Low Carbon Asia Society Research Network
5th Annual Meeting

Toward realizing 2°C/1.5°C target: Why deep decarbonization is requied and what kinds of pathways can achieve it?

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25-26 October 2016

Bandon, Indonesia

How much efforts do we need to stay below 2ºC/1.5ºC?

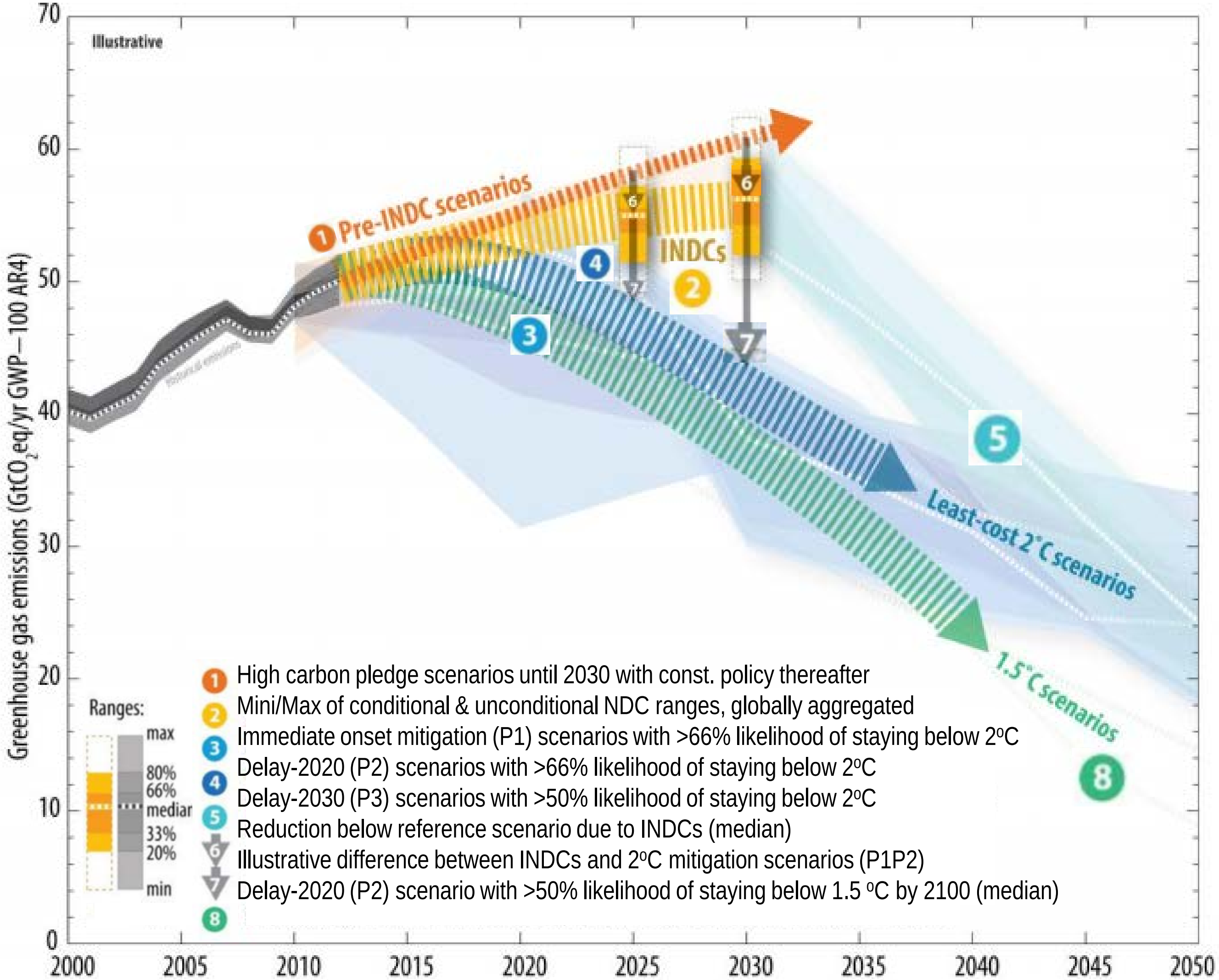
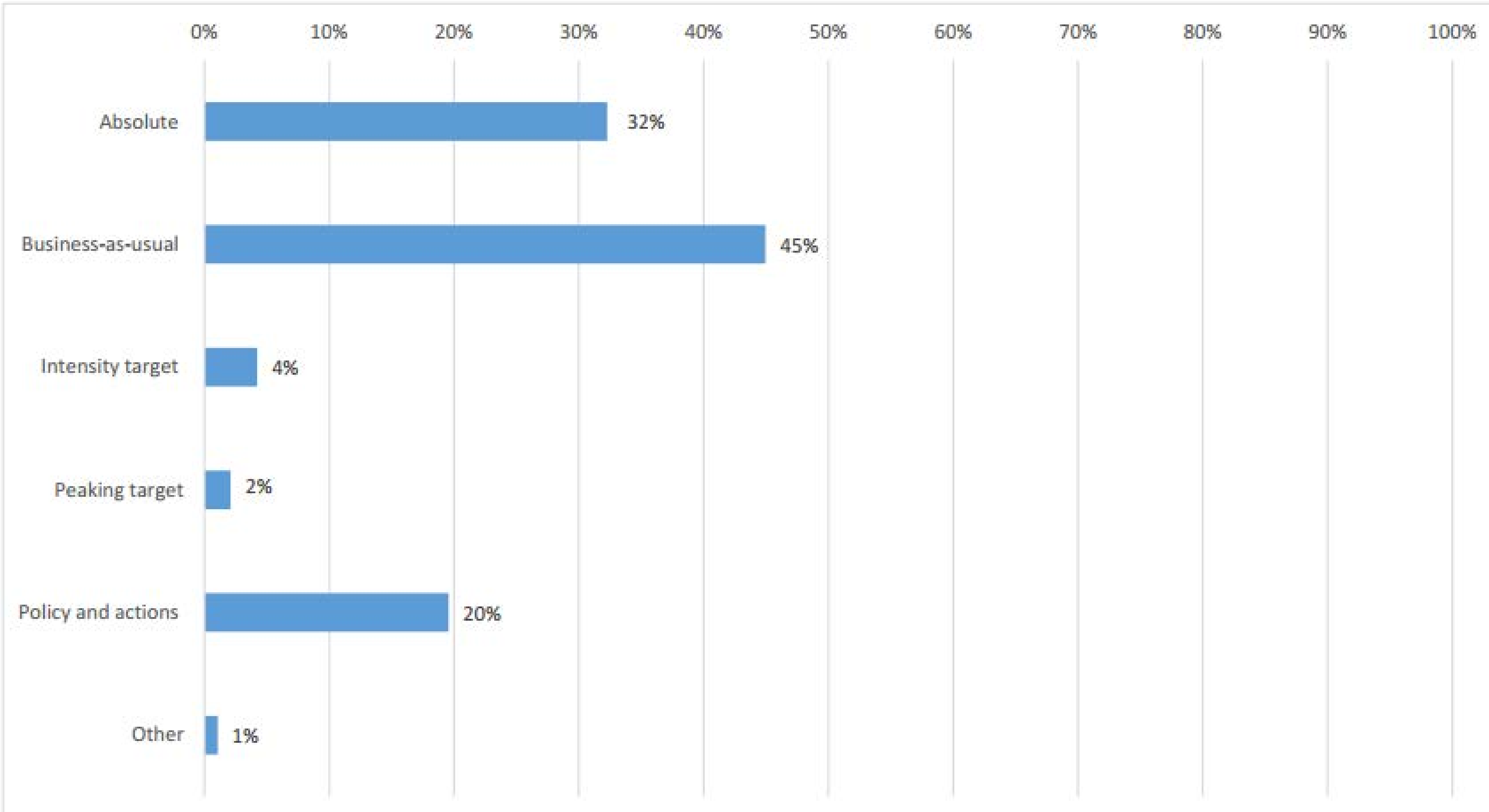


Figure 2 Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions and under other scenarios

Source: UNFCCC/CP/2016/2

Types of mitigation target communicated in the intended nationally determined contribution



Note: The percentages shown are percentages of the Parties that submitted an INDC by 4 April 2016.

Source: UNFCCC/CP/2016/2

Why it is so important to curve GHG emissions?

Temperature increase after GHG emissions will go down. Ocean thermal expansion continues even after GHG emissions will go almost zero.

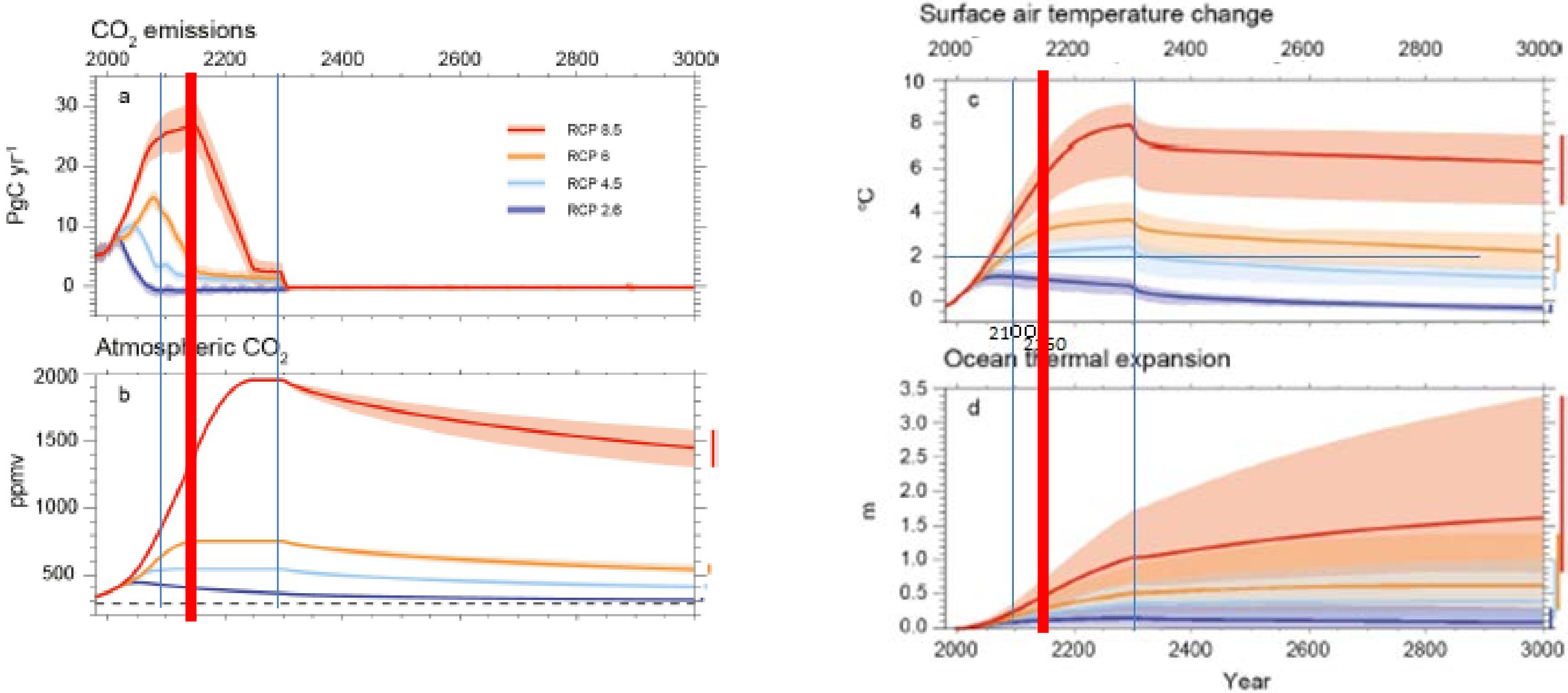
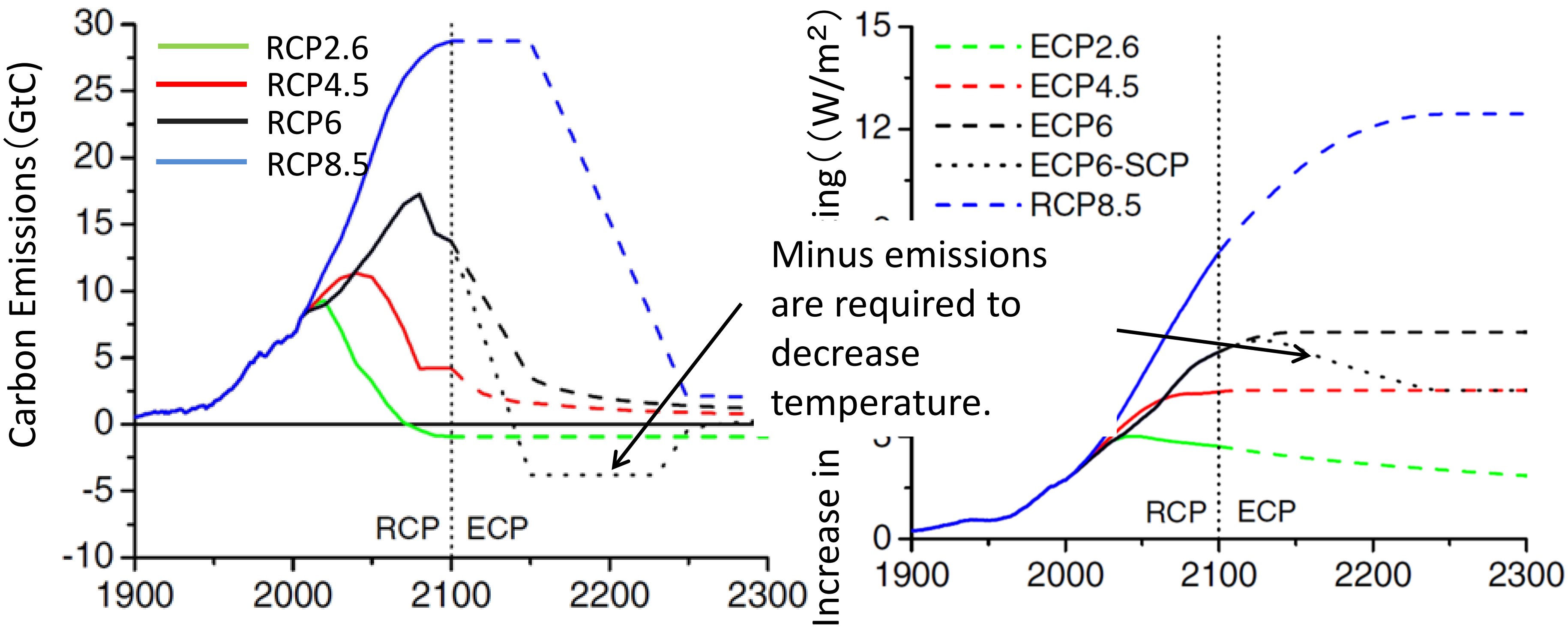


Figure 12.44: a) Compatible anthropogenic CO_2 emissions up to 2300, followed by zero emissions after 2300, b) prescribed atmospheric CO_2 concentration up to 2300 followed by projected CO_2 concentration after 2300, c) global mean surface temperature change and d) ocean thermal expansion as simulated by EMICs for the four concentration driven RCPs with all forcings included (Zickfeld et al., 2013). A 10-year smoothing was applied. The drop in temperature in 2300 is a result of eliminating all non-CO_2 forcings along with CO_2 emissions. Shadings and bars denote the minimum to maximum range. The dashed line on panel (b) indicates the pre-industrial CO_2 concentration.

Source : IPCC AR5 WG3 Fig 12.44

The more GHG emissions will be emitted, the more difficult it will be to lower the temperature.

Will ecosystems be back when the temperature will be the original climate condition?



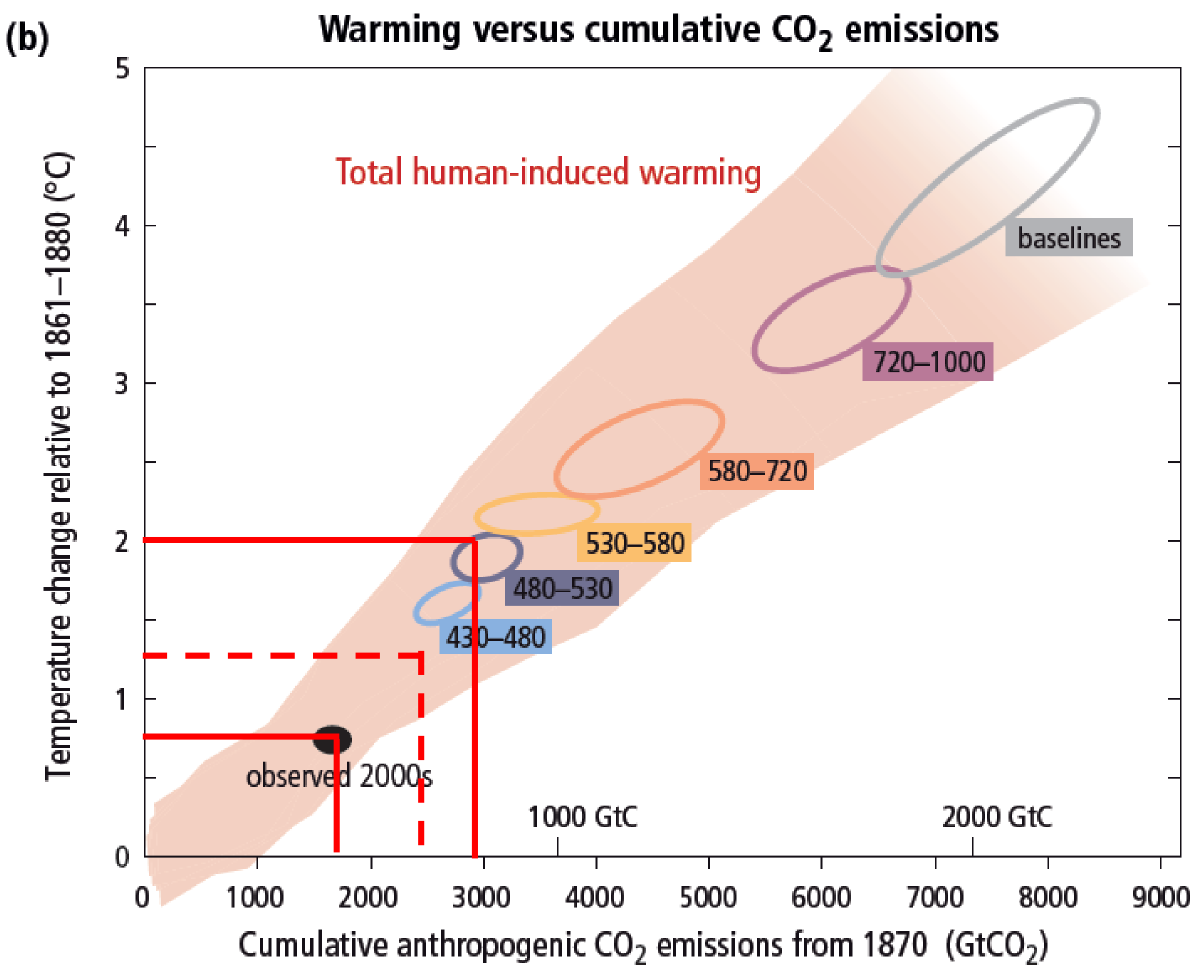
CO_2 emissions pathways in four Representative Concentration Pathways (RCPs) used for IPCC 5th Assessment Report (left) and corresponding increase in radiative forcing (right).

AIM ASIA-PACIFIC INTEGRATED MODEL

（Source: Detlef P. van Vuuren et al., 2011)

How much is carbon budget left?

Warming versus cumulative CO2 emissions



Multi-model results show that limiting total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66% would require cumulative CO_2 emissions from all anthropogenic sources since 1870 to remain below about 2900 $GtCO_2$ (with a range of 2550 to 3150 $GtCO_2$ depending on non-CO_2 drivers). About 1900 $GtCO_2$ had already been emitted by 2011.

The rest = (2900 − 1900) $GtCO_2$
= 1000 $GtCO_2$

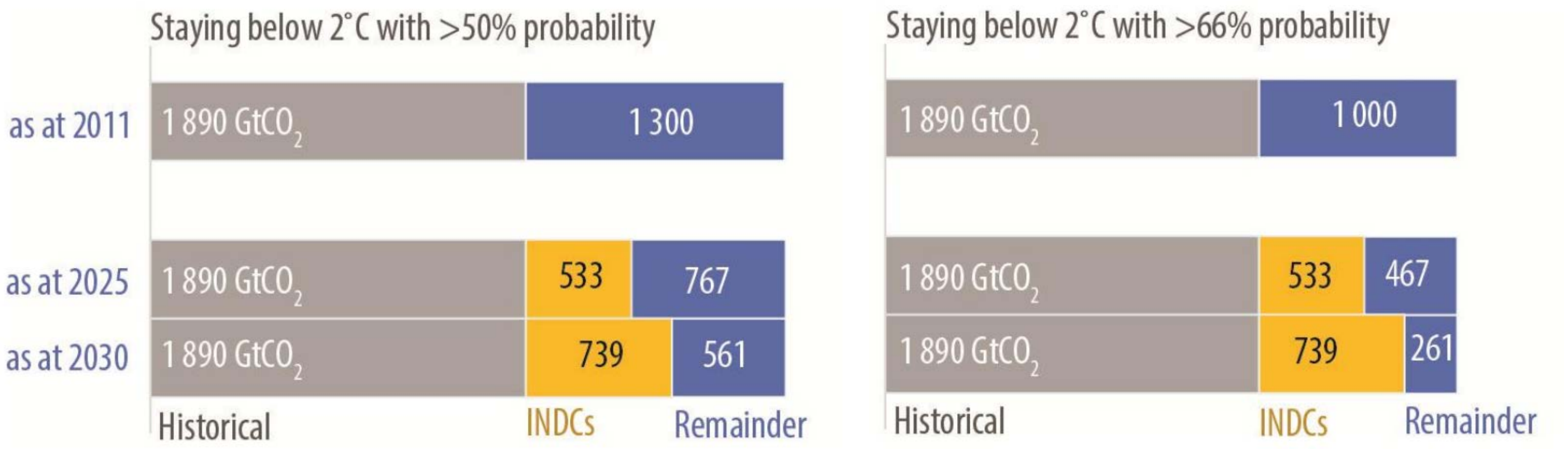
Source: IPCC AR5 Synthesis Report Figure SPM.5

CO2排出量　32.6　GtCO2 in 2012　（EDMC）

GHG emission in 2010 = 49 $GtCO_2$ （IPCC AR5）

CO_2 Emissions Budget for Staying Below 2°C

Comparison of cumulative CO2 emissions under different scenarios

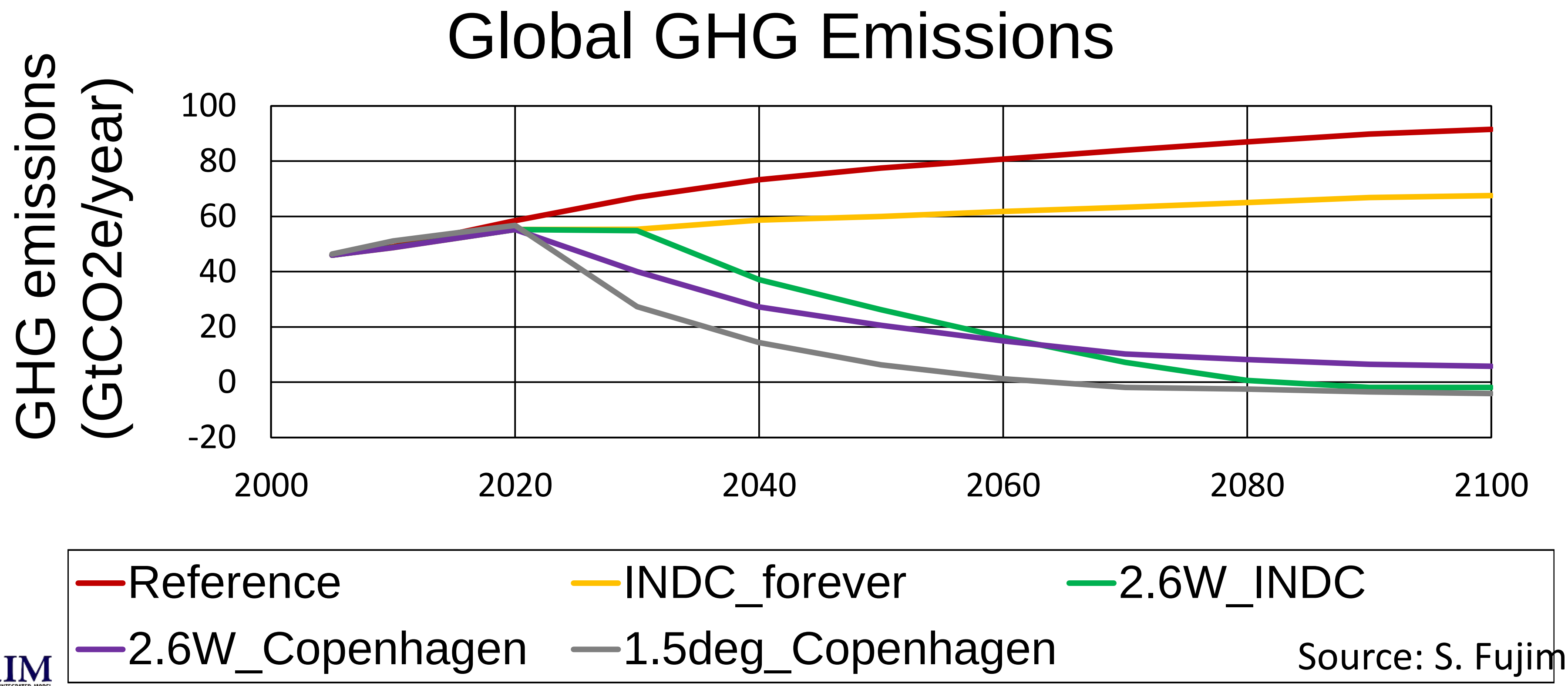


Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.
Abbreviation: INDCs = intended nationally determined contributions

Source: UNFCCC/CP/2016/2

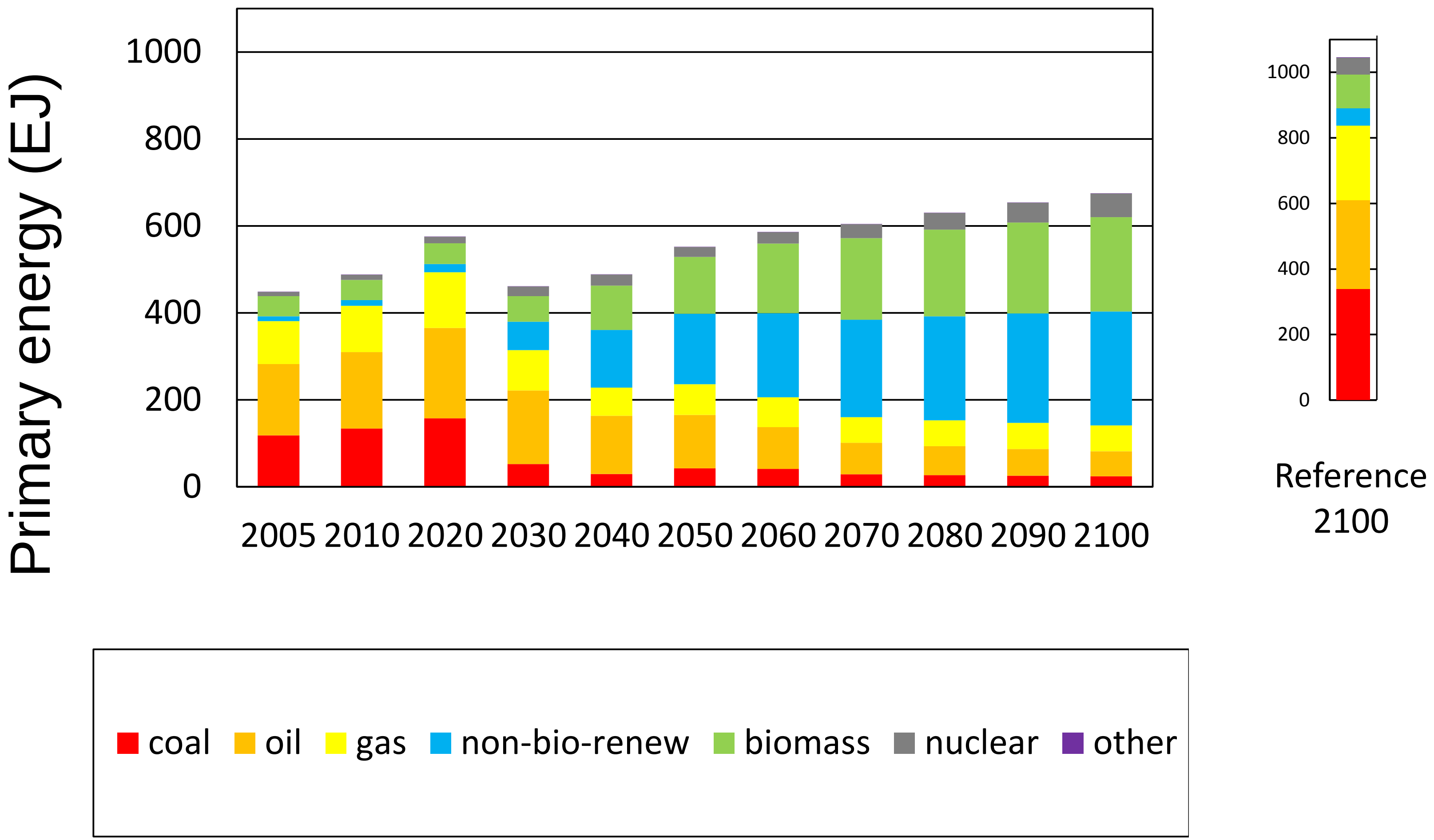
Is there a feasible path to limit the average temperature increase to 1.5 ºC. Challenges?

- Lower the GHG emissions earlier in order to keep low the total cumulative GHG emissions. We cannot expect much of minus emissions.
- Move the world towards increased share of renewables.
- The world needs to recognize how important it is to start reduction earlier.



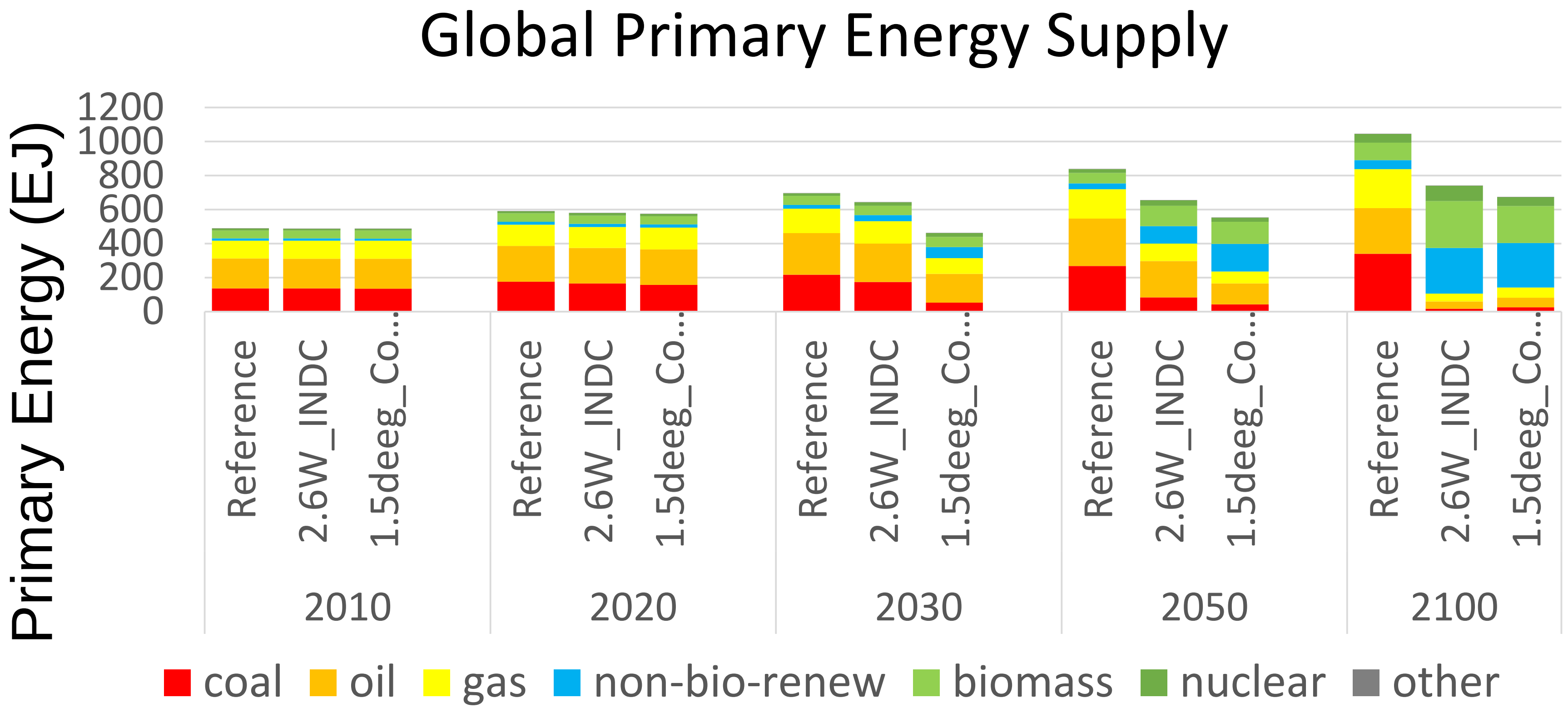
Source: S. Fujimori

Global primary energy supply (1.5 deg_Copenhagen)



Increasing the capacity of renewables is a key in achieving 1.5 ºC target.

- As the availability of renewables in 2030 is limited, the amount of primary energy in 2030 in 1.5deg_Copenhagen scenario becomes much lower than in 2030 in 2.6W_INDC and other scenarios because of CO_2 constraint.
- The amount of primary energy consumption in 2100 in 1.5 degree scenario is 65% of that in the reference. This is due to energy efficiency improvement.



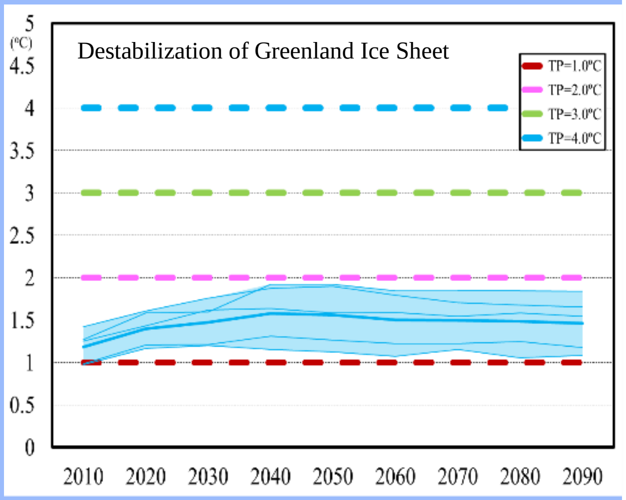
Source: S. Fujimori

AIM ASIA-PACIFIC INTEGRATED MODEL

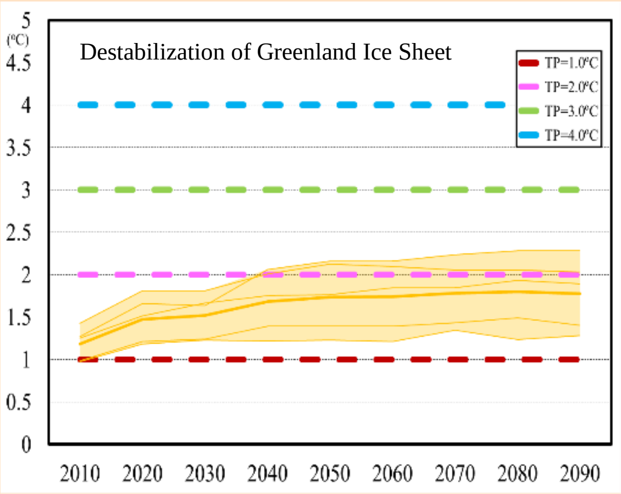
The tipping point temperature of Greenland Ice Sheet

- According to IPCC AR5, the tipping point for destabilization of the Greenland ice sheet can be crossed at a global temperature rise of between 1℃ and 4 ℃ from pre-industrial levels.
- Under T15S30, it would probably not be reached in this century if the tipping point temperature is 2 ^{o}C.
- The tipping point of 2 ^{o}C would be passed during the 2040s with T20S30 (depending on the climate model).

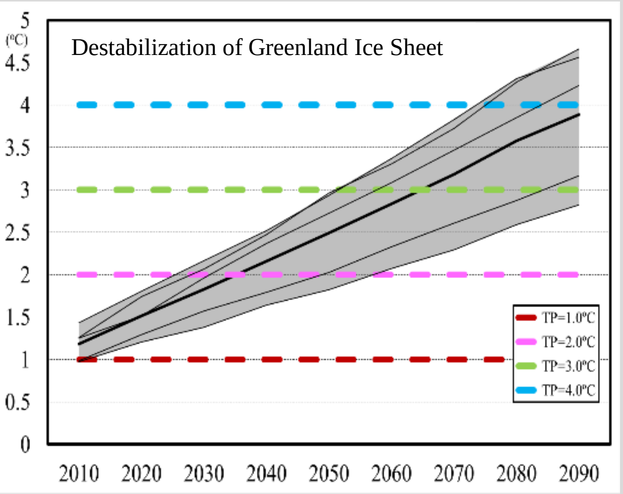
T15S30 (SSP2)



T20S30 (SSP2)



Reference (SSP2)



Data from ICA-RUS project

Core innovative entry points to the 1.5C question in Deep Decarbonization Pathways Project (DDPP)

Our comparative advantage: derive insights that cannot be delivered from IAMs.

- ❑ What are the key actions to be taken in the next 15 years, in order to keep the window of opportunity open?
- ❑ What are the domestic socio-economic implications in the light of sustainable development?
- ❑ What are the key priorities for international cooperation to support the domestic transition?

Source: M. Colombier, DDPP, IDDRI

Mitigation Risks of 1.5 ^{0}C versus 2^{0}C?
The Pending Agenda of decarbonization

- **How much higher are mitigation costs?**
- **Impacts on sustainable development including poverty eradication**
- **Technology needs, including negative emissions, and risks not to meet them**
- **Impacts on food security, e.g. by BECCS**
- **Impacts on biodiversity, e.g. by BECCS**
- **Impacts on carbon cycle by more ambitious mitigation (e.g. forests)**
- **Overshoot risks (temperature, atmos. GHG conc.), irreversibility**

Source: Shukla, 2016

Which scenarios?

- **Analysis is conducted using three core scenarios:**
  - *Current Policies Scenario:*

    What is the impact of policies enacted as of mid-2016?
  - *New Policies Scenario:*

    What is the impact of newly announced policies, including the NDCs from COP21?
  - *450 Scenario:*

    What is required from the energy sector to limit temperature increase to 2 C with a 50% probability?
  - *Well Below 2 Degrees Scenario*

    What is required from the energy sector to limit temperature increase to 2 C with a 66% probability?

Examples of topics in the next phase of DDPP (Deep Decarbonization Pathways Project)

1. Deep and fast diffusion of innovative technological options in the more difficult sectors
   a. Transport, including electric vehicles
   b. Energy-intensive heavy industry
2. Changes in energy service demand
   a. Organization, eg. urban structures
   b. Behaviors
   c. Material intensity
3. Scale-up of international cooperation
   a. Regional cooperation on electricity systems
   b. Scale-up of technology transfer
   c. Finance

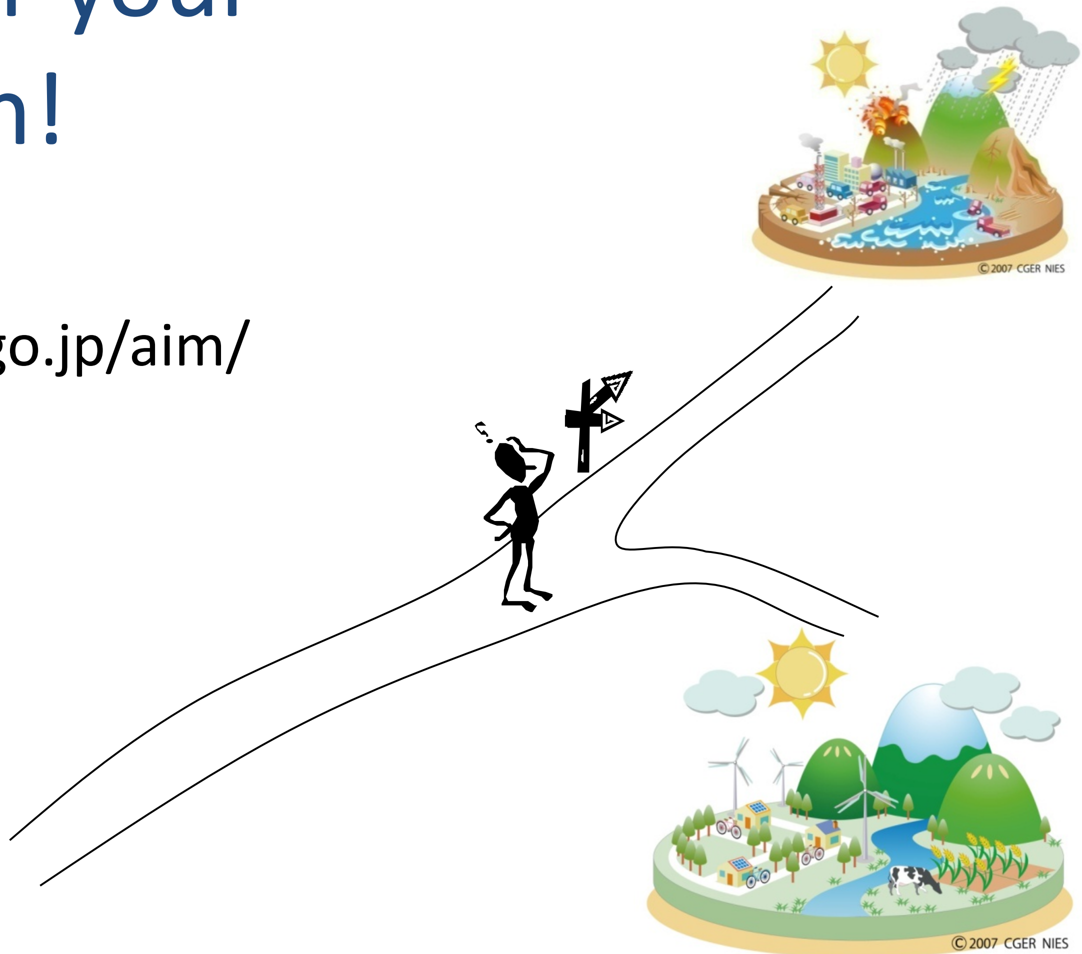
Discussions

1. Leap-frog development in Asia
    a. Renewables: What are needed to increase the share of renewables?
    b. Infrastructure: What is low infrastructure and how can be done?
    c. Industry: What kinds of transformation are required in the industry sector?
    d. New technologies
2. Policies
3. Cities
    a. Megacities in Asia: how megacities could be low carbon?
4. Adaptation
5. Financing
6. Tools and interface to support decision making

Thank you for your attention!

http://www-iam.nies.go.jp/aim/

http://lcs-rnet.org/



You must be the change you wish to see in the world.

- Mahatma Gandhi