“Climate Change and Global Response” (UNFCCC, KP & road to Paris)

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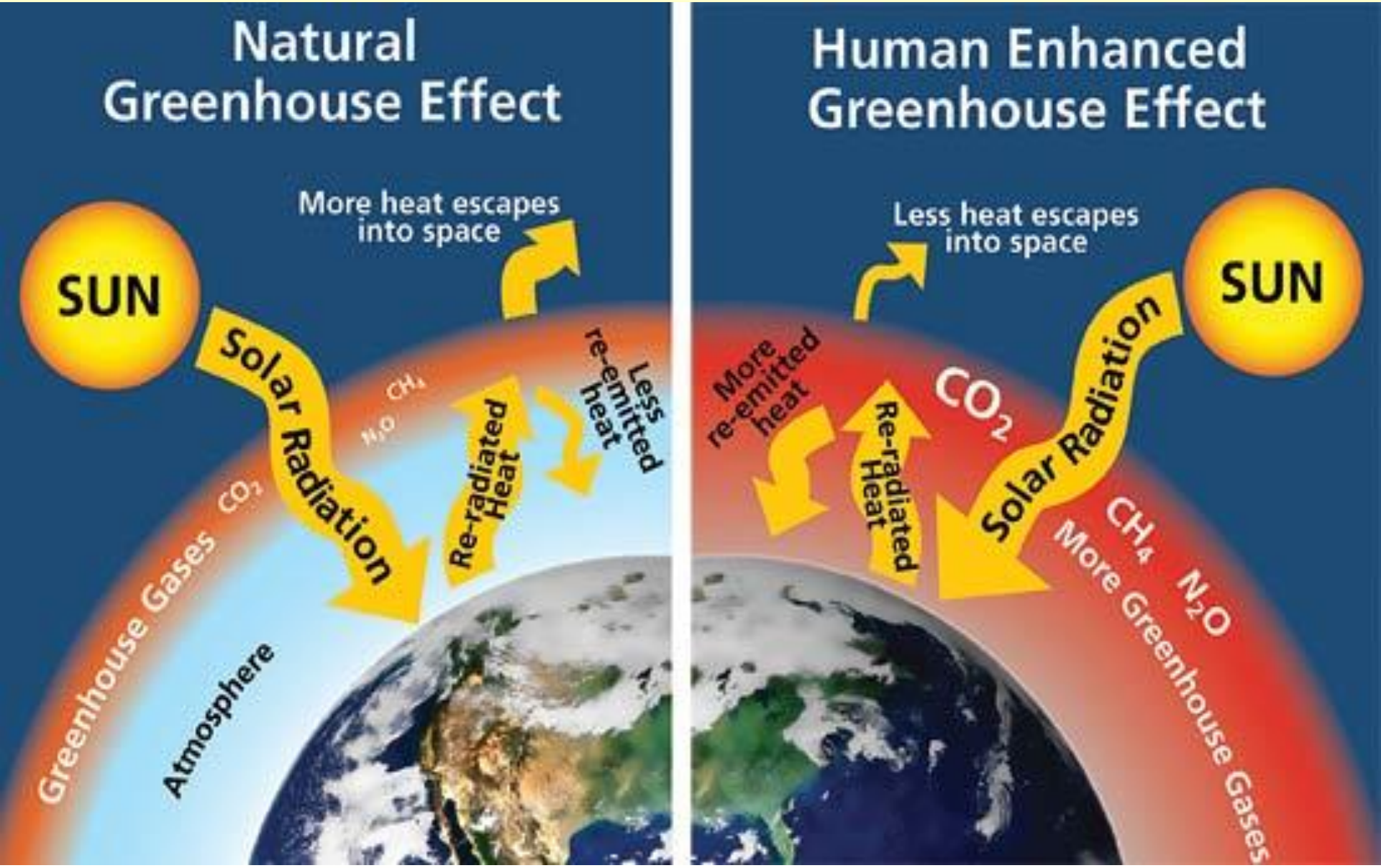
Outline…

- Green House Effect / Global Warming
- Projected Climate Change (AR4&5)
- A short film on AR5 (WG-I report)
- Global Response to Climate Change
- Kyoto Protocol and CDM
- Achievements in recent COPs
- Latest from Paris…


Natural Greenhouse Effect
More heat escapes into space
SUN
Solar Radiation
Re-radiated Heat
Less re-emitted heat
CH_4
N_2O
CO_2
Greenhouse Gases
Atmosphere
Human Enhanced Greenhouse Effect
Less heat escapes into space
SUN
More re-emitted heat
Re-radiated Heat
CO_2
Solar Radiation
CH_4 N_2O
More Greenhouse Gases

Difference

GLOBAL WARMING

is the increase of the Earth's average surface temperature due to a build-up of greenhouse gases in the atmosphere.

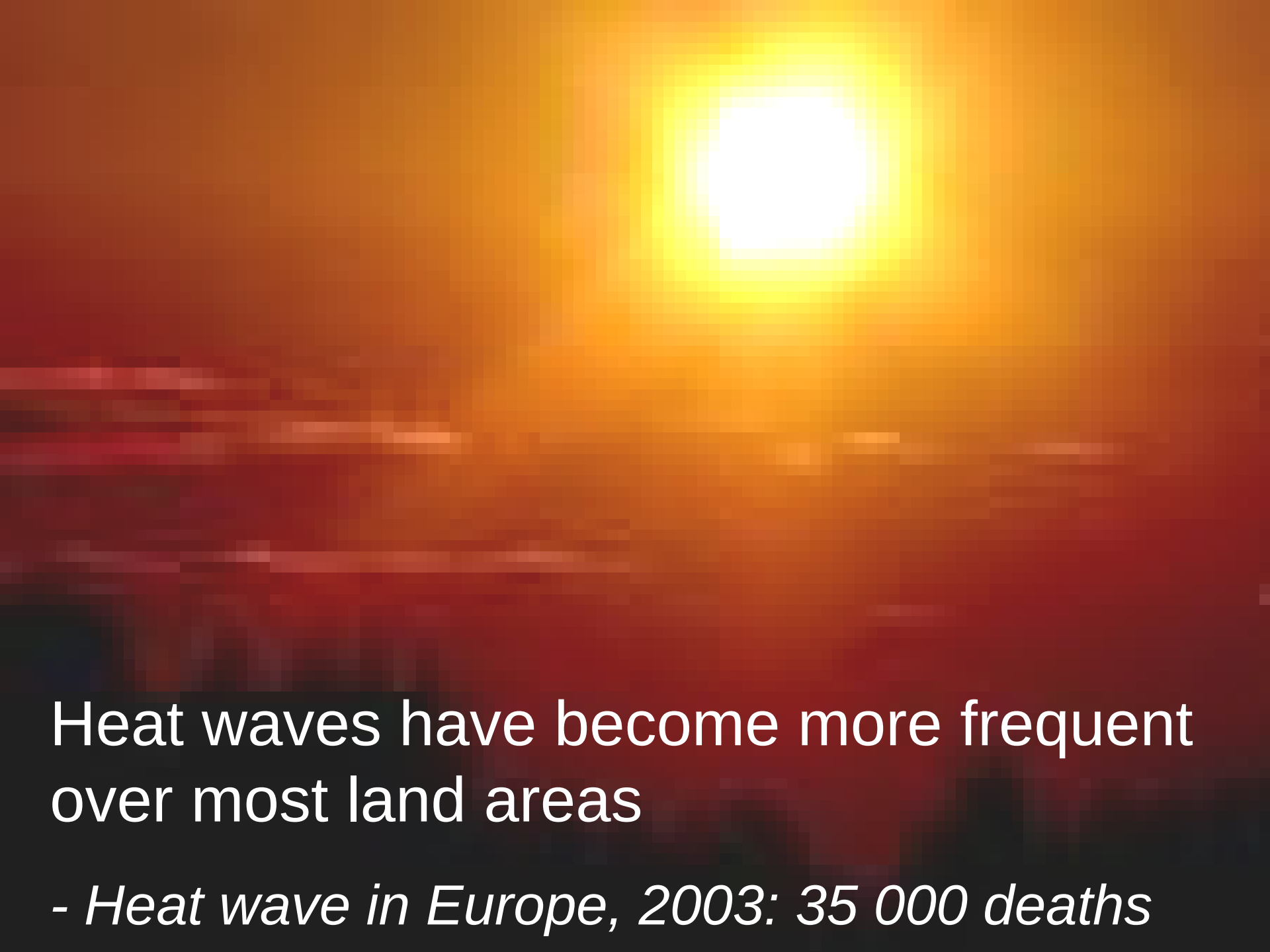
CLIMATE CHANGE

is a broader term that refers to long-term changes in climate, including average temperature and precipitation.

CC vis a vis Climate Variability

The frequency of heavy precipitation events has increased over most land areas

- Rainfall in Mumbai (India), 2005:
1 million people lost their homes



Heat waves have become more frequent over most land areas

- Heat wave in Europe, 2003: 35 000 deaths

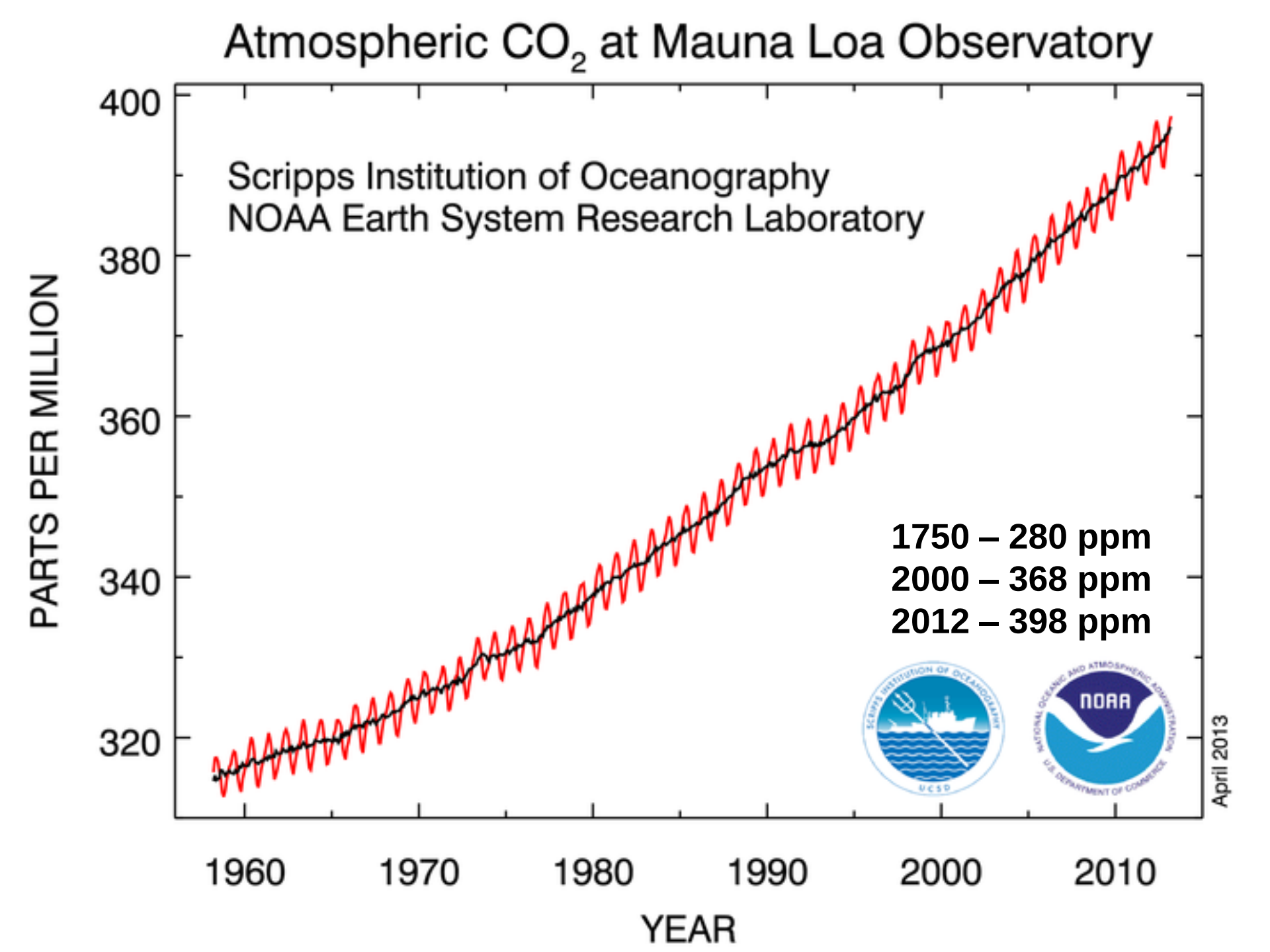
Chennai Rains

GHGs affected by human activities

	CO_2	CH_4	N_2O	HFC
Pre-industrial concentration	About 290 ppm	About 700 ppb	About 270 ppb	Zero
Concentration in 1998	365 ppm*	1745 ppb	314 ppb	14 ppt
Rate of concentration change	1.5 ppm/yr	7.0 ppb/yra	0.8 ppb/yr	0.55 ppt/yr
Atmospheric lifetime	5 to 200 yr	12 yr	114 yr	260 yr

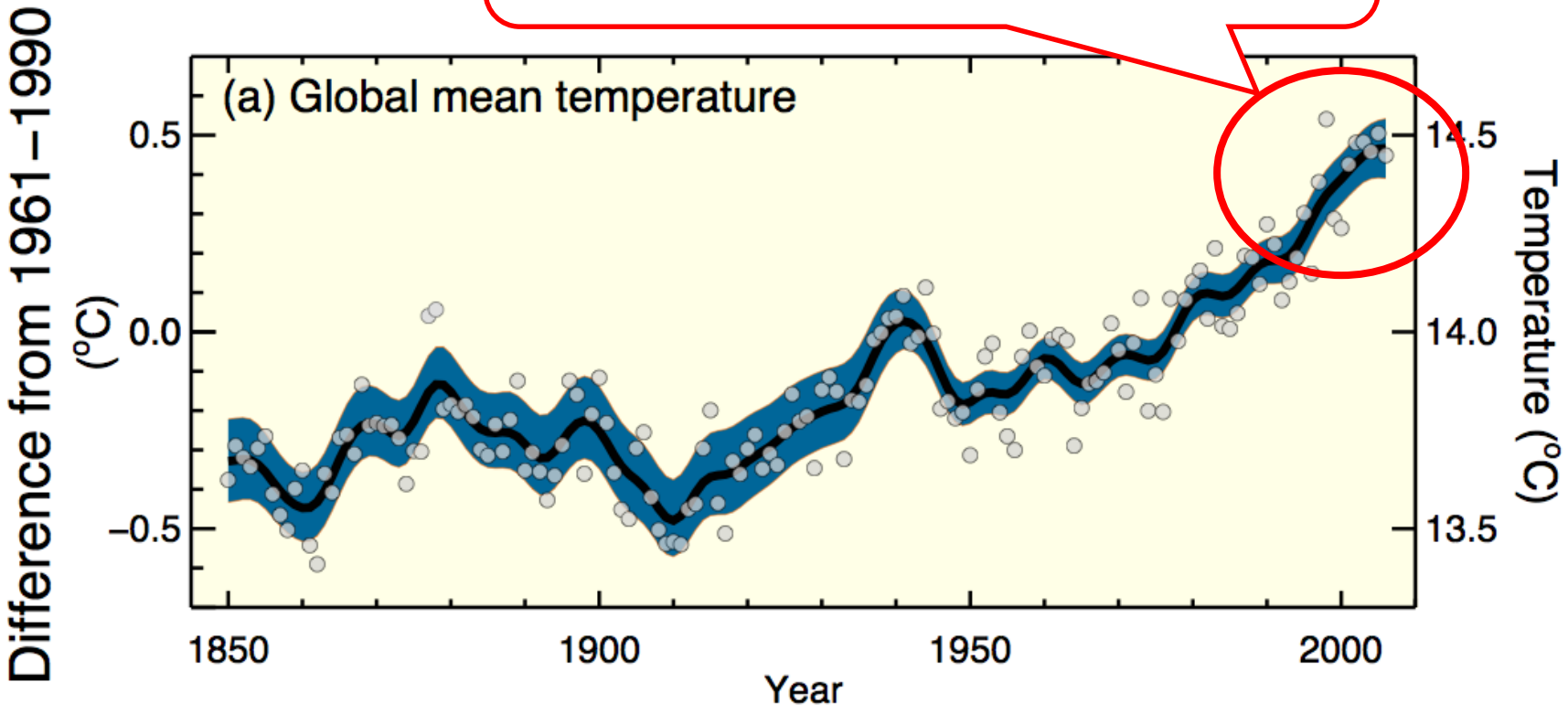
**** Present concentration is 400 ppm***

(Source: climate change 2001, The Scientific Basis, Technical Summary of the Working Group/Report)


Atmospheric CO_2 at Mauna Loa Observatory
Scripps Institution of Oceanography
NOAA Earth System Research Laboratory
PARTS PER MILLION
400
380
360
340
320
1960
1970
1980
1990
2000
2010
YEAR
1750 – 280 ppm
2000 – 368 ppm
2012 – 398 ppm
NOAA
April 2013

Global mean temperatures are rising faster with time

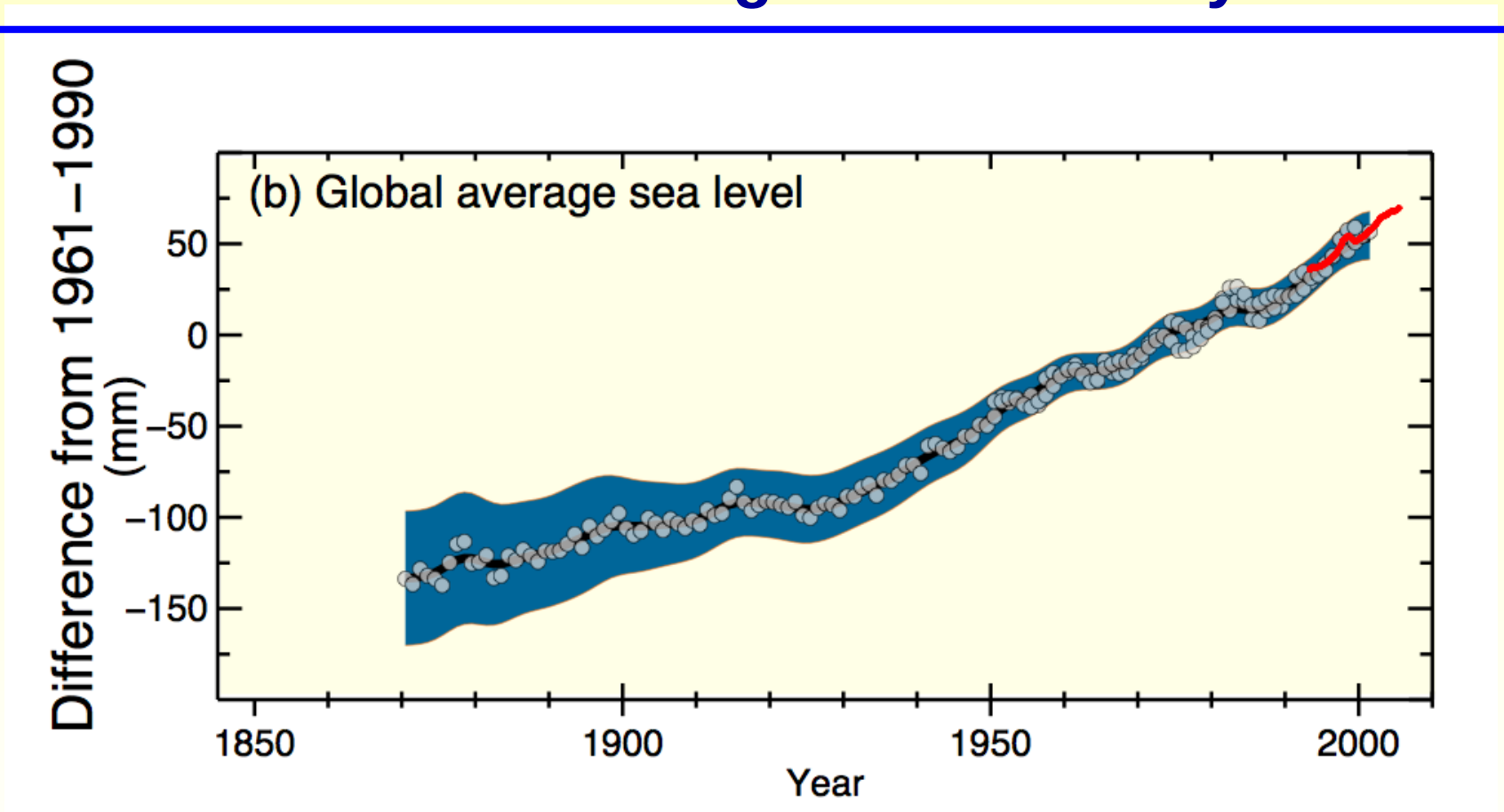
Warmest 12 years:
1998,2005,2003,2002,2004,2006,
2001,1997,1995,1999,1990,2000



SPM-3a

Source: IPCC, 2007

Sea level is rising in 20th century



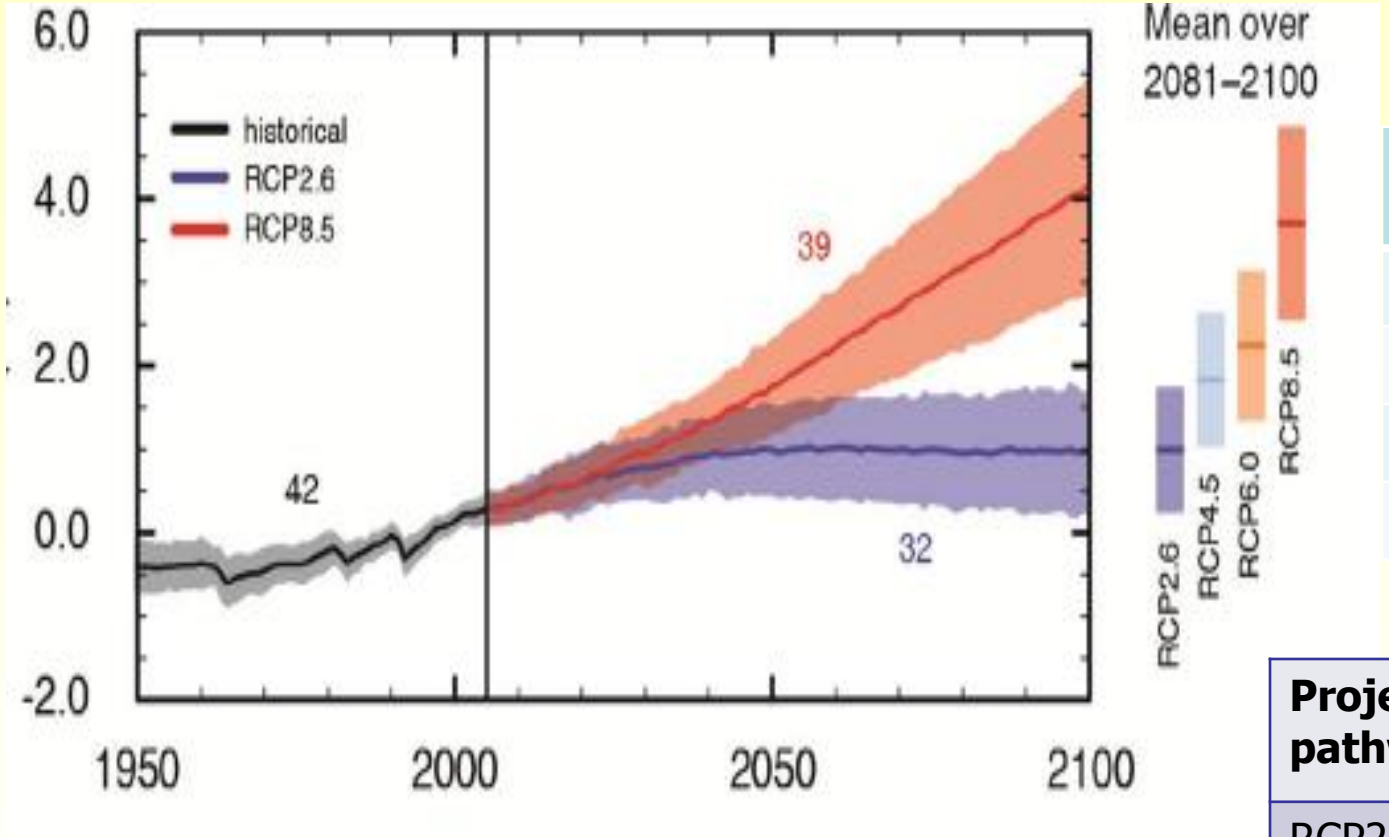
SPM-3b

Rates of sea level rise:

- 1.8 + 0.5 mm yr^{-1}, 1961-2003
- 1.7 + 0.5 mm yr-1, 20th Century
- 3.1 + 0.7 mm yr^{-1}, 1993-2003

Source: IPCC, 2007

Projected global average surface temperature change



RCP	GHG Peaking
2.6	2010-20
4.5	2040
6.0	2080
8.5	2100

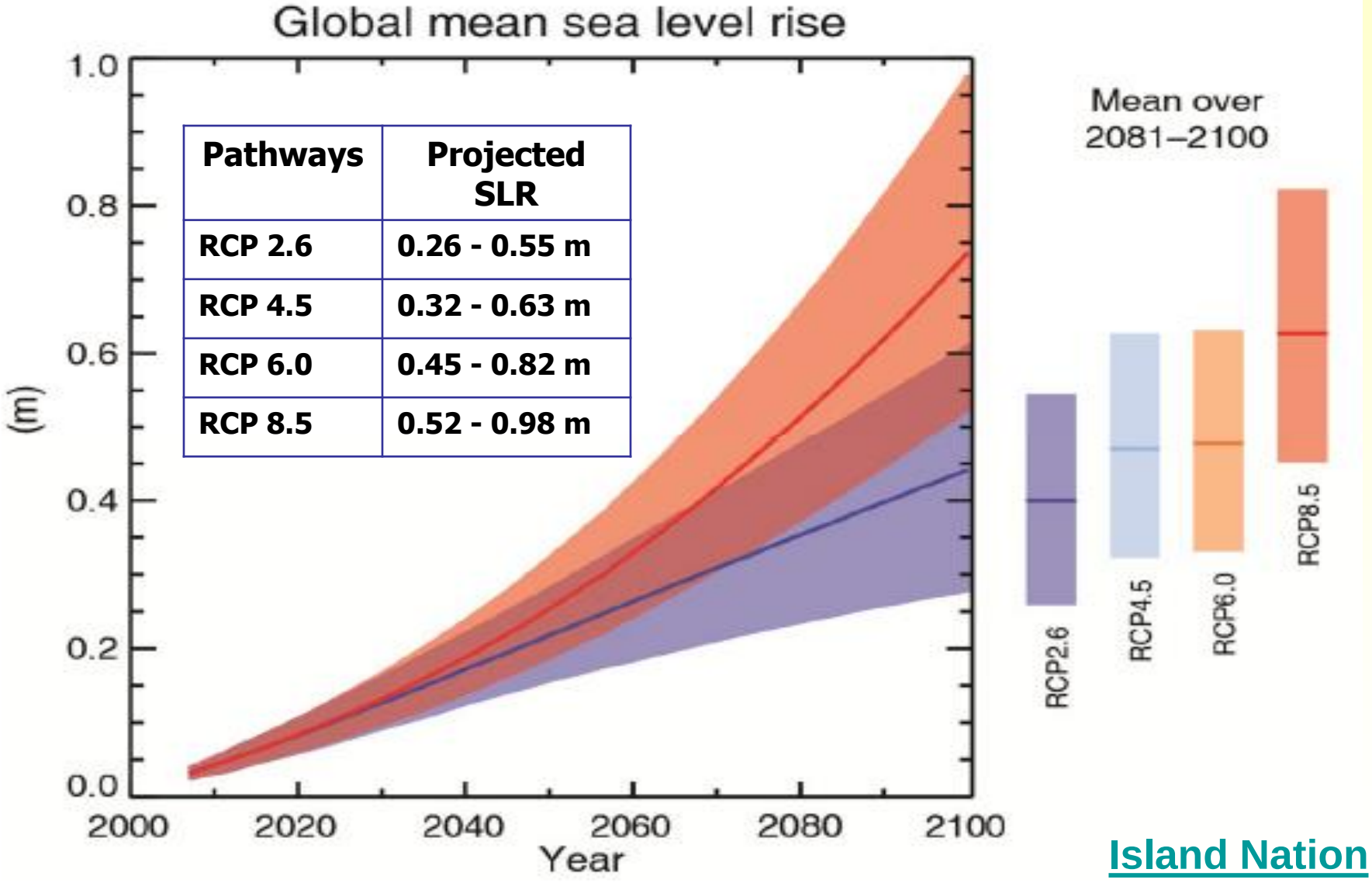
In AR5 of IPCC, a set of four new scenarios has been taken, denoted by Representative Concentration Pathways (RCPs).

Likely temp rise – 1.5 to 4.5 deg C

Reference period – 1986-2005

Projected pathways	CO_2 conc. in 2100
RCP2.6	421 ppm
RCP4.5	538 ppm
RCP6.0	670 ppm
RCP 8.5	936 ppm

Projected mean sea level rise



Pathways	Projected SLR
RCP 2.6	0.26 - 0.55 m
RCP 4.5	0.32 - 0.63 m
RCP 6.0	0.45 - 0.82 m
RCP 8.5	0.52 - 0.98 m

Reference period – 1986 - 2005

[Island Nation - Kiribati]

"Warming of the climate system is unequivocal, and most of the warming of the past 50 years is very likely (>90%) due to increase in greenhouse gases"

(Source: AR4, IPCC, 2007)

It is extremely likely (95-100%) that human activities caused more than half of the observed increase in global average surface temperature from 1951 to 2010.

(Source: AR5, IPCC, 2013)

Short film on IPCC WG-I report of AR5 for policy makers

(Dec, 2013)

Message from the WG-I report – (AR5)

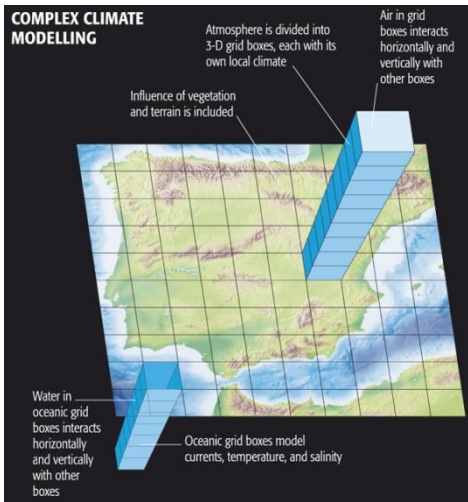
- Relationship between rise in CO_2 and global temperature is established.
- Since 1850, each of 3 preceding decades have been warmer than the earlier ones and 2000-2010 have been the warmest.
- Levels of CO_2 are now 40% higher than the per-industrial era. Most of it is due to human interference.
- Ice sheets, glaciers are losing mass and permafrost is falling. Arctic is melting. Loss of ice mass from Greenland is six times more now than 10 yrs ago.

Message from the WG-I report – (AR5)

- Ocean is warming and sea level is rising.
- More sophisticated climate models have been used for predictions in AR5.
- Key Messages
  - Warming is unequivocal
  - Human influence is clear and responsible for more than 50 % of warming.
  - Limiting Climate Change requires substantial and sustained reduction in GHGs.

Climate Models

- **GCMs (General Circulation Models) are global level modeling tools to simulate the response of climate systems to changing concentrations of GHGs (CO_2). Resolution between 250 to 600 Km.**
- **PRECIS RCM (Providing regional climates for impact studies)**
  - **Resolution**
    - **50 x 50 km**
    - **25 x 25 km**



Global Response to Climate Change

Background to UNFCCC

- First world climate conference – 1979
- Establishment of IPCC – 1988
- IInd climate conference and Ist assessment report of IPCC – 1990
- Adoption of UNFCCC – 1992
- UNFCCC enters into force – 1994
- COP begins – 1995
- Kyoto protocol adopted – 1997
- KP ratified, MOP begins – 2005
- 21st COP meeting in Paris -- 2015

Objectives of UNFCCC
(adopted in 1992)

- To stabilize GHG concentrations at levels that prevent dangerous anthropogenic interference with the climate system.
- Ensure that economic development proceeds in a sustainable manner and food production is not threatened

Annex I - Developed countries
Non-Annex I - Developing countries

Principles of UNFCCC

- Equity (right to share global commons)
- Common but differentiated responsibilities (Annex-I & Non Annex-I parties)
- Precautionary approach
- Development and Climate Change (sustainable economic growth & development are essential ingredients in policy making)

Cumulative GHG emissions

Countries	Cumulative CO_2 emissions * 1850-2008	Cumulative fair share (1850-2008)	CO_2 Debt or Credit	
Annex-I	878	309	568	Debtor
Non-Annex-I	336	902	-565	Creditor

**in billion tons*

Global annual GHG emissions

	1990	2010
Annex-I countries	70%	43%
Non-Annex I countries	30%	57%

Climate Change History

- Historical Emissions since 1880 has resulted in rise in global temperature by 0.85° Celsius

- **Historical carbon space occupied by various countries** in 2009 (1850 as base year):
  - **USA: 29%**
  - **Other Developed countries: 45%**
  - **China: 10%**
  - **Other Emerging Economies: 9%**
  - **India: 3%**

- **India, even though not part of problem, wants to be part of solution.**

Emissions by Countries (2012)

Country	CO_2 Emissions per year (billion tons)	%age Share in Global Annual Emissions	CO_2 Emissions per capita (tons/person)
World	34.5	100%	4.9
China	9.86	28.6%	7.1
United States	5.19	15.1%	16.4
European Union	3.74	10.9%	7.4
India	1.97	5.7%	1.6
Russia	1.77	5.1%	12.4
Japan	1.32	3.8%	10.4

UNFCCC

- Annex I - 42 Developed countries
- Annex II – 24 OECD* members of Annex I, but not EIT parties *(They are required to provide financial resources to enable developing countries for mitigation and adaptation to climate change)*
- Non-Annex I - Developing countries

*Organization for Economic Co-operation and Development

(Economies in transition: Poland, Ukraine, Romania, Latvia, Slovakia etc.)

Kyoto protocol - commitments on emissions

- At the heart of the Protocol lie its legally binding emissions targets for Annex I Parties. These amount to an aggregate reduction shared among all such Parties of at least 5.2 per cent from 1990 levels by 2008-2012.
- All Annex I parties have individual emissions targets, which are listed in the Protocol's **Annex-B** and were decided in Kyoto after intensive negotiation.

(KP is operational since 16.02.2005)

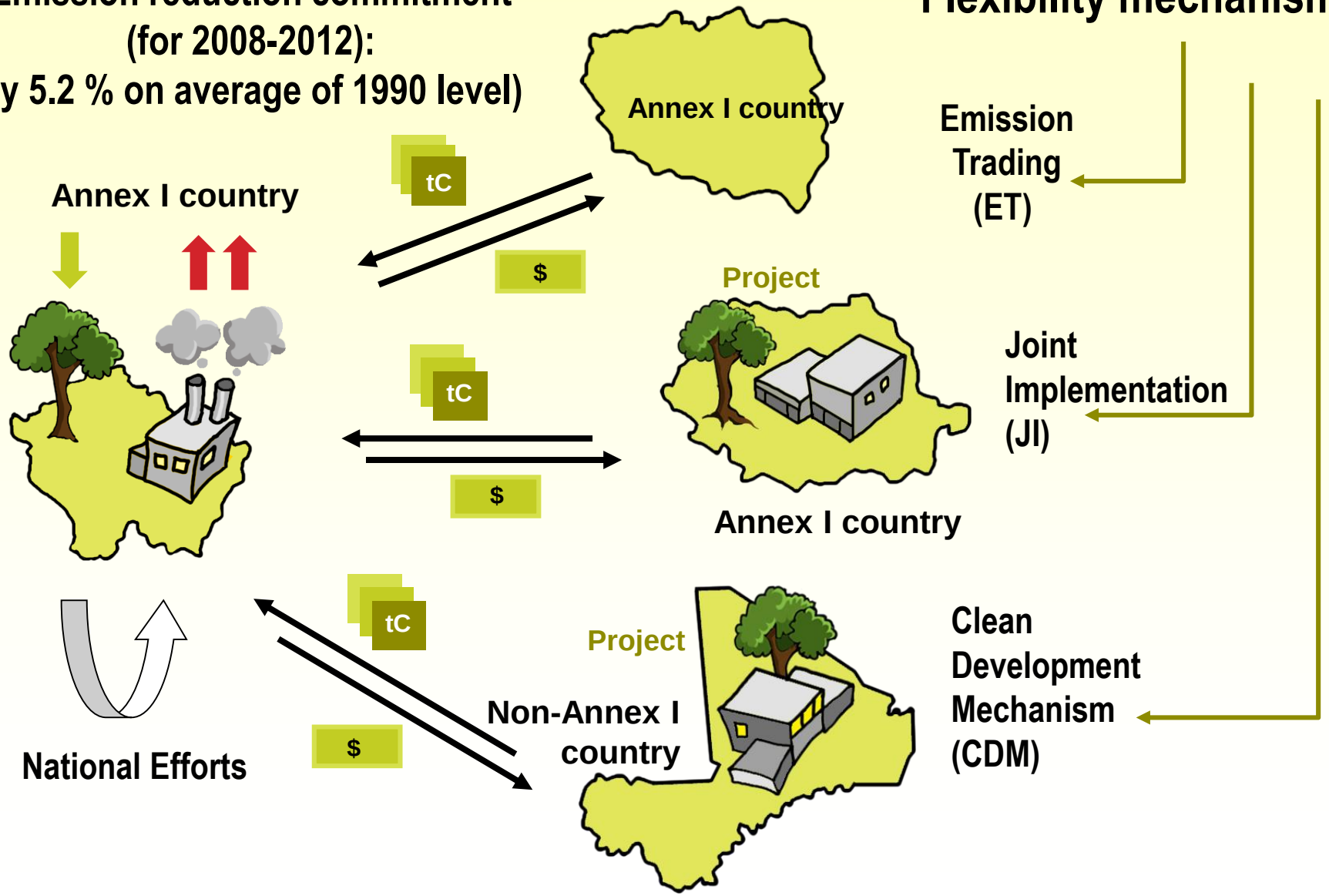
Kyoto protocol commitments on emissions

contd....

- All six green house gases are put together in the same basket for accounting purposes, weighted by their respective global warming potentials (GWP).
    - Carbon dioxide (CO_2) (50%)
    - Methane (CH_4) (18%)
    - Nitrous oxide (N_2O) (6%)
    - Hydroflurocarbons (HFCs)
    - Perfluorocarbons (PFCs)
    - Sulpur hexafluoride (SF_6)
    - Nitrogen trifluoride (NF_3)* *(Added in 2011)*
- A GWP is a measure, defined by the IPCC, of the relative effect of a substance in warming the atmosphere over a given period *(100 yr in the case of the Kyoto Protocol),* compared with a value of one for carbon dioxide. Methane's GWP is 25.

The Kyoto Protocol at a Glance

Emission reduction commitment (for 2008-2012): by 5.2 % on average of 1990 level)



Flexibility mechanisms

- Emission Trading (ET)
- Joint Implementation (JI)
- Clean Development Mechanism (CDM)

Clean Development Mechanism (CDM)

CDM is designed to :

(a) Help developing (non-Annex I) countries in achieving sustainable development and

(b) Assist developed countries (Annex I) to meet emission reduction targets.

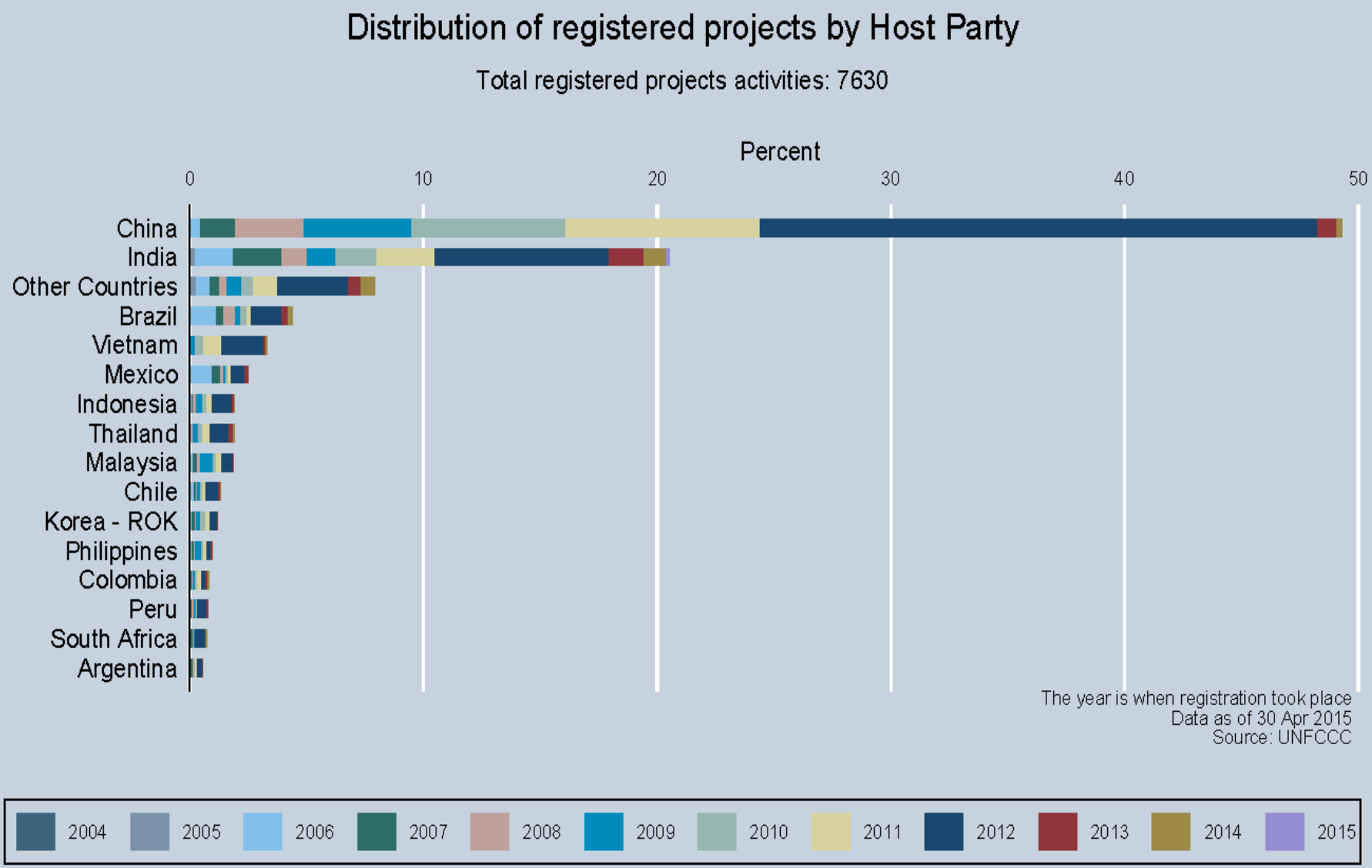
The aim is that the entities from developed countries would invest in 'clean' projects in developing countries and emissions reduced or removals increased through such investment would be credited to them.

Clean Development Mechanism *(CDM)*

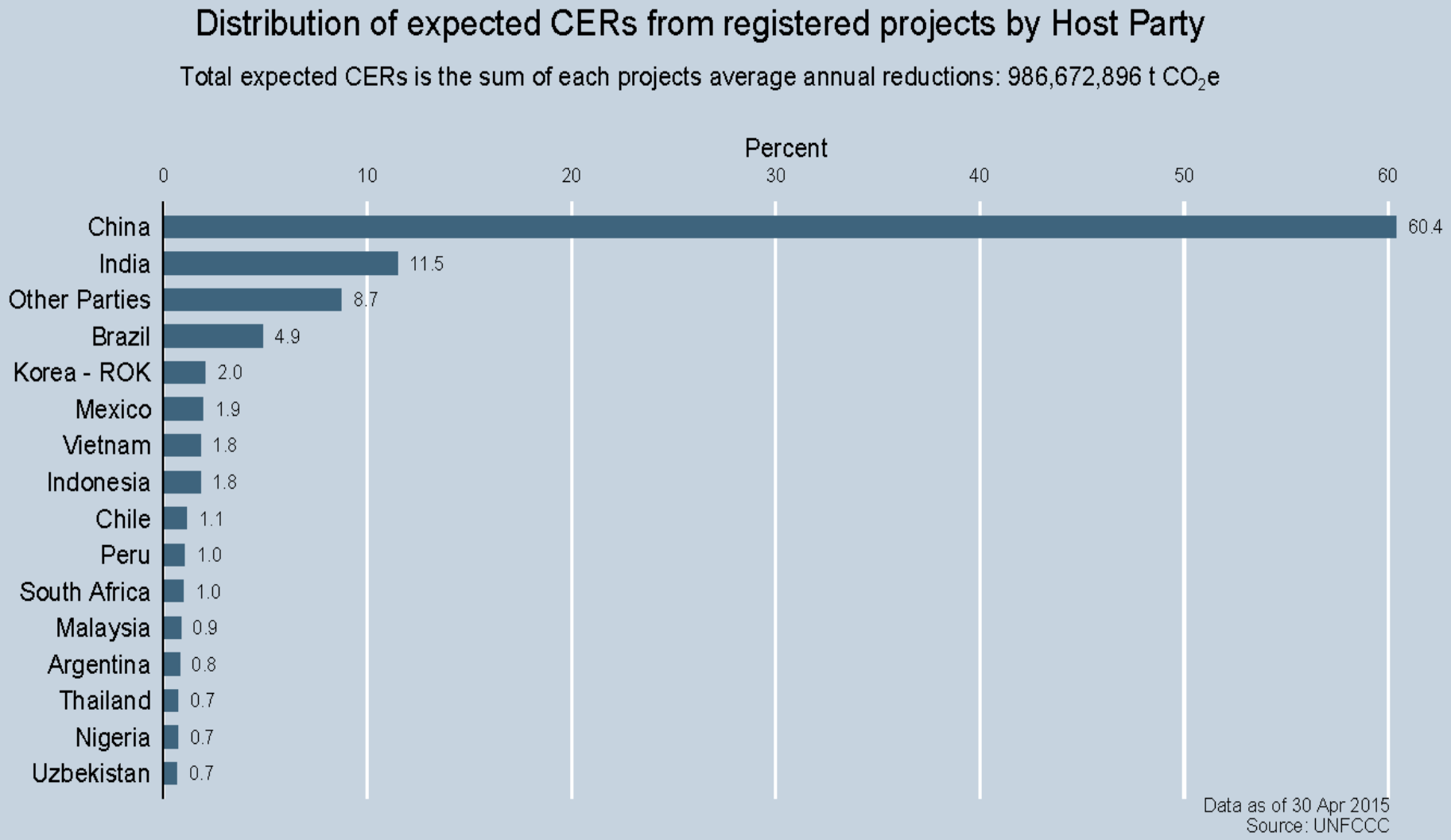
The CDM is expected to generate investment in developing countries, especially from the private sector to

- Contribute towards achievement of UNFCCC objectives.
- Enhance the transfer of environmentally friendly (cleaner) technologies.
- Promote sustainable development in general.

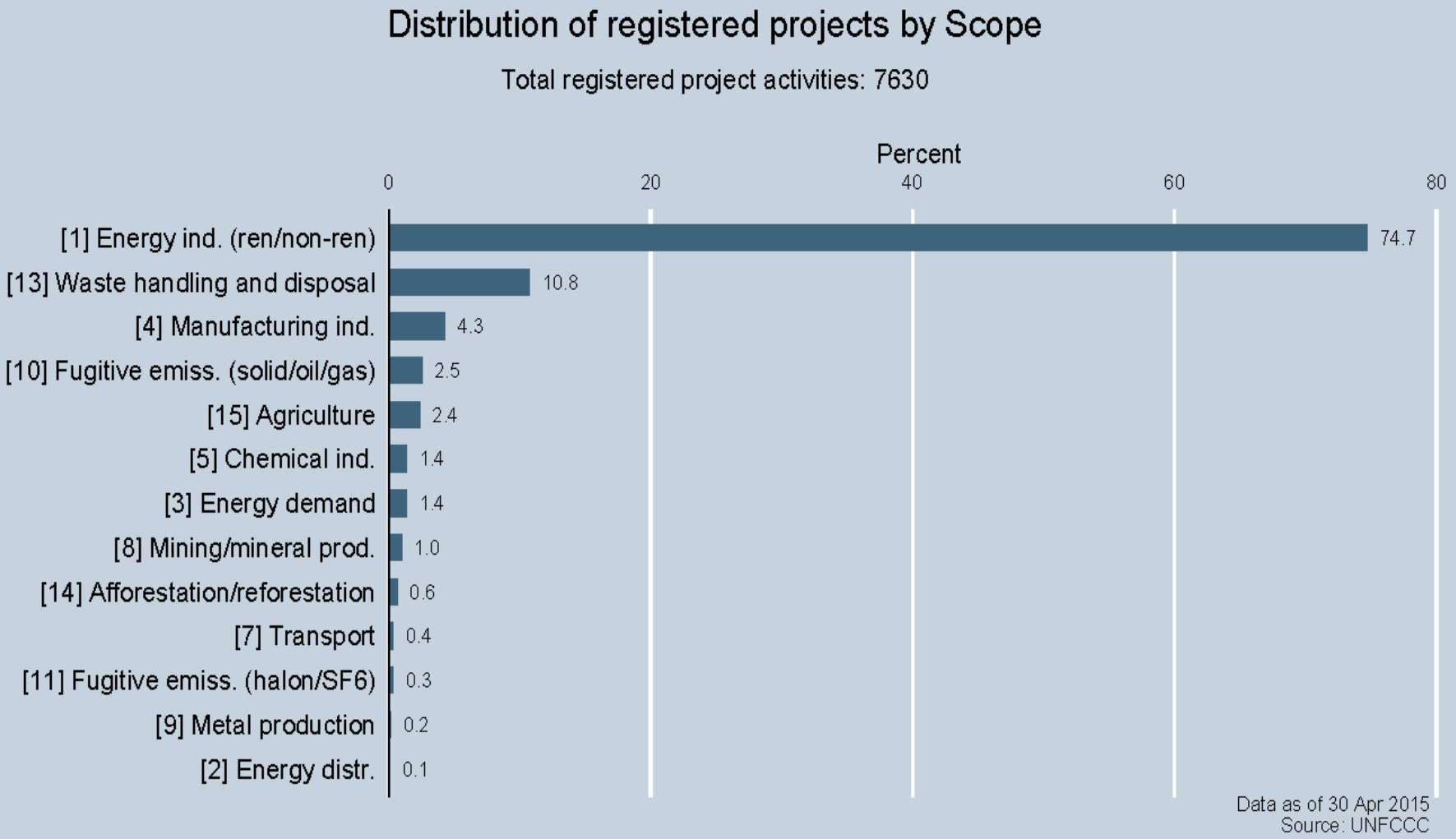
Registered projects by host party



Expected CERs from the registered projects



Distribution of projects by sector scopes



Note that a project activity can be linked to more than one sectoral scope.

Major outcome of Durban, 2011 (COP–17)

- Countries agreed to work towards "a protocol, legal instrument or agreed outcome with legal force" which is to be adopted no later than 2015 but won't come into force until after 2020. *(Durban Platform).*
- Kyoto Protocol extended for another term.
- Commitments ??? The decision says that GHGs of KP parties need to be reduced by 25-40% below 1990 levels by 2020. However, country wise quantified targets vary between 15 – 20%.

Major outcome of Doha, 2012 (COP-18)

- KP-2 period is 2013 to 2020
- Canada, Japan, Russia are out of KP-2
- EU, Australia, Norway & Switzerland & few others agreed *(Account for lesser GHG emissions)*
- All countries to make a legally binding contribution towards combating climate change post 2020.
- Principle of Climate Damage/Loss accepted. To mobilize $100 billion a year by 2020 for poor nations to adapt to Climate Change.

Major outcome of Warsaw, 2013 (COP-19)

- Warsaw Framework for REDD-plus
  - Result based finance for REDD-plus
  - National Forest Monitoring System
  - Safeguards (Environment & Social)
  - Forest Reference Emission Levels
  - Measuring, Reporting & Verification of C-stocks
  - Drivers of Deforestation & Forest Degradation
- Expansion of UN REDD platform
- WB announced US$ 280m initiative under BioCarbon fund

Major outcome of Lima, 2014 (COP-20)

- Lima call for Climate Action, that lays the foundation of new global climate deal
- Parties agreed to submit INDCs (Intended Nationally Determined Contributions) by March 2015
- Contribution under Green Climate Fund crossed $10bn mark

Expectations from Paris, 2015 (COP-21)

- Voluntary pledges based on domestic policies & measures – Bottom-up approach
- Intended Nationally Determined Contributions (INDCs) – 170 countries amounting to 95% emissions have submitted so far…
- Likely rise of temp: 2.7-3.5 degrees by 2100
- Whether the role of forest sector including REDD-plus is recognized for mitigation of Climate Change?
- Financing Redd-plus & Adaptation?
- Whether the deal will be legally binding?
- Role of developing countries!

Discussion. . .