

# Emission Pathways toward the 2 Degree Target

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Structuring a New Climate Regime toward the Two Degree Target

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## From Cancun Agreement

- Further recognizes that deep cuts in global greenhouse gas emissions are required according to science, and as documented in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, with **a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below 2 ° C above pre-industrial levels**, and that Parties should take urgent action to meet this long-term goal, consistent with science and on the basis of equity; Also recognizes the need to consider, in the context of the first review, as referred to in paragraph 138 below, strengthening the long-term global goal on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5 ° C;



## Findings in IPCC AR4

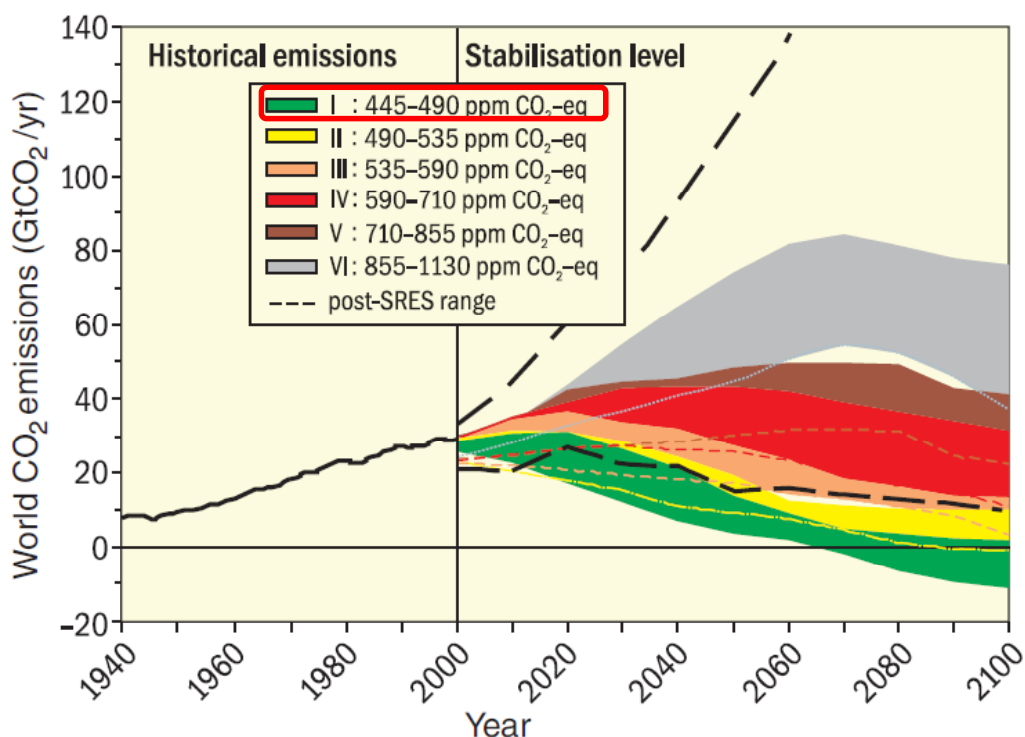
| Class | Anthropogenic addition to radiative forcing at stabilization ( $\text{W/m}^2$ ) | Multi-gas concentration level (ppmv $\text{CO}_2\text{-eq}$ ) | Stabilization level for $\text{CO}_2$ only, consistent with multi-gas level (ppmv $\text{CO}_2$ ) | Number of scenario studies | Global mean temperature C increase above pre-industrial at equilibrium, using best estimate of climate sensitivity | Likely range of global mean temperature C increase above pre-industrial at equilibrium | Peaking year for $\text{CO}_2$ emissions | Change in global emissions in 2050 (% of 2000 emissions) | RCP    |
|-------|---|---|---|----------------------------|--|--|--|--|--------|
| I     | 2.5-3.0   | 445-490   | 350-400   | 6                          | 2.0-2.4  | 1.4-3.6  | 2000-2015                                | -85 to -50   | RCP2.6 |
| II    | 3.0-3.5   | 490-535   | 400-440   | 18                         | 2.4-2.8  | 1.6-4.2  | 2000-2020                                | -60 to -30   |        |
| III   | 3.5-4.0   | 535-590   | 440-485   | 21                         | 2.8-3.2  | 1.9-4.9  | 2010-2030                                | -30 to +5  |        |
| IV    | 4.0-5.0   | 590-710   | 485-570   | 118                        | 3.2-4.0  | 2.2-6.1  | 2020-2060                                | +10 to +60   | RCP4.5 |
| V     | 5.0-6.0   | 710-855   | 570-660   | 9                          | 4.0-4.9  | 2.7-7.3  | 2050-2080                                | +25 to +85   | RCP6   |
| VI    | 6.0-7.5   | 855-1130  | 660-790   | 5                          | 4.9-6.1  | 3.2-8.5  | 2060-2090                                | +90 to +140  |        |

Source: Metz et al.(2007)



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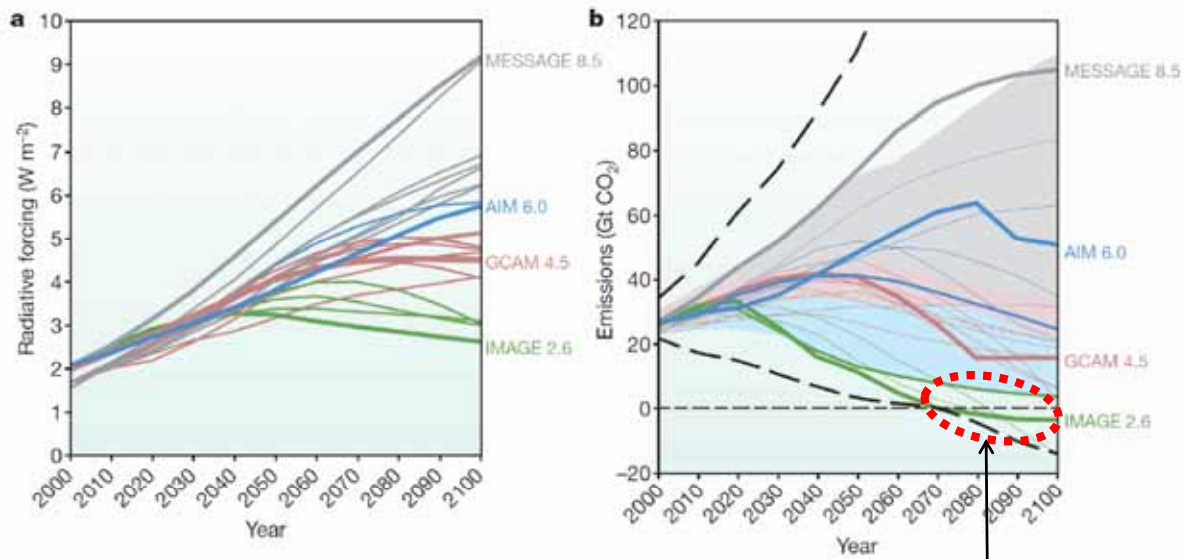
## CO2 Emission pathways in IPCC AR4



Source: Synthesis Report of Climate Change 2007:

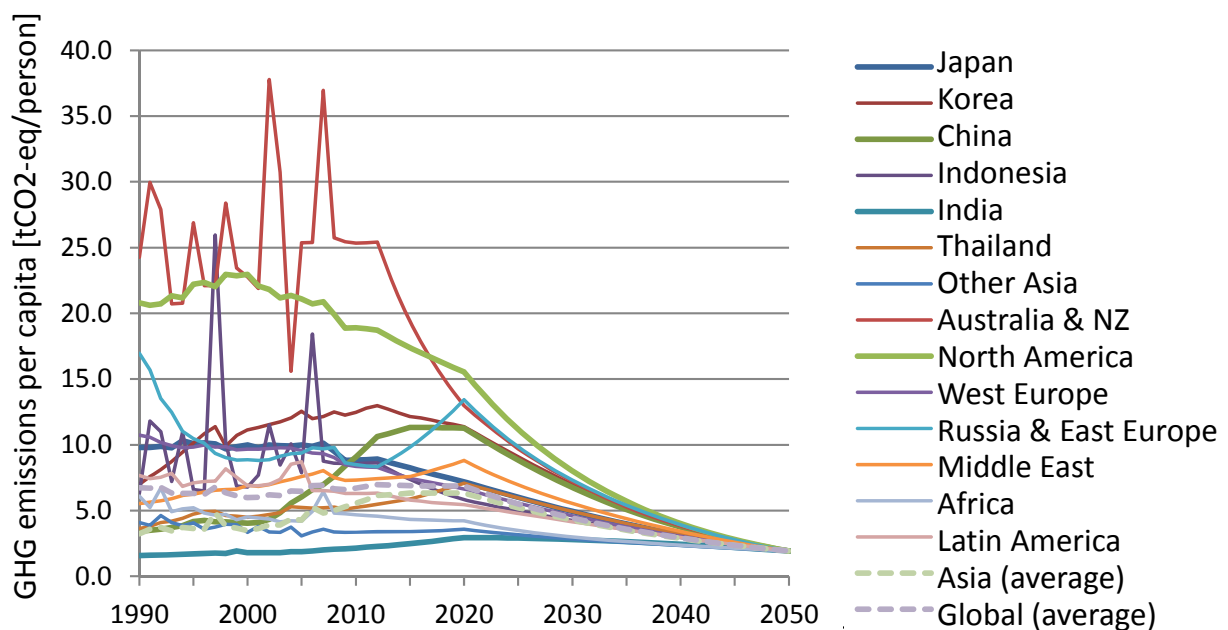
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## Emission Pathways in RCPs (Representative Concentration Pathways)



Negative emissions will be needed.

If per capita emissions in 2050 are equal among the all countries to achieve the 2 degree target...



In 2050, the GHG emission per capita will be about 2  $\text{tCO}_2\text{-eq}$ .

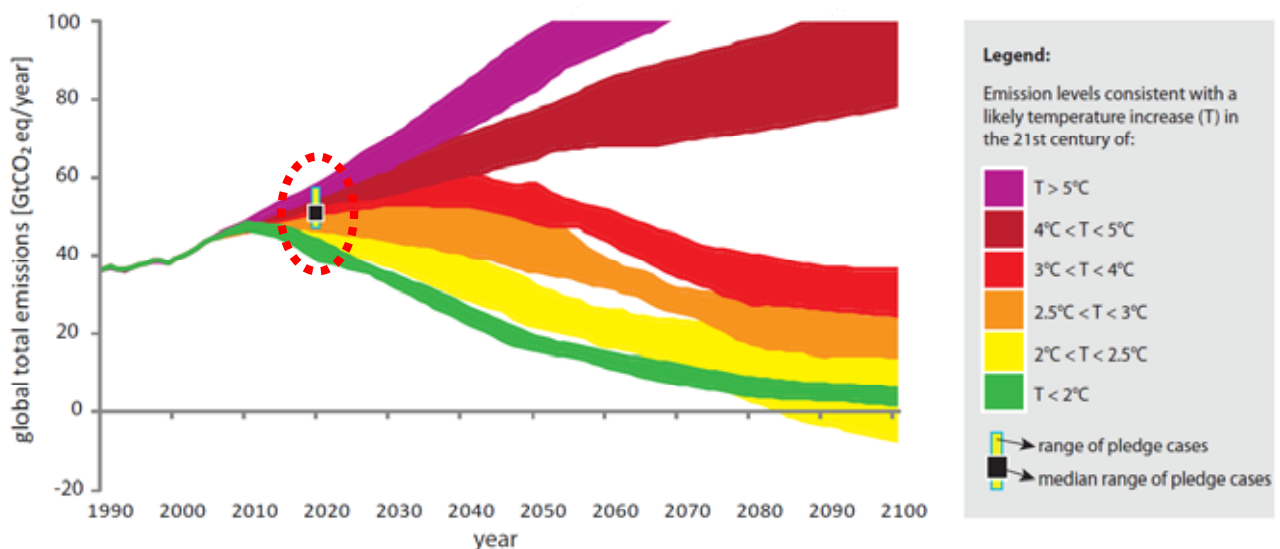
## Long term target and short term target

Long term target toward 2 degree:

- In 2050, the global GHG emissions will be half compared to the 1990 level.
- At the end of 21<sup>st</sup> century, CO<sub>2</sub> emissions will have to be negative.

On the other hand, the short term mitigation targets in 2020 as Copenhagen Accord Pledges are enough to two degree target?

## Will mitigation target in 2020 be sufficient to 2 degree target?



UNEP(2012) The emission GAP report

Depending on future emission pathways,  
the present pledge level is not enough to two degree target.

## How to bridge the gap?

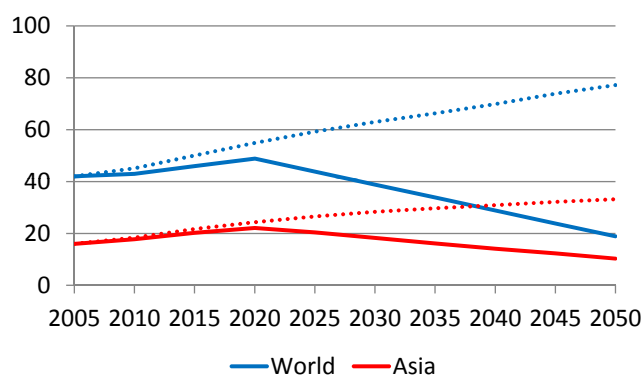
- Change in development pathway
  - Leap frog development from high GHG society (conventional development pathway) to low GHG society (new development pathway).
  - Green growth, Green development, ...
  - Ambitious mitigation target and various support to achieve it.
  - What is welfare without environmental load?
- Technology innovation
  - Renewable energy
  - Enduse technology
  - CCS
- Management of SLCP (Short Lived Climate Forcing) emissions
  - CCAC: Climate and Clean Air Coalition

## Activities in Asia toward 2 degree target

- At the session “Comparison of reduction potential of Asian countries towards achieving two degree target (13:15-15:45, Wednesday, Room 301/PL-12)”, Asian researchers will introduce their activities toward 2 degree target.
  - China: Jiang Kejun, Energy Research Institute, China, and Hancheng Dai, National Institute for Environmental Studies, Japan
  - India: P. R. Shukla, Indian Institute of Management, India
  - Thailand: Bundit Limmeechokchai, Sirindhorn International Institute of Technology, Thammasat University, Thailand
  - Malaysia: Ho Chin Siong, Universiti Teknologi Malaysia, Malaysia
  - Cambodia: Hak Mao, Kyoto University, Japan, and Ministry of Environment, Cambodia
  - Vietnam: Nguyen Tung Lam, Institute of Strategy and Policy on Natural Resources and Environment, Vietnam
  - Nepal: Ram Manohar Shrestha, Asian Institute of Technology, Thailand
  - Indonesia: Retno Gumilang Dewi, Institut Teknologi Bandung, Indonesia



2 degree target is quite tough target, but it is achievable.



Tentative results

GHG emissions in Advanced Society Scenario  
(unit: GtCO<sub>2</sub>-eq)

The Global CGE (Computable General Equilibrium) model results.

In Asia, the total GHG emissions in 2050 will have to be lower than the present level, although the GDP will be 5 times between 2005 and 2050.

All countermeasures will have to be introduced to achieve the 2 degree target.

See <http://2050.nies.go.jp/index.html>