

# *Global Carbon Space and Development Possible Pathways*

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# Global Aspects Concerning Global Warming

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graph TD; A[Global Aspects Concerning Global Warming] --> B[Global Emissions and Stabilization Level Targets]; A --> C[Distributed Emissions per Countries or Group of Countries];
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Global Emissions  
and  
Stabilization  
Level Targets

Distributed  
Emissions per  
Countries or  
Group of  
Countries

# Present Situation

- Kyoto Protocol: Annex I countries GHG Emissions Reduction in the commitment period of 2008 - 2012
- Prospective scenarios on GHG emissions show an upward, usually higher in developing countries
- More pressure on developing countries to have quantified commitments in the Post-Kyoto period
- On the environmental point of view participation of developing countries in the GHG reduction is fundamental

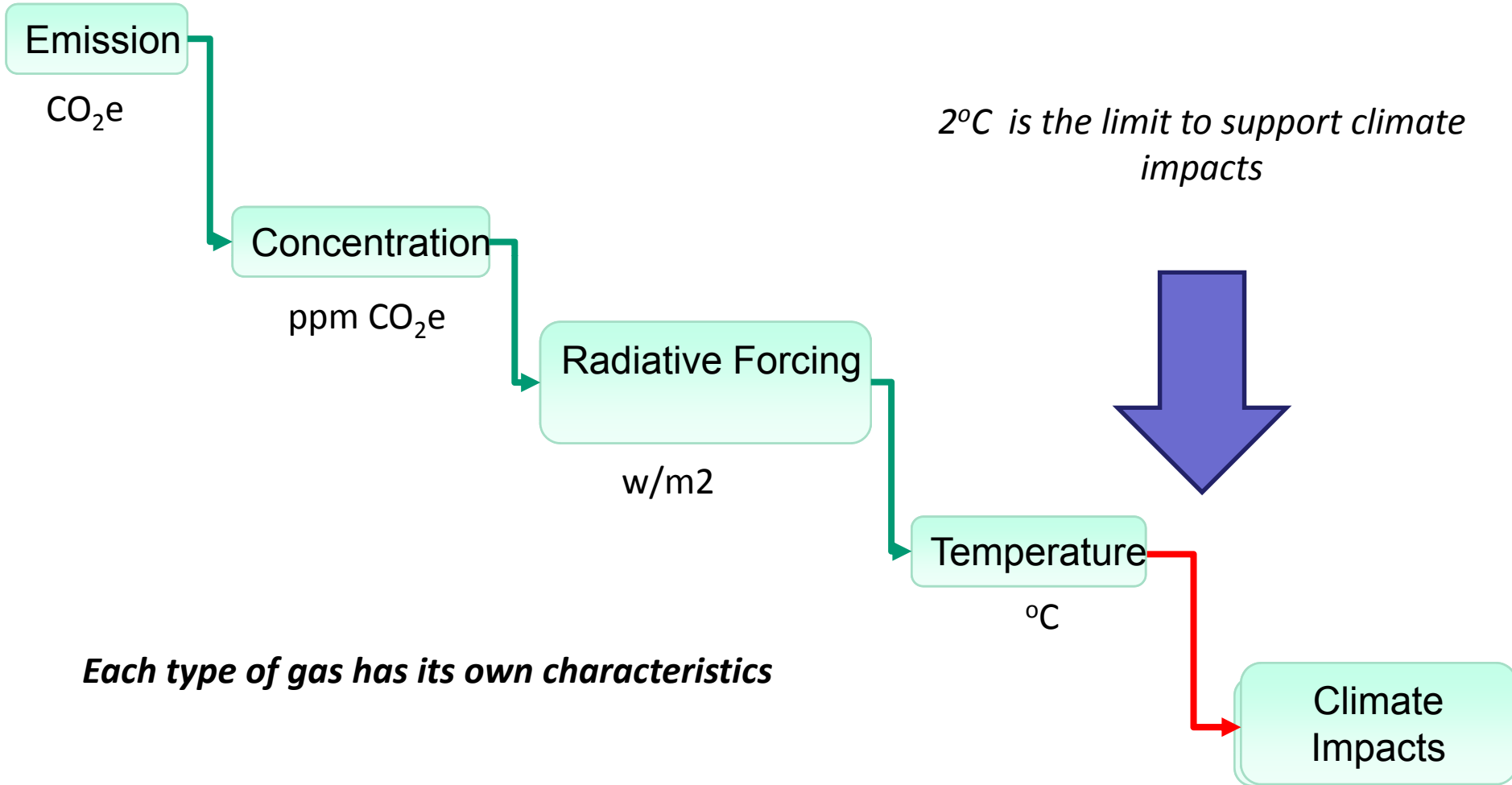
# Dilemma

1. Developing countries participation is crucial to solve the problem.
2. Targets only for developed countries would affect their economy competitiveness.
3. Developing countries per capita emissions are much lower.
4. Historical emissions responsibility of developed countries is much greater than that of developing countries due to the time GHG remains in the atmosphere.

# Dilemma

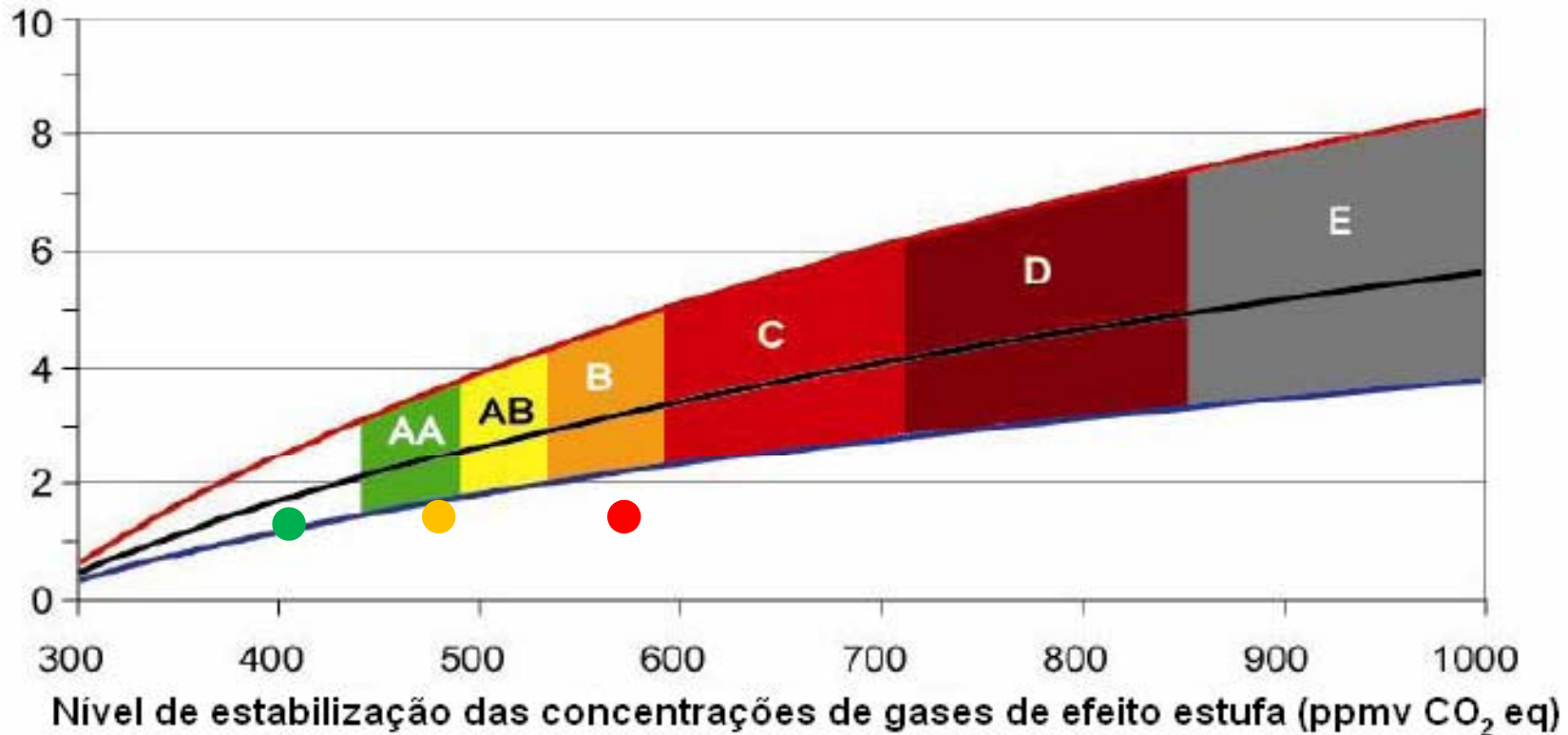
- Uncertainties due to the magnitude and scope of the necessary changes for atmospheric concentration stabilization in a non dangerous level.
- Uncertainties regarding definition of dangerous level.
- Uncertainties regarding place and intensity of the impacts.

# Climate Context – Present knowlegde



# IPCC Scenario

Aumento da temperatura global média de equilíbrio  
acima dos níveis pré-industriais (°C)

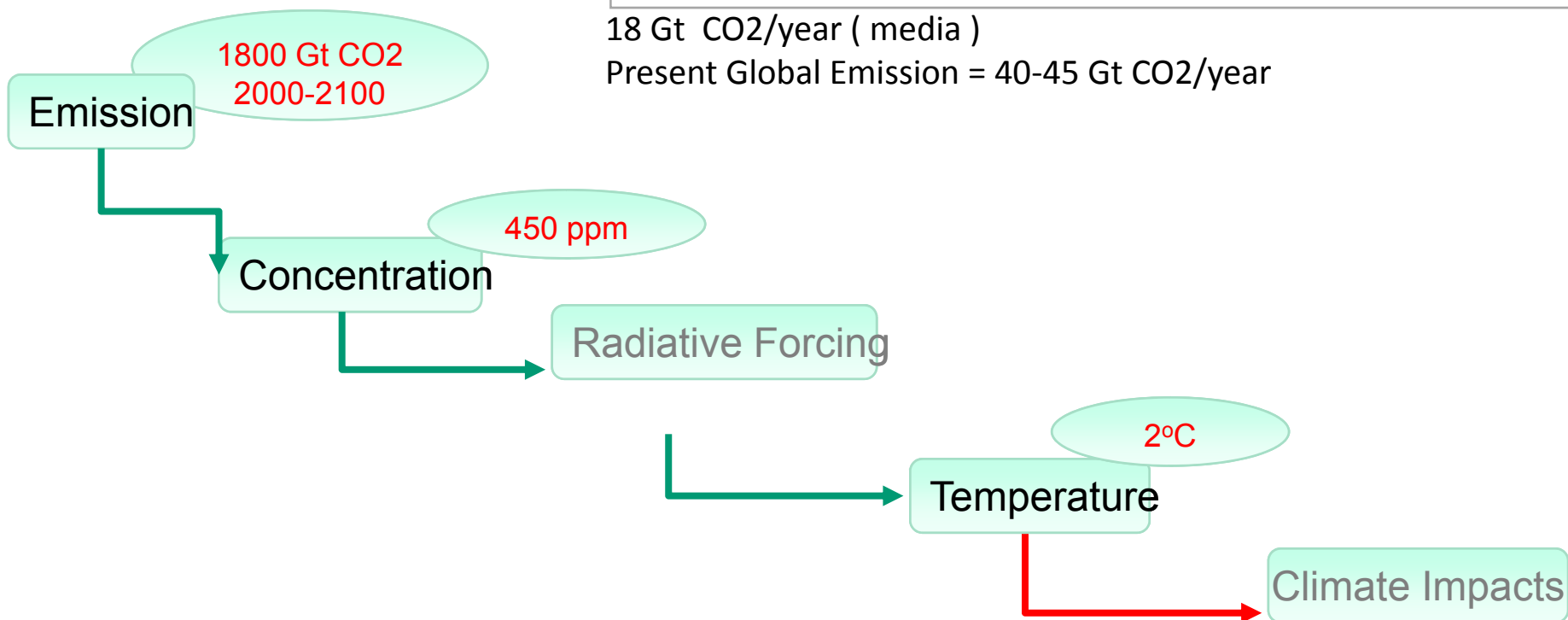


Com base na compreensão atual da realimentação entre o clima e o ciclo do carbono, os estudos com modelos sugerem que, para se estabilizar em 450 ppm de dióxido de carbono, seria necessário que as emissões cumulativas de dióxido de carbono ao longo do século XXI fossem reduzidas de uma média de aproximadamente 2460 Gt CO<sub>2</sub> para aproximadamente 1800 [1370 a 2200] Gt CO<sub>2</sub>.

*IPCC AR4 G1 - pg 23*

18 Gt CO<sub>2</sub>/year ( média )

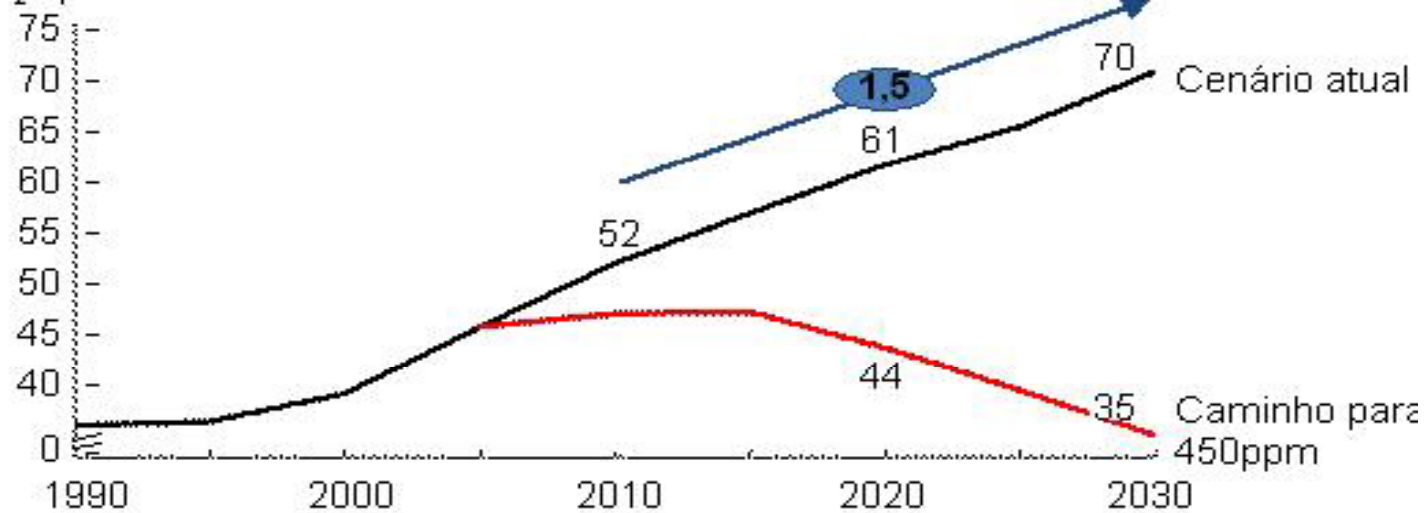
Present Global Emission = 40-45 Gt CO<sub>2</sub>/year





### Emissões globais de GEE,

Gt CO<sub>2</sub>e por ano



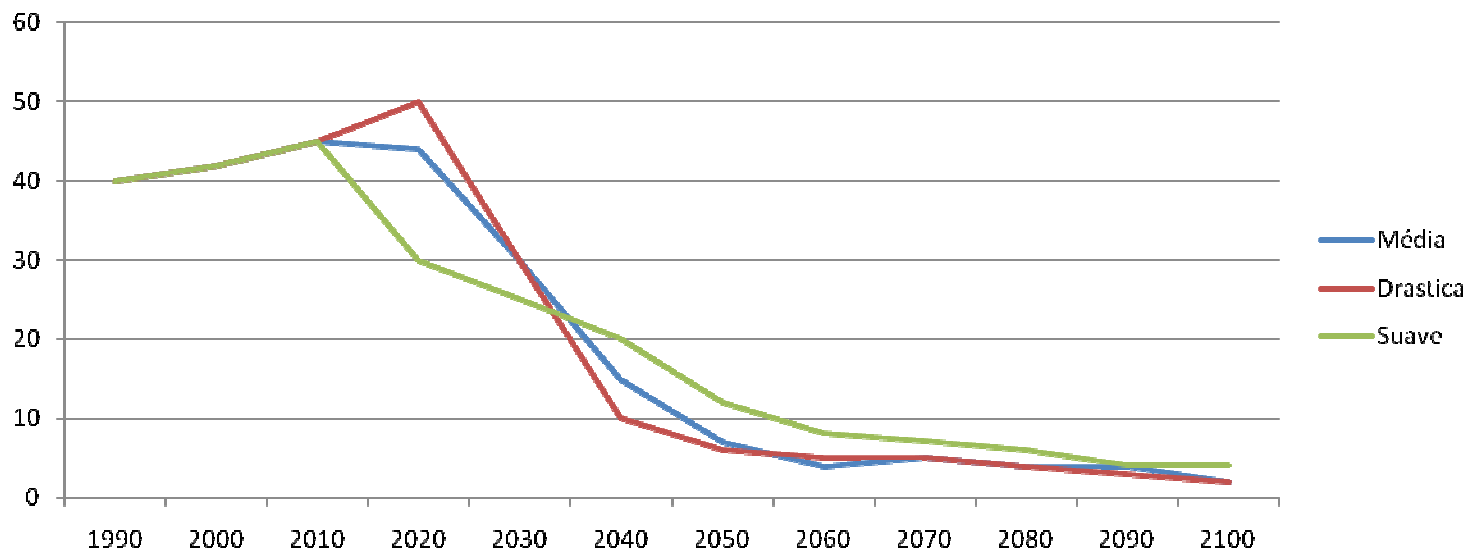
Anexo 1 60%

52%

36%

32%

## Cenário 1800 Gt



Cenários 1800 Gt	1990	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
Suave				30	25	20	12	8	7	6	4	4
Média	40	42	45	44	30	15	7	4	5	4	4	2
Drástica				50	30	10	6	5	5	4	3	2

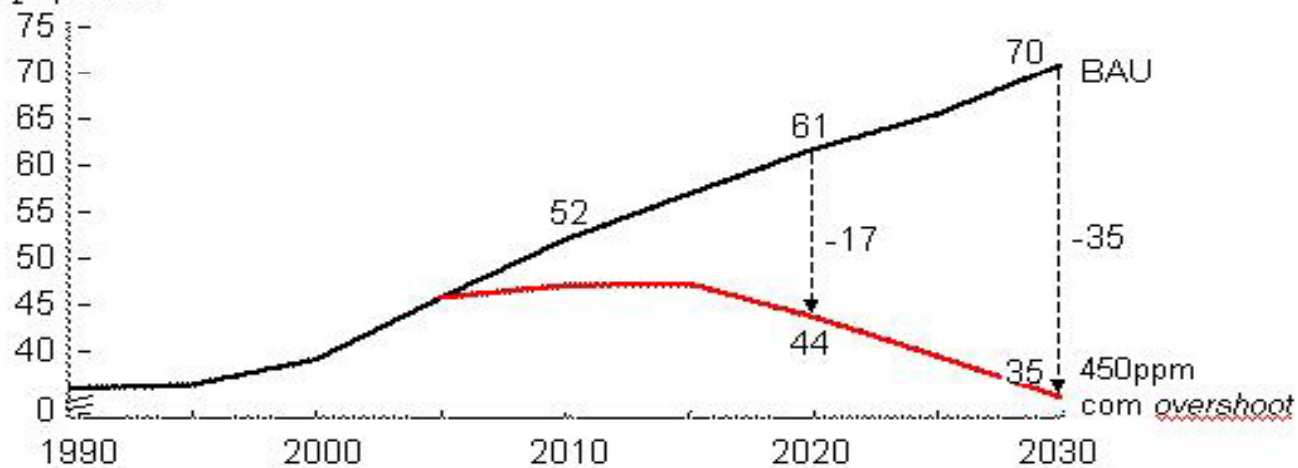
➡ 1800 Gt

<b>Cenário atual</b>	<b>40</b>	<b>42</b>	<b>45</b>	<b>61</b>	<b>70</b>
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➡ ~2000 Gt em 2030!!!

# Emission Reduction Challenge

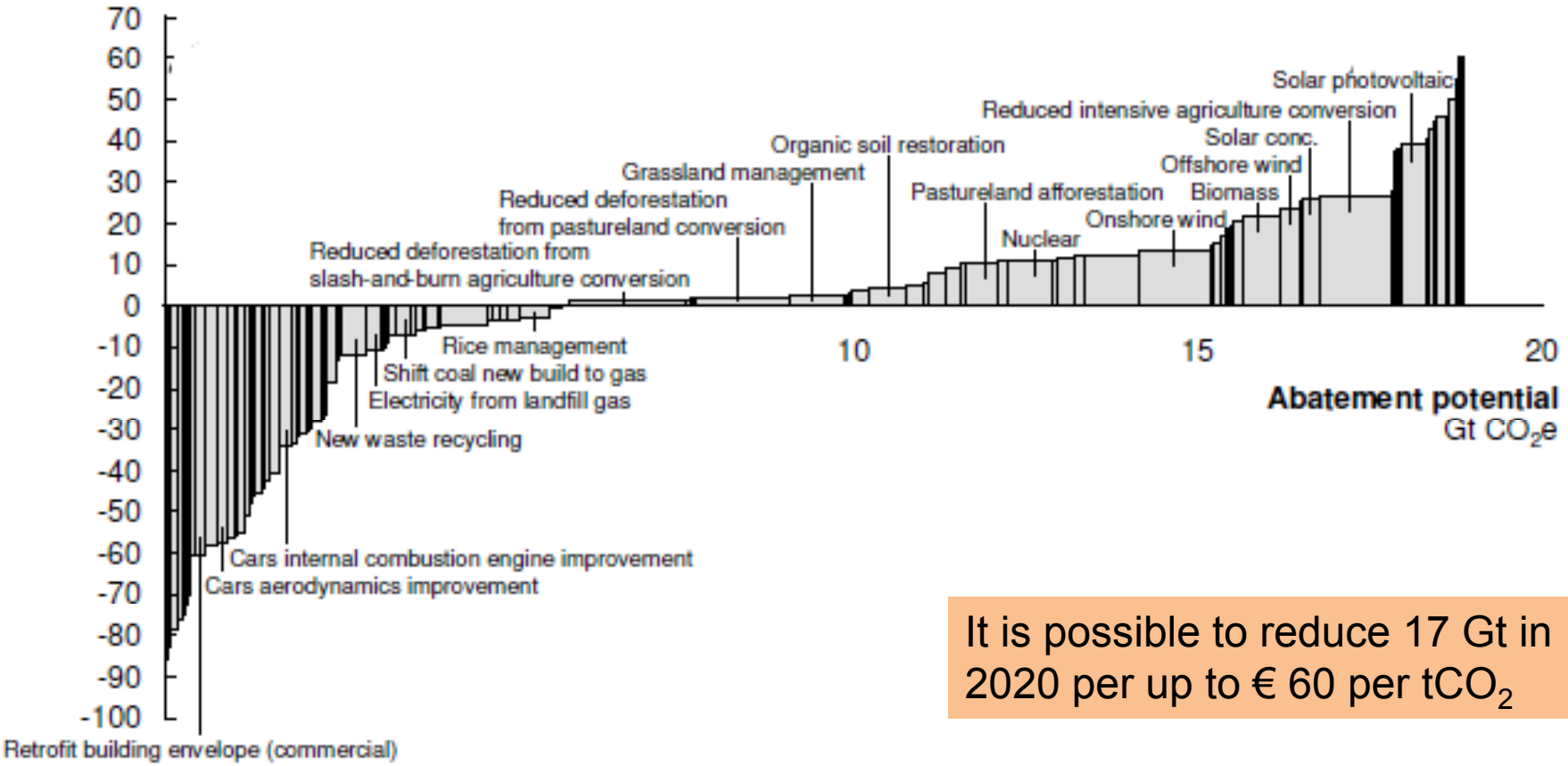
Emissões globais de GEE,  
Gt CO<sub>2</sub>e por ano



# Abatement Cost Curve

## Curva de custos de abatimento de gases do efeito estufa para 2020 por iniciativa

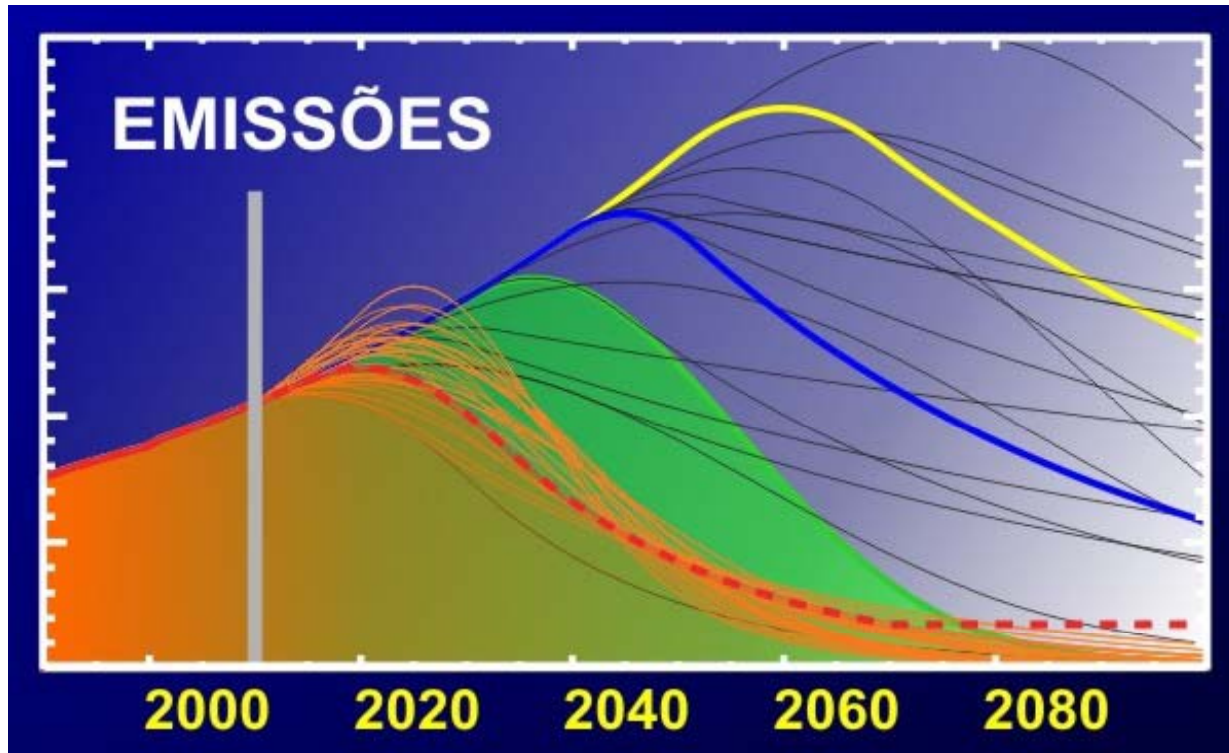
Abatement cost  
€ per tCO<sub>2</sub>e



It is possible to reduce 17 Gt in 2020 per up to € 60 per tCO<sub>2</sub>

Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO<sub>2</sub>e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play

# Possible National Pathways



# *International Commitments*

## *Emission Reduction Challenges*

### **IPCC Guidelines**

- Developed Countries should reduce their emissions between 25 e 40% in 2020 in relation to 1990.
- Developing Countries should reduce their level of emission increase (BAU deviation)

#### Tools:

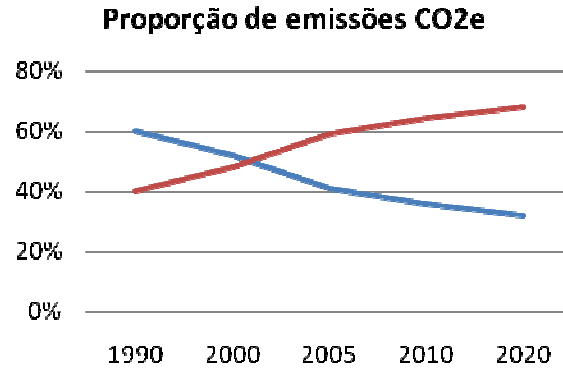
- CDM
- NAMA\*
- REDD\*

(still under elaboration)

# Common and Differentiated Responsibilities

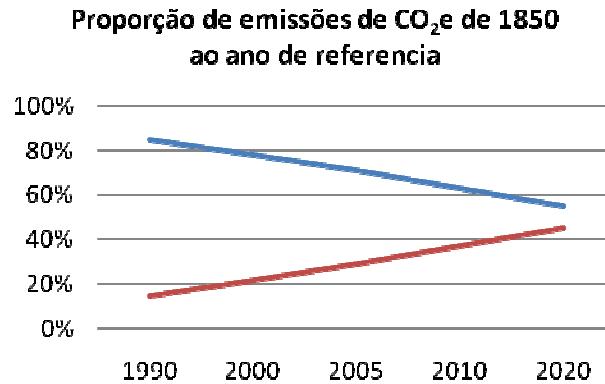
## A. Annual Emissions

Annual emissions of developing countries are higher than developed ones



## B. GHG Concentration

By the mid of the century concentration responsibility will be almost the same among developed and developing countries.



## C. Temperature Impact

Due to carbon lifetime (>100) the contribution on the temperature increase in this century could be interpreted as a consequence of developed countries emissions.

In 2020

The level of responsibility on the emission reduction effort of developing countries will increase.

The responsibility for adaptation costs should be of developed countries.

# Criteria for defining a carbon space share

- Responsibility
- Need
- Capacity

**Equity  
Principles**

- Universal applicability
- Easy to make operational
- Simplicity
- Allows for future refinements
- Allows for flexibility
- Allows for country-specific circumstances

**Operational  
Requirements**



## Differentiated Commitments by Groups of Countries

- Level of mitigation potential
- Level of responsibility for mitigation
- Level of mitigation capacity

Mitigations Commitments	
Quantitative Commitments	Nacional Emissions Reduction Targets Deviation from BAU targets
Qualitative Commitments	Policies and Measures Towards Emissions Reduction

# Deviation Target

Developing Developed

GtCO<sub>2</sub>e

61

45

36

1990

2005

2020

2020

2020

14

22

26

19

40

20

12,5

27,5

16,5

Deviation  
BAU - 30%

8,2

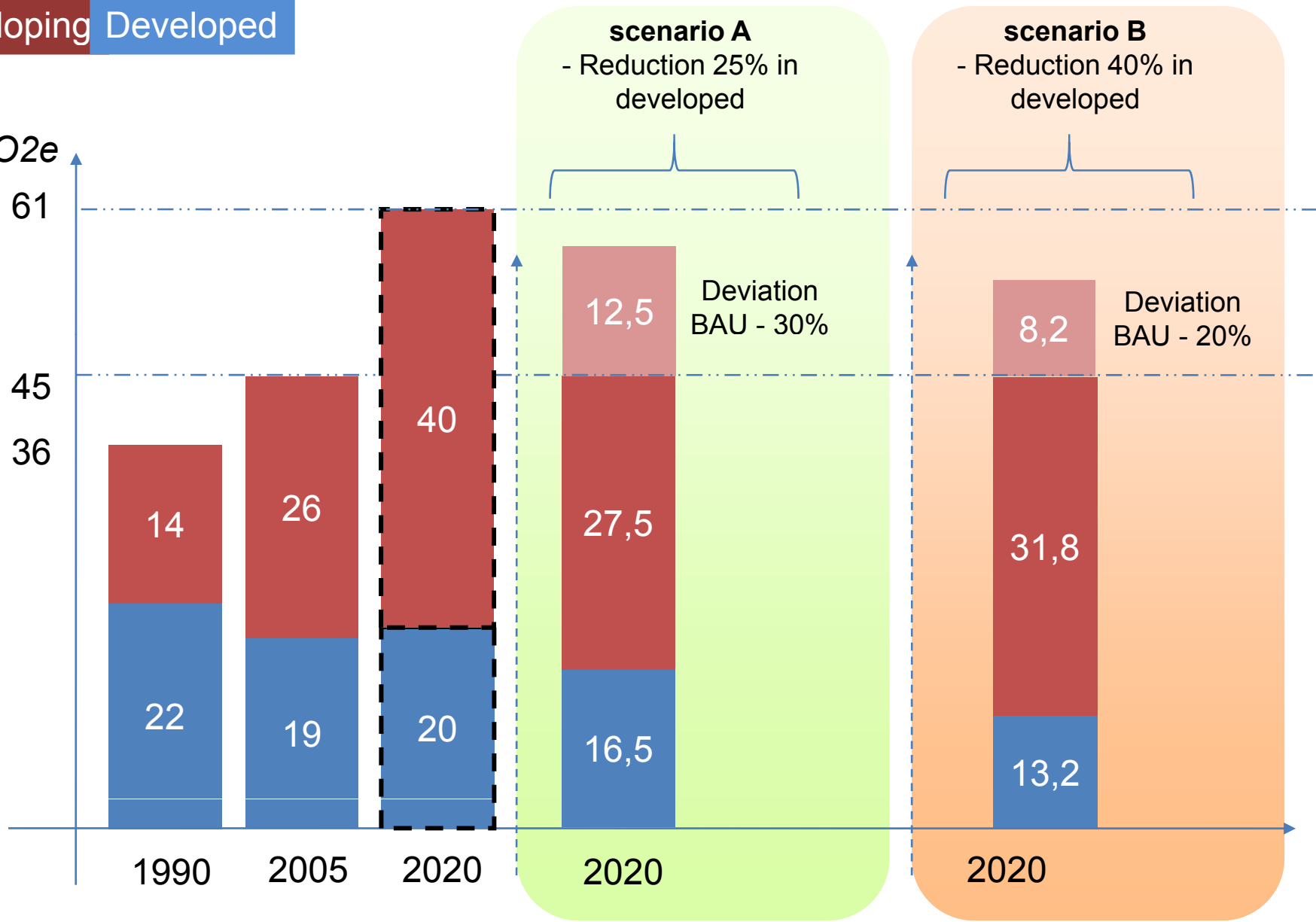
31,8

13,2

Deviation  
BAU - 20%

**scenario A**  
- Reduction 25% in  
developed

**scenario B**  
- Reduction 40% in  
developed



# There is a huge variety of policies and instruments to foster mitigation actions

- Integrating climate policies in broader development policies
- Regulations and standards
- Taxes and charges
- Tradable permits

- Financial incentives
- Voluntary agreements
- Information instruments
- Research and development

- Applicability depends on national circumstances and interaction
- There are advantages and disadvantages for any given instrument
- Instruments can be designed well/poorly, lax/stringent and need to be monitored to improve implementation
- Four main criteria are used to evaluate national (and international) policies: environmental effectiveness, cost-effectiveness, distributional and equity, institutional feasibility

# Alternatives to Define Carbon Space

## Contraction & Convergence

- *Contraction: Establishment of acceptable threshold (450 ppm or temperature increase); **Science based***
- *Convergence: Establishment of an equal level of emission per capita at a national level or an equal level at a sectoral level; **Equity based***

# Conclusions

- In order to stabilize concentration in 450 ppm by 2100, it is mandatory to reduce emissions substantially up to 2050.
- The later we start to reduce the greater will be the future effort and the higher will be the costs.
- Mitigation cost are lower than adaptation cost to climate change.
- A Abatement Cost Curve addressing different sectors and different regions should be done so that right decisions could be made in terms of optimizing the overall mitigation cost.