27 Oct. 2009

Policy Implication of Z520, Z650 emissions pathways

Outline

- Avoiding Dangerous impacts and non-CO_2 GHGs reduction
- Climate targets and per capita emissions

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Long-term target : Preventing ice sheet melting to avoid dangerous impacts

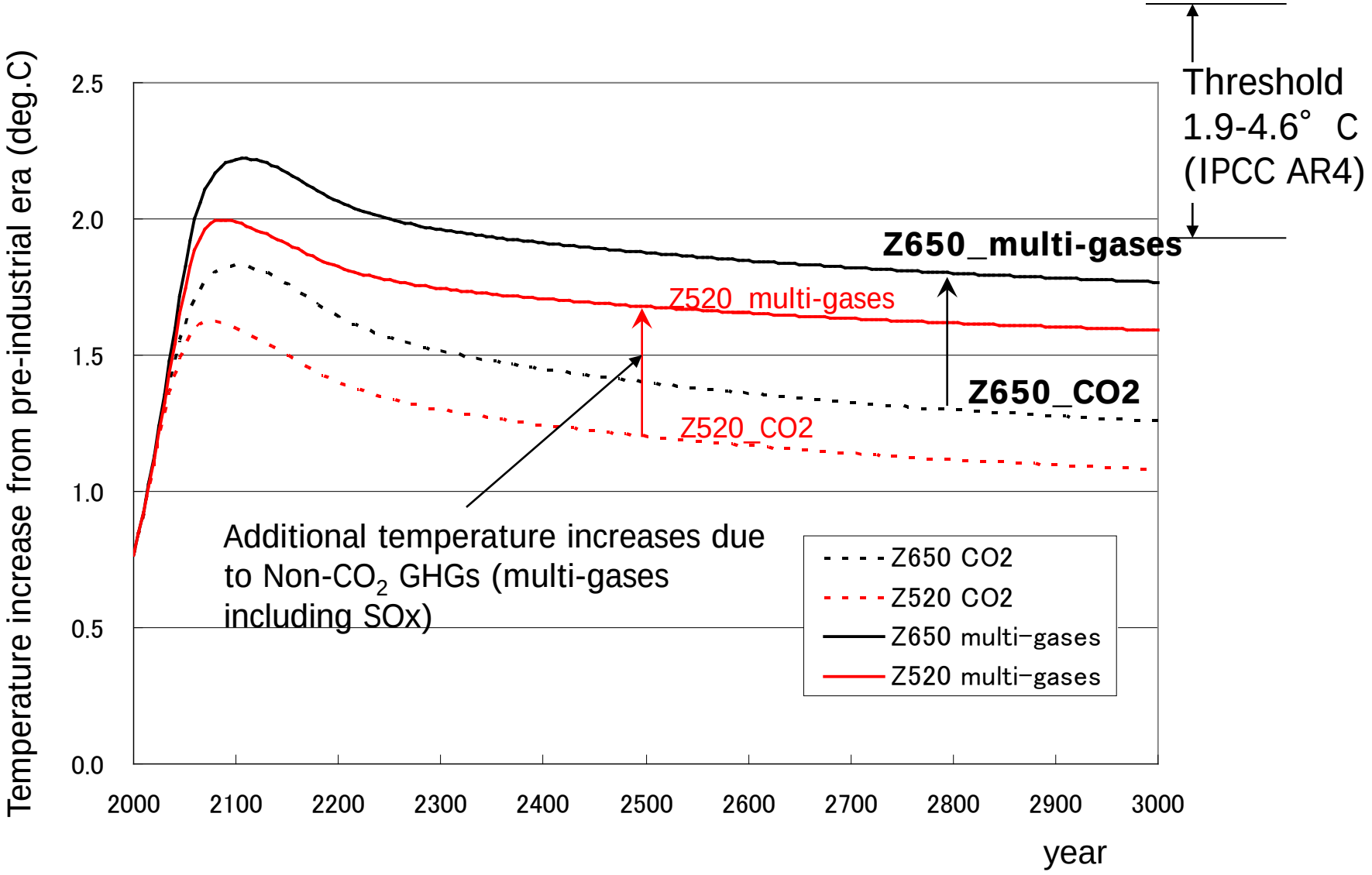
The World Heritage : Ilulissat Glacier

The mass balance for the ice sheet will become negative for global average warming in the range of 1.9 ℃ to 4.6 ℃.

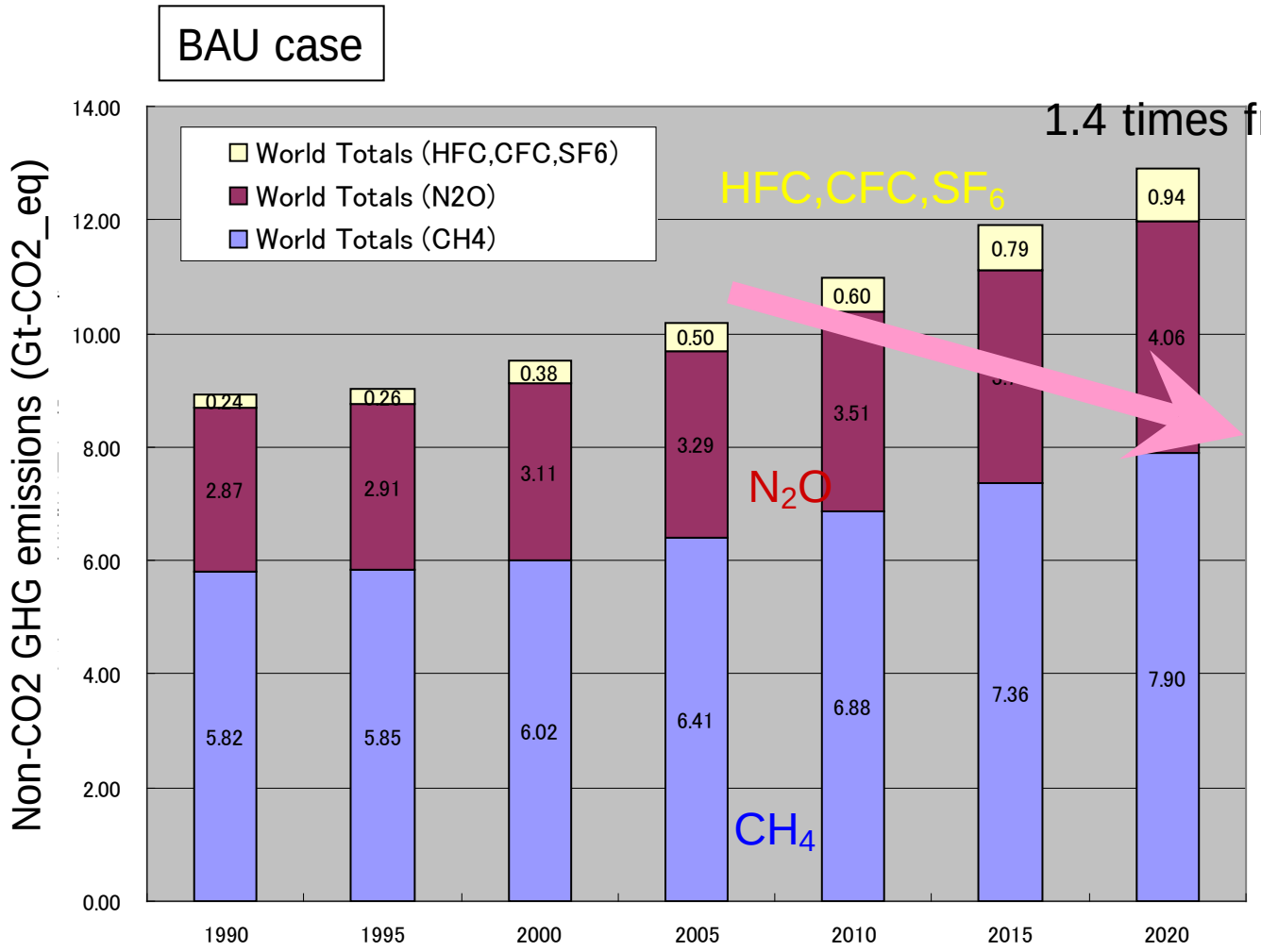
If a negative were sustained for a millennia, that would lead to elimination of the Greenland Ice Sheet and contribute about 7 m to sea level rise.

(Source) IPCC WGI AR4(2007) SPM

Long-term temperature changes of Z520, Z650



Global Non-CO_2 GHGs emissions increase ;1990-2020



1.4 times from 1990 level

Reductions should be considered for 2020 targets at COP15 focusing attention on prevention of dangerous impacts such as ice sheet melting.

(Source) Global Anthropogenic Non-CO2 Greenhouse Gas Emissions: 1990-2020 US EPA(2006)

Comparison of recent studies related to cumulative emissions

CO_2 emission pathways	Total (GtC)	Pre-industrial era～Year 2000	21th Century (2000～2100)	Beyond 21th century
Matsuno et al.(2009) :Z650	1120GtC	420GtC	650GtC	50GtC
Matsuno et al.(2009) :Z520	970GtC		520GtC	30GtC
Allen et al.(2009)	Cumulative emissions from pre-industrial era：1000GtC			
Meishausen et al.(2009)	Year 2000～2050：270GtC(1000Gt-CO2)			

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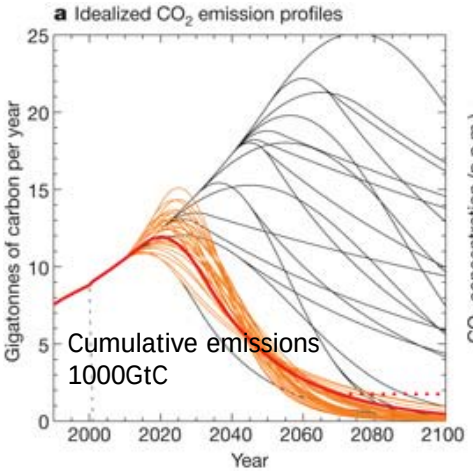
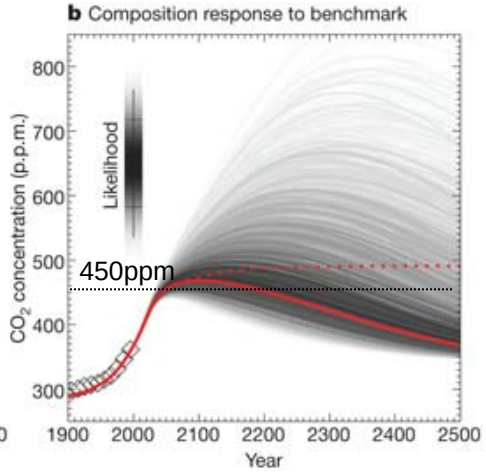
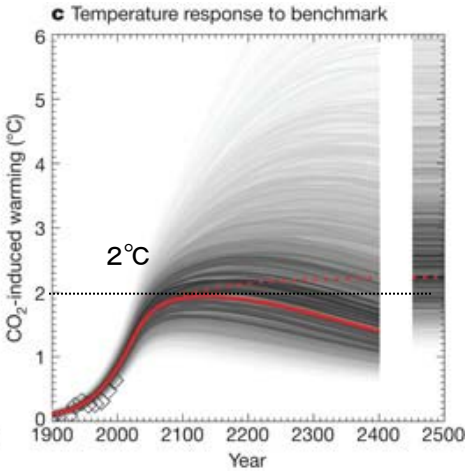
CO_2 emissions (GtC)



CO_2 concentrations (ppm)



Temperature rise(℃)



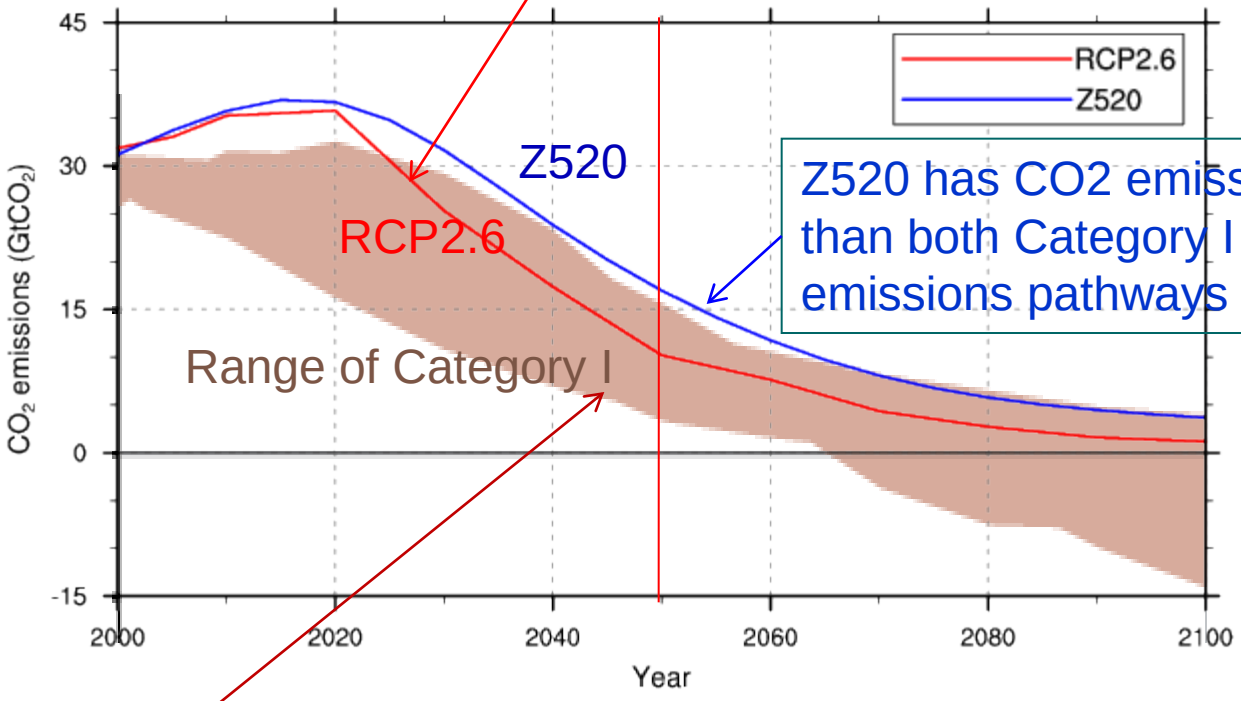
(Source) Allen et al.(2009) Warming caused by cumulative carbon emissions towards the trillionth tonne Nature 458, 1163-1166(30 April 2009)

IPCC scenarios vs Z520 for 2℃ limit constraint

IPCC Box13.7 emissions pathways by den Elzen and Meishausen(2006) , which is background for following reduction target;

2020 Annex I -25%～- 40%

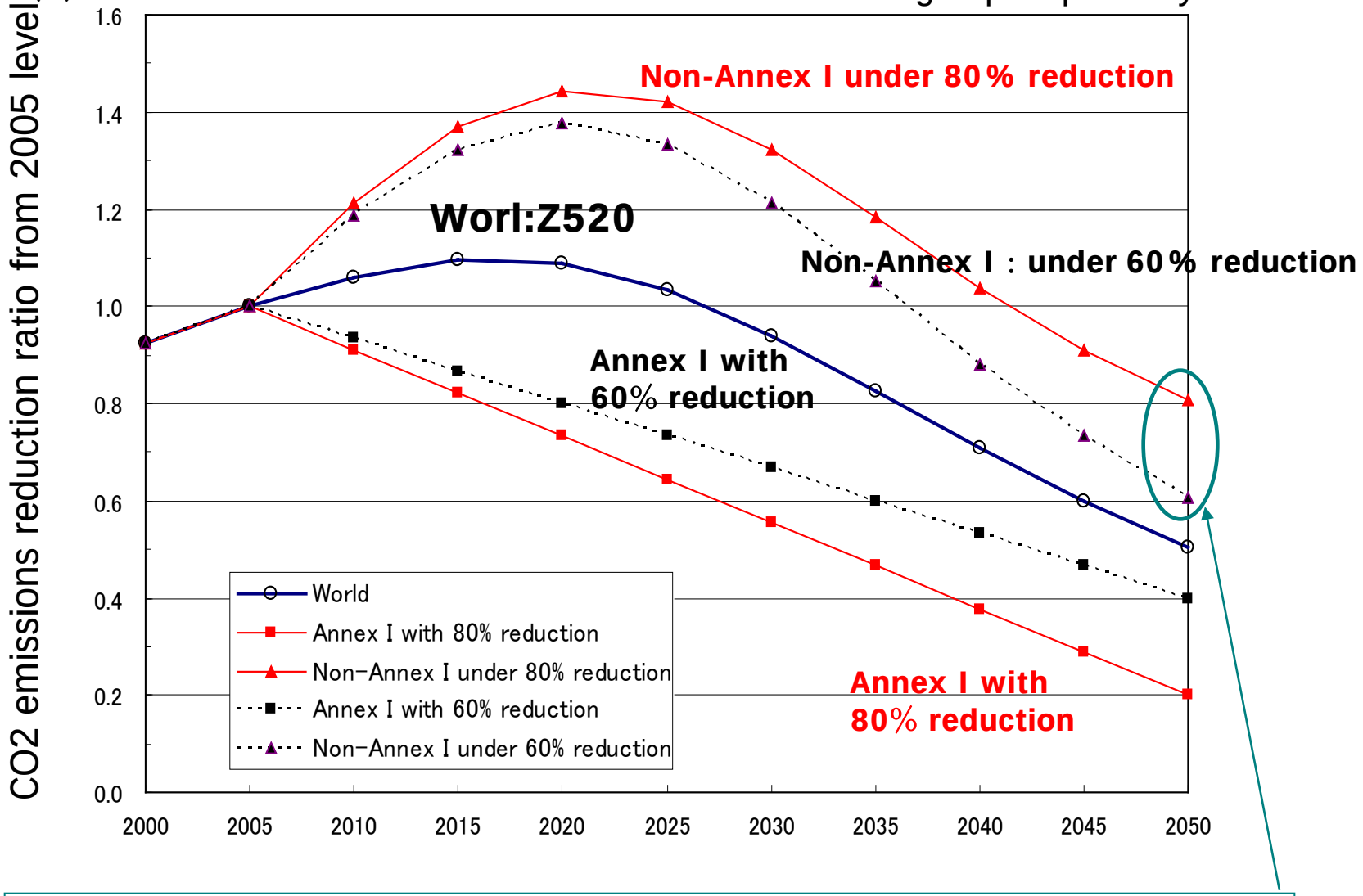
2050 Annex I -80%～ -95%



IPCC：Category I scenarios;
background for 50% reduction in the world

If Z520, 2℃ constraints will be achieved but....

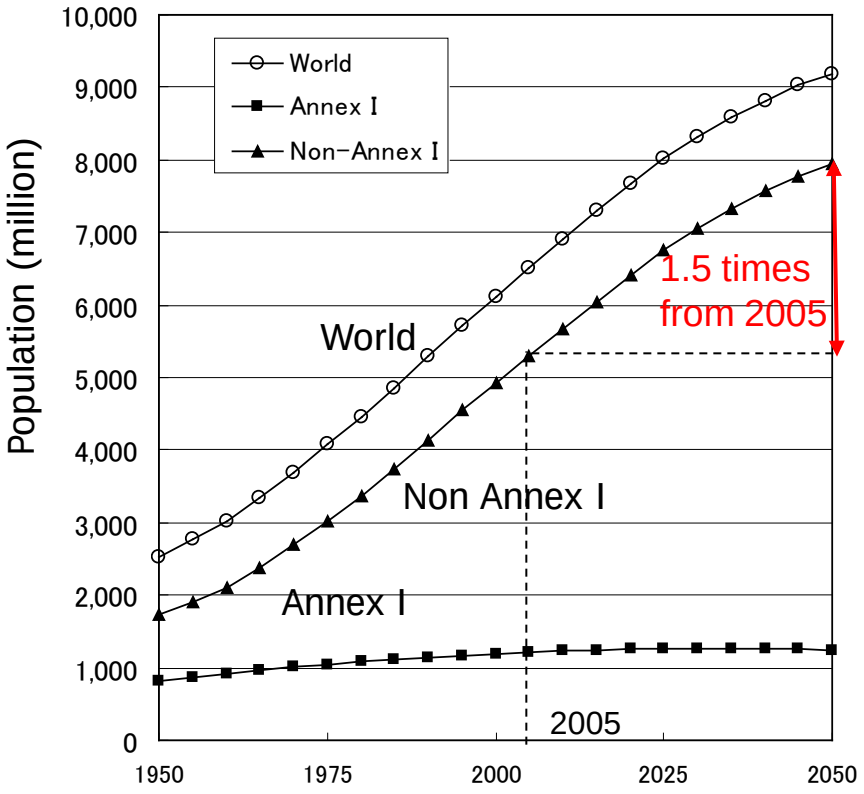
(*) We assume Annex I and Non Annex I countries as a group respectively.

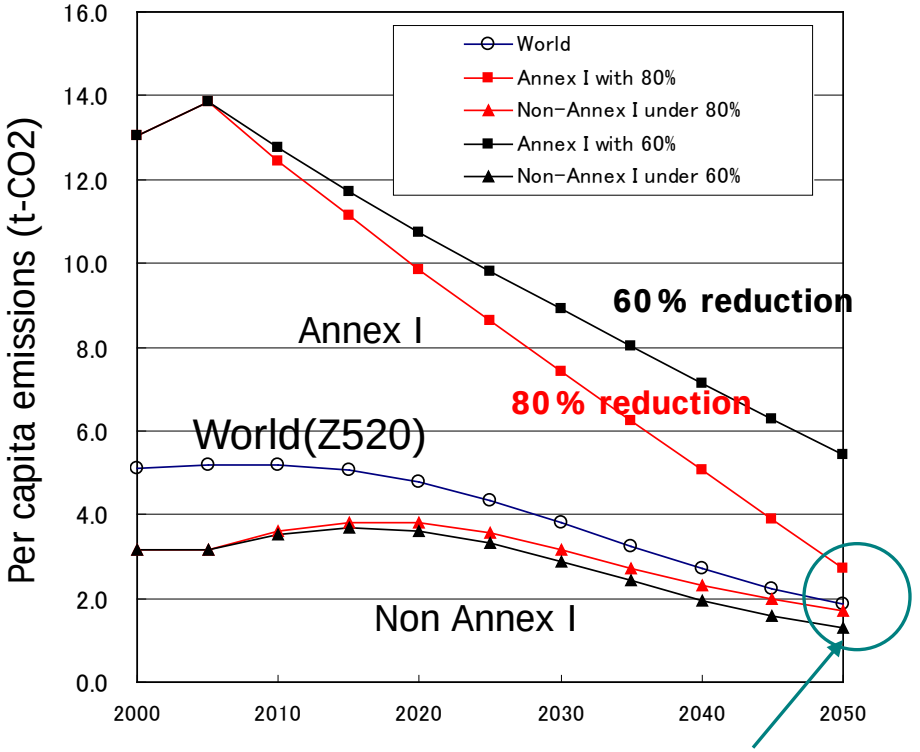


Non-Annex I should reduce CO_2 emissions by 20%40% from 2005 levels by 2050

If Z520, per capita CO_2 emissions will not converge by 2050

(*) We assume Annex I and Non Annex I countries as groups respectively.





(Source) UN, World Population Prospects(2006)
World population(2005) :6.52 billion
CO2 emissions from energy (2005) :2.70 Gt-CO2
CO2 World mean per capita emissions :4.1t-CO2

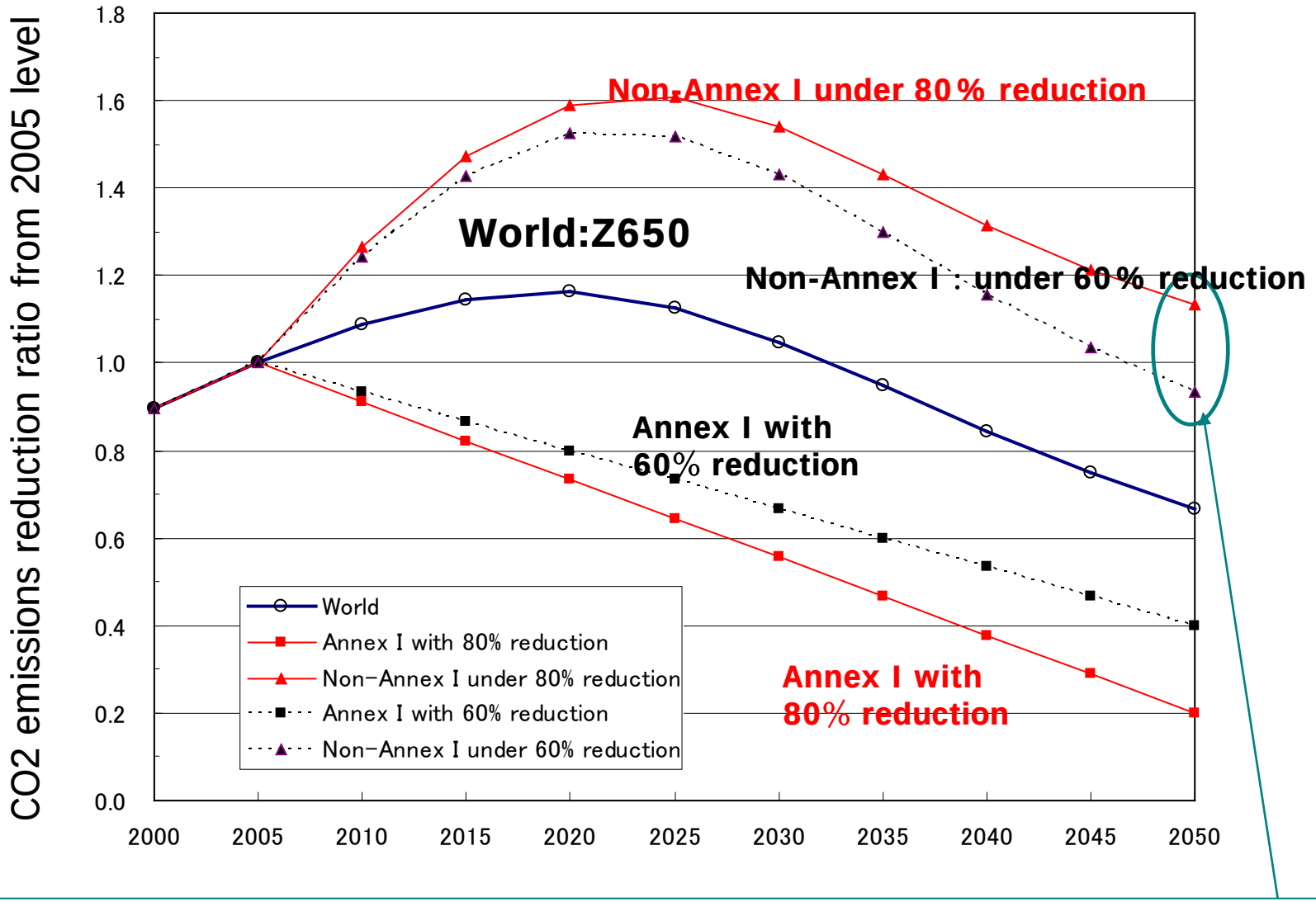
Per capita (P/C) emissions at 2050 under 80% reductions by Annex I countries;

- Annex I : 2.7 t-CO2
- Non-Annex I : 1.7 t-CO2
- World : 1.8 t-CO2

P/C emissions in the all countries in the world will not converge by 2050.

If we choose Z650 with slightly relaxed 2℃ limit constraint

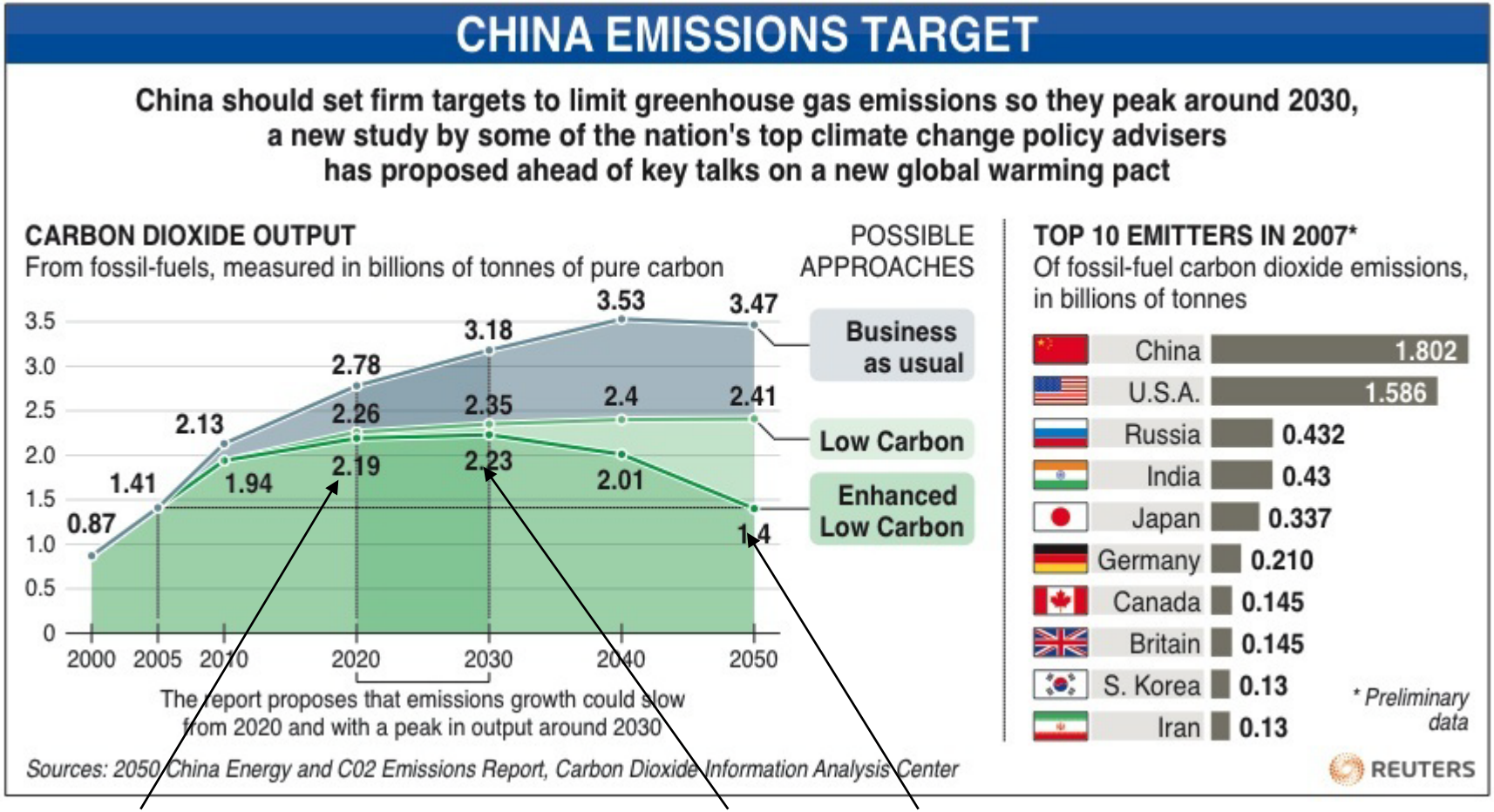
（*） We assume Annex I and Non Annex I countries as groups respectively.



Reduction in Non-Annex I countries will be the same relative to the 2005 level in 2050.

Recent study of reduction target in China

Emissions in Enhanced Low Carbon scenario are very similar to Z650 case under 60%-80% reductions by Annex I countries.



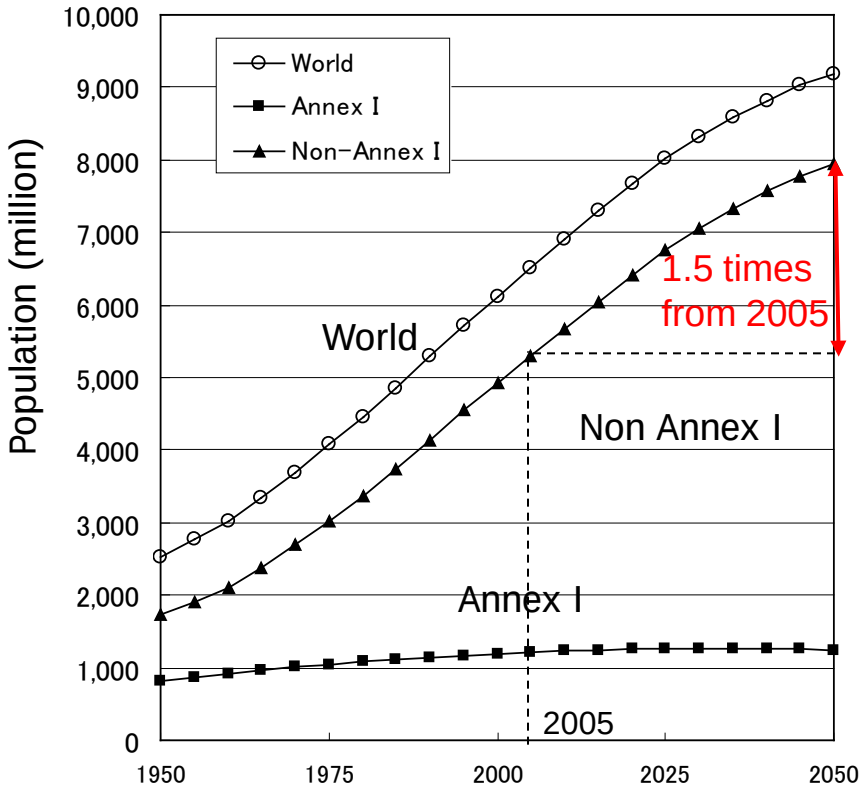
Increase ratio is 1.55 in 2020 from 2005 level.

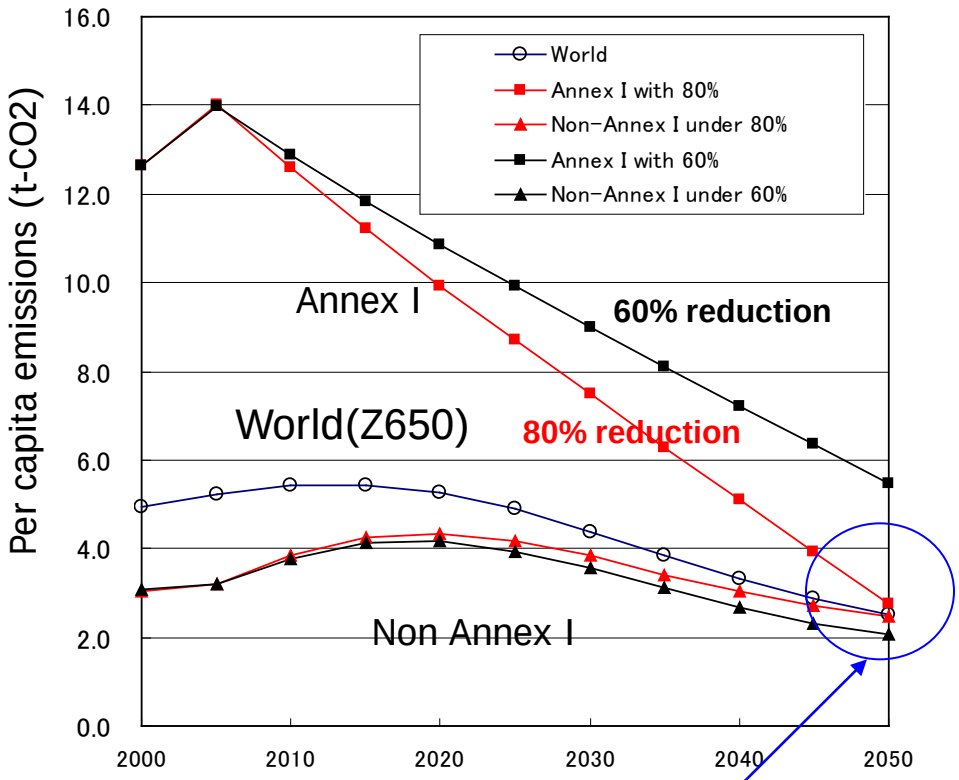
1.58 in 2030

0.99 in 2050

Moreover, if Z650, P/C CO_2 emissions will converge by 2050

(*) We assume Annex I and Non Annex I countries as groups respectively.





(Source)UN, World Population Prospects(2006)
World population(2005):6.52 billion
CO2 emissions from energy :2.70 Gt-CO2(2005)
World mean per capita emissions:4.1t-CO2

If Z650, per capita emissions under 80% reductions by Annex I countries will converge at around 2.5 t-CO2 in all the countries by 2050.

Conclusion

Plan A for the future vision

If nations in the world can achieve the Z650 emission pathway with slightly relaxed 2℃ climate target constraint, per capita emissions in the world will converge at around 2.5t-CO2 by 2050.

Plan B ?

If Plan A is not accepted, what is the Plan B for the future vision?