

International Meeting on Mid-Long Term Strategy  
on Climate Change, June 30-July 1 2008, Tokyo

# Balanced Approach to Climate Change, A proposal for effective framework

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# The Fourth Tokyo International Conference on African Development

## 第4回アフリカ開発会議

May 28-30, 2008 Yokohama, Japan

Organized by Government of Japan, United Nations, UNDP, and World Bank

Towards a vibrant Africa: a continent of hope and opportunity / Vers un Afrique qui gagne: un continent d'espoir et d'opportunités



# Millennium Development Goals

(Balance 1)

- Eradicate Extreme poverty and hunger
- Achieve Universal Primary Education
- Promote Gender Equality and Empower Woman
- Reduce Child Mortality
- Improve Maternal Health
- Combat HIV/AIDS, Malaria and other deseases
- **Ensure Environmental Sustainability**
- Develop a Global Partnership for Development

Efficient Allocation of globally scarce resources

Other urgent issues: Foods, Oil Price, Energy Security

# Climate Change: Ultimate Objective

- To stabilize GHG concentration at a level that would prevent dangerous anthropogenic interference (DAI) with the climate system
- Within a time frame sufficient to
  - a) allow ecosystems to adapt naturally
  - b) ensure that that food production is not threatened
  - c) enable economic development to proceed in a sustainable manner

# Climate Policy and sustainable economic development (Balance 2)

- Choosing a stabilization level implies the balancing of the risks of climate change (risks of gradual change and of extreme events, risk of irreversible change of the climate, including risks for food security, ecosystems and sustainable development) against the risk of response measures that may threaten economic sustainability. (AR4 TS p. 32)
- The criterion that relates to enabling economic development to proceed in a sustainable manner is a double-edged sword. Projected anthropogenic climate change appears likely to adversely affect sustainable development, with adverse effects tending to increase with higher levels of climate change and GHG concentrations. Conversely, costly mitigation measures could have adverse effects on economic development. This dilemma facing policymakers results in (a varying degree of) tension that is manifested in the debate over the scale of the interventions and the balance to be adopted between climate policy (mitigation and adaptation) and economic development. (AR4 Ch. 1 p.99)

# No consensus on DAI so far

- What is DAI?
    - 1) Tolerable Windows Approach
    - 2) Cost Benefit Approach
  - Science can not show the level
  - Any decision of 'dangerous interference' is by necessity based on social and political ramification (AR4 Ch. 1)
- No consensus on the Ultimate Objective

# EU's position on Ultimate Objective

- European Council June 1996 (2°C、550ppm)

6. Given the serious risk of such an increase and particularly the very high rate of change, the Council believes that global average temperatures **should not exceed 2 degrees above pre-industrial level** and that therefore **concentration levels lower than 550 ppm CO2** should guide limitation and reduction efforts.

- European Council March 2004 (2°C)

37. ACKNOWLEDGES that to meet the ultimate objective of the UNFCCC to prevent dangerous anthropogenic interference with the climate system, overall global temperature increase **should not exceed 2°C above pre-industrial levels**;

# Then, why 50/50?

CO <sub>2</sub> Concentration (ppm)	CO <sub>2e</sub> Concentration (ppm)	Temperature Increase (since industrialization, °C)	Peaking Year, CO <sub>2</sub> emission	CO <sub>2</sub> reduction ratio 2050/2000 (%)	GDP reduction (%)	Damages	No. of scenarios
350–400	445–490	2.0–2.4	2000–2015	-85~ -50	< 5.5		6
400–440	490–535	2.4–2.8	2000–2020	-60~ -30			18
440–485	535–590	2.8–3.2	2010–2030	-30~ +5	1.3 (-0~4)		21
485–570	590–710	3.2–4.0	2020–2060	+10~ +60	0.5 (-1~2)		118
570–660	710–855	4.0–4.9	2050–2080	+25~ +85	—	1~5% of GDP	9
660–790	855–1130	4.9–6.1	2060–2090	+90~ +140	—		5

Source: IPCC AR4 WG2 SPM P.20, WG3 SMP Table 5 & 6

## SRES Scenario and temperature change

Case	Temperature change (°C at 2090-2099 relative to 1980-1999) <sup>a, d</sup>	
	Best estimate	Likely range
Constant year 2000 concentrations <sup>b</sup>	0.6	0.3–0.9
B1 scenario	1.8	1.1–2.9
A1T scenario	2.4	1.4–3.8
B2 scenario	2.4	1.4–3.8
A1B scenario	2.8	1.7–4.4
A2 scenario	3.4	2.0–5.4
A1FI scenario	4.0	2.4–6.4



# What does 50/50 mean? (1)

From Developed and Developing countries perspective

	2000 actual E (MtCO <sub>2</sub> )	2050 BAU		50% reduction in 2050 Case 1 (Zero E for Annex I)			50% reduction in 2050 Case 2 (20% E for Annex I)		
		Emission (MtCO <sub>2</sub> )	Ratio (%)	Emission (MtCO <sub>2</sub> )	Ratio to 2000	Ratio to BAU	Emission (MtCO <sub>2</sub> )	Ratio to 2000	Ratio to BAU
	A	B	B / A	C	C / A	C / B	D	D / A	D / B
Annex I	13507	17391	128.8	0	—	—	2701	20.0	15.5
Non AI	9151	30928	348.9	11329	123.8	36.6	8628	94.3	27.9
Total	22658	48319	213.3	11329	50.0	23.4	11329	50.0	23.4

BAU by RITE DNE 21+ model

- Can Annex I Countries achieve zero emissions by 2050?
- Can Non-Annex Countries constrain their emissions increase less than 24% during the period of 2000-2050? (per capita emission must decrease from 1.8 to 1.4tCO<sub>2</sub>)

In any case, global emissions must be reduced by 37Gt/CO<sub>2</sub> from BAU in 2050 to achieve 50/50.

# What does 50/50 mean? (2)

## From Technology Perspective

(2/3 of 37Gt-CO<sub>2</sub> reduction must come from power sector)

- Nuclear power 2,600 TWh/yr → 10,800 TWh/yr
- Wind power 30 TWh/yr → 2,630 TWh/yr
- Solar Power 0.2TWh/yr → 4,450 TWh/yr
- CCS for all coal fired power plants
- Biomass with CCS

Minus emissions from power sector in 2050

Is this feasible?

RITE, least cost approach

# Technology is the key

- $\text{CO2 emissions} = \frac{\text{CO2 emissions}}{\text{GDP}} \times \text{GDP}$

- $\Delta \text{CO2}/\text{CO2}$

$$= \frac{\Delta(\text{CO2 emissions}/\text{GDP})}{\text{CO2 emissions}/\text{GDP}} + \frac{\Delta \text{GDP}}{\text{GDP}}$$

= Technology improvement ratio + GDP growth ratio

To achieve 50% reduction	
GDP loss (%) against BAU	Technology improvement ratio (%)
<b>0</b>	<b>3.856</b>
10	3.681
20	3.485
30	3.262
40	3.005
50	2.701
80	1.174

With technology improvement ratio of 1.227%	
CO2 reduction (%)	GDP loss (%) against BAU
0	58.710
10	62.839
20	66.968
30	71.097
40	75.226
<b>50</b>	<b>79.355</b>

Average annual technology improvement ratio since 1970 is 1.227%.

BAU GDP growth ratio up to 2050 is 2.76%/yr (RITE estimate based on World Bank and IPCC SRES B2 Marker scenario).

# Post-Kyoto Framework (1)

- Decoupling mid-term (binding) target from long-term non binding target  
(to make it realistic and to avoid collapse, 50/50 is not feasible)
- All the major emitters must participate  
(environmental effectiveness)
- Pay full attention to each country's circumstance  
(Priority as well as culture should be different country by country)
- Climate Change and Economic Sustainability  
(Balancing the risks)
- Add “promotion of technology” to policy criteria  
(Whether a framework promote technology development and deployment?)

# Post-Kyoto Framework (2)

The ideal and the real

- Theoretically Kyoto-style cap & trade is the best if,
  - 1) all major emitters join
  - 2) all parties feel their initial allocation as equitable and acceptable
- Under current situation, this is quite unlikely

# Why unlikely ? (1)

- Will emerging economies accept cap?  
(priority differs)
- US situation is uncertain  
(Whether US accept cap with China/India outside the scheme?)
- Will it work?  
(Can international society enforce against non compliance?)
- Can politicians bind future generation's decision?  
Examples: measures to cope with budget deficit

# Why unlikely ? (2)

- Environmentally ineffective (RITE DNE21+ model)  
What if developing countries reject any cap?
- To set cap does not necessarily lead to emissions reduction  
unless accompanied by technology improvement
- One international framework does not fit all.  
Difference in priority, situation and culture  
(ex. Case in Japan and Canada)

# Basic Assumption

Catastrophe is unlikely for at least coming 100 years  
(no threshold during this period)

- It is *very unlikely that* the MOC will undergo a large abrupt transition during the 21st century. (AR4 WG1 SPM p. 16)
- The Greenland and Antarctic Ice Sheets contain much more ice and could make large contributions over many centuries. The processes of accelerated ice flow are not yet completely understood but could result in overall net sea level rise from ice sheets in the future. (WG1 TS p.51)
- If a global average warming of 1.9°C to 4.6°C relative to pre-industrial temperatures were maintained for millennia, the Greenland Ice Sheet would largely be eliminated except for remnant glaciers in the mountains. (TS p.80)
- Current global model studies project that the Antarctic Ice Sheet will remain too cold for widespread surface melting and will gain in mass due to increased snowfall. (TS p.80)



# Alternative Framework

- Mitigation treaty is not enough
- Incorporating Adaptation and Technology Transfer in a treaty
- May need additional treaty for RDDD & D in technology both for adaptation and mitigation
- Then what kind of mitigation treaty is feasible and desirable? Is it environmentally effective?

# How to invite Major Emitters

## Current Commitments

Japan	(30% improvement of energy efficiency by 2030, base year 2005)
EU 27	20% reduction in 2020 (base year 1990) then linearly 60% in 2050
USA	20% reduction of gasoline consumption by 2017, 30% improvement of energy efficiency by 2015 (base year 2003)
APEC	25% improvement of energy efficiency by 2030 (base year 2005)
China	Same as above
India	.....
Other Major Es	.....

APEC: ASEAN 7 (Brunei, Indonesia, Malaysia, Philippine, Singapore, Thailand, Vietnam), Japan, Korea, China, Taiwan, Mexico, Papua New Guinea, Australia, New Zealand, USA, Canada, Peru, Chile and Russia (20 countries)

# Commit & Act, How effective? (Case 1)

	Assumed Commitments
Japan	30% improvement of energy efficiency by 2030 (base year 2005)
EU 27	20% reduction in 2020 (base year 1990) then linearly 60% in 2050
USA	20% reduction of gasoline consumption by 2017, 30% improvement of energy efficiency by 2015 <b>then linearly toward 50% reduction in 2050</b>
APEC	25% improvement of energy efficiency by 2030 (base year 2005)
China	Same as above
India	<b>Same as above</b>
Other Major Es	<b>Same as above</b>

Global Reduction 4.0 Gt-CO<sub>2</sub> in 2020,  
6.0 Gt-CO<sub>2</sub> in 2030  
RITE DNE+ model

# Commit & Act, How effective? (Case 2)

	Assumed Commitments
Japan	Make marginal abatement cost equal to EU's commitment
EU 27	20% reduction in 2020 (base year 1990) then linearly 60% in 2050
USA	20% reduction of gasoline consumption by 2017, 30% improvement of energy efficiency by 2015 then linearly toward 50% reduction in 2050
APEC	25% improvement of energy efficiency by 2030 (base year 2005)
China	Same as above
India	Same as above
Other Major Es	Same as above

Global Reduction 4.2 Gt-CO<sub>2</sub> in 2020,  
6.4 Gt-CO<sub>2</sub> in 2030

# Commit & Act, How effective? (case 3)

	Assumed Pledges
Japan	MAC is same as EU's pledge, also <b>subject to APEC's pledge</b>
EU 27	20% reduction in 2020 (base year 1990) then linearly 60% in 2050
USA	<b>Same commitment as proposed Lieberman/Warner Bill (15% reduction in 2020 and 33% reduction in 2030, base year 2005)</b>
APEC	<b>30%</b> improvement of energy efficiency by <b>2020</b> (base year 2005) <b>40%</b> by <b>2030</b> (same as above)
China	<b>20%</b> improvement of energy efficiency by <b>2010</b> (base year 2005) <b>40%</b> by <b>2020</b> (same as above) <b>60%</b> by <b>2030</b> (same as above)
India	<b>30%</b> improvement of energy efficiency by <b>2020</b> (base year 2005) <b>50%</b> by <b>2030</b> (same as above)
S. Africa, Brazil	<b>30%</b> improvement of energy efficiency by <b>2020</b> (base year 2005) <b>40%</b> by <b>2030</b> (same as above)

Global Reduction 5.6 Gt-CO<sub>2</sub> in 2020,  
8.9 Gt-CO<sub>2</sub> in 2030

# Comparison of 3 cases (image)



# Sectoral Benchmark Approach

## Another Alternative

Assumption of intensities in 2020 by regions and by sectors

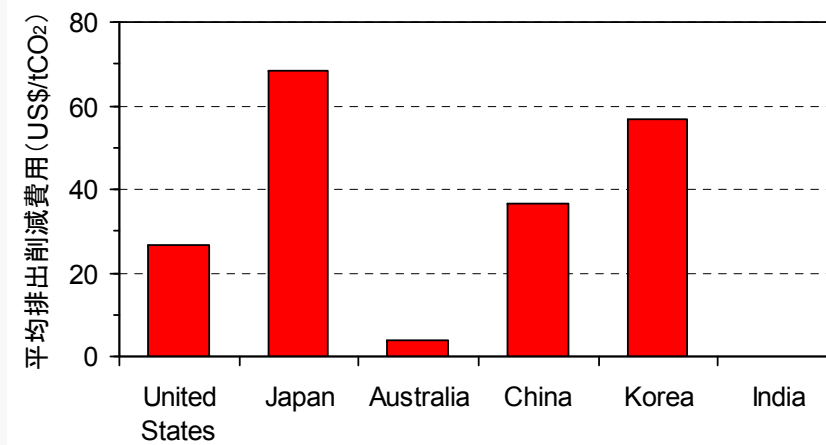
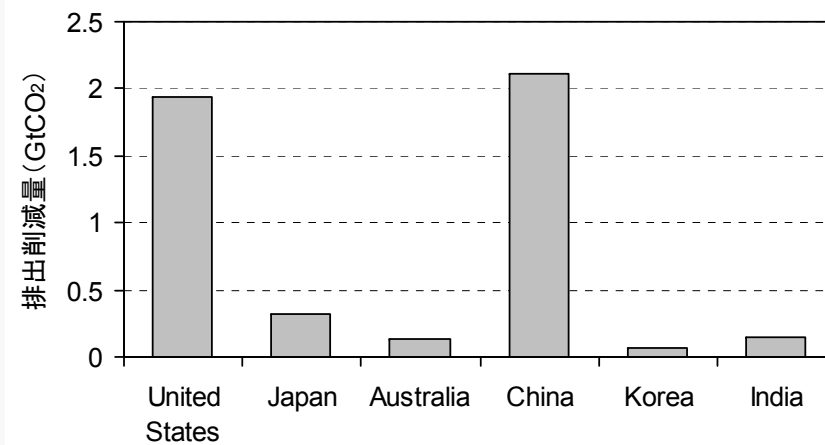
	Japan	Other Annex I	Other APP	Other MEs
Power Generation	0.95	1.00	1.20	1.20
Steel, Cement, Aluminium	0.95	1.00	1.20	1.20
Paper & Pulp	0.95	1.00	1.20	1.20
Transport	0.6	0.65	0.85	0.85
Electric Appliance	1.00	1.05	1.25	1.25

Japanese efficiency in 2005 = 1

Power: CO2 intensity, Others: Energy efficiency

# Sectoral Benchmark Approach

Reduction Potential (GtCO<sub>2</sub> left) and Average Cost (\$/tCO<sub>2</sub> right)  
in 2020 in 6 member countries of APP



Global reduction  
6.3 Gt-CO<sub>2</sub> in 2020  
8.8 Gt-CO<sub>2</sub> in 2030

Source; Dr. K. Akimoto, RITE



# Comparison and Evaluation of Environmental Effectiveness

Comparison A						Unit GtCO <sub>2</sub>			
	Global Emissions	Global Emissions		BAU Emissions		Increase Ratio in Comparison to 2000		Reduction Ratio in Comparison to BAU	
	(A)	(B)	(C)	(D)	(E)	B/A-1	C/A-1	1-B/D	1-C/E
	2000	2020	2030	2020	2030	2020	2030	2020	2030
C&A 1	22.7	33.6	36.7	37.6	42.7	48.0%	61.7%	10.6%	14.1%
C&A 2	22.7	33.4	36.3	37.6	42.7	47.1%	59.9%	11.2%	15.0%
C&A 3	22.7	32.0	33.8	37.6	42.7	41.0%	48.9%	15.8%	20.8%
SA	22.7	31.3	33.9	37.6	42.7	37.9%	49.3%	16.8%	20.6%

C&A 1(2,3): Commit & Act Case 1(2,3), SA: Sectoral Benchmark Approach

## Comparison B (C&A, SA, Kyoto-Like)

	Increase Ratio from 2000		Reduction Ratio for BAU	
	2020	2030	2020	2030
C&A Case3	41.0%	48.9%	15.8%	20.8%
SA	37.9%	49.3%	16.8%	20.6%
Kyoto-Like	45.8%	56.6%	12.2%	16.8%

Kyoto-like case: Japan & EU C&A Case 3, USA Lieberman/Warner Bill, China & APEC Case 1 commitment, Others BAU

# Comparison and Evaluation

- **Environmental Effectiveness**  
As shown in the previous slide
- **Cost Effectiveness**  
Matter of comparison, not substantially different
- **Equity & Competitiveness**  
Sectoral Approach is better
- **Institutional feasibility**  
C&A may have higher feasibility
- **Technology development/deployment**  
Sectoral Approach is better

# Conclusion

- Mixture of Commitment & Act and Sectoral Approach
- First start with C&A and add SA to the extent possible
- Then SA portion should be extended to other sectors and countries
- Some scheme for technology transfer and financial assistance should be promoted