-1 countries are intended to benefit in terms of sustainable development and to support faster access to and dissemination of clean technologies.

How does the CDM work?

- Any legal entity (foreign, domestic, joint venture, public, corporate, non-profit) may set up a project to reduce CO2 emissions in a non-Annex I country
- Certified Emissions Reductions [CERs] issued by CDM Executive Board are transferred to the buyer in Annex-I country. These can also be traded in a global market such as Emission Trading

Steps in Earning of CERs

- Project Screening
- Project Development
- Approval of NCDA
- Validation and Registration
- Implementation and Monitoring
- Verification and Certification
- Trading & CERs Delivery

Technical Steps

- Additionality - Baseline
- Leakage
- Permanence
- Project Accreditation and Registration
- Measurement, Monitoring and Verification

Types of Approved projects

- Renewable energy (Wind, Biomass, Solar, Hydro)
- Switching to Alternate Fuels
- Energy Efficiency
- Waste Management
- Agriculture & Forestation

First Forestry CDM project in India

- Small Scale Afforestation Clean Development Mechanism (CDM) activity on private lands affected by shifting sand dunes
- Private entrepreneurs and forest departments to effectively use degraded lands to promote forestry sector activities in India and beyond.
- Project will benefit poor farmers by creating over 11,500 carbon credits annually for a period of 20 years.

Land Use, Land Use Change and Forestry

- Rules adopted at CoP9 in December 2003: LULUCF strictly restricted in the CDM
  - Only Afforestation/Reforestation (avoided deforestation and forest management excluded)
  - Max 1% of Annex I 1990 emissions
  - Complex rules
    - Temporary crediting: 5-year leases
    - Replacement after 60 years
- 6 baseline & monitoring methodologies submitted to CDM Executive Board, none approved
- LULUCF = 4% of the market and declining

Bali Action Plan

- COP13 in 2007 proposed outline of Reducing emissions from forestation just before start of Kyoto Period
- Reducing Emissions from Deforestation and Forest Degradation (REDD) was suggested as a cost effective mitigation option
- REDD+ has emerged as a mechanism for earning CERs while generating additional conservation.

Relevance to India

- India has 23.84 % forest and tree cover area
- One sixth of its population is entirely dependent of forests for livelihood
- Forest Acts and Action Plan on Climate Change provide policy infrastructure
- Both fund based and market based approaches are envisaged for sustenance

Role of Women in Climate Change

- As Scientists
- As Engineers
- As Social Scientists

Role of Women

- REDD can address issue of deforestation while providing sustainable livelihood
- Active participation of women through targeted consultations would lead to better forest management
- Legal rights and claim over forest resources would empower them in the long-term

What is needed?

- Creation of Carbon Database
- Development of Methodologies
- Development of Inter-sectoral Linkages
- Creating Awareness among Agencies
- Creating Markets by Increasing value of CERs

Thank You

A presentation by Dr. (Mrs.) Malti Goel,
Former Adviser, Government of India

(maltigoel2008@gmail.com)