Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V.

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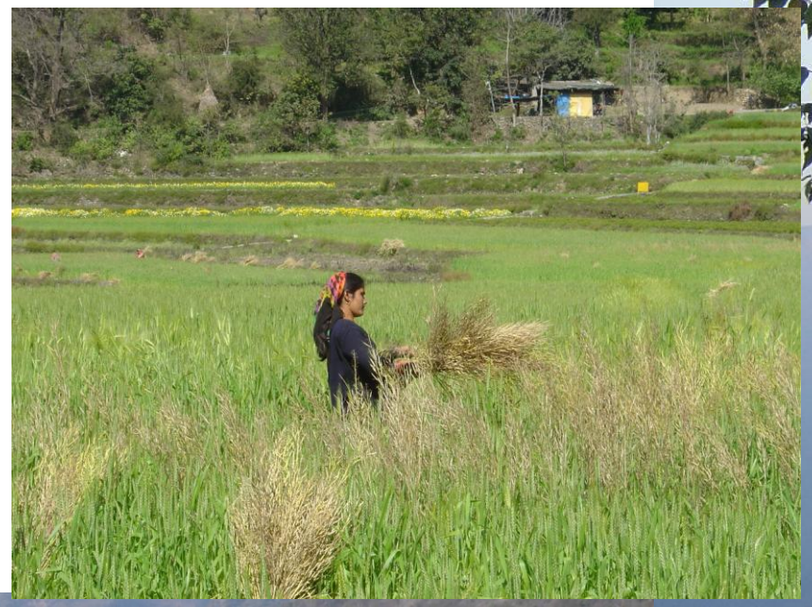
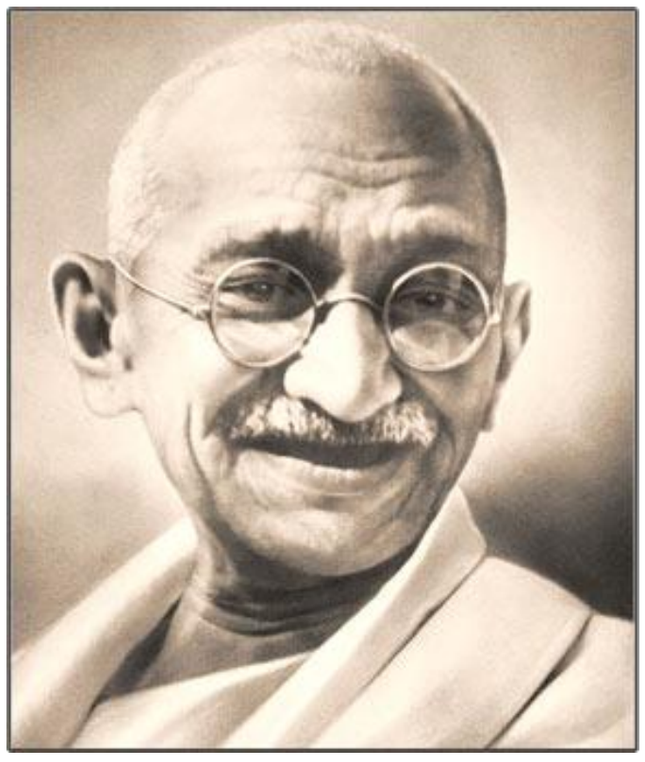
Rural India: A Long-term Perspective Addressing Climate Change Challenge?

Harald Kaechele and T.S. Amjath-Babu



Nature provides enough for human need, but not for human **greed!**



Mahatma Gandhi

Preview

The climate change challenge

The WBGU Budget Approach - 4 core issues

Discussion the role of rural India under the Budget Approach

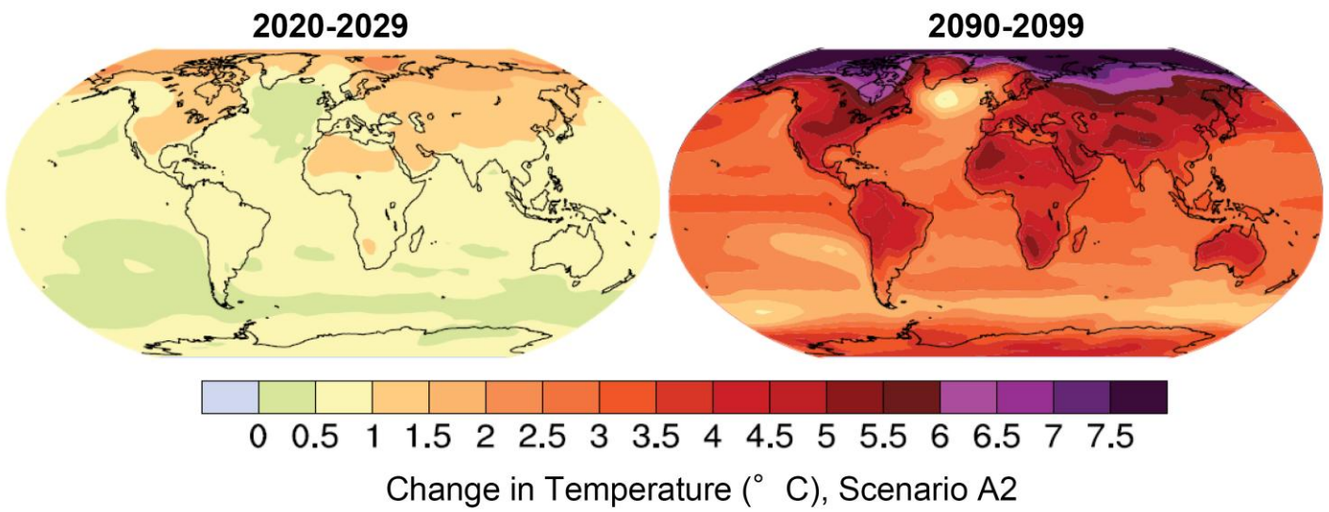
Some conclusions

The Climate Change Challenge

Intergovernmental Panel on Climate Change

IPCC (2007):

*Continued GHG emissions ... would induce many changes ... that would **very likely** be larger than those observed ...*



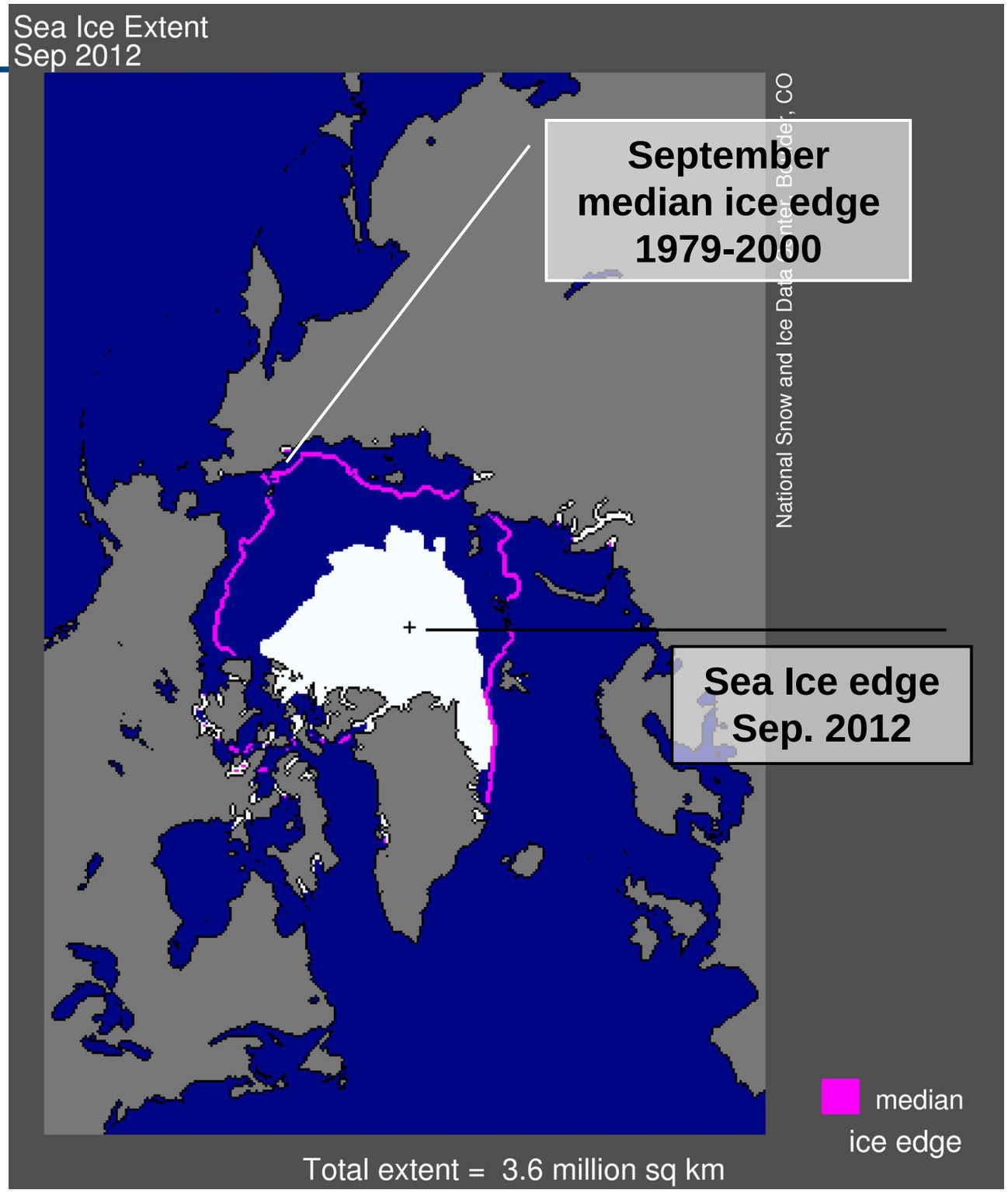
(IPCC, 2007, Fig. WGI-SPM-6)

North Pole total ice area at the end of the summer

(1979-2000)
6.76 Mio. km²

(2012)
3.41 Mio. km²

India: 3.29 Mio km²
Germany: 0.36 Mio. km²



Source: NSIDC 2012

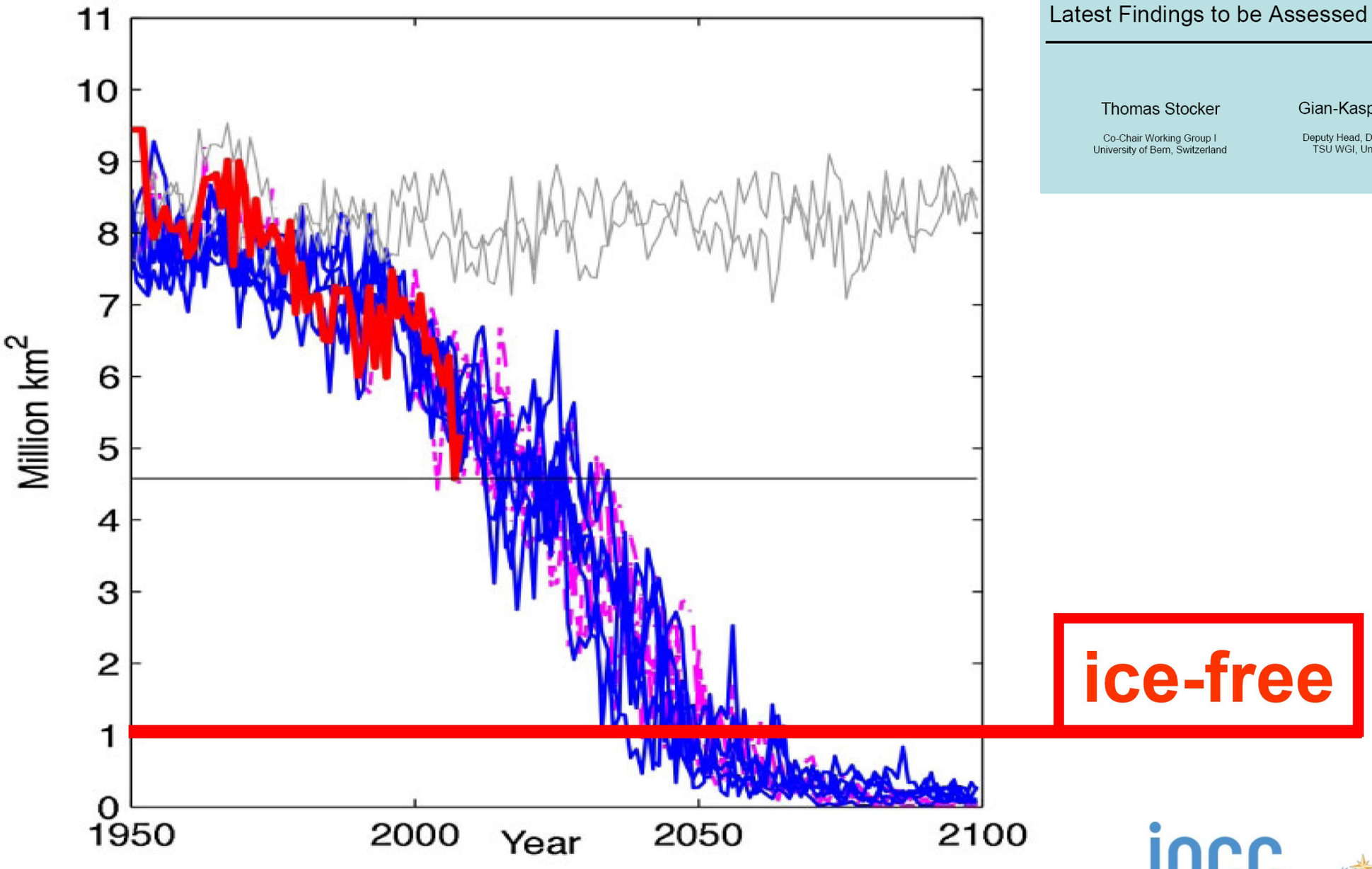
4. Rapid loss of Arctic sea ice

IPCC Working Group I: The Physical Science Basis

The Physical Science Basis of Climate Change: Latest Findings to be Assessed by WGI in AR5

Thomas Stocker
Co-Chair Working Group I
University of Bern, Switzerland

Gian-Kasper Plattner
Deputy Head, Director of Science
TSU WGI, University of Bern



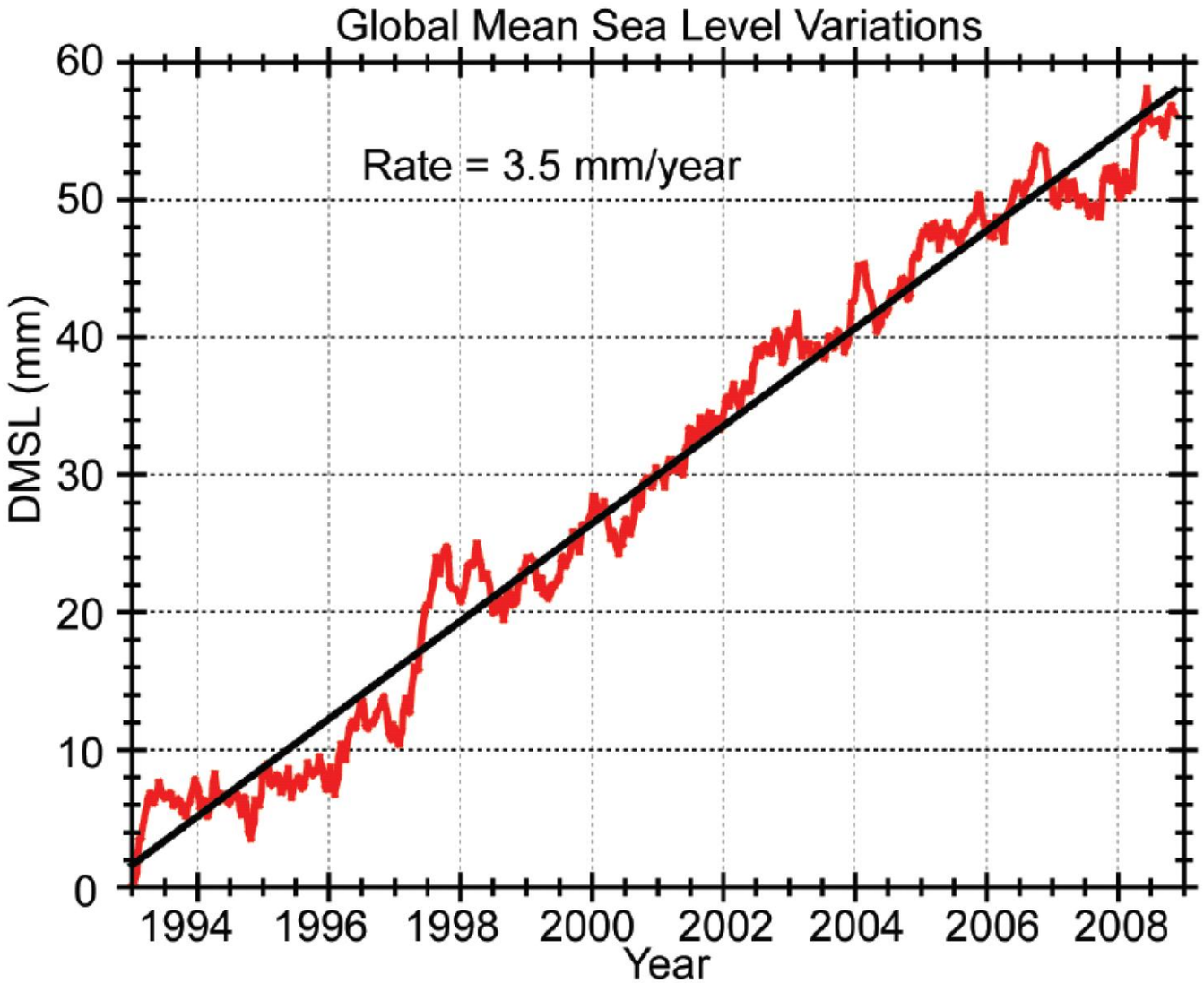
(Wang and Overland, 2009)

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Source: Stocker and Plattner 2009

3. Persistent sea-level rise consistent with earlier estimates



(Merrifield et al., 2009, in BAMS)

Merrifield et al., 2009:

[1993–2008] (3.5 ± 0.4) mm/yr

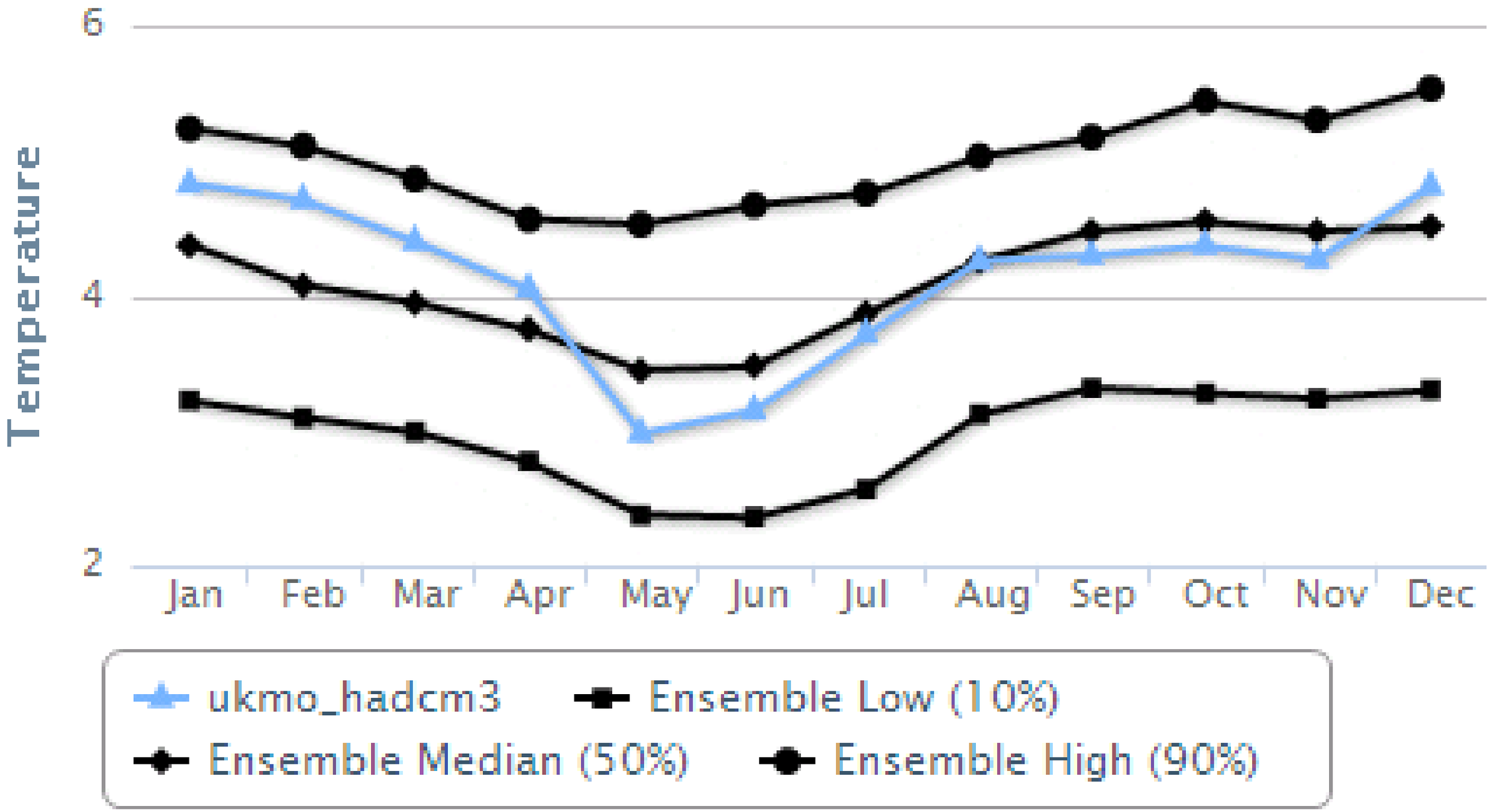
IPCC 2007:

[1993–2003] (3.1 ± 0.7) mm/yr

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

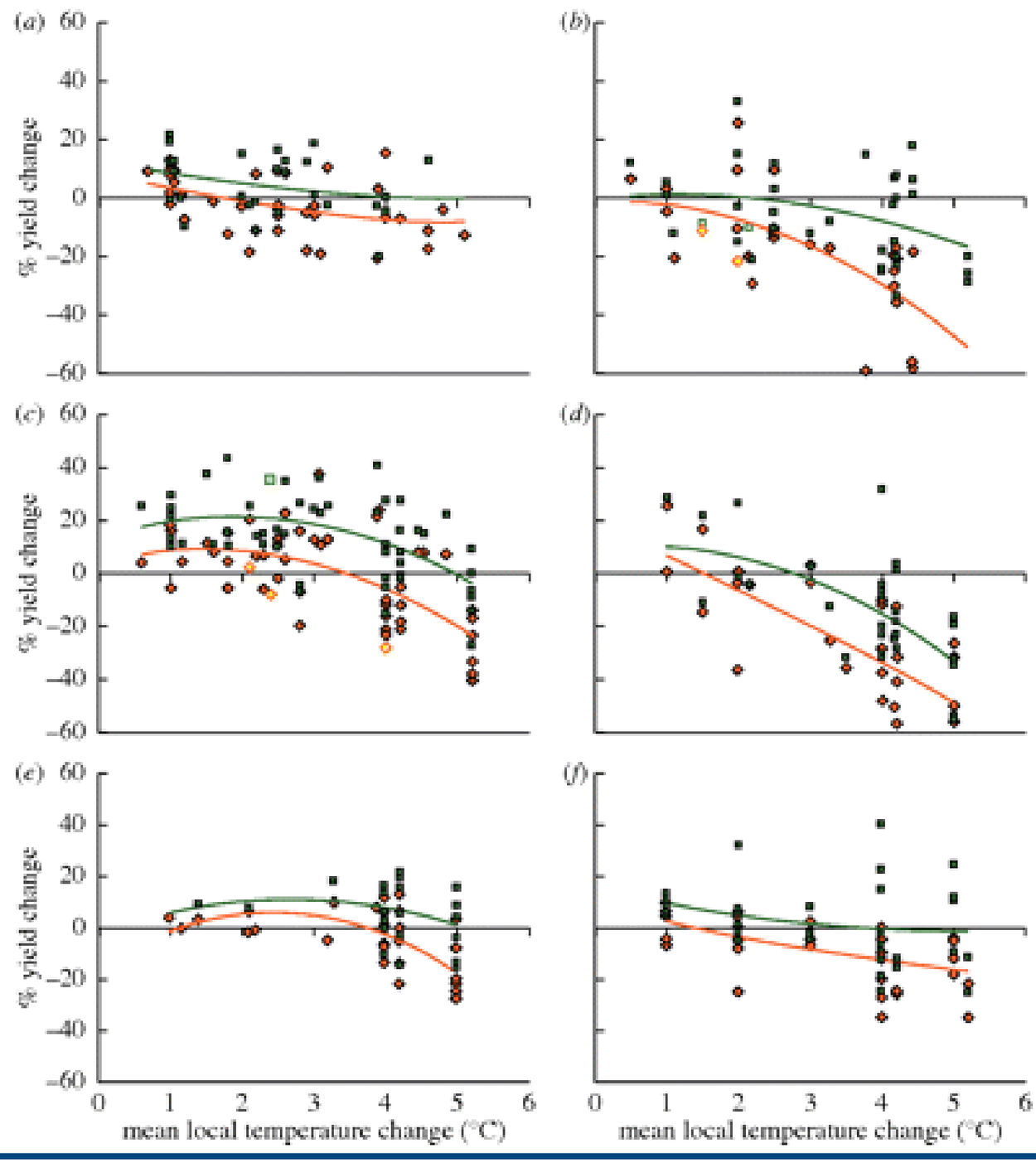
Source: Stocker and Plattner 2009

PROJECTED CHANGE IN TEMPERATURE FOR INDIA FROM 2080 TO 2099.



Source: World Bank

Temperature increase and crop yield change



Maize

Wheat

Rice

With adaptation (green), without adaptation (red)

mid- to high-latitude

low latitude

Source: Gornall et al. 2010

Carbon Dioxide emission is the major driver of Climate Change

CO_2 and temperature relationship

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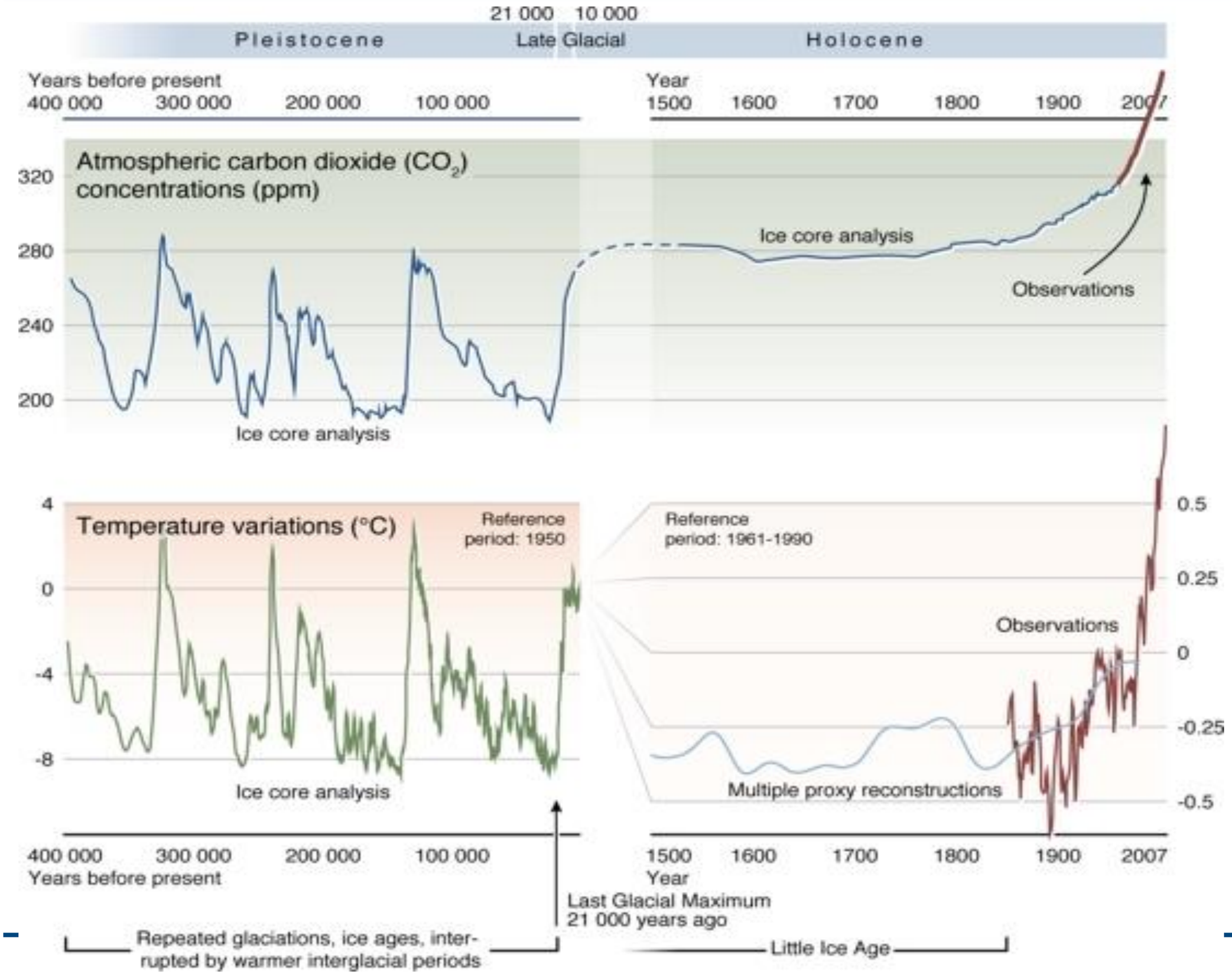
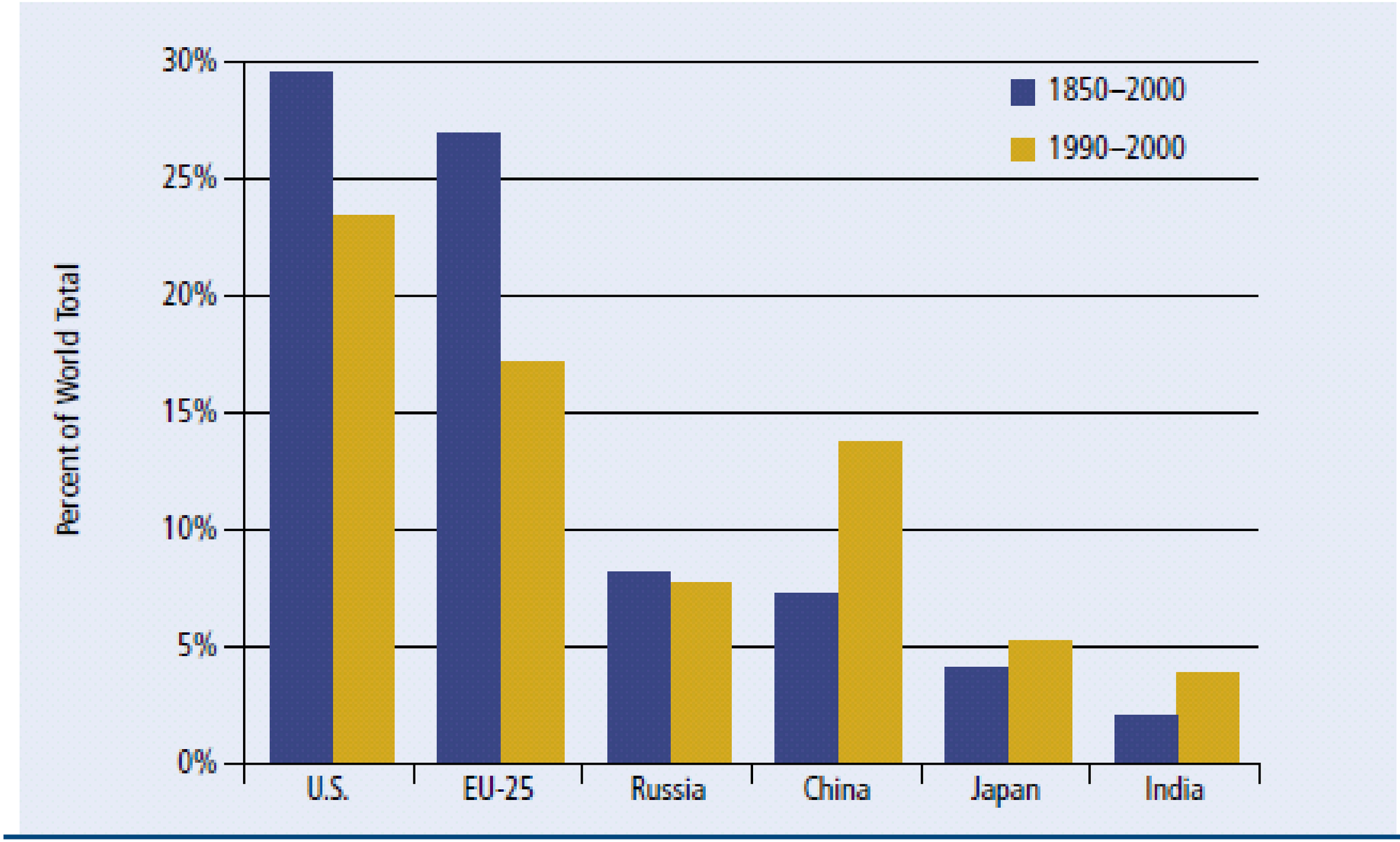


Source: UNEP/GRID

Cumulative CO_2 emission contribution



The vital linkage between rural India and industrialized Germany is exemplified by the fight against climate change.

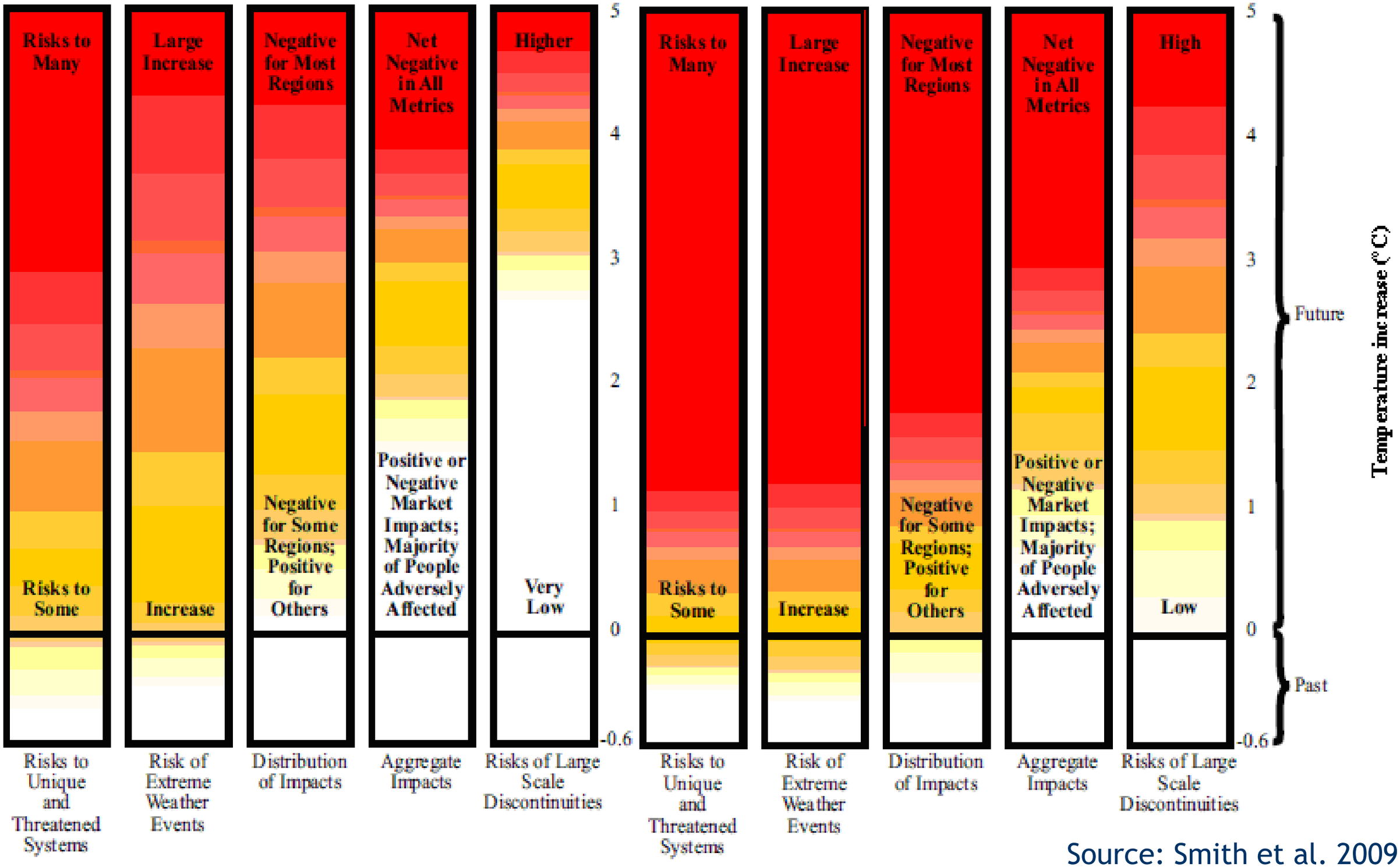
We cause the problem while they have to cope with the problem!

Global Concensus

G 20 and Copenhagen Accord agreed to 2°C guard rail.

It refers to limiting the rise in global temperature to a maximum of 2°C above pre-industrial levels

Impacts of global warming at various temperature escalation scenarios



Source: Smith et al. 2009

To meet 2 degree celsius guard rail with a probability of 67 %, max. 750 Gt CO_2 may be released into earth atmosphere until 2050

It is the carbon budget for all countries to realise the aim

Source: Meinshausen et al. 2009

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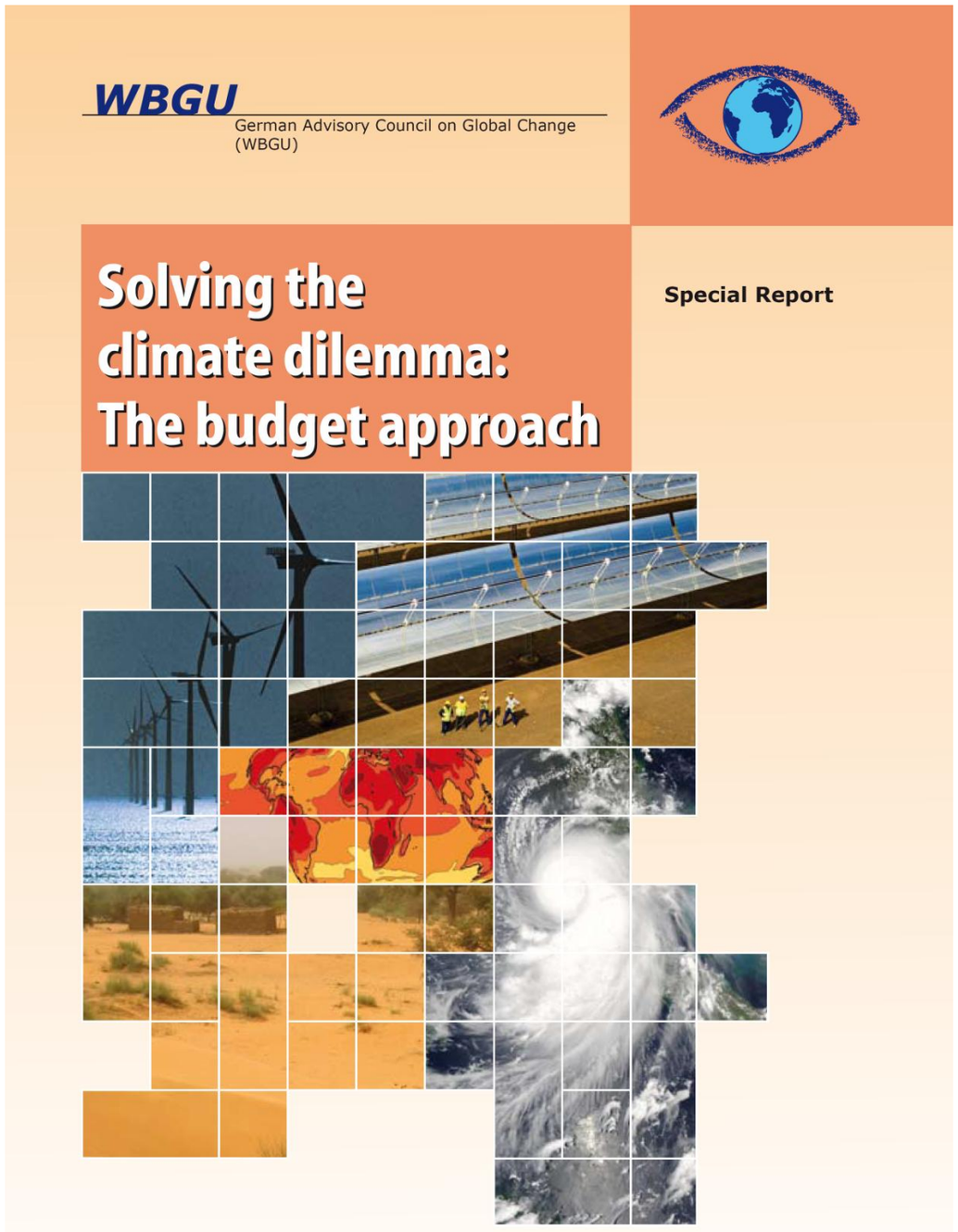
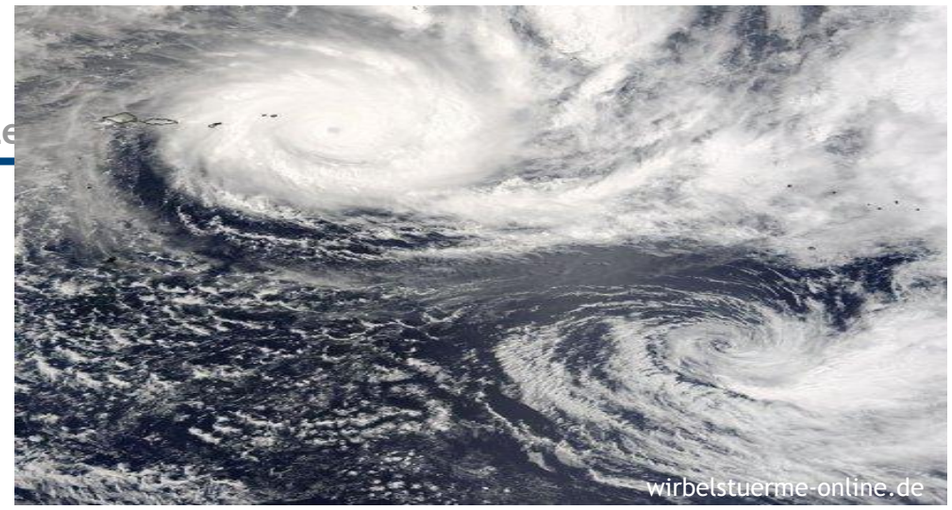
German Advisory Council on Global Change (WBGU)

The Budget Approach





Not a real political option but a very good paradigm or whatever we are able to make out of it!

Core Issues of Budget Approach

1st core issue:

750 Gt CO_2 carbon budget

First time we got aware that CO_2 emissions have become a scarce commodity!

Who owns the sky?

Core Issues of Budget Approach

2nd core issue:

How should distribution of property rights look like?

Core Issues of Budget Approach

Along with the vision of ***climate justice*** formulated by Indian Prime Minister Manmohan Singh and German Chancellor Angela Merkel,

global CO_2 budget should be distributed equally among the world population (***per capita basis)***

Currently it is a story about **Sky-Grabbing** but this approach can bring the issue of **Climate Justice** into forefront!

Core Issues of Budget Approach

According to WBGU,

average yearly emission allowance

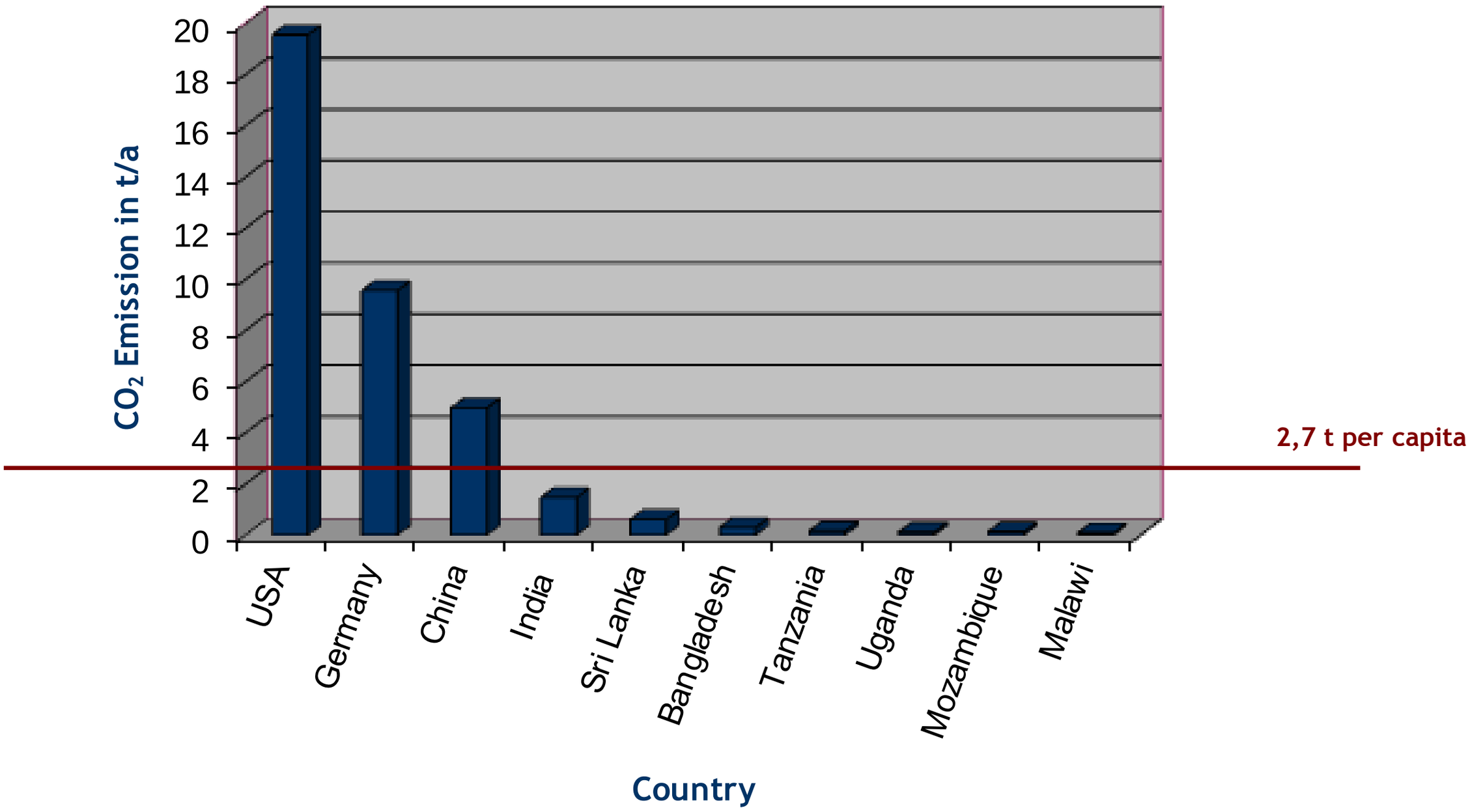
amounts to

2.7 t CO_2 per capita

(for world population 2010)

Core Issues of Budget Approach

Per capita CO_2 Emissions in 2007



Source: World Bank 2009

Core Issues of Budget Approach

WBGU identifies 3 groups of countries that can follow different pathways to decarbonisation

group 1	> 5,4 t	CO_2 per capita per year
group 2	2.7 to 5.4 t	CO_2 per capita per year
group 3	< 2.7 t	CO_2 per capita per year

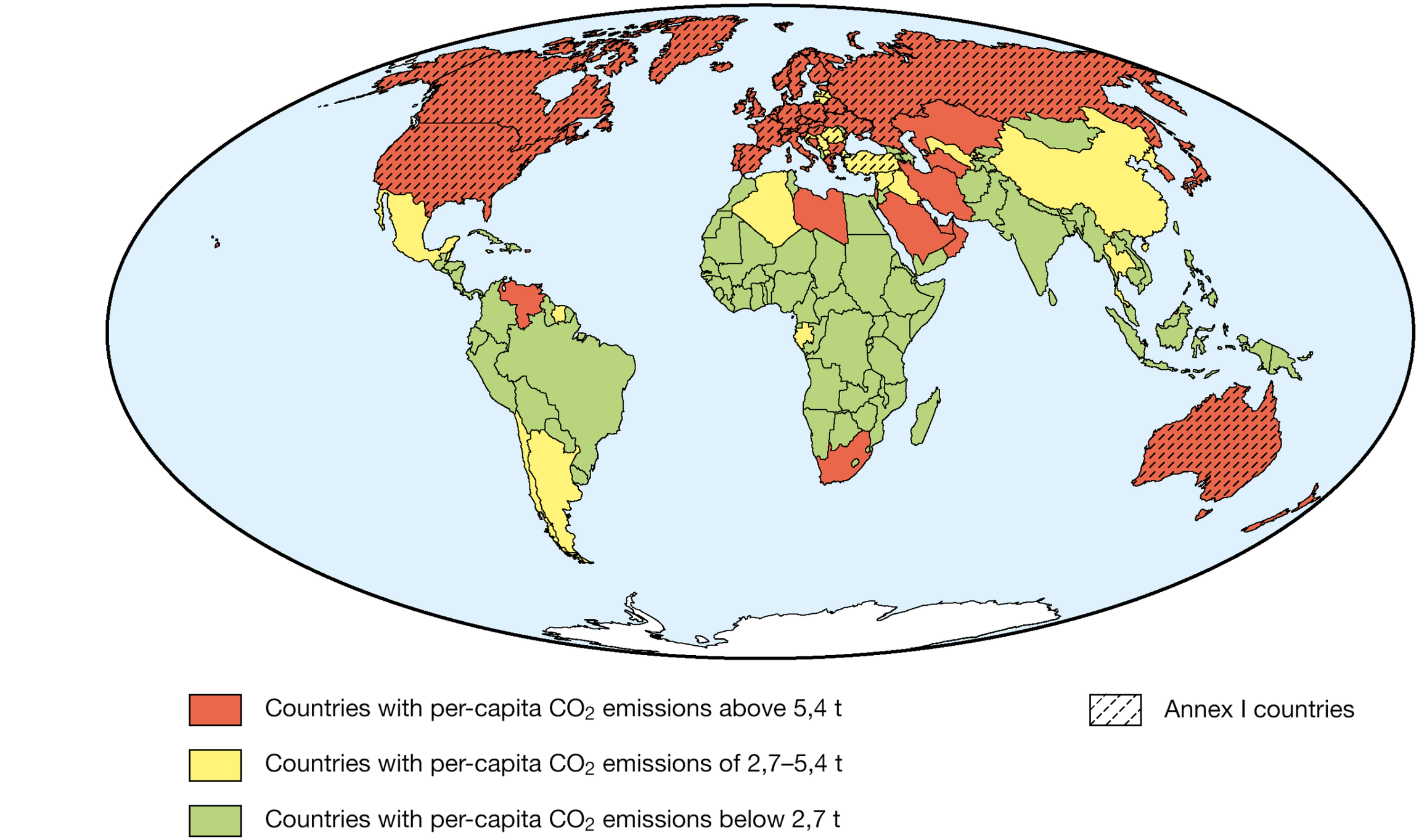


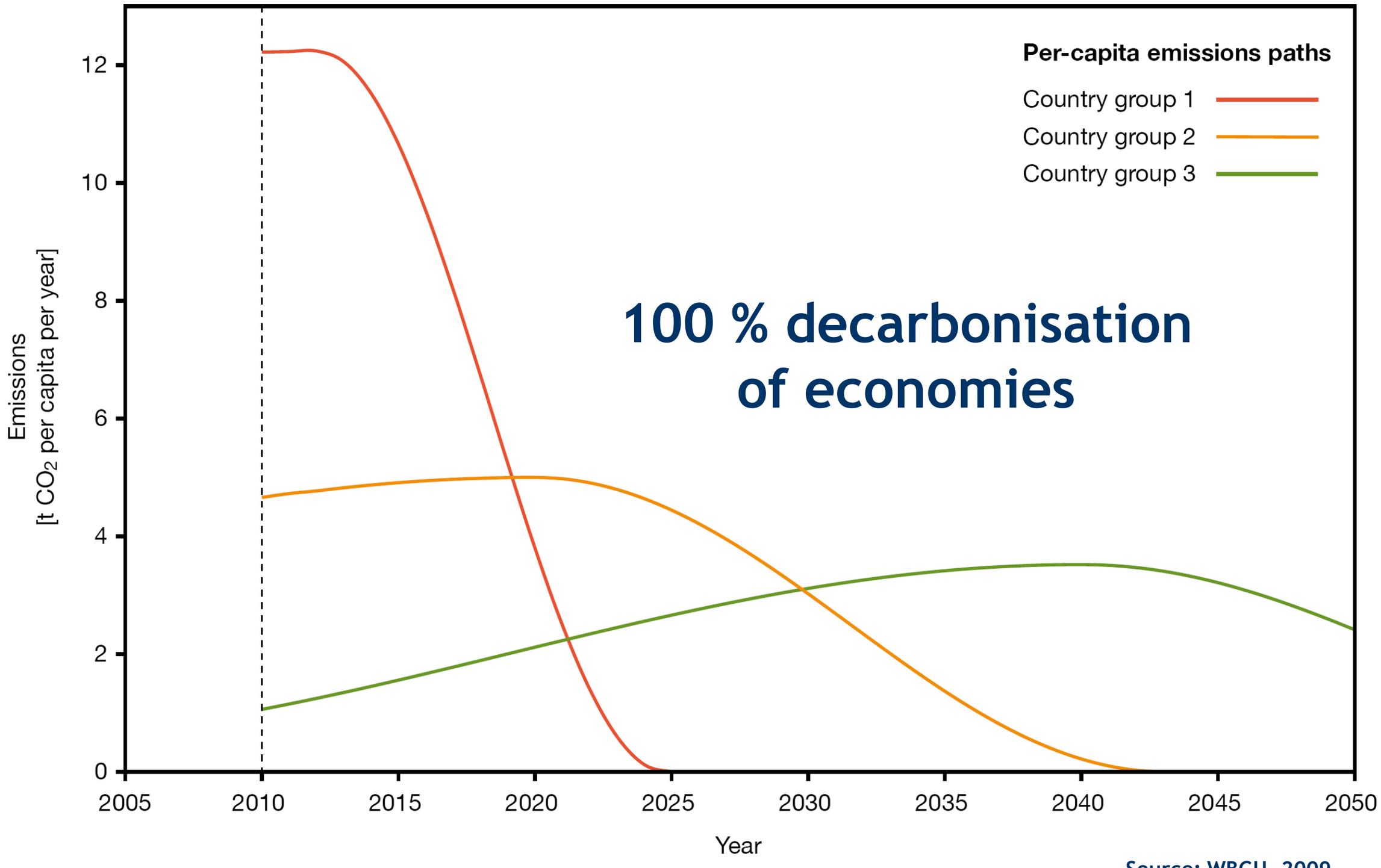
Figure 4.1-1
Per-capita CO_2 emissions in 2005, differentiated by emissions level and country (not including land-use changes).
Source: WBGU, using data from WRI-CAIT, 2009

Core Issues of Budget Approach

3rd core issue:

Decarbonisation of economies is essential to limit temperature increase with in 2⁰C

Examples of per-capita emissions paths of CO_2 for three groups of countries according to the WBGU budget approach



Source: WBGU, 2009

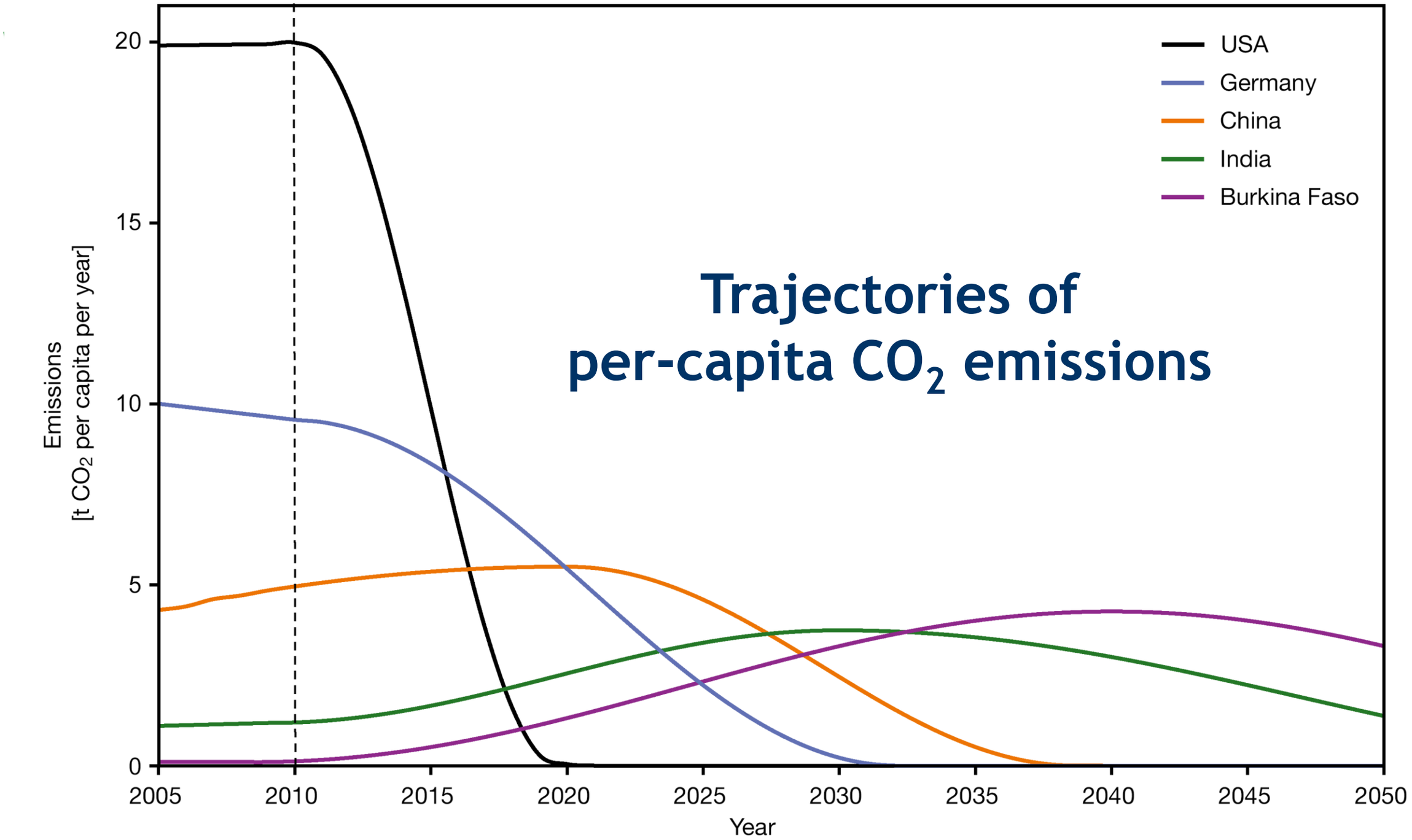


Figure 5.3-4
Examples of theoretical trajectories, over time, of the per-capita emissions of selected countries under the WBGU budget approach, without emissions trading, based solely on CO_2 emissions from fossil sources and assuming a constant population (2010). Starting from current emissions (estimated for 2008), theoretical per-capita emissions trajectories over time were calculated that would allow compliance with the national budgets. However, for some countries (e.g. the USA), the trajectory presented would be unrealistic in practice. Each country is entitled to a total of 110 t CO_2 emissions per capita over the period from 2010 to 2050, based on population data for 2010. Actual per-capita emissions will deviate, sometimes substantially, from these trajectories due to the sale and purchase of emission allowances.
Source: WBGU

Core Issues of Budget Approach

4th core issue:

Possibility of trading of CO_2 emission permits among countries may facilitate a cost effective path of decarbonisation

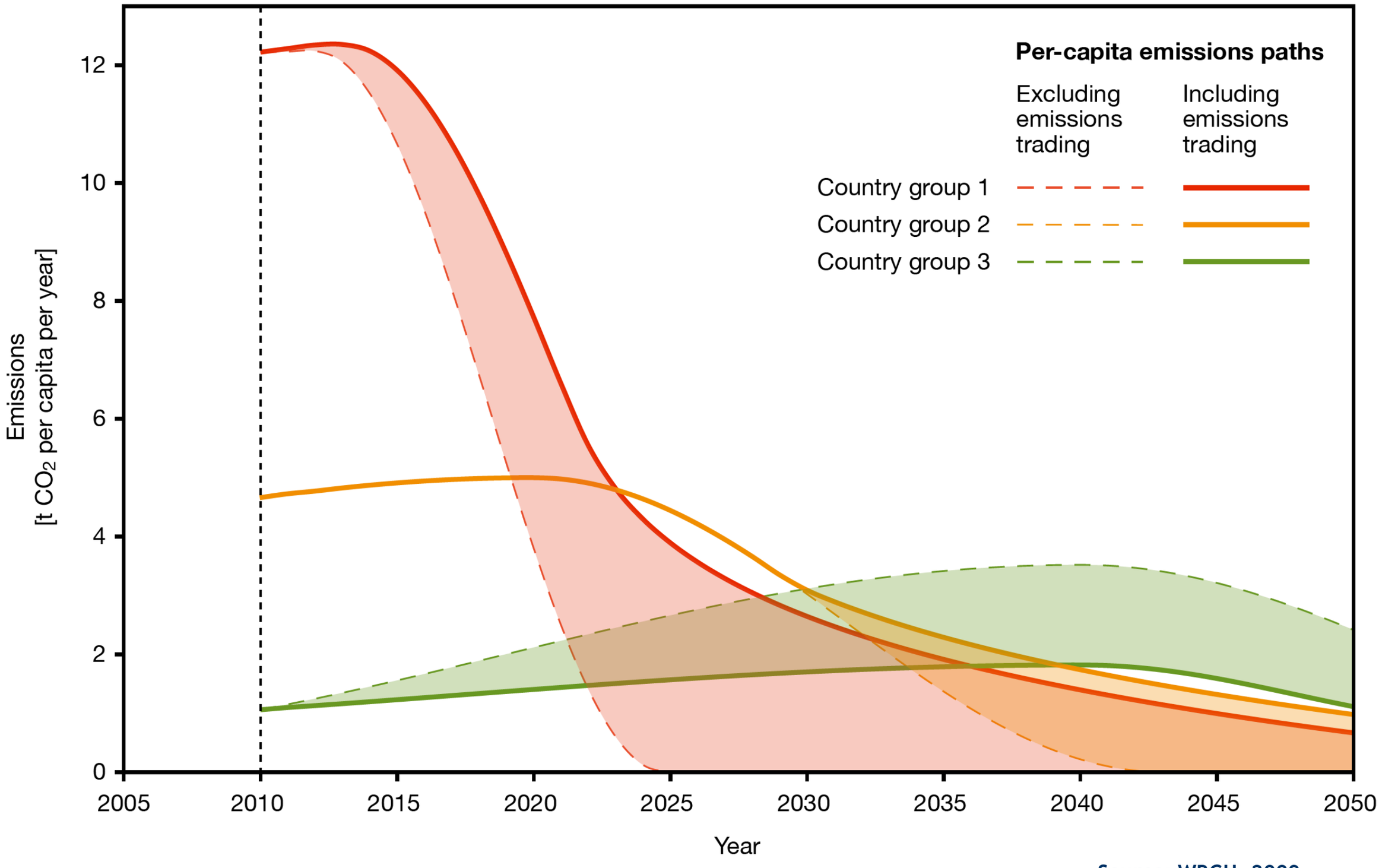
Core Issues of Budget Approach

Group 1: even if countries undertake exceptional efforts to de-carbonize their economy, for a limited time there is a need for extra CO_2 permits from other countries

Group 2 might meet CO_2 guard rail without extra permits

Group 3 might provide permits for group 1 countries (sell permissions via International Climate Bank)

Examples of per-capita emissions paths of CO2 from fossil sources for three groups of countries according to the WBGU budget approach, which could emerge through emissions trading



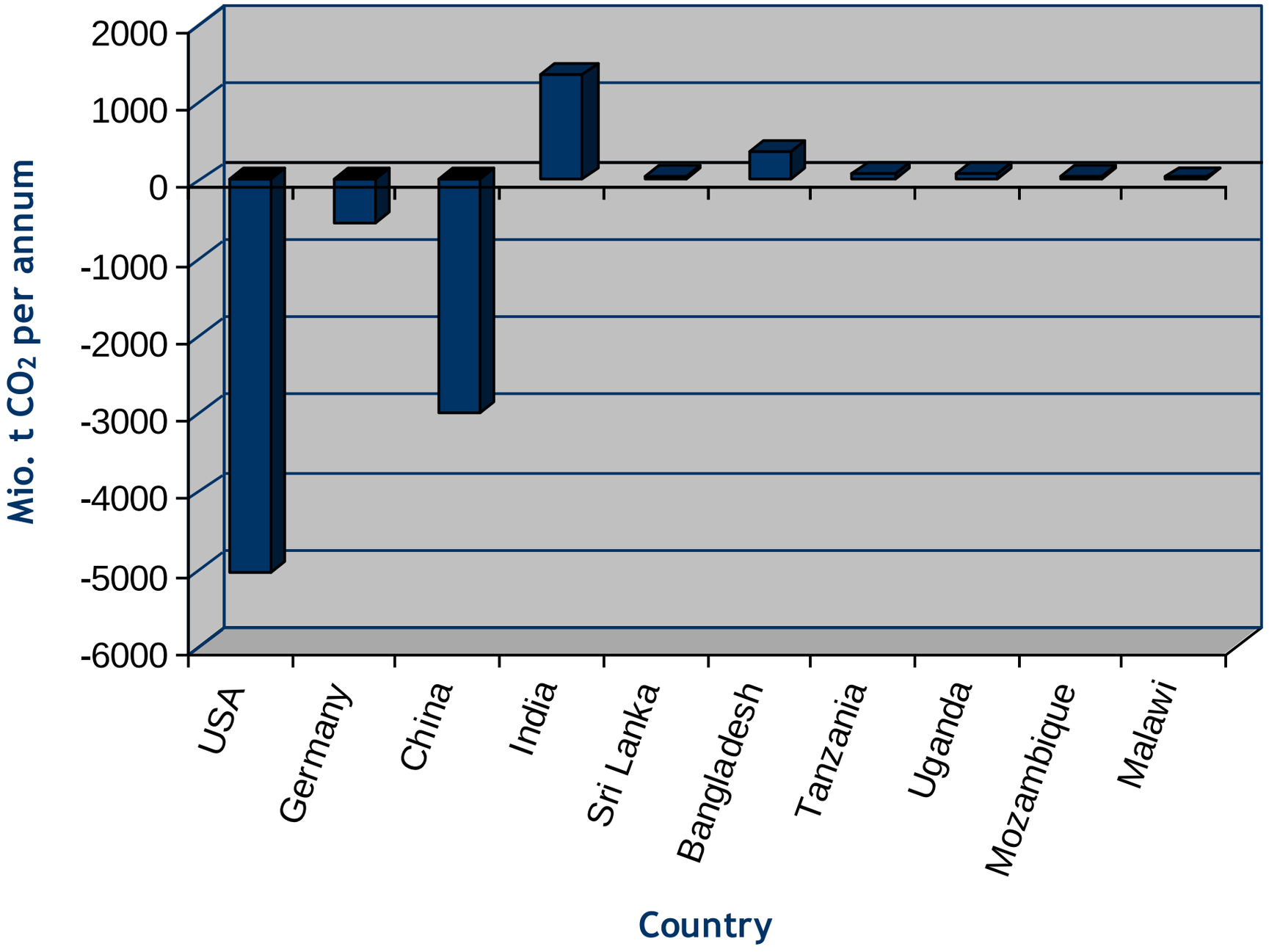
Source: WBGU, 2009

Core Issues of Budget Approach

India, due to its big population and lower per capita emissions, is the only country within 3rd group that might be able to provide substantial amount of CO_2 permits

Core Issues of Budget Approach

Demand/Supply of CO_2 Budgets per annum in Mio t in 2007



Source: World Bank ~~2008~~ 2009

Discussing the role of rural India under cumulative emission budget approach

I) Tradable carbon surplus stems from the poor

Population, expenditure class and CO_2 emissions in India 2003-2004.				
Expenditure class (2003-04)	Population (millions)		CO_2 emissions (t/capita/year)	
	rural	urban	rural	urban
EC1 very poor	77.2	30.0	0.150	0.272
EC2 (poor below poverty line)	154.4	60.0	0.215	0.432
EC3 average	308.7	120.1	0.336	0.802
EC4 above average	154.4	60.0	0.677	1.567
EC5 relatively well off	77.2	30.0	1.365	4.099

Source: Saluja and Yadav, 2006; Parikh et al., 2009.

II) Trade of CO_2 surplus budget might provide funding for low carbon development in rural India

Picture: New and Renewable Energy

Auctioning of Emission Allowances in Germany: Periodical Report July 2011

Month	Contract	Dates	Bid Volume	Auction Volume	Cover Ratio	Clearing Price	Revenue
January	Spot	4	5,931,000	1,200,000	*4.94	*14.14 €	16,965,000 €
	Futures	4	11,877,000	2,280,000	*5.21	*14.51 €	33,071,400 €
February	Spot	3	8,657,000	1,200,000	*7.21	*14.66 €	17,595,000 €
	Futures	4	14,081,000	2,280,000	*6.18	*14.87 €	33,892,200 €
March	Spot	5	11,693,000	1,500,000	*7.80	*15.92 €	23,886,000 €
	Futures	5	25,105,000	2,850,000	*8.81	*16.54 €	47,139,000 €
April	Spot	4	9,529,000	1,200,000	*7.94	*16.45 €	19,737,000 €
	Futures	4	18,997,000	2,280,000	*8.33	*16.92 €	38,577,600 €
May	Spot	5	19,924,000	1,500,000	*13.28	*16.62 €	24,930,000 €
	Futures	4	24,197,000	2,280,000	*10.61	*16.69 €	38,047,500 €
June	Spot	4	15,479,000	1,200,000	*12.90	*15.12 €	18,147,000 €
	Futures	5	20,503,000	2,850,000	*7.19	*15.55 €	44,328,900 €
July	Spot	4	15,477,000	1,200,000	*12.90	*12.49 €	14,988,000 €
	Futures	4	21,270,000	2,280,000	*9.33	*12.63 €	28,790,700 €
Spot		**29**	**86,690,000**	**9,000,000**	***9.63**	***15.14 €**	**136,248,000 €**
Futures		**30**	**136,030,000**	**17,100,000**	***7.95**	***15.43 €**	**263,847,300 €**
Total		**59**	**222,720,000**	**26,100,000**	****8.53**	****15.33 €**	**400,095,300 €**

Source: DEHSt 2011

Per capita value of annual CO_2 trading budget in India 2003-2004

($20,25$ US $ /t CO_2)

Expenditure class (2003-04)	Population (millions)		CO_2 trading budget (US $/capita/year)	
	rural	urban	rural	urban
EC1 very poor	**77.2**	**30.0**	**51.64**	**49.17**
EC2 (poor below poverty line)	**154.4**	**60.0**	**50.32**	**45.93**
EC3 average	**308.7**	**120.1**	**47.87**	**38.43**
EC4 above average	**154.4**	**60.0**	**40.97**	**22.94**
EC5 relatively well off	**77.2**	**30.0**	**27.03**	**-21.65**

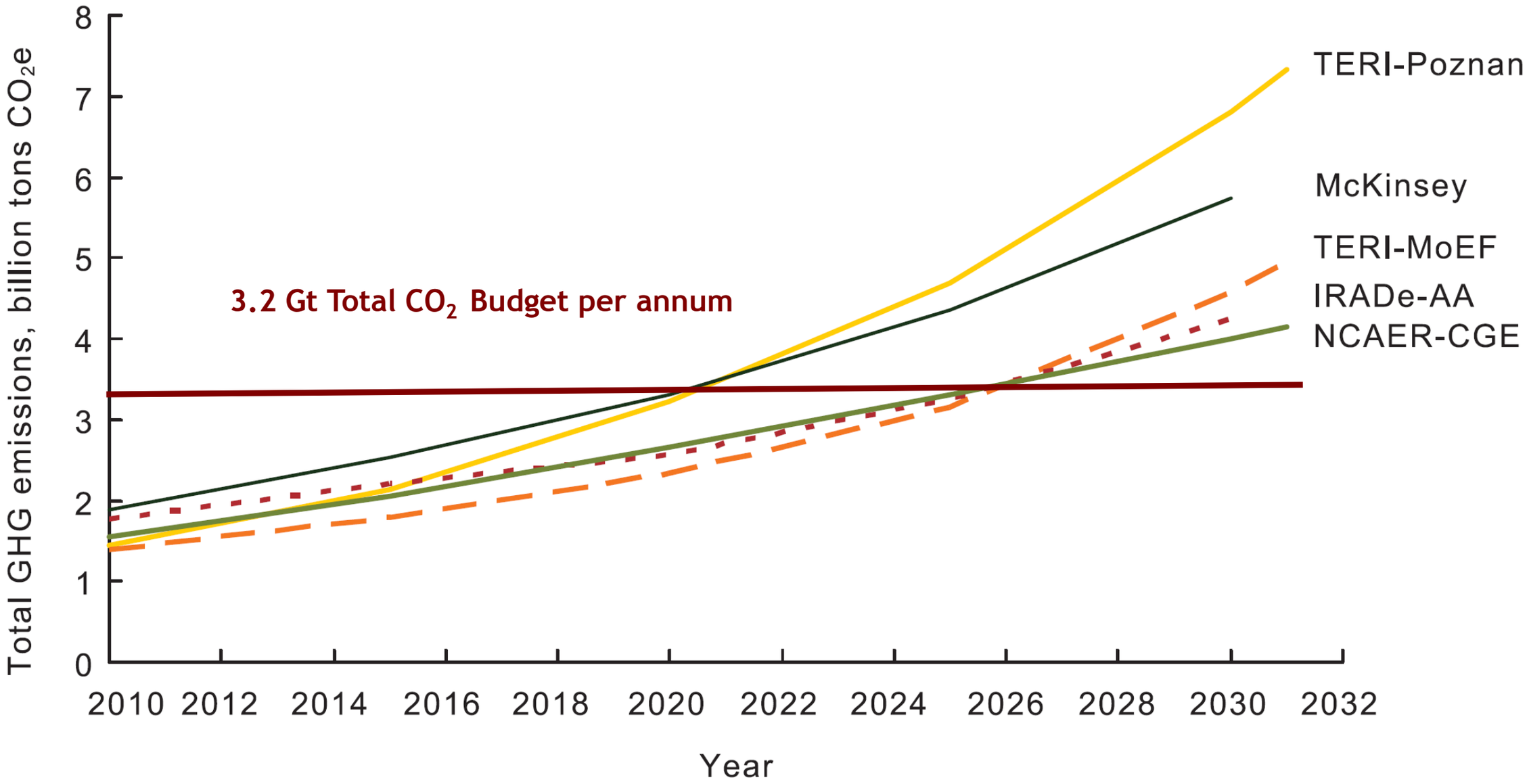
Source: according Kaechele et. al 2011

III) Current tradable carbon budget surplus is 1.7Gt (worth 35 billion US $) but in the case of business as usual development, this window of opportunity closes soon


Picture: Git4you.com

Total GHG emissions

GHG emissions projections for India from 5 studies in Illustrative Scenarios (2010-2031)



Source: Climate Modelling Forum, 2009

Conclusions

General Conclusions

- There are a number of reasons to belive that the ongoing emissions poses unprecendented risks of climate change
- Budget approach proposes a way of realizing the 2 degree celisus limit and addresses the issue of climate justice
- The cumulative budget, the equal per capita allowance, distinct decarbonisation path and the carbon trading mechanism are features of the approach

General Conclusions (Western Countries)

Given the Budget approach,

- Industrialised world has to depend on India's poorest to provide sur-plus budget to buffer their carbon budget deficit

- Western Countries need buffer budget for long time

- Western Countries should have a vital interest to support India's poorest to develop without additional CO_2 requirement (low carbon growth)

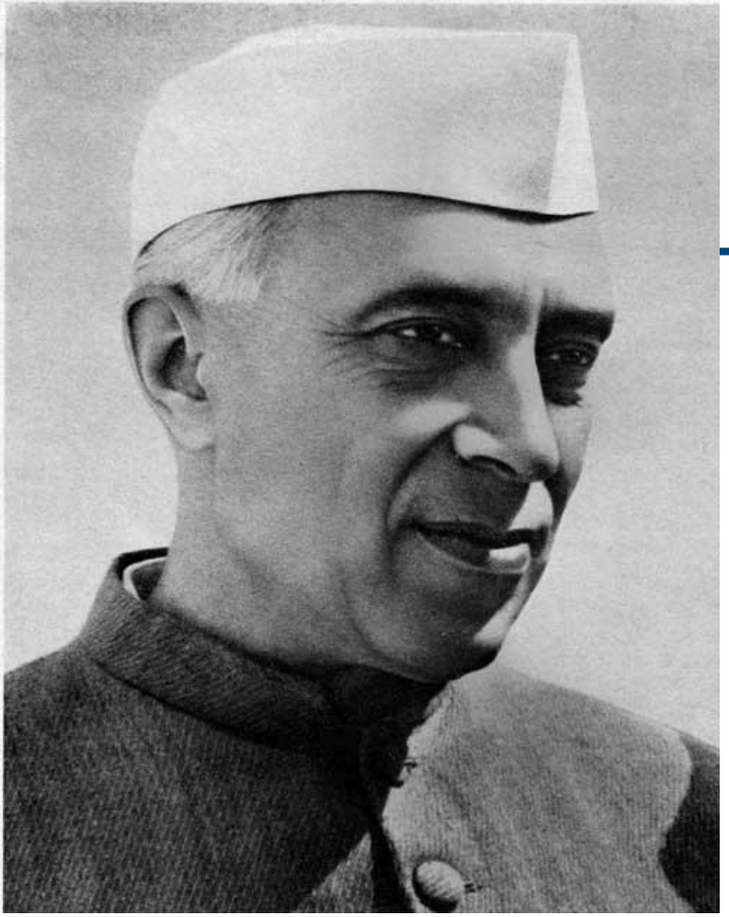
General Conclusion (India)

Even though Indian rural societies have a right to increase CO_2 emission tremendously, mutual benefits can be obtained from following an innovative low carbon pathway instead of carbon intensive development

Generating tradable CO_2 permissions might become a powerful instrument for generating money for low carbon develop-ment in rural societies

General Conclusions

- In a business as usual scenario, today's low emitters of India could transform to high emitters and hence closing the tradable carbon space within few years.
- It means that a cost effective decarbonization of industrialized countries using the surplus budget (still meeting the tolerable warming limit) is possible only if a mechanism similar to WBGU budget approach is in place as soon as possible
- The political will to realize such a climatic regime is questionable!



All the nations and peoples are too closely knit together today for any one of them to imagine that it can live apart. Peace has been said to be indivisible.

Jawaharlal Nehru

Thank You

For applying for a fellowship from German government:

Master students: www.daad.de

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Contact me: hkaechele@zalf.de