



# Climate Actions and National Interests 気候変動対策と国益

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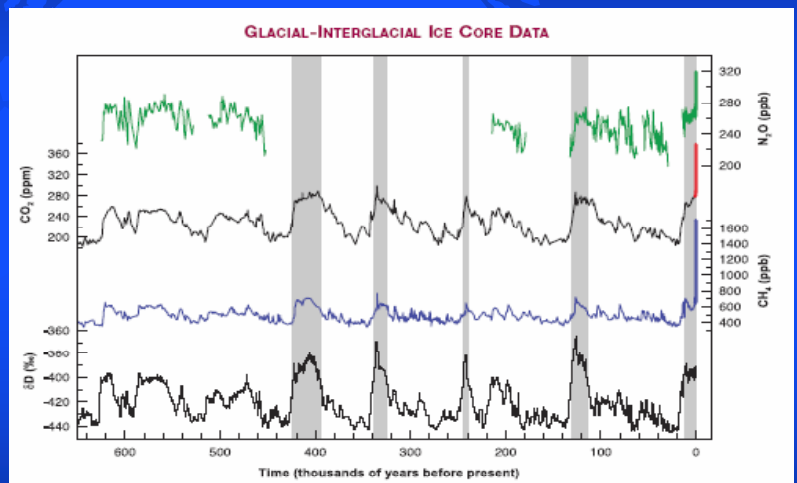
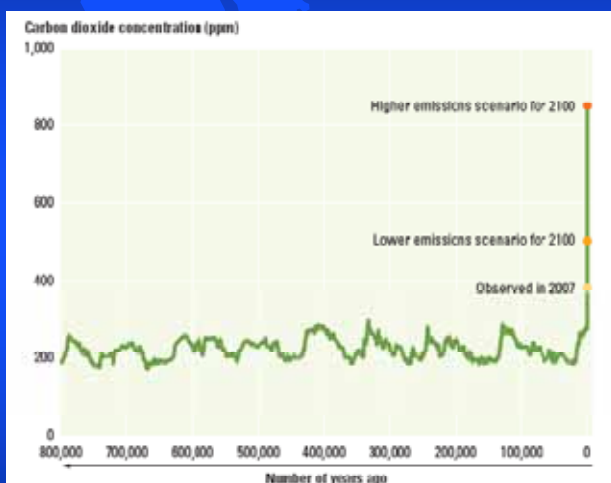
## Low Carbon Society and Sustainable Development 低炭素社会と持続可能な開発

- ◆ *Our Common Future*, 1987 (The World Commission on Environment and Development)
- ◆ 2 pages on climate change in total 380 pages book
- ◆ No such word as ‘low carbon society’ in the book
- ◆ But its message was valid as ever

“Many important economic and social decisions are being made today on ... major water resource management activities such as irrigation and hydropower; drought relief; agricultural land use; structural designs and coastal engineering projects; and energy planning—all based on the assumption that past climatic data, without modification are a reliable guide to the future. This is no longer a good assumption.”

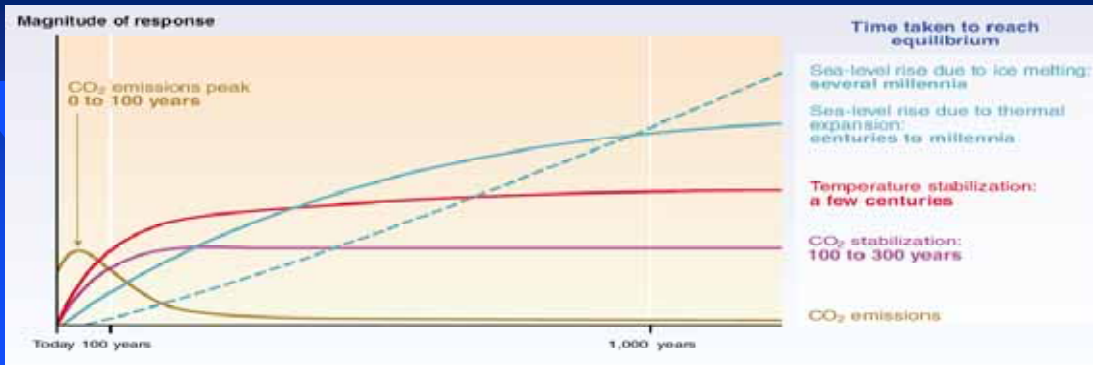
[The World Commission on Environment and Development, *Our Common Future*, 1987, p.175]

## Atmospheric Concentrations of Greenhouse Gases for last 650,000 years 大気中の温室効果ガス(過去65000年)

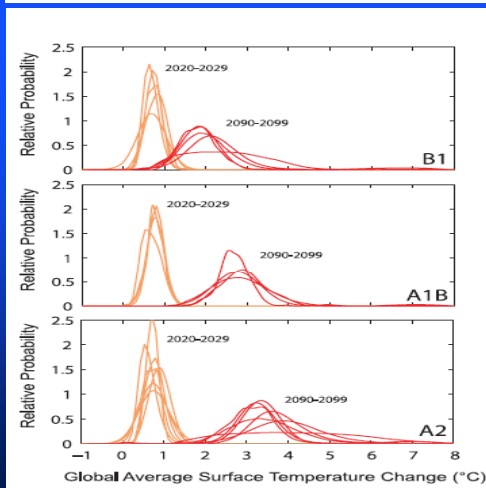


# Defining Feature of Climate Change: Inertia and Uncertainty

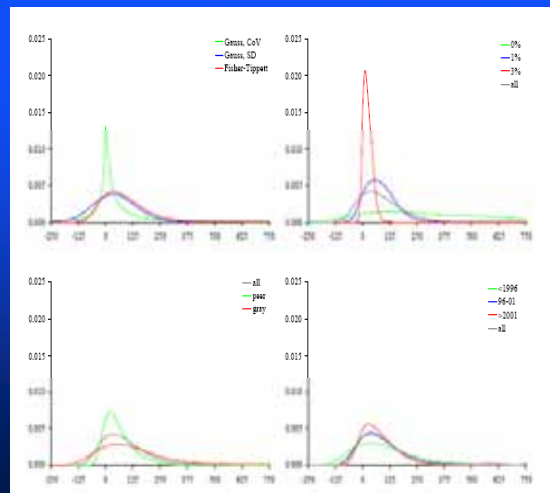
気候変動の特性：慣性と不確実性



IPCC TAR  
Synthesis Report, 2001



IPCC AR4, WGI SPM 2007



## Social Cost of Carbon (炭素の社会的コスト)

	All	PRTP			Review		Publication date		
		0%	1%	3%	peer	gray	<1996	1996-2001	>2001
<i>Fisher-Tippett, sample standard deviation</i>									
Mode	35	129	56	14	20	53	36	37	27
Mean	127	317	80	24	71	196	190	120	88
St.Dev.	243	301	70	21	98	345	392	179	121
Median	74	265	72	21	48	106	88	75	62
90%	267	722	171	51	170	470	397	274	196
95%	453	856	204	61	231	820	1,555	482	263
99%	1,655	1,152	276	82	524	1,771	1,826	867	627
Stern	0.92	0.56	1.00	1.00	0.97	0.84	0.86	0.92	0.96
<i>Gauss, sample standard deviation</i>									
Mode	33	136	46	14	21	46	32	35	29
Mean	88	220	55	16	49	135	131	83	61
St.Dev.	243	298	70	21	98	345	392	178	121
Median	47	194	53	16	33	65	49	50	42
90%	213	626	146	44	142	350	298	221	164
95%	371	747	172	52	201	766	1,453	428	219
99%	1,623	953	221	67	503	1,734	1,782	843	610
Stern	0.94	0.65	1.00	1.00	0.97	0.89	0.91	0.94	0.97
<i>Gauss, sample coefficient of variation</i>									
Mode	0	19	5	2	3	0	4	5	0
Mean	102	225	55	16	55	144	125	100	68
St.Dev.	351	342	69	20	186	437	424	323	223
Median	15	107	34	10	14	18	14	16	17
90%	304	676	151	43	159	407	360	264	210
95%	596	989	195	58	310	891	808	537	361
99%	2,025	1,502	285	89	885	2,420	2,411	1,841	1,127
Stern	0.90	0.76	0.99	1.00	0.95	0.87	0.89	0.92	0.94

The Stern Review estimate is at the 92nd percentile. →

## Inertia in the built environment (in addition to the inertia in the climate system) 建築物などの慣性(気候システムの慣性に加えて)

- ◆ Long life of power plants, road, rail and electricity and gas distribution networks
- ◆ Land use decisions have impacts lasting decades and centuries
- ◆ Mitigation actions may force premature retirement of capital stocks

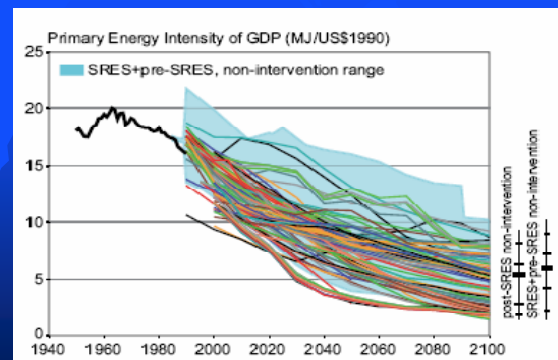
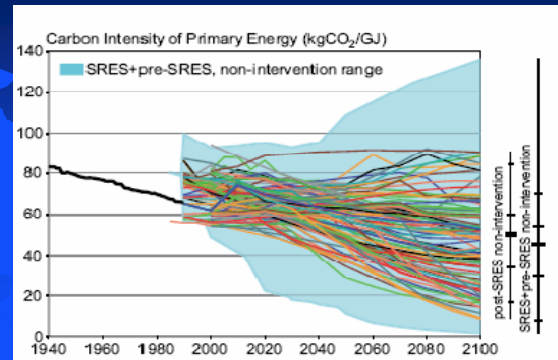
## Implication of inertia and uncertainty for global climate policy

### 慣性と不確実性:地球規模の気候変動政策への含意

- ◆ Trade-off between mitigation action and delay is limited
  - 2 degree C stabilization requires global emissions declining immediately by 1.5%/y (World Bank, World Development Report 2010)
  - If delayed by 10 years, 2 degree C stabilization would not be possible (WB)
- ◆ Safety margins should be considered in setting targets, time tables, and strategies for stabilization
  - Uncertainty is so large that a considerable risk premium is warranted: reduce emissions more than recommended by cost-benefit analysis
- ◆ Minimizing lock-in of carbon-intensive infrastructure investment becomes crucial
- ◆ Adaptation is inevitable
- ◆ Hedging strategies and sequential decision-making (act, learn, and then act) are appropriate

CO<sub>2</sub> mitigation means the sum of two intensities' (carbon and energy) reduction rates exceeds the combined growth rates of population and income

- 0.3%/y = annual rate of decline in carbon intensity (carbon per unit of energy) during last 200 years
- 0.9%/y = annual rate of decline in energy intensity (energy per unit of GDP) during last 200 years
- As a result, 1.2%/y = annual rate of decline in carbon emission per GDP
- 2.5%/y : expected annual rate of decline in carbon emission per GDP in most base line scenarios for next 100 years (twice the trend rate for last 200 years)
- For mitigation, carbon emission per GDP should decline more than 2.5%/y



### Copenhagen Accord:

Countries agree that "deep cuts in global emissions are required ...to hold the increase in global temperature below 2 degree C

コペンハーゲン合意:

各国は「世界全体の気温の上昇が摂氏2度より下にとどまるよう(中略)世界全体の排出量の大幅な削減が必要であること」に同意

- ◆ Participating countries are to pledge specific mitigation actions—the first time ever that countries are to offer the degree of willingness to act on climate
- ◆ For Annex I countries, the Accord calls for quantified economy-wide emissions targets for 2020
- ◆ For Non-Annex I countries, it calls for 'nationally appropriate mitigation actions'
- ◆ As of now, 53 parties have filed pledges: 16 Annex I; 37 Non-Annex I parties

## Copenhagen Accord Pledges

### Annex I: 12-19% reduction below 1990

コペンハーゲン合意による約束:  
Annex I 国: 1990年比12 - 19%削減

- ◆ 12–19 % reduction below 1990 levels (WRI analysis), comparable to 10-13 % reduction below BAU (Pew Center analysis)
- ◆ Required reductions: 25-40% below 1990 by 2020 to meet 450 ppm CO<sub>2</sub>eq (IPCC AR4)
- ◆ More rapid reduction will be required for 2020-2050 to meet the target of 80% reduction by 2050
  - The reduction rate should be 2.5%/y (implies that potential turnover of capital stock at a rate well beyond what is technologically feasible based on historical trends [WRI study])

## Copenhagen Accord Pledges

### Non-Annex I: 6-9% reduction below BAU

コペンハーゲン合意による約束:  
非Annex I 国: BAU比6 - 9%削減

- ◆ 6-9% reduction below BAU (Pew Center analysis)
- ◆ China
  - Carbon intensity (CO<sub>2</sub>/GDP) to decrease by 40-45% by 2020 compared to 2005 level
  - Share of non-fossil fuel in total primary energy consumption increases to 15% by 2020
  - Forest coverage increases by 45 million hectares and forest volume increases by 1.3 billion m<sup>3</sup> by 2020 from 2005 level
- ◆ India: carbon intensity (CO<sub>2</sub>/GDP) to decrease by 20-25% by 2020 compared to 2005 level
- ◆ Indonesia: 26% reduction by 2020
- ◆ Korea: 30% reduction by 2020 from BAU
- ◆ Singapore: 16% reduction by 2020 from BAU

## Copenhagen Accord Pledges: an assessment\*

コペンハーゲン合意による約束に関する評価

- ◆ The pledges are inadequate to achieve a 2-degree goal, and instead imply a global emissions pathway leading to 3 to 3.9 degrees of warming.
- ◆ Collectively, the pledges would reduce global emissions between 4 percent and 16 percent below business as usual (BAU) in 2020. A 2-degree pathway requires reductions of 21 percent to 26 percent below BAU.
- ◆ Pledges by developed countries would reduce their emissions 10 percent to 13 percent below BAU in 2020, and pledges by developing countries would reduce their emissions 6 percent to 9 percent below BAU.

\*Pew Center, "Targets and Actions under the Copenhagen Accord", [www.pewclimate.org/copenhagen-accord](http://www.pewclimate.org/copenhagen-accord), 2010

## Putting Copenhagen Accord in Perspective

コペンハーゲン合意の意味するところ

- ◆ “The challenge is not to find the best policy today for the next 100 years, but to select a prudent strategy and to adjust it over time in the light of new information.” (IPCC Second Assessment WG III Report, 1996)
- ◆ In the absence of binding global climate agreement, reasons for climate actions are domestic

## Mitigation Actions and National Interests:

### (1) Co-benefits of Improved Health and Agricultural productivity

#### 緩和行動と国益 (1)健康・農業生産性向上によるコベネフィット

- ◆ Mitigation actions aiming at 10-20% reduction in carbon emissions relative to BAU in next 20 years will also lead to reduction in SO<sub>2</sub> emissions by 10-20% and NO<sub>x</sub> and PM emissions by 5-10%
- ◆ Health benefits from improved air quality will be substantial, amounting to 30-50% of mitigation costs
- ◆ Particularly for developing countries, several studies report health benefits exceeding mitigation costs
- ◆ Agricultural productivity will increase due to mitigation measures through reduction in surface level ozone which is sensitive to emissions from fossil fuel combustion and soil emissions of NO<sub>x</sub>
- ◆ For China, one study reports that co-benefits consisting of improved health and increased agricultural productivity would support China's mitigation actions up to 15-20% without welfare loss
- ◆ China's 'green growth' scenario developed in 2003 shows that for the same GDP growth of 7%/y, policies of increased energy efficiency standards, higher taxes on transport fuels and more use of low carbon technologies in power generation reduce 50% the CO<sub>2</sub> emissions growth rates compared to BAU

## Mitigation Actions and National Interests:

### (2) Impacts of Mitigation on Employment

#### 緩和行動と国益 (2)雇用へのインパクト

- ◆ Many studies point out that investment in mitigation could have a greater impact on employment than investment in conventional technologies
- ◆ A 1 % annual improvement in energy efficiency increases total employment in Europe (European Commission study as reported in IPCC AR4)
- ◆ A 20% reduction in energy consumption in EU by 2020 will have the potential to create 1 million new jobs in Europe (the EC study)
- ◆ The labor intensity of renewable energy sources is 10 times higher than that of traditional coal power in some countries (IPCC AR4)



## Mitigation Actions and National Interests: (3) Impacts of Mitigation on Energy Security 緩和行動と国益 (3)エネルギー安全保障へのインパクト

- ◆ Transportation sector has strong synergies: alternative transport fuel will reduce CO<sub>2</sub> emissions as well as oil imports, improving energy security
- ◆ Electricity sector has also has strong synergies: decentralized renewable-based power will reduce energy import dependence
- ◆ Trade-off possibility: security reasons may lead countries to increase their dependence on internal reserves of coal rather than relying on imports of natural gas
- ◆ Possibilities for synergies and trade-offs between mitigation and energy security are very specific to national circumstances due to differences in fuel mixes and energy resource endowment

## CO<sub>2</sub> Emissions Growth: Non-OECD Asia vs OECD (2007-2035)\*

CO<sub>2</sub>排出増: アジアの非OECD諸国とOECD諸国との比較

- ◆ 2.5% vs 0% per year
- ◆ Population growth: + 0.3 %
- ◆ Per capita income: + 2.9 %
- ◆ Energy intensity: - 0.7 %
- ◆ Carbon/Energy: 0
- ◆ Carbon intensity(CO<sub>2</sub>/GDP): - 0.7% (-2.3% vs -1.8%)

\* US Energy Information Administration, International Energy Outlook 2010, Reference Case

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## Way forward 今後の方向

- ◆ Mitigation is in harmony with national interests for both short- and long-term
  - Co-benefits
  - Future mitigation costs will be lower as BAU becomes less carbon-intensive and premature retirement of capital stock is minimized
  - Establishing ‘early mover’ advantage: potential benefits of technological leadership by appropriating knowledge accumulated from learning effects
- ◆ New research is required for an integrated approach between the assessment of mitigation and national interests
  - Direction and magnitude of interdependence
  - Comprehensive assessment of potential synergies and trade-offs

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## Thank You