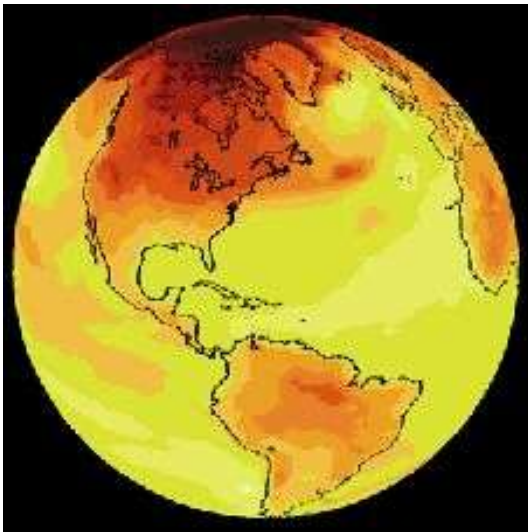
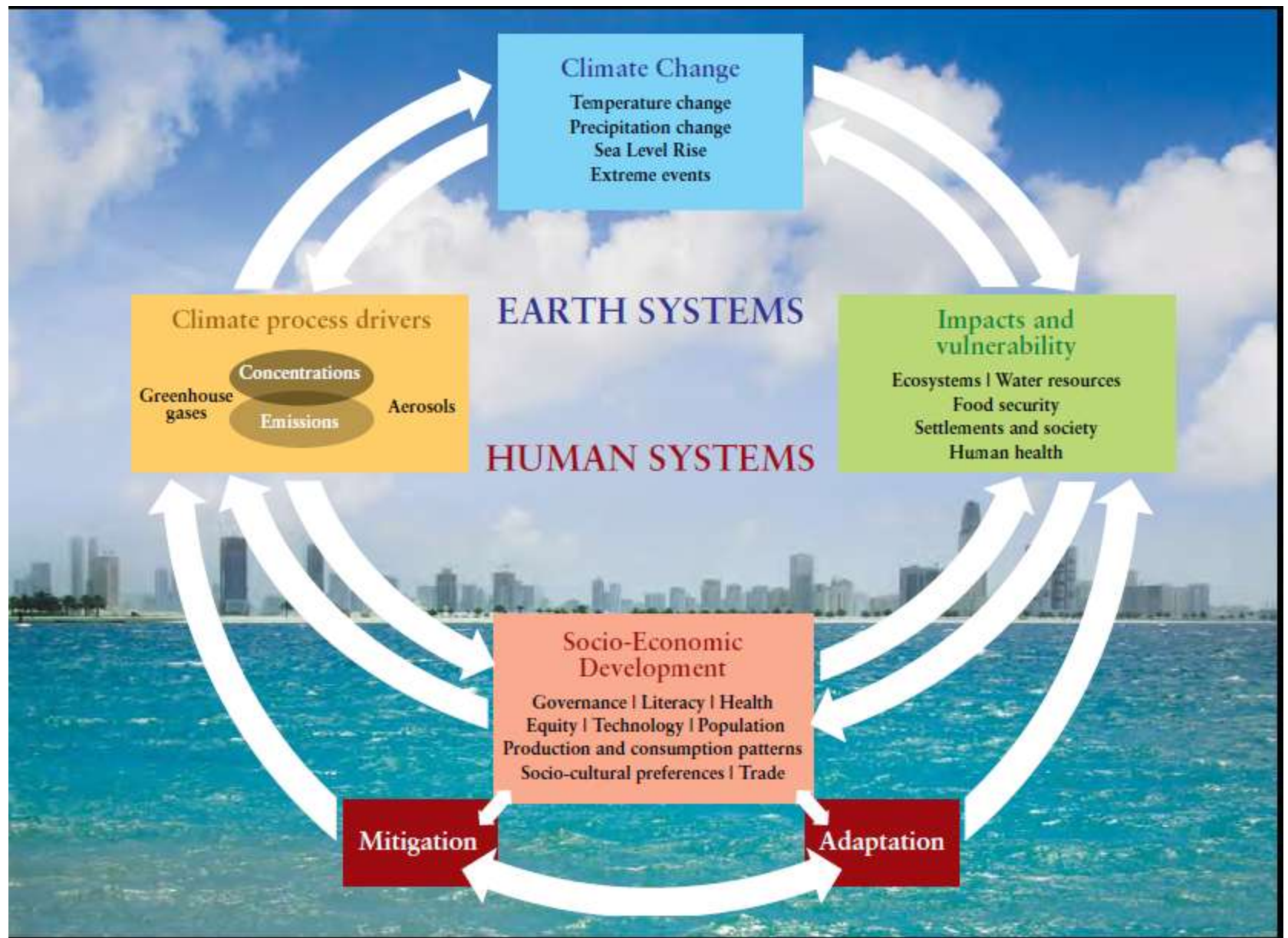


EMERGING CHALLENGES ON MITIGATION OF CLIMATE CHANGE



SAUT M LUBIS

8TH AUGUST 2011

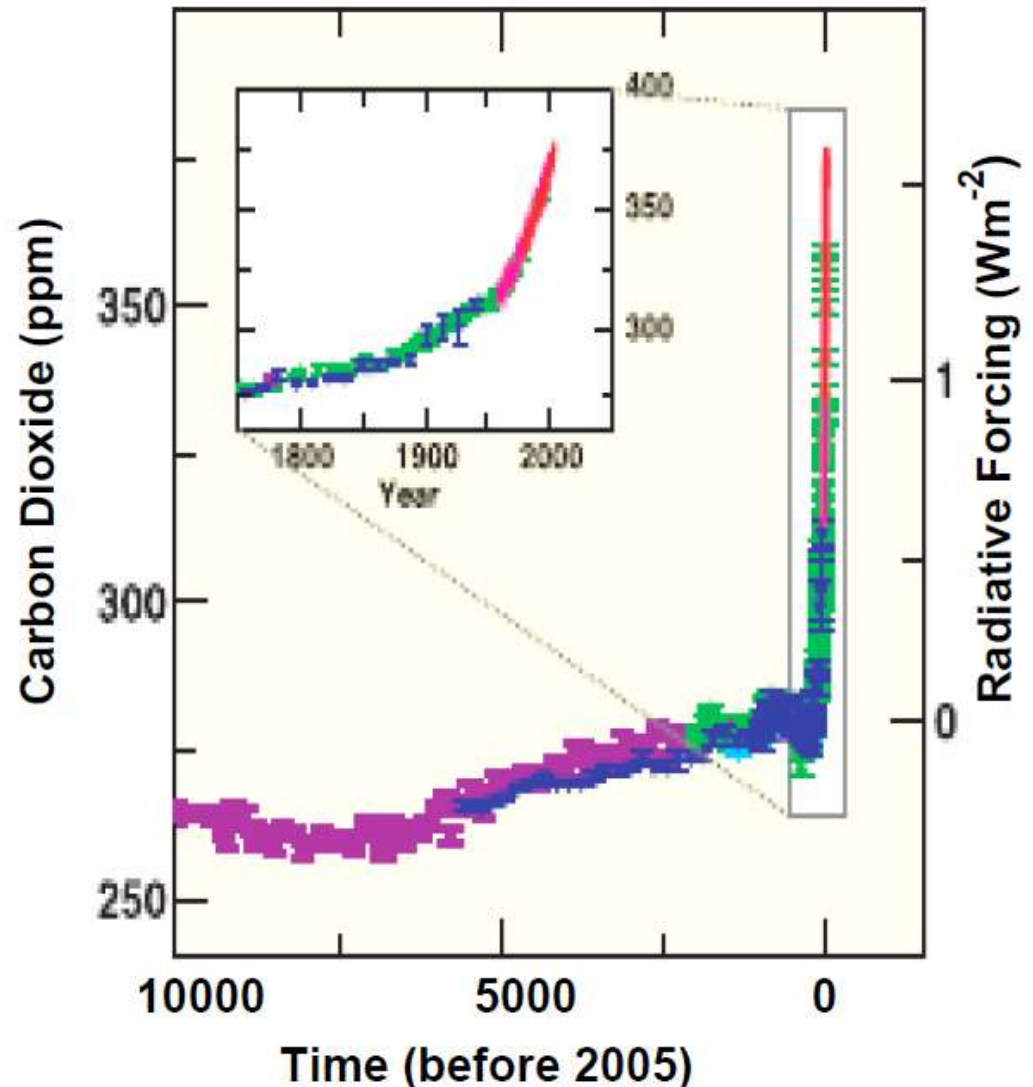


Human contribution to climate change

Changes in CO₂ from ice core and modern data

Global atmospheric concentrations of greenhouse gases **increased markedly as result of human activities**

In 2005 concentration of CO₂ **exceeded by far the natural range** over the last 650,000 years



GHG/CO₂ ATMOSPHERIC TRENDS

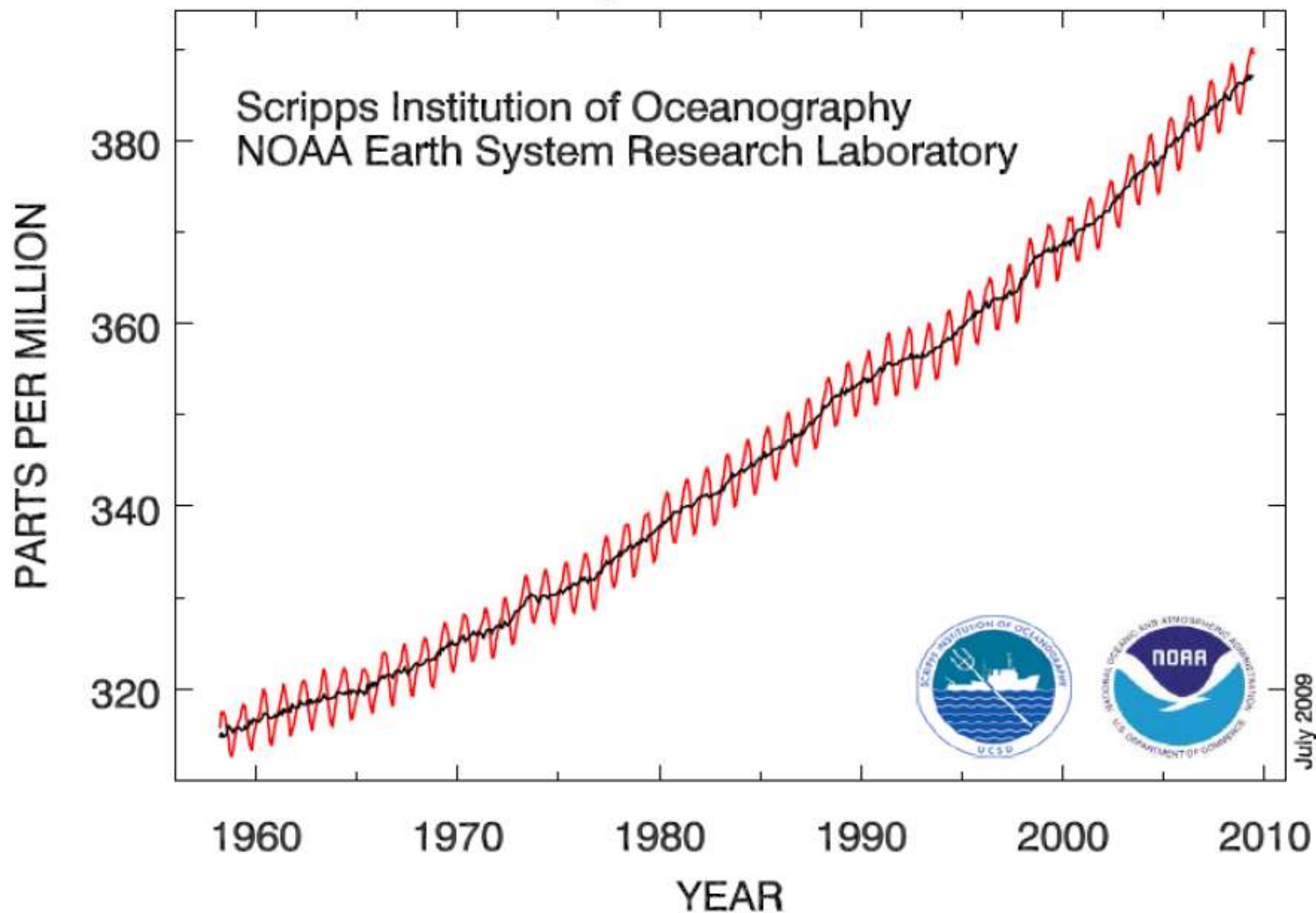
- ❑ CO₂ IS THE MOST IMPORTANT ANTHROPOGENIC GHG. ITS ANNUAL EMISSIONS HAVE GROWN BETWEEN 1970 AND 2004 BY ABOUT 80%, FROM 21 TO 38 GT AND REPRESENTED 77% OF TOTAL ANTHROPOGENIC GHG EMISSIONS IN 2004. THE RATE OF GROWTH OF CO₂-EQ EMISSIONS WAS MUCH HIGHER DURING THE RECENT TEN YEAR PERIOD OF 1995-2004 (0.92 GtCO₂-EQ PER YEAR) THAN DURING THE PREVIOUS PERIOD OF 1970-1994 (0.43 GtCO₂-EQ PER YEAR). THE GLOBAL MEAN CONCENTRATION OF CO₂ IN 2005 WAS 379 PPM.
- ❑ THE CURRENT ATMOSPHERIC CONCENTRATIONS OF ALL LONG-LIVED GHGS IE. CO₂, CH₄, N₂O, HFCs, PFCs AND SF₆ IS NOW ABOUT 455 PPM CO₂-EQ. INCORPORATING THE COOLING EFFECT OF AEROSOLS, OTHER AIR POLLUTANTS AND GASES RELEASED FROM LAND-USE CHANGE INTO THE EQUIVALENT CONCENTRATION, LEADS TO AN EFFECTIVE 311-435 PPM CO₂-EQ CONCENTRATION (A BEST ESTIMATE IS ABOUT 375 PPM CO₂-EQ). ACCORDING TO STUDY BY HADLEY CENTRE, THE GHG CONCENTRATIONS IN 2004 IS AT 430 PPM CO₂EQ, RISING AT 2,5 PPM P.A. AND THIS RATE OF INCREASE IS INCREASING (HADLEY CENTRE, 2004).

CO₂-EQUIVALENT EMISSION



CO₂-EQUIVALENT IS THE AMOUNT OF CO₂ EMISSION THAT WOULD CAUSE THE SAME TIME INTEGRATED RADIATIVE FORCING, OVER A GIVEN TIME HORIZON, AS AN EMITTED AMOUNT OF A LONG-LIVED GHG OR A MIXTURE OF GHGs. THE EQUIVALENT CO₂ EMISSION IS OBTAINED BY MULTIPLYING THE EMISSION OF A GHG BY ITS GLOBAL WARMING POTENTIAL (GWP) FOR THE GIVEN TIME HORIZON. FOR A MIX OF GHGs IT IS OBTAINED BY SUMMING THE EQUIVALENT CO₂ EMISSIONS OF EACH GAS. EQUIVALENT CO₂ EMISSION IS A STANDARD AND USEFUL METRIC FOR COMPARING EMISSIONS OF DIFFERENT GHGs BUT DOES NOT IMPLY THE SAME CLIMATE CHANGE RESPONSES (SYNTHESIS REPORT, IPCC, AR4).

Atmospheric CO₂ at Mauna Loa Observatory



Carbon Dioxide

Fossil fuel emissions:

1980s: 19.8 GtCO₂ /yr

1990s: 23.5 GtCO₂ /yr

2000-2005: 26.4 GtCO₂ /yr

Land Use Change flux:

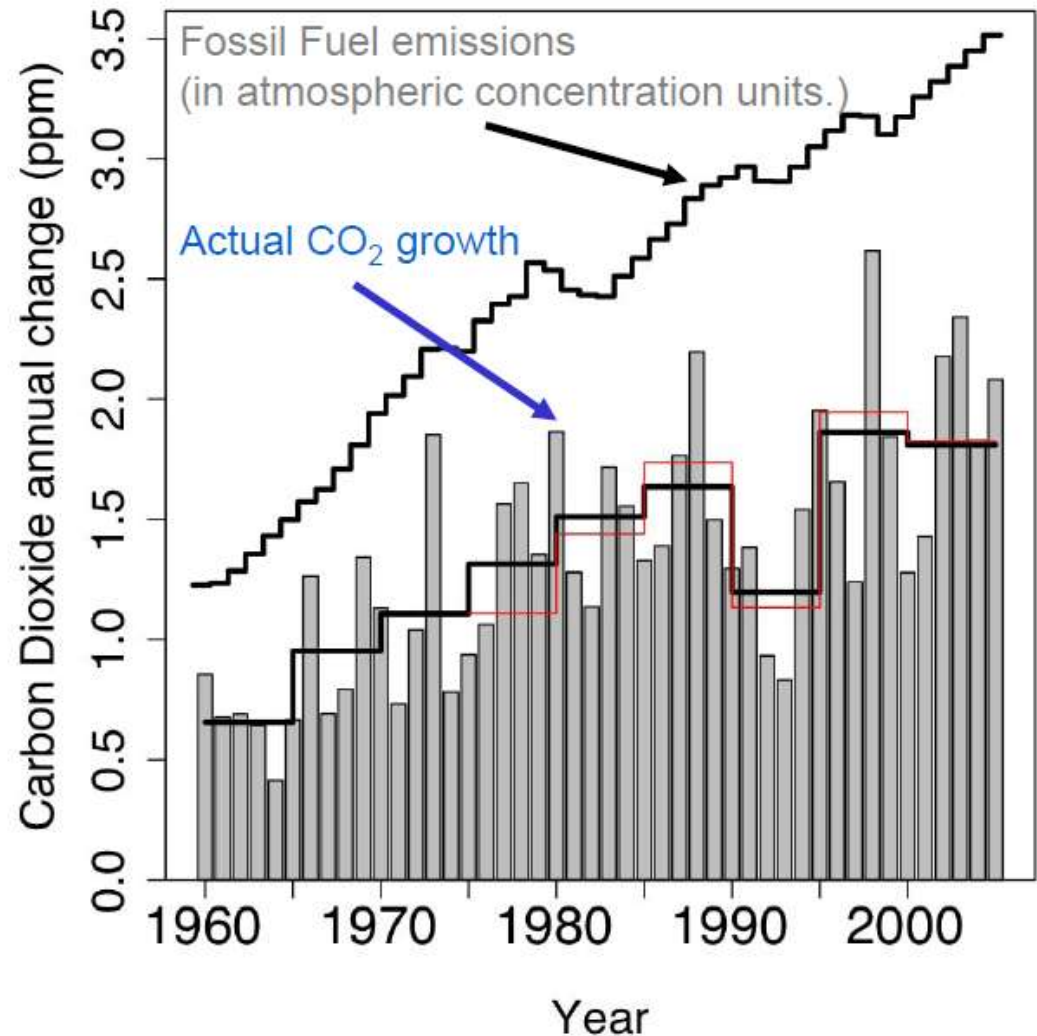
1980s: 5.1 GtCO₂ /yr

1990s: 5.9 GtCO₂ /yr

Atmospheric CO₂ growth rate:

1960 – 2005: 1.4 ppm /yr

1995 – 2005: 1.9 ppm /yr



Direct observations of recent climate change

Changes in temperature, sea level and northern hemisphere snow cover



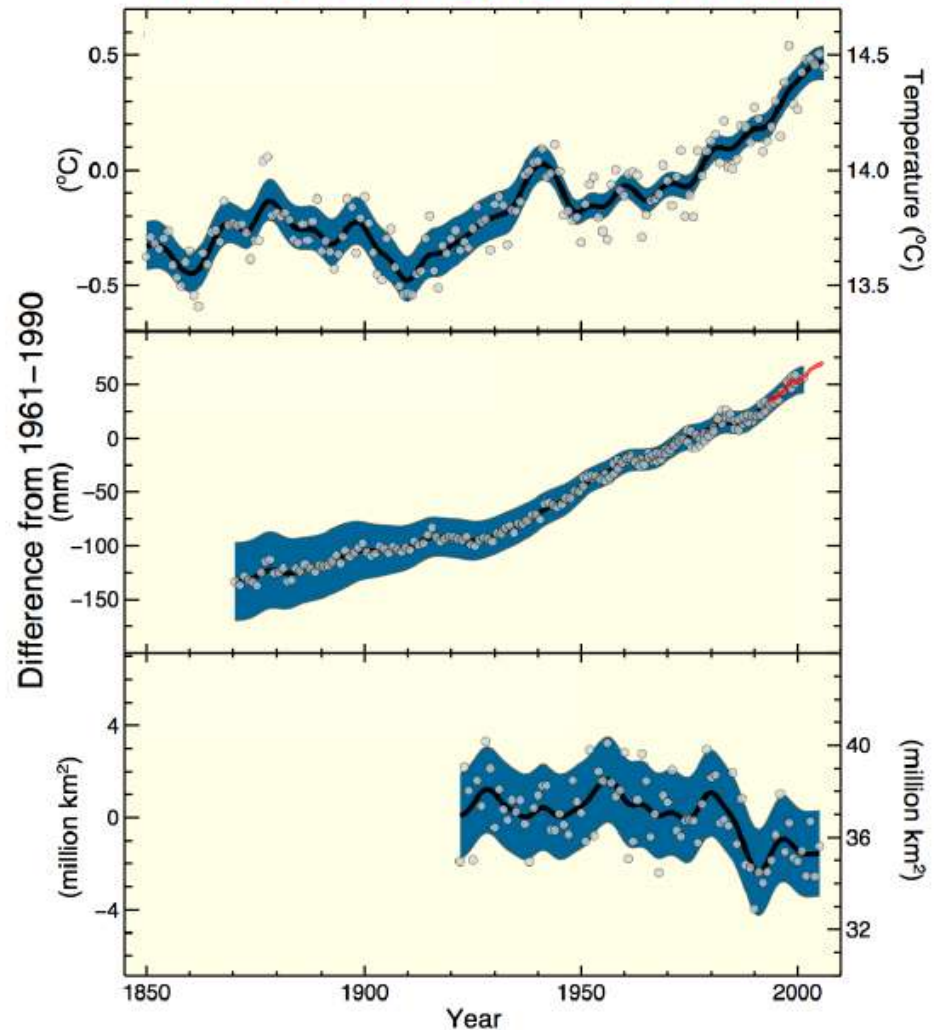
Global average temperature



Global average sea level



Northern hemisphere
snow cover

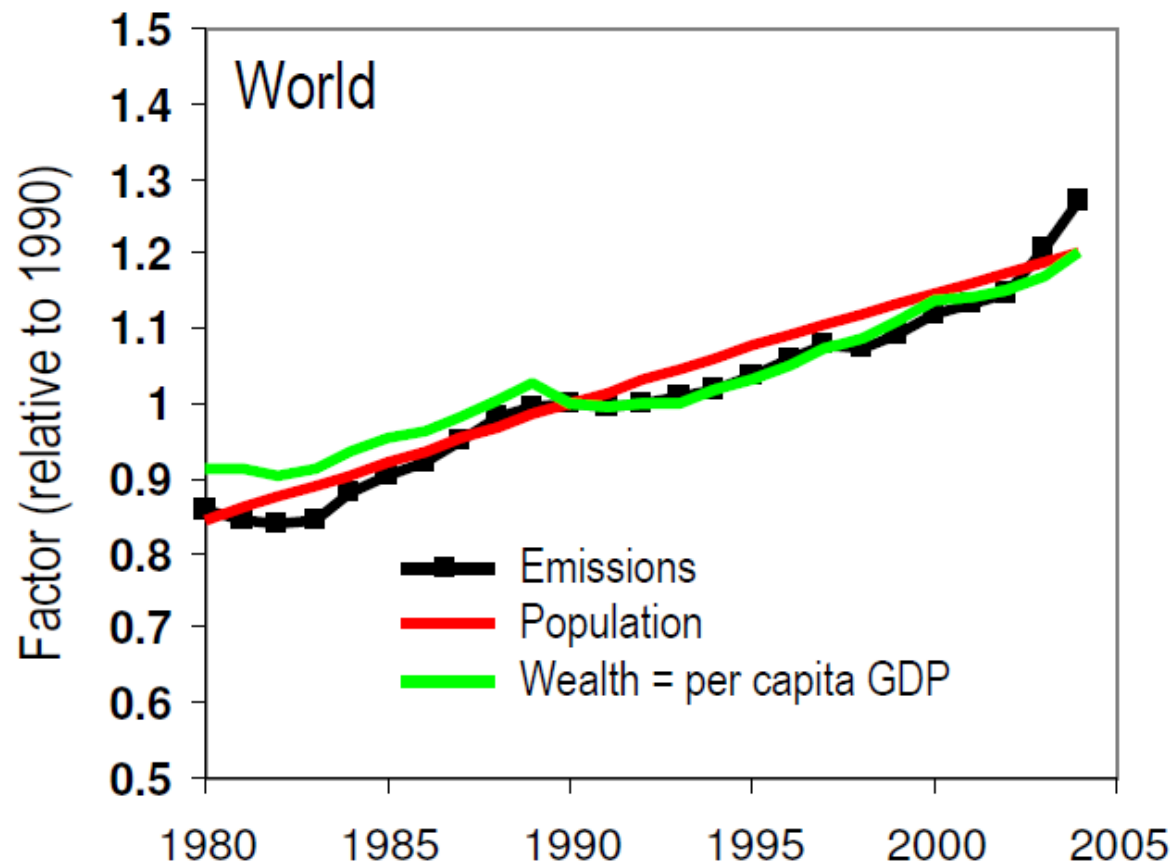




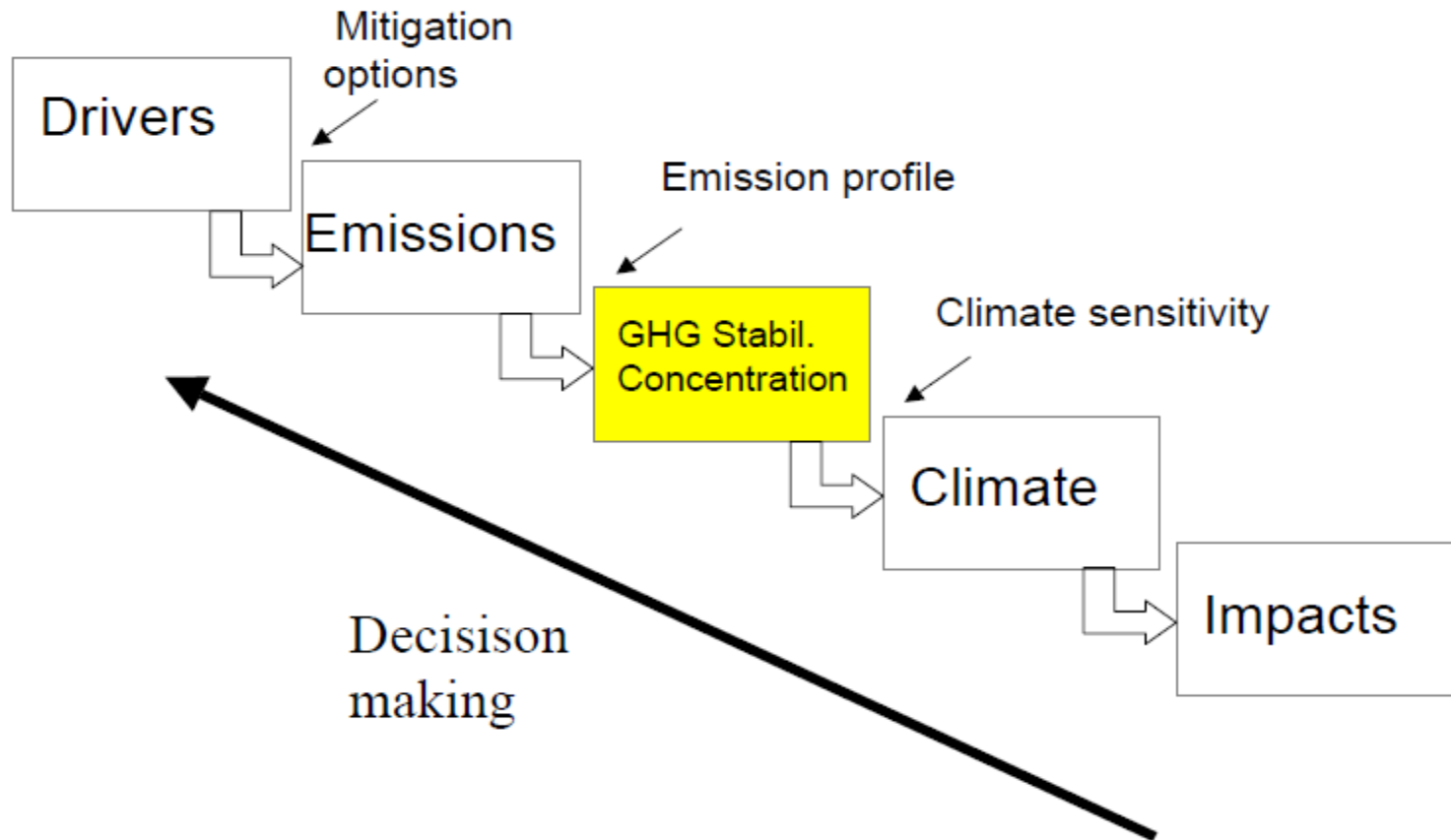
Increasing Sea Level Rise

- Rate of global average sea level rise has risen from 1.8mm/yr to 3.1mm/yr from 1961 to 1993
- The reasons for sea level rise has been due to thermal expansion, melting glaciers & ice caps and the polar ice sheets
- Projected sea level rise at the end of the 21st Century will be 18-59 cm

Drivers of Anthropogenic Emissions



Stabilisation and its implications



UNFCCC OBJECTIVE

ARTICLE 2

TO ACHIEVE, IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF THE CONVENTION, STABILIZATION OF GHGs CONCENTRATIONS IN THE ATMOSPHERE AT THE LEVEL THAT WOULD PREVENT DANGEROUS **ANTHROPOGENIC** INTERFERENCE WITH THE CLIMATE SYSTEM. SUCH A LEVEL SHOULD BE ACHIEVED WITHIN A TIME FRAME SUFFICIENT TO ALLOW **ECOSYSTEMS TO ADAPT NATURALLY** TO CLIMATE CHANGE, TO **ENSURE THAT FOOD PRODUCTION** IS NOT THREATENED AND TO **ENABLE ECONOMIC DEVELOPMENT** TO PROCEED IN A SUSTAINABLE MANNER.

**20% - 30% of plants
and animals species
likely at “increased
risk of extinction”**

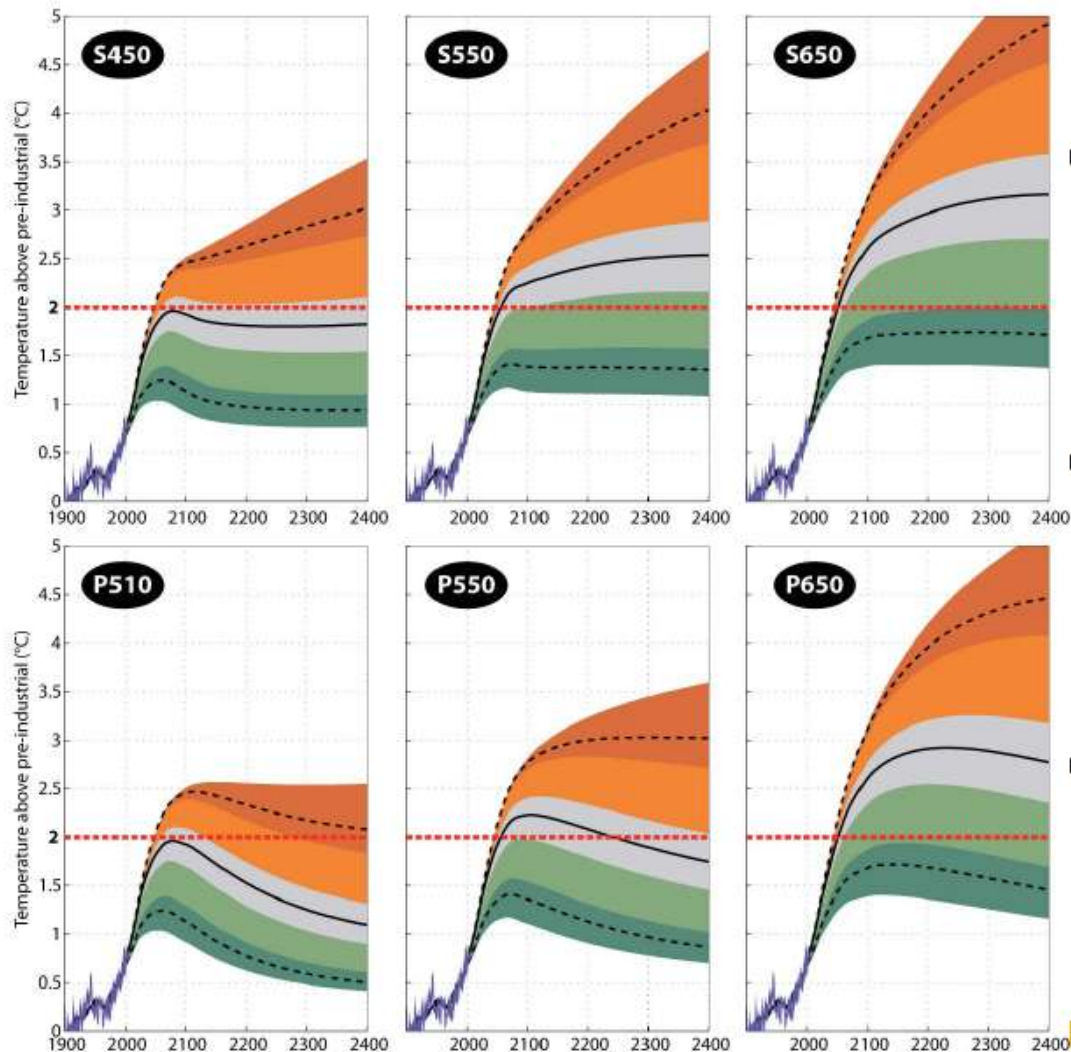
**if ΔT 1.5°C - 2.5°C
(above 1990 temperature)**



GLOBAL MEAN TEMPERATURE



GLOBAL MEAN TEMPERATURE INCREASES OF UP **TO 2⁰C** (RELATIVE TO PRE INDUSTRIAL LEVELS) ARE LIKELY TO **ALLOW ADAPTATION** TO CLIMATE CHANGE FOR MANY HUMAN SYSTEMS AT GLOBALLY ACCEPTABLE ECONOMIC SOCIAL AND ENVIRONMENTAL COSTS. A GLOBAL MEAN TEMPERATURE INCREASE **GREATER THAN 2⁰C** WILL RESULT IN INCREASINGLY **COSTLY ADAPTATION** AND CONSIDERABLE IMPACTS THAT EXCEED THE ADAPTIVE CAPACITY OF MANY SYSTEMS AND AN INCREASING AND UNACCEPTABLY OF HIGH RISK OF LARGE SCALE IRREVERSIBLE EFFECTS



- 550 ppm is “unlikely” to meet the 2°C target
- 450 ppm: fifty: fifty chance to meet 2°C
- Peaking increases the likelihood

IPCC

EMISSION PATHWAY



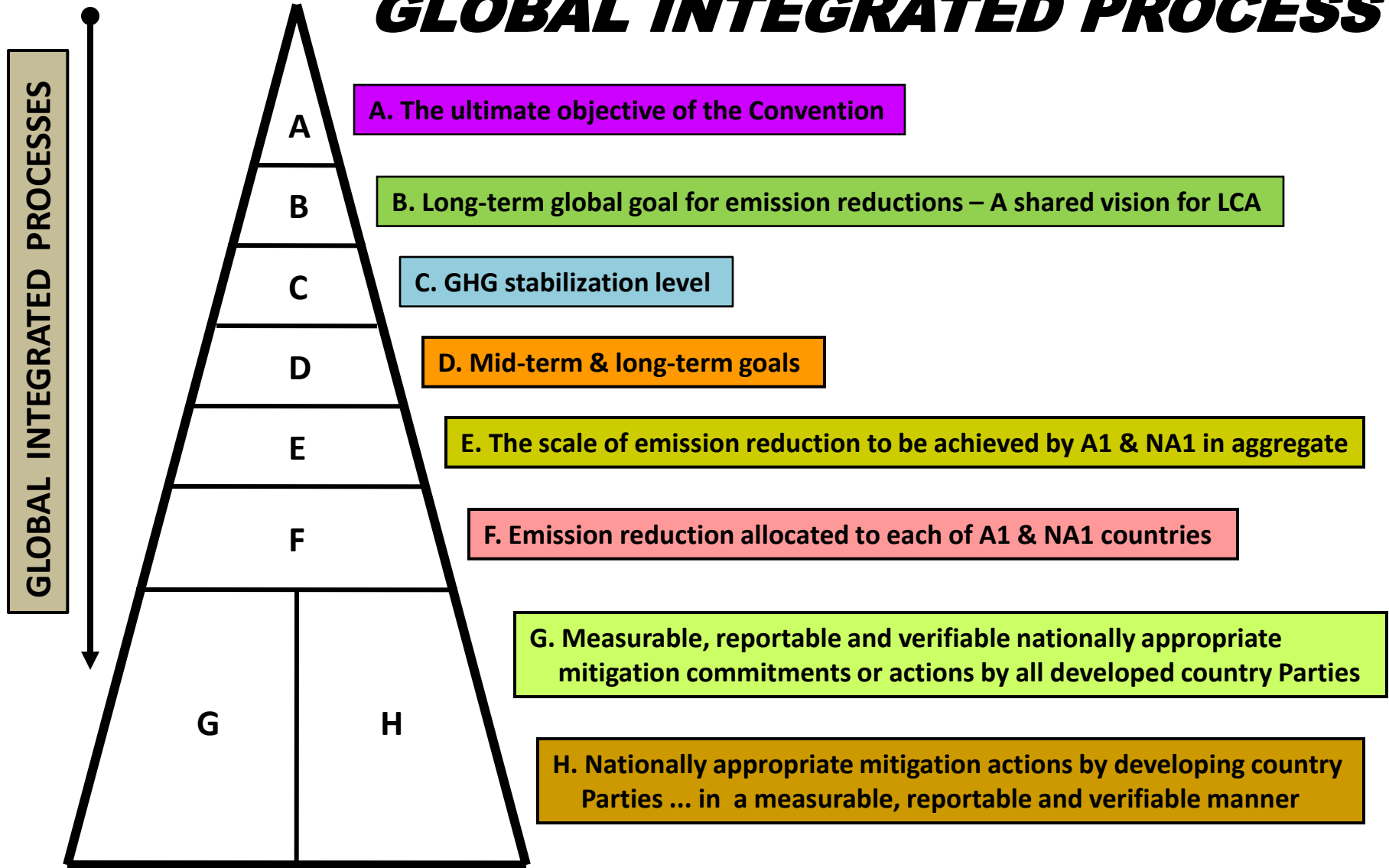
IN ORDER TO HAVE A **50%
CHANGE** OF KEEPING THE
GLOBAL MEAN TEMPERATURE
RISE BELOW 2C RELATIVE TO
PRE INDUSTRIAL LEVELS,
ATMOSPHERIC GHG
CONCENTRATIONS MUST
STABILIZE **BELOW 450 PPM**
CO₂ EQUIVALENCE

CURRENT GHG CONCENTRATION



- CURRENT ATMOSPHERIC GHG CONCENTRATIONS ARE ESTIMATED ALREADY EQUIVALENT TO ABOUT 450 PPM CO₂-EQ. HOWEVER IF WE INCLUDE THE COOLING EFFECT THE CURRENT GREENHOUSE GAS CONCENTRATION GIVES A WARMING EFFECT EQUIVALENT TO ABOUT 375 PPM CO₂-EQ
- THE 2C TARGET CAN STILL BE ACHIEVED IF THIS **OVERSHOOT** OF CONCENTRATIONS IS ONLY TEMPORARY AND REVERSED QUICKLY (GLOBAL EMISSION HAVE TO PEAK BY 2015-2020, AND DECLINE RAPIDLY UNTIL 2050 AND BEYOND)

GLOBAL INTEGRATED PROCESS



2°C
450 ppm CO₂-eq

**Climatic
Scientific Issues.**

More than 100 countries
call for 2°C target or
lower

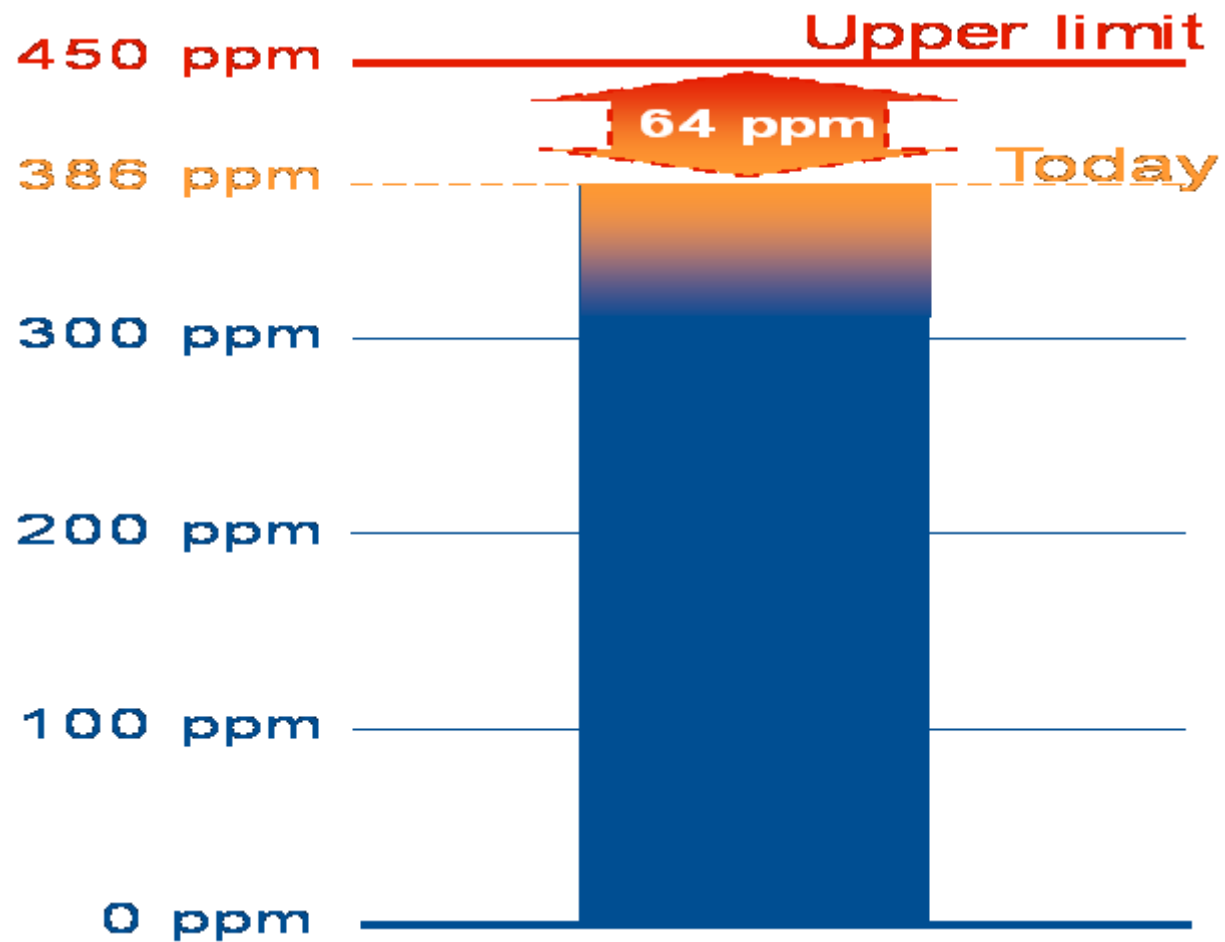


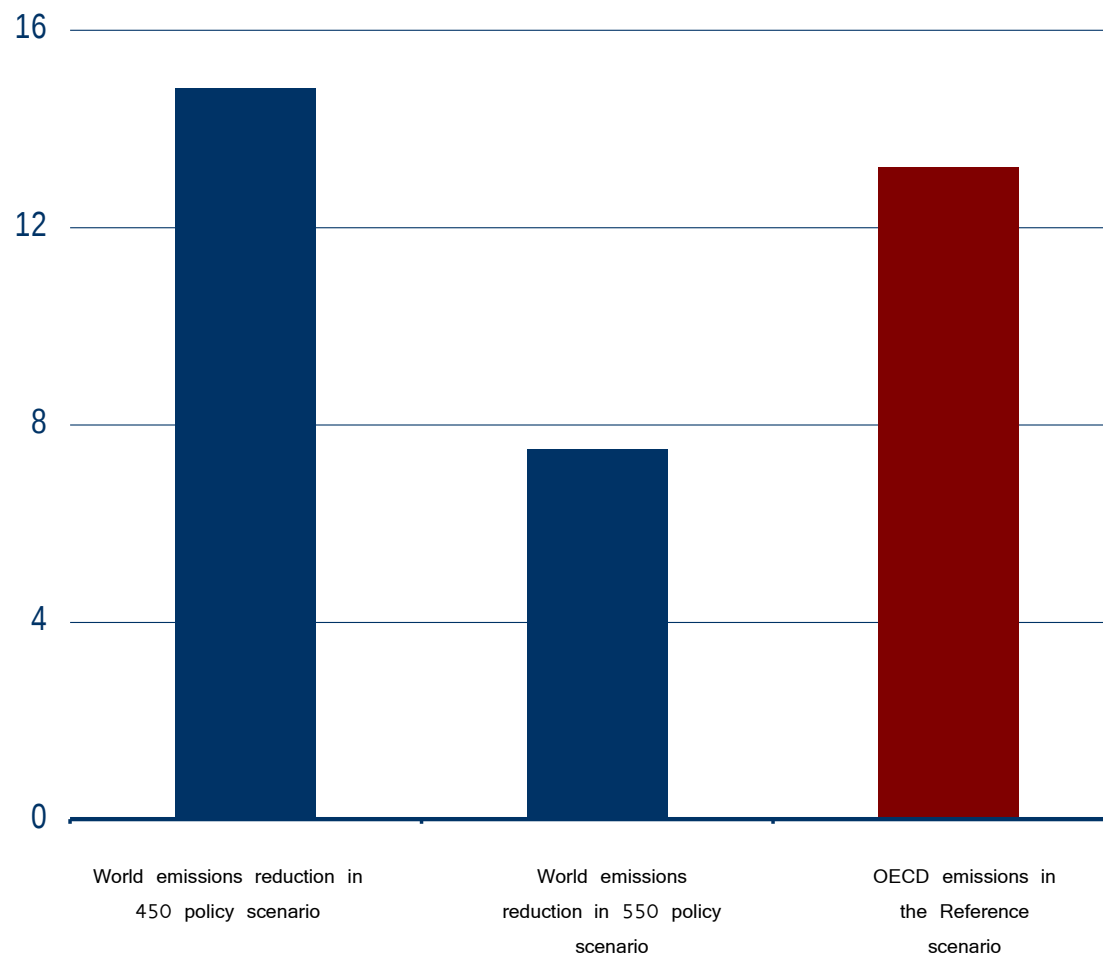
Allocation	Mitigation	Reduction
Annex I		Non Annex I

**Politics, Economics,
Historical & Future
emissions, RC Issues.**

KP 1st Period Annex
1 commitment -5,2
refer to 1990 level

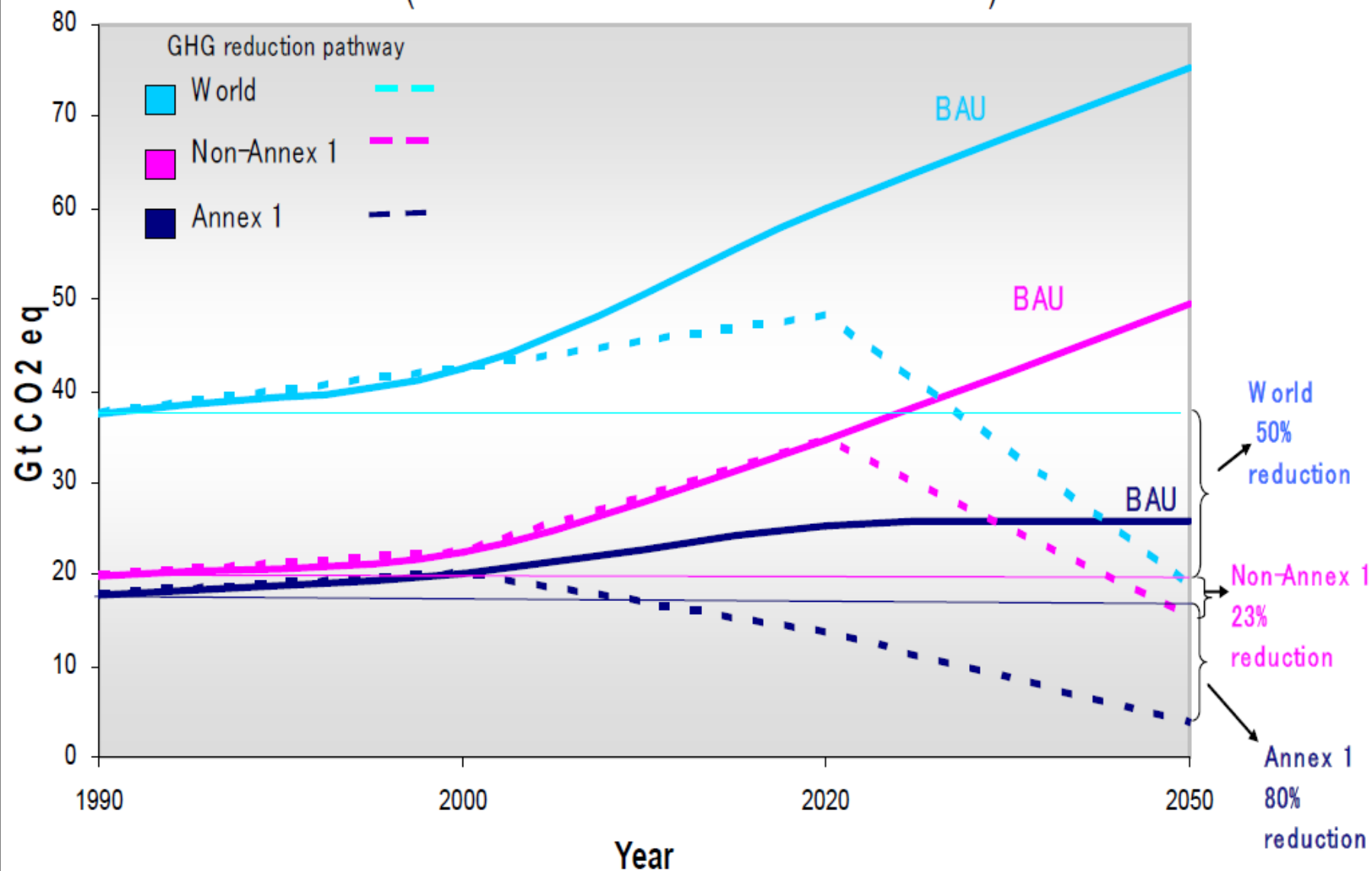
1 Trillion Tonnes of CO₂ between 2000 and 2050, if probability of exceeding
2 °C shall be limited to 25%





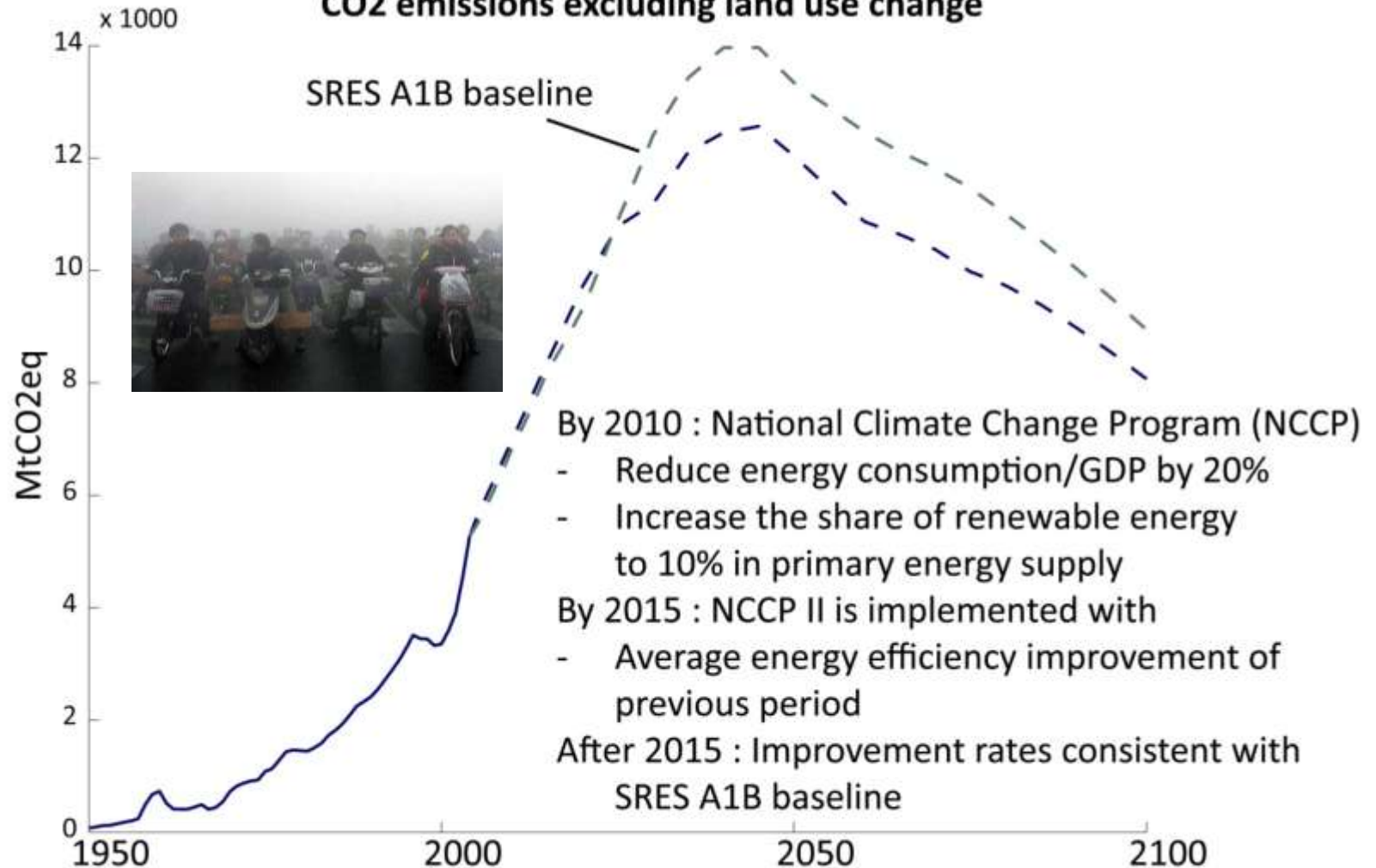
GHG Emission Reduction by 2050

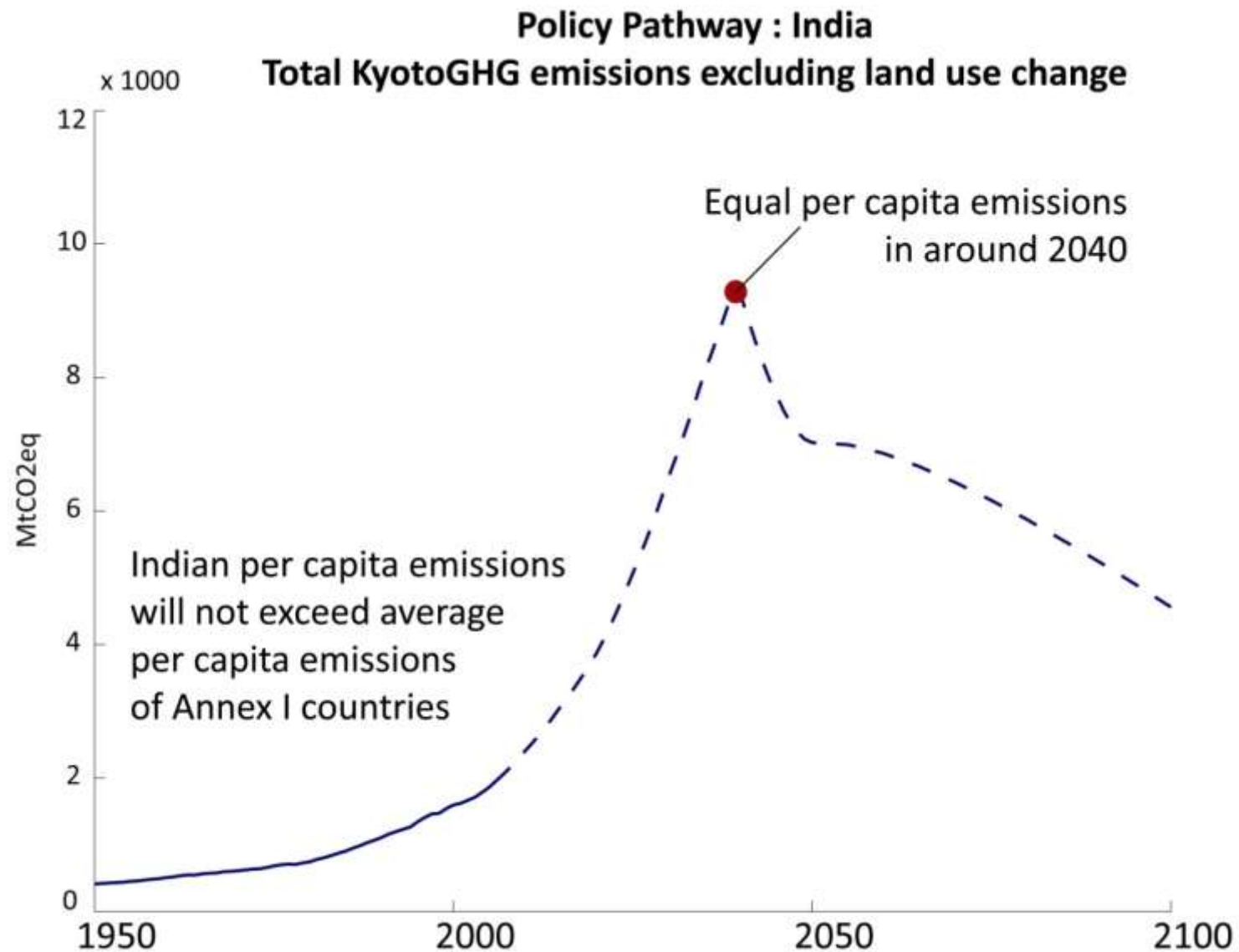
(50% Reduction from 1990 World Level)

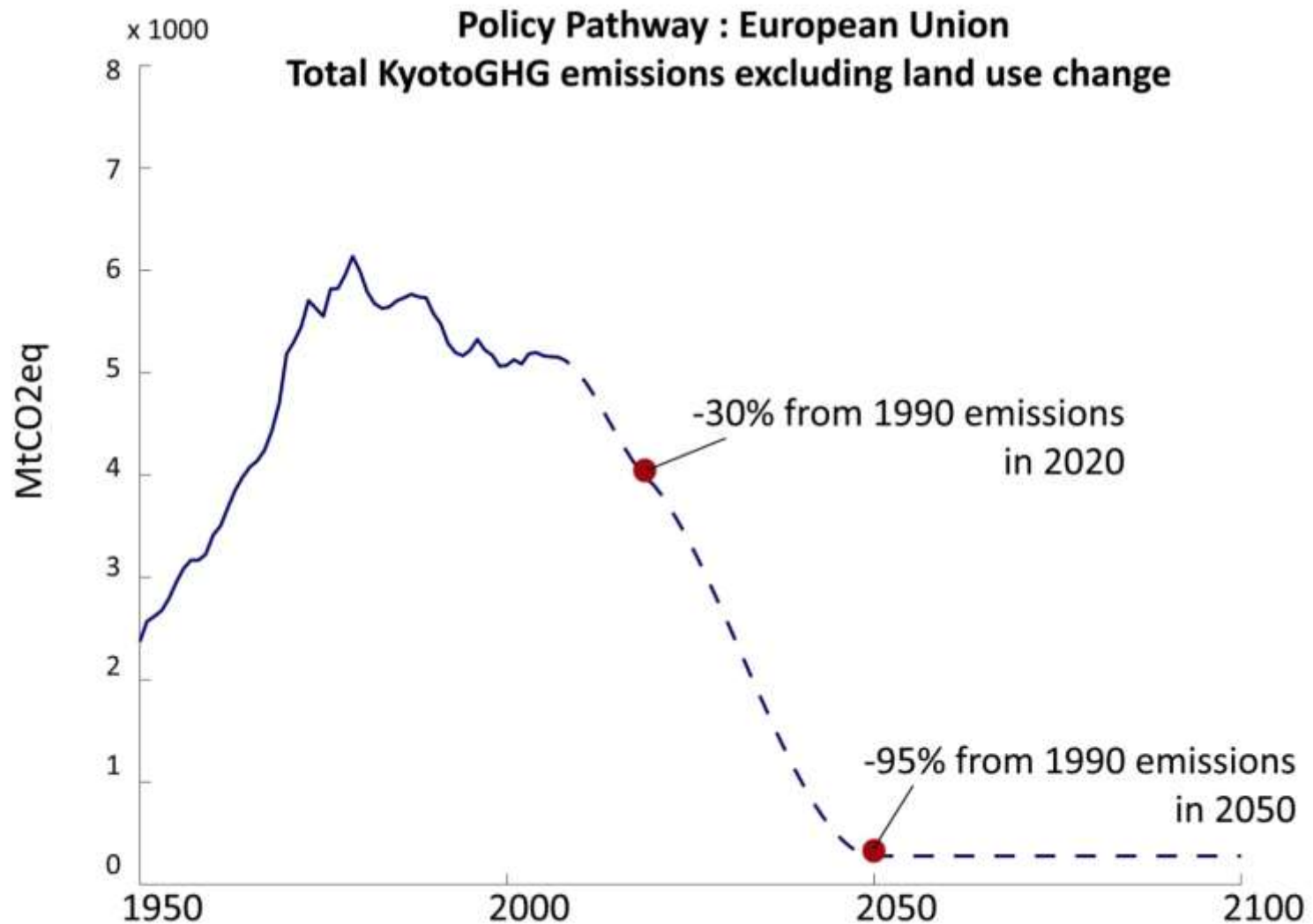


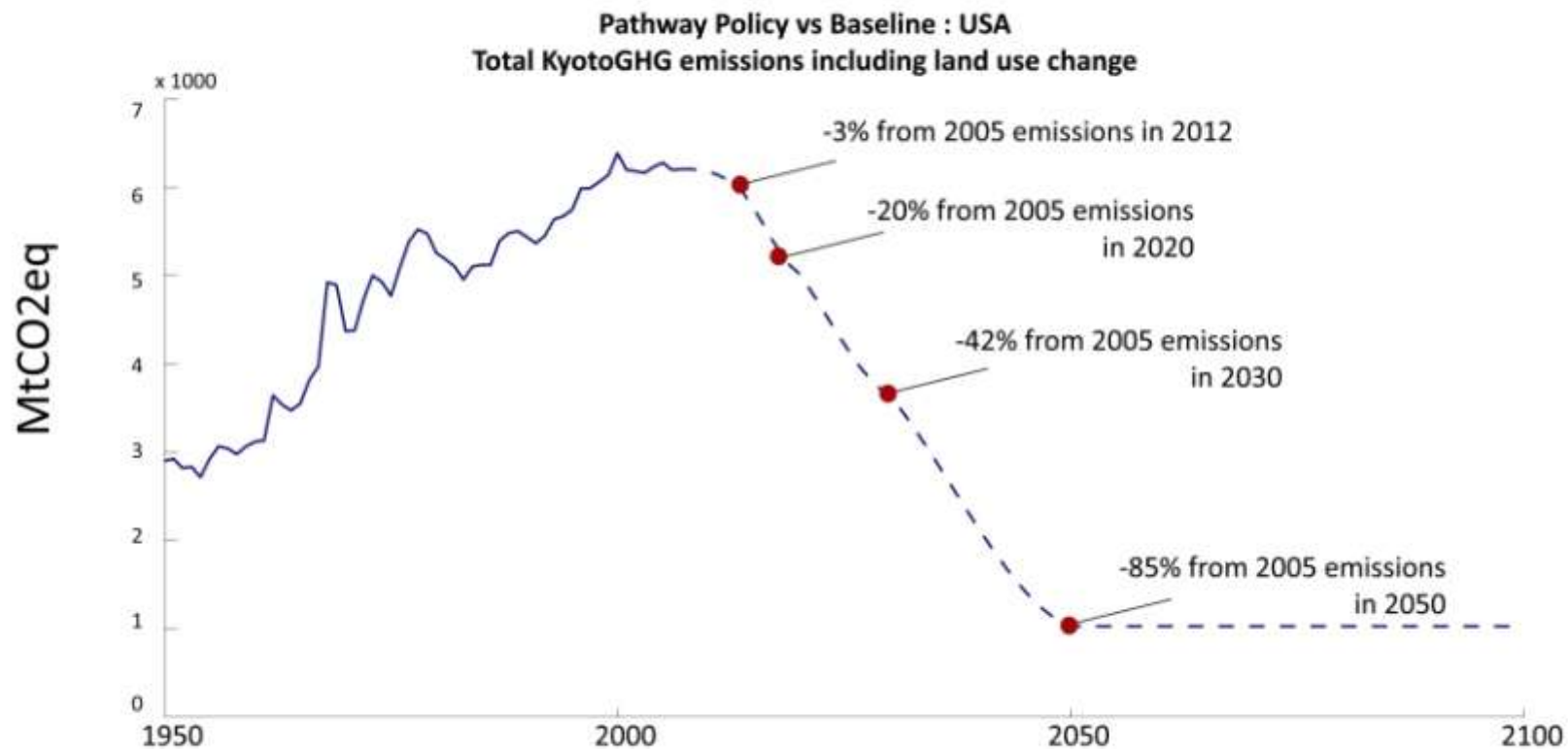
Policy Pathway : China

CO2 emissions excluding land use change









(C)

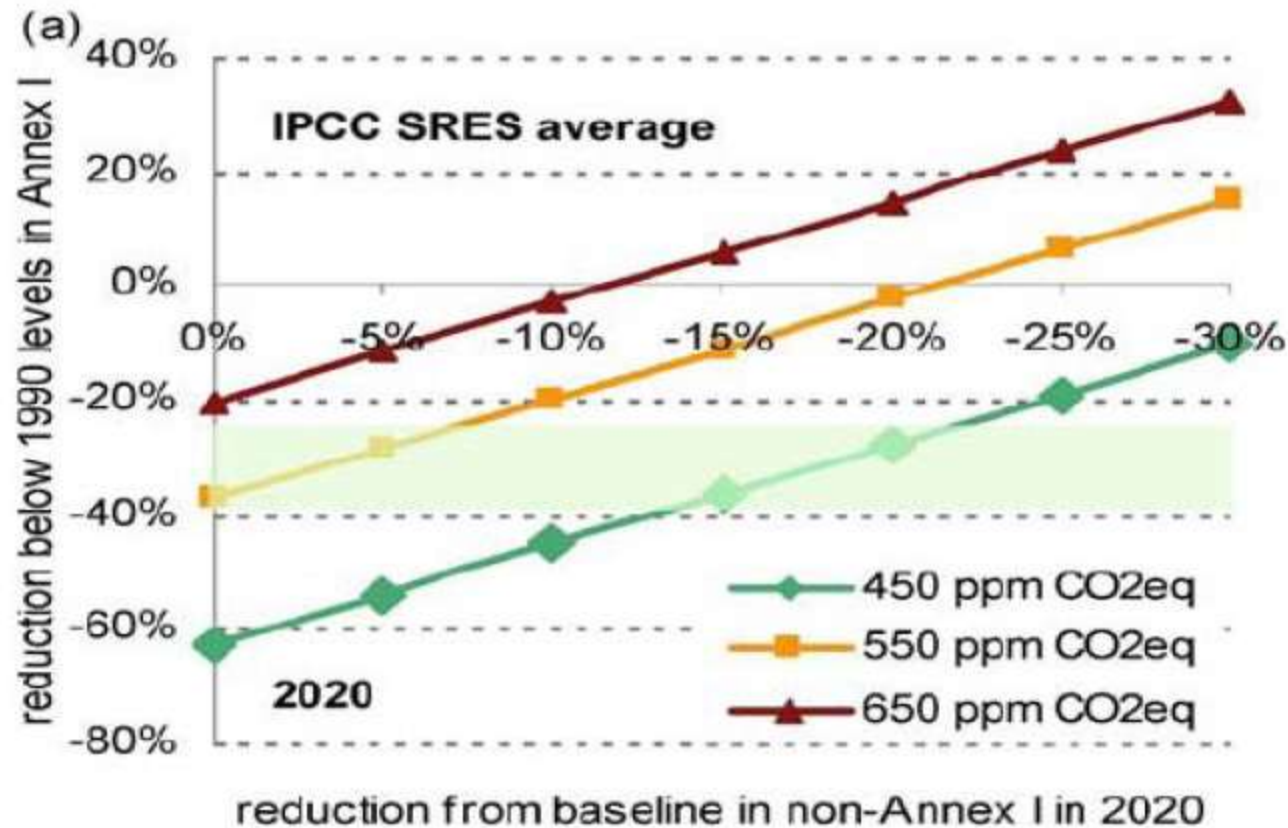
The Range of the Difference between Emissions in 1990 and Emission Allowances in 2020/2050 for Various Concentration Levels for Annex I And Non-Annex I Countries as a Group^a

Scenario Category	Region	2020	2050
A-450 ppm CO ₂ -eq ^b	Annex I	-25 % to – 40 %	-80% to -95 %
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
B-550 ppm CO ₂ -eq	Annex I	-10% to -30%	-40% to -90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C-650 ppm CO ₂ -eq	Annex I	0% to -25%	-30% to -80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

- Source: IPCC Working Group III, Chapter 13, Box 13.7, page 776.
- a) The aggregate range is based on multiple approaches to apportion emissions between regions (contraction & convergence, multistage, Triptych and intensity targets, among others). Each approach makes different assumption about the pathways, specific national efforts and other variables. Additional extreme cases – in which Annex I undertakes all reductions, or non-Annex I undertakes all reductions – are not included. The range presented here do not imply political feasibility, nor do the results reflect cost variance.
- b) Only the studies aiming at stabilization at 450 ppm CO₂-eq assume a (temporary) overshoot of about 50 ppm (See Den Elzen and Meinshausen, 2006)

Trade-offs in reductions for Annex I and Non-Annex I emissions for different stabilization levels

Source: den Elzen and Hohne, Climatic Change Policy, 2008.



REDUCTION IN BOX 13.7

- For non-Annex I (NA1) countries as a group “substantial deviation from baseline” is now specified: **15-30%** for 450 ppm CO₂-eq, **0-20%** for 550 ppm CO₂-eq and from 10% above to 10% below baseline for 650 ppm CO₂-eq, in 2020. Roughly the first 10% can be “no-regret options”
- If Annex I countries as a group reduces with **30% below 1990** level, non-Annex I need to reduce about **10-25% below baseline** for meeting 450 ppm CO₂-equivalent
- For baseline that assume ongoing rapid growth in non-Annex I emissions (higher than IPCC SRES range), the reductions will be higher.
- Avoiding deforestation relaxes the reductions for Annex I and non-Annex I

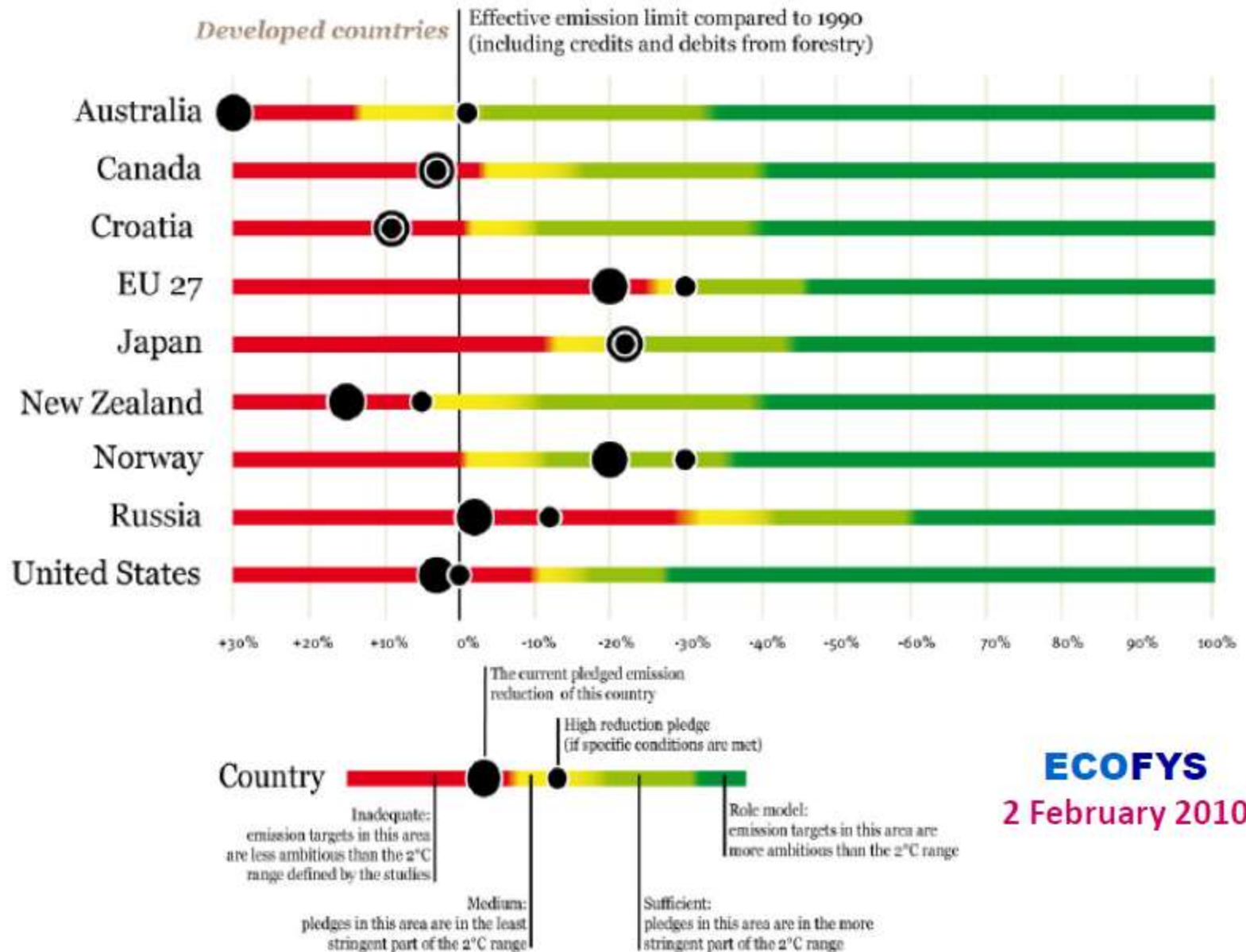
Indonesia Voluntary Mitigation Actions

[Letter to Executive Secretary UNFCCC - 30 January 2010]

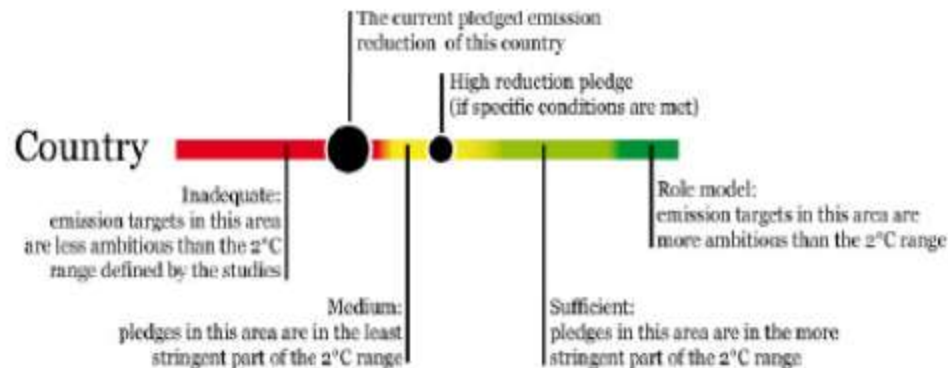
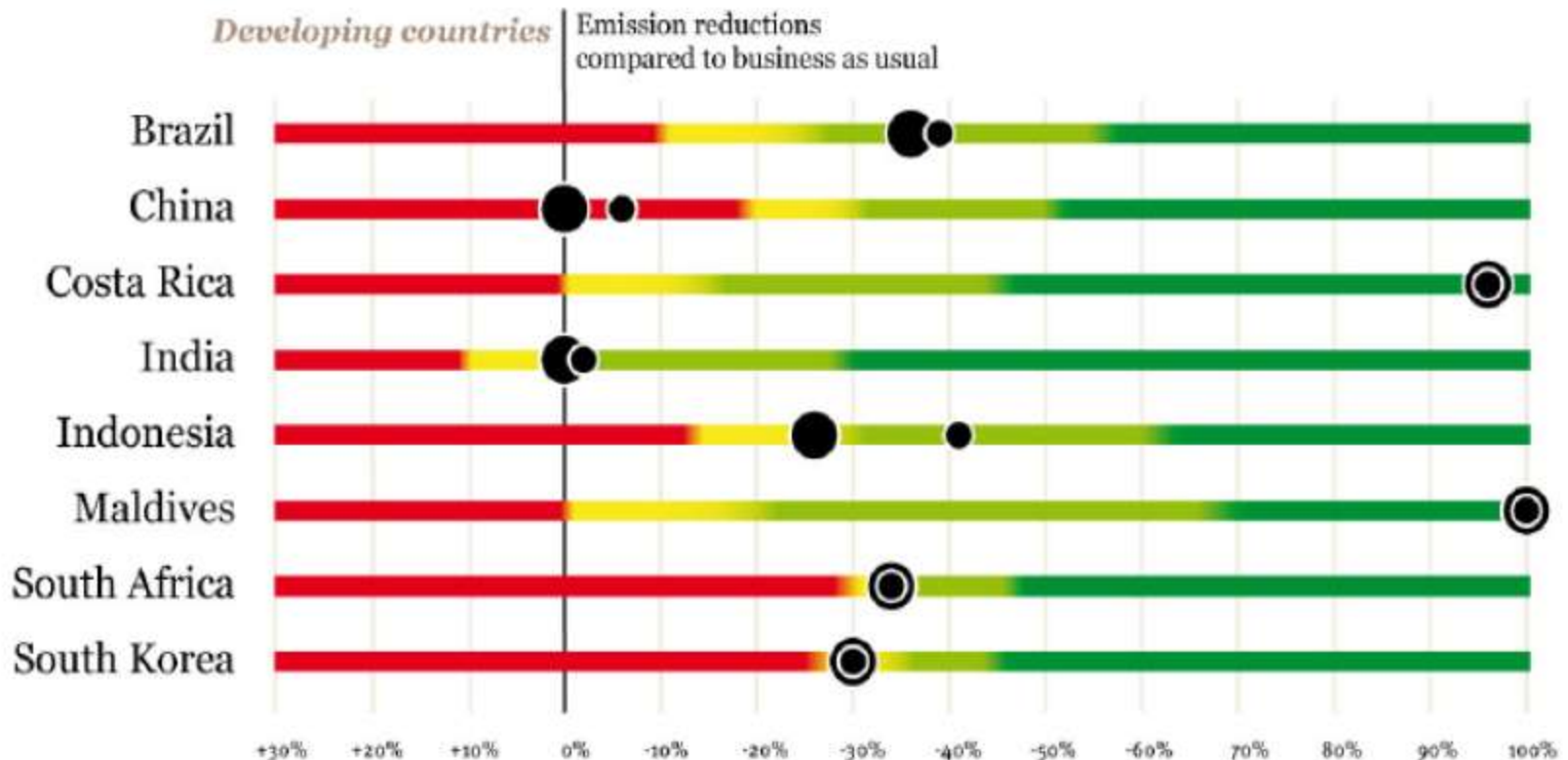
Nationally Appropriate Mitigation Actions	Emission Reduction
The Reduction will be achieved, inter alia, through the following action: 1. Sustainable Peat Land Management 2. Reduction in Rate of Deforestation and Land Degradation 3. Development of Carbon Sequestration Projects in Forestry and Agriculture 4. Promotion of Energy Efficiency 5. Development of Alternative and Renewable Energy Sources 6. Reduction in Solid and Liquid Waste 7. Shifting to Low-Emission Transportation Mode	26 % by 2020

Emission Reduction Proposals – a long way from 2°C

AMBITION OF ONLY 2 DEVELOPED COUNTRIES SUFFICIENT FOR COPENHAGEN ACCORD MEETING 2°C TARGET



Emission Reduction Proposals – a long way from 2°C



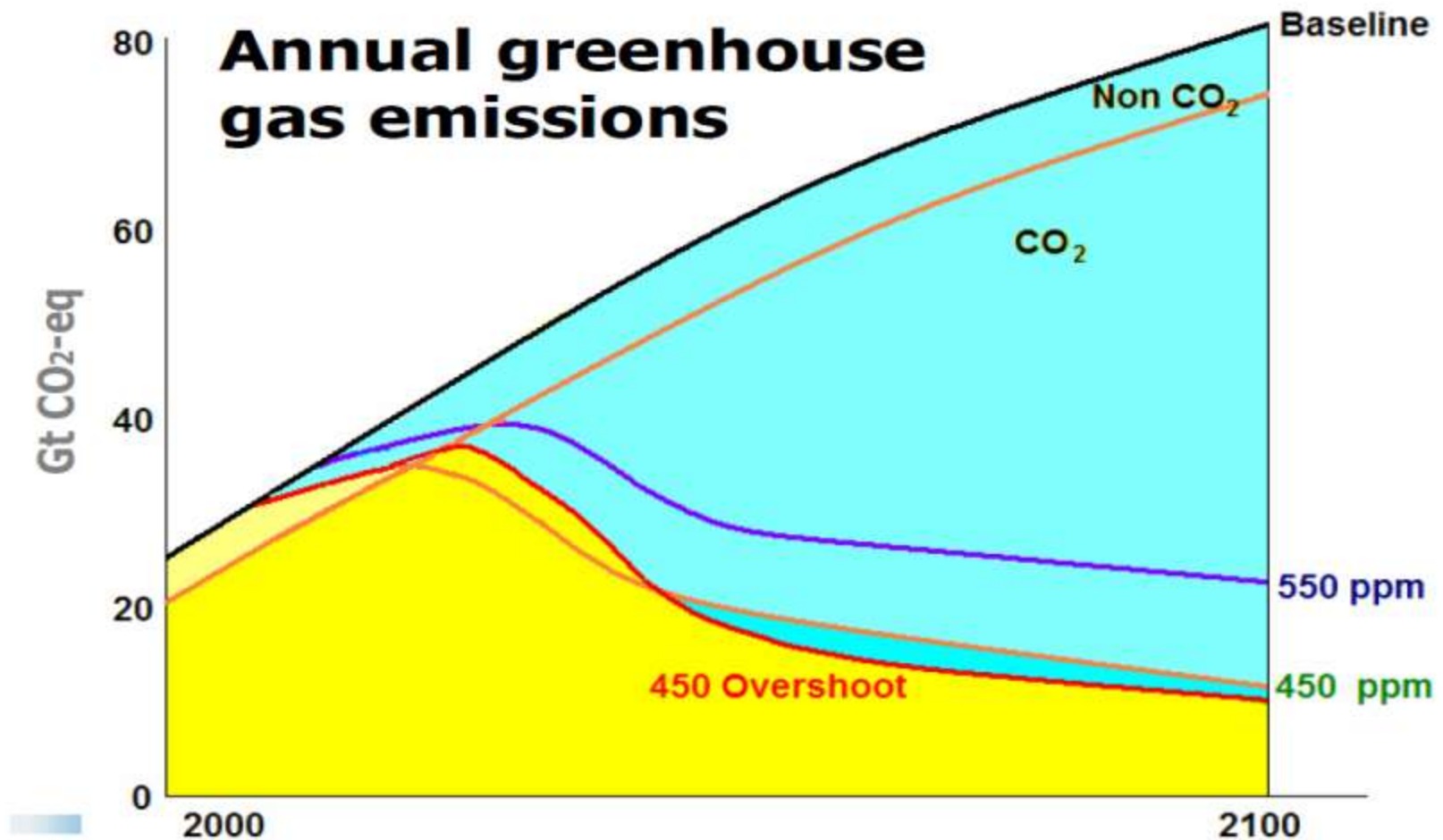
ECOFYS
2 February 2010

Aggregate Reductions from 1990 (Gg CO_{2-eq})

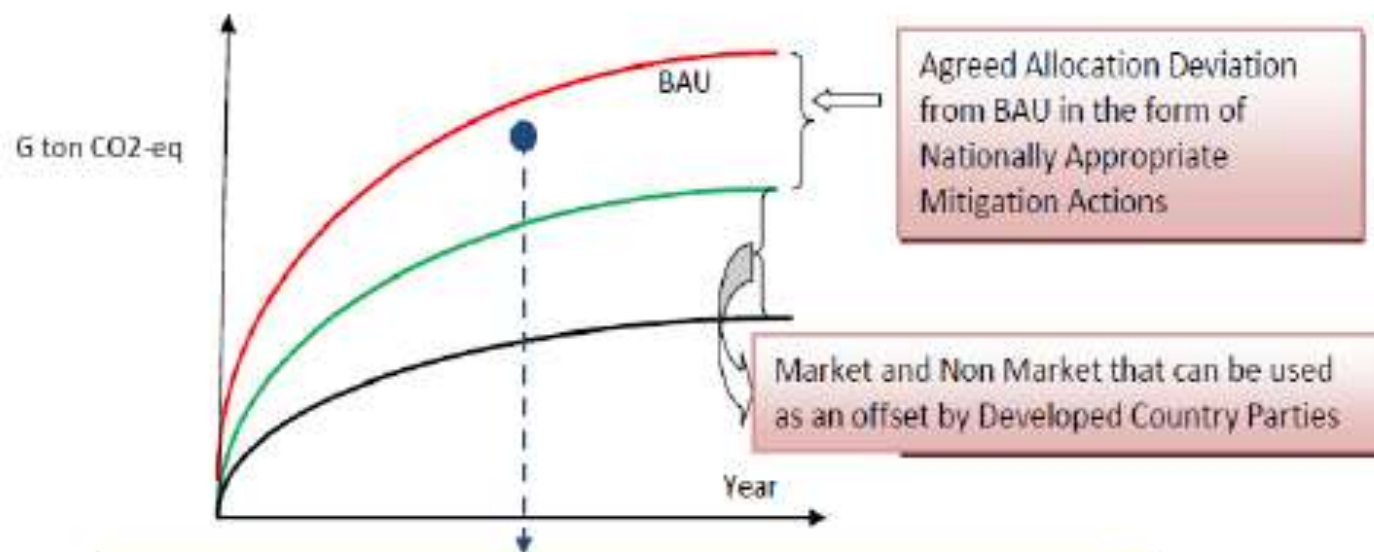
- Existing pledges by developed countries, when added together, could represent a substantial effort for reducing Annex I emissions by 2020, -12% to -19% reduction of emissions below 1990 levels depending on the assumptions made about the details of the pledges.
- But they still far short of the range of emission reductions -25% to -40% that the IPCC notes would be necessary for stabilizing concentrations of CO_{2-eq} at 450 ppm, a level associated with a 26 to 78% risk of overshooting a 2°C goal.

		Emissions	Constraint on emissions by 2020	
		1990	LOW	HIGH
AUSTRALIA	Excluding LULUCF	416214	470112	371141
	Including LULUCF	453794	384172	303294
CANADA	Excluding LULUCF	591793	606703	
	Including LULUCF	540227	641076	
EU	Excluding LULUCF	5556523	4445218	3889566
	Including LULUCF	5222374	4177899	3655662
JAPAN	Excluding LULUCF	1269657	952243	
	Including LULUCF	1195370	896528	
RUSSIA	Excluding LULUCF	3319327	2821428	2489495
	Including LULUCF	3359567	2855632	2519675
US	Excluding LULUCF	6084490	5878237	
	Including LULUCF	5257278	4968274	
BELARUS	Excluding LULUCF	129129	122673	116216
	Including LULUCF	107101	101746	96391
NORWAY	Excluding LULUCF	49695	34786	29817
	Including LULUCF	37406	26184	22444
UKRAINE	Excluding LULUCF	926033	740827	
	Including LULUCF	852887	682310	
NEW	Excluding LULUCF	61853	55668	49482
ZEALAND	Including LULUCF	43714	39343	34972
TOTAL				
	Excluding LULUCF	18404714	16127894	15123727
	Including LULUCF	17069718	14828879	13820624
PERCENT BELOW 1990 LEVELS BY 2020				
	Excluding LULUCF		-12%	-18%
	Including LULUCF		-13%	-19%

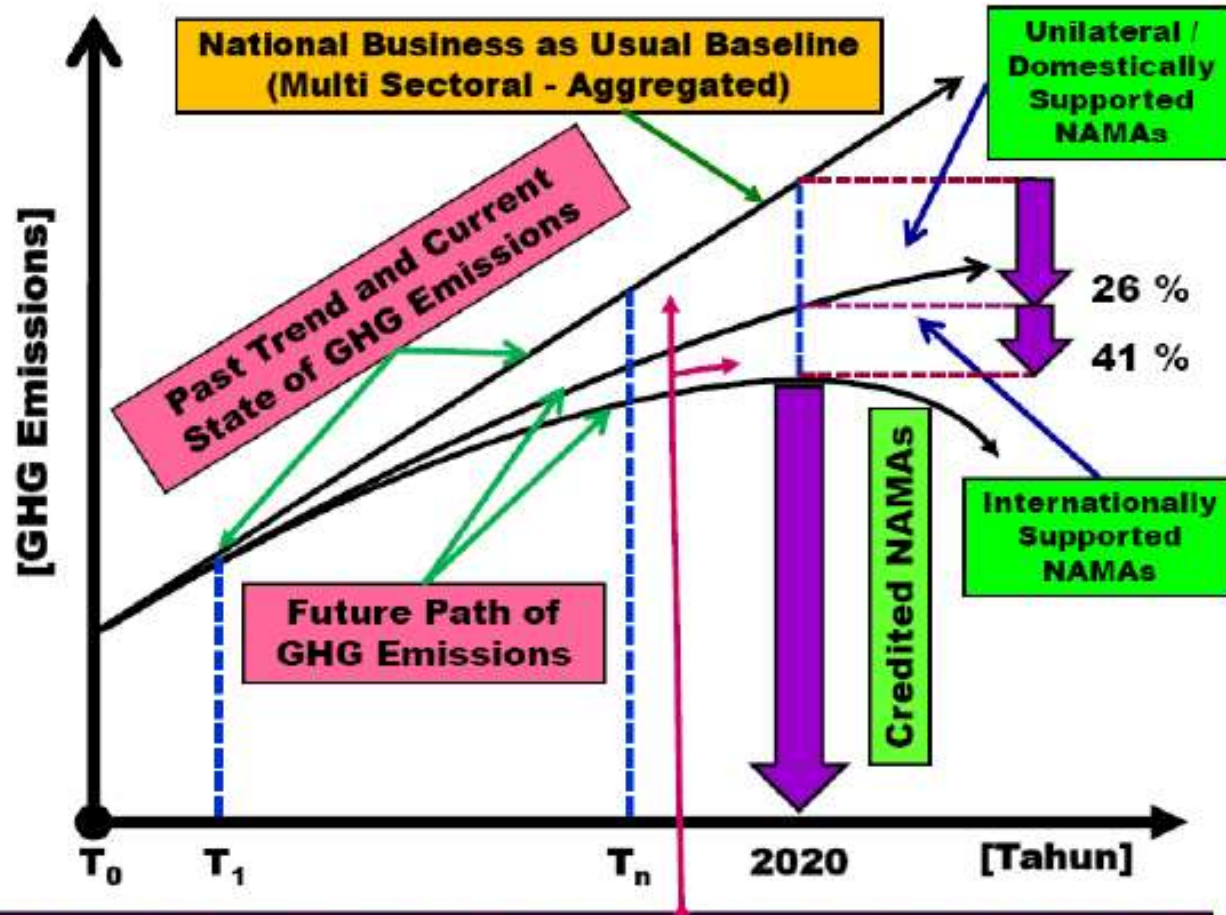
(WRI Working Paper, February 2010)



DIFFERENT PERIOD OF STABILIZATION LEVELS



- No offset (cannot be used as an offset by developed country Parties)
- Type of Financing :
 - ✓ Financed by Financing Mechanism under the Convention
 - ✓ Self Financing



National integrated processes in meeting the national emission reduction target based on cost effectiveness and its implementability level.

Required National Integrated Processes To Establish National Business as Usual Baseline (Aggregated Business as Usual Baseline)

As a main part of proposed national integrated process, national business as usual baseline as aggregated business as usual baseline should be established as indispensable tool.

The required processes to render the national business as usual baseline consists of 2 (two) key elements that need to be constructed:

- 1. Establishment of aggregated business as usual baseline of each sectors, and**
- 2. Establishment of national business as usual baseline as aggregated business as usual baseline.**

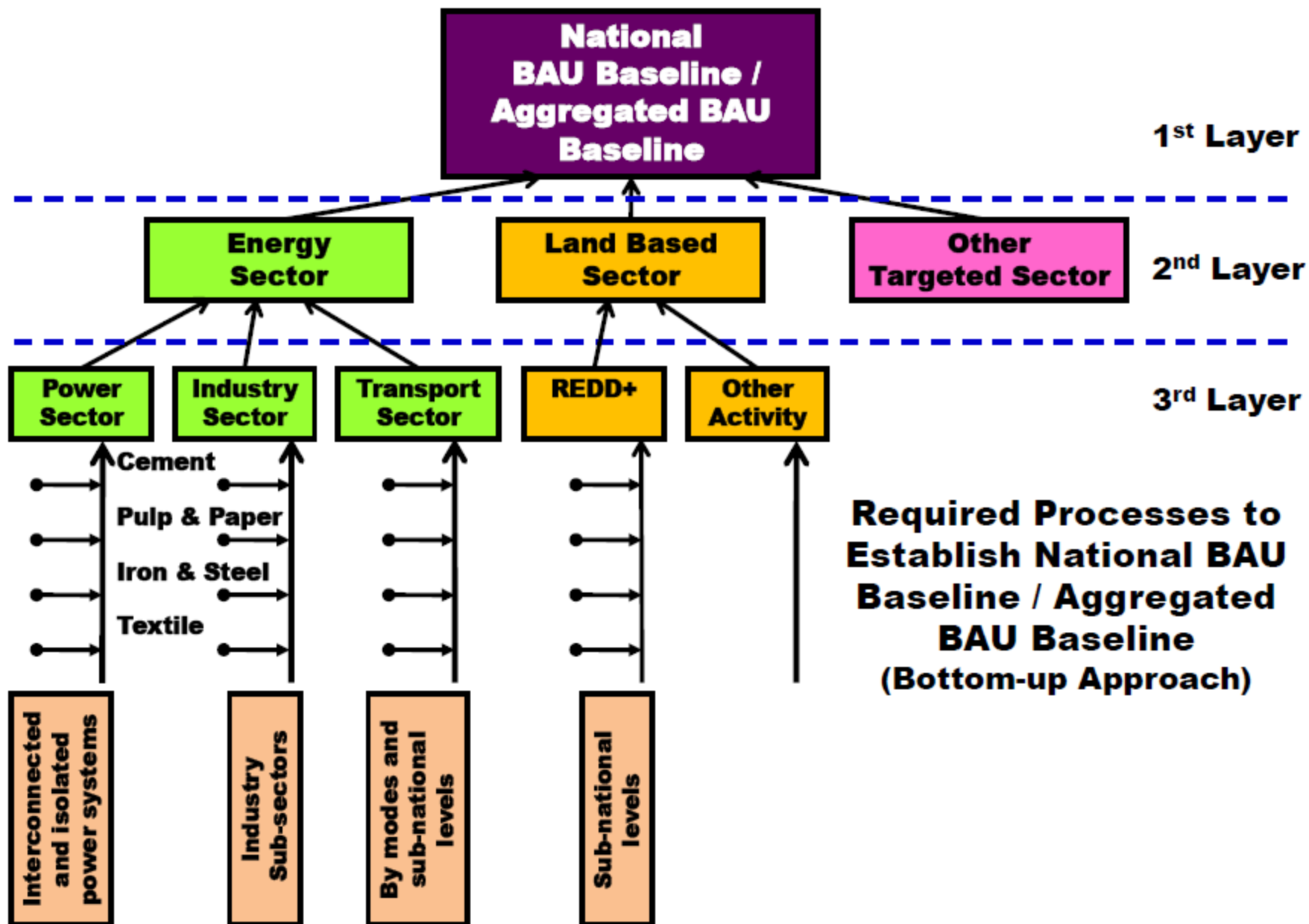


Table IV.1: Matrix of Domestically Supported NAMAs (Indonesia Case – 26% from BAU in 2020)

No	Sector	Mitigation Actions	Emissions Reduction		Mitigation Cost	Abatement Cost	Time Frame	
			[Mt CO ₂]	[%]	Cost [US\$]	[US\$/tCO ₂]	Required Completion Period [Years]	Operating Date
1	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx,xxx	xx.xx	xx	---zz---
2	--bb--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
3	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
4	--cc--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
5	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
6	--dd--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
7	--ee--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
n-1	--bb--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
n	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xxx	xx.xx	xx	---zz---
TOTAL			xx,xxx,xx	26	x,xxx,xxx	xx.xx		

Table IV.2: Matrix of Internationally Supported NAMAs (Indonesia Case – Increase up to 41% from in 2020)

No	Sector	Mitigation Actions	Emissions Reduction		Mitigation Cost	Abatement Cost	Required Financing Support ^{*)}	Time Frame	
			[Mt CO ₂]	[%]	[US\$]	[US\$/tCO ₂]	[US\$]	Required Completion Period [Years]	Operating Date
1	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
2	--bb--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
3	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
4	--cc--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
5	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
6	--dd--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
7	--ee--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
n-1	--bb--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
n	--aa--	---xxx---	xx,xxx,xx	-x-	x,xxx.xx	xx.xx	x,xxx.xx	xx	---zz---
TOTAL			xx,xxx,xx	-y-	x,xxx.xx	xx.xx	x,xxx.xx		

Note:

1. 26% + -y-% = 41%, which is deviation from the baseline in 2020

2. *) Submit to the UNFCCC Secretariat (support by Developed Country Parties)

SIFAT CLIMATE CHANGE :

- SCIENTIFIC DRIVEN
- MERUPAKAN GLOBAL ISSUES – NATIONAL ISSUES – LOCAL ISSUES
- PERLU COHERENT ACTION
- MEETS THE OBJECTIVE OF THE CONVENTION (UNFCCC)
- CROSS SECTORAL ISSUES
- MILIK SEMUA INSANI



*Terima Kasih
atas
Perhatiannya*