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Balanced Approach to Climate Change, A proposal for effective framework

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Millennium Development Goals

(Balance 1)

- Eradicate Extreme paverty and hunger
- Achieve Universal Primary Education
- Promote Gender Equality and Empower Woman
- Reduce Child Mortality
- Improve Maternal Health
- Combat HIV/AIDS, Malaria and other desearses
- 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℃、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℃）

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 2ºC above pre-industrial levels;

Then, why 50/50?

CO_2 Concentration (ppm)	CO_{2e} Concentration (ppm)	Temperature Increase (since industrialization、℃)	Peaking Year, CO_2 emission	CO_2 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) [a, d]	
	Best estimate	*Likely* range
Constant year 2000 concentrations [b]	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

AR4 Synthesis report p.7

What does 50/50 mean? (1)

From Developed and Developing countries perspective

	2000 actual E ($MtCO_2$)	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 ($MtCO_2$)	Ratio (%)	Emission ($MtCO_2$)	Ratio to 2000	Ratio to BAU	Emission ($MtCO_2$)	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 1.4tCO2)

In any case, global emissions must be reduced by 37Gt/CO2 from BAU in 2050 to achieve 50/50.

What does 50/50 mean? (2)

From Technology Perspective

(2/3 of 37Gt-CO_2 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

RITE, least cost approach

Minus emissions from power sector in 2050

Technology is the key

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

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

$$= \text{Technology improvement ratio} + \text{GDP growth ratio}$$

To achieve 50% reduction	
GDP loss (%) against BAU	Technology improvement ratio (%)
0	3.856
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
50	79.355

Average annual technology improvement ratio since 1970 is1.227%.

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℃ to 4.6℃ 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
- Imcorporating 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 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 4.0 Gt-CO2 in 2020,
6.0 Gt-CO2 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

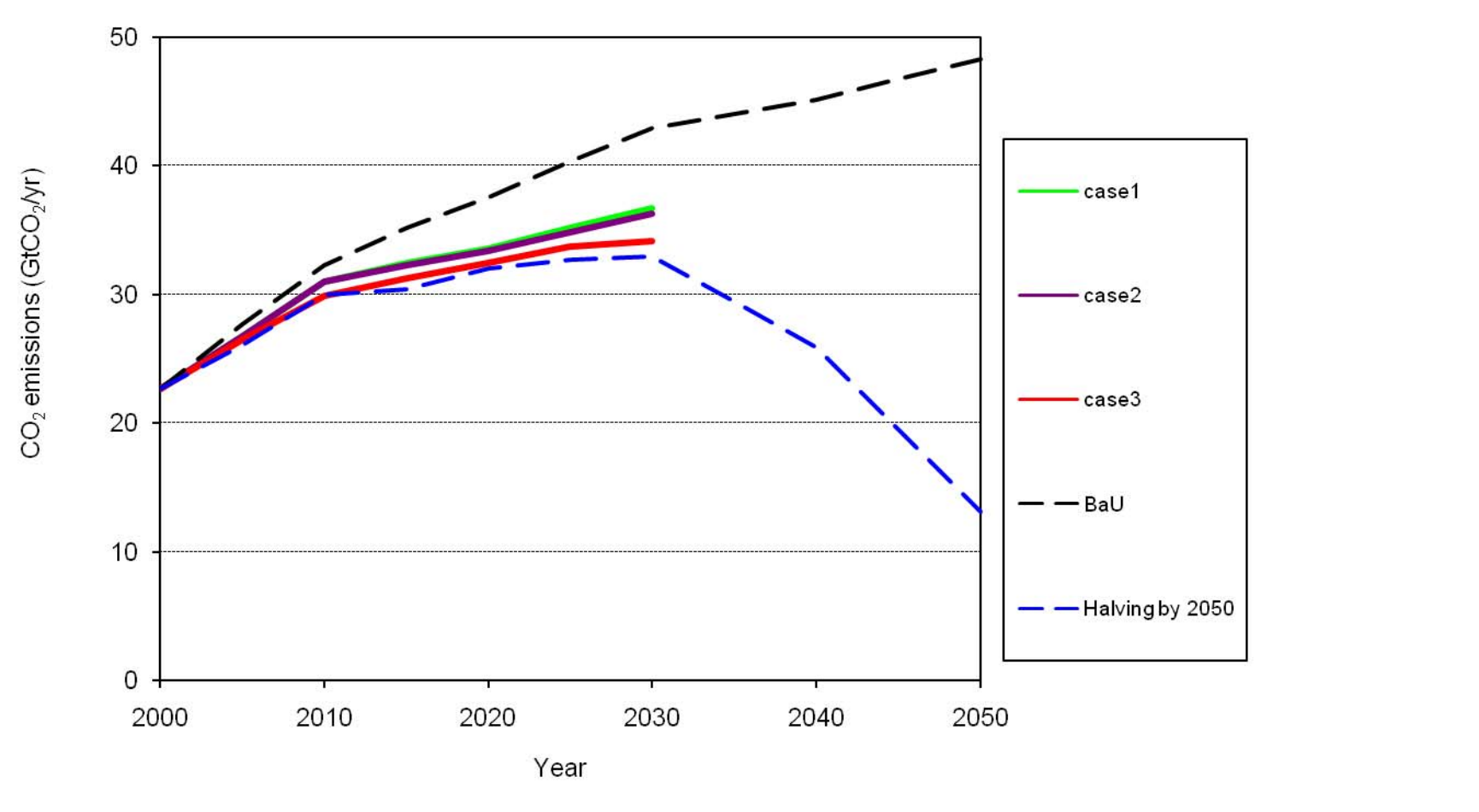
Global Reduction 4.2 Gt-CO2 in 2020,
6.4 Gt-CO2 in 2030

Commit & Act, How effective? (case 3)

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

Global Reduction 5.6 Gt-CO2 in 2020,
8.9 Gt-CO2 in 2030

Comparison of 3 cases (image)



Sectoral Benchmark Approach
Another Alternative

Assumption of intensities in 2020 by regions and by sectors

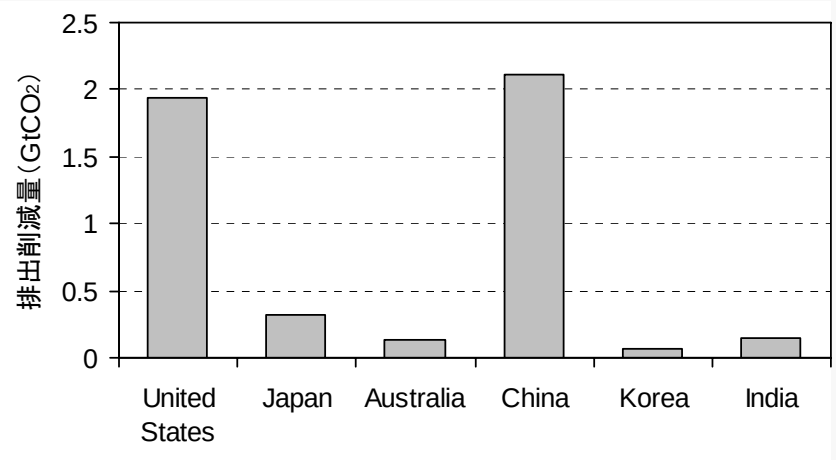
	Japan	Other Annex	Other APP	Other MEs
Power Generation	0.95	1.00	1.20	1.20
Steel, Cement, Alminium	0.95	1.00	1.20	1.20
Paper & Pulp	0.95	1.00	1.20	1.20
Transport	0.6	0.65	0.85	0.85
Electric Appliance	1.00	1.05	1.25	1.25

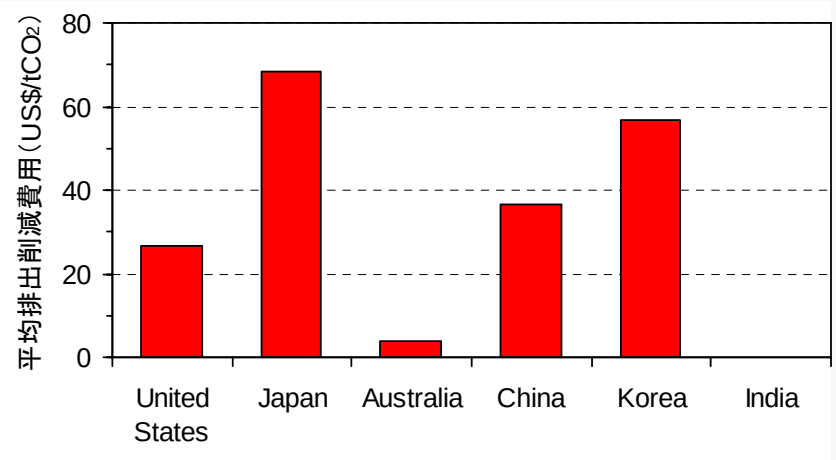
Japanese efficiency in 2005 = 1
Power: CO_2 intensity, Others: Energy efficiency

Sectoral Benchmark Approach

Reduction Potential (GtCO2 left) and Average Cost ($/tCO2 right)

in 2020 in 6 member countries of APP





Global reduction
6.3 Gt-CO2 in 2020
8.8 Gt-CO2 in 2030

Source; Dr. K. Akimoto, RITE

Comparison and Evaluation of Environmental Effectiveness

Comparison A

Unit GtCO2

	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