

# The Future of IPCC: Context – Tasks - Challenges

International Symposium on Post-Kyoto International Climate  
Change Framework and Sectoral Approaches

Tokyo, February 27<sup>th</sup> 2009



Research Domain Sustainable Solutions

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Technische Universität Berlin

Chair: Economics of Climate Change



**INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE**

IPCC Working Group III - Mitigation

Co-Chair of WG III



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- Key messages of AR4
- Building upon AR4, WG III
- Context of AR5
- New challenges and tasks of AR5

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- Key messages of AR4
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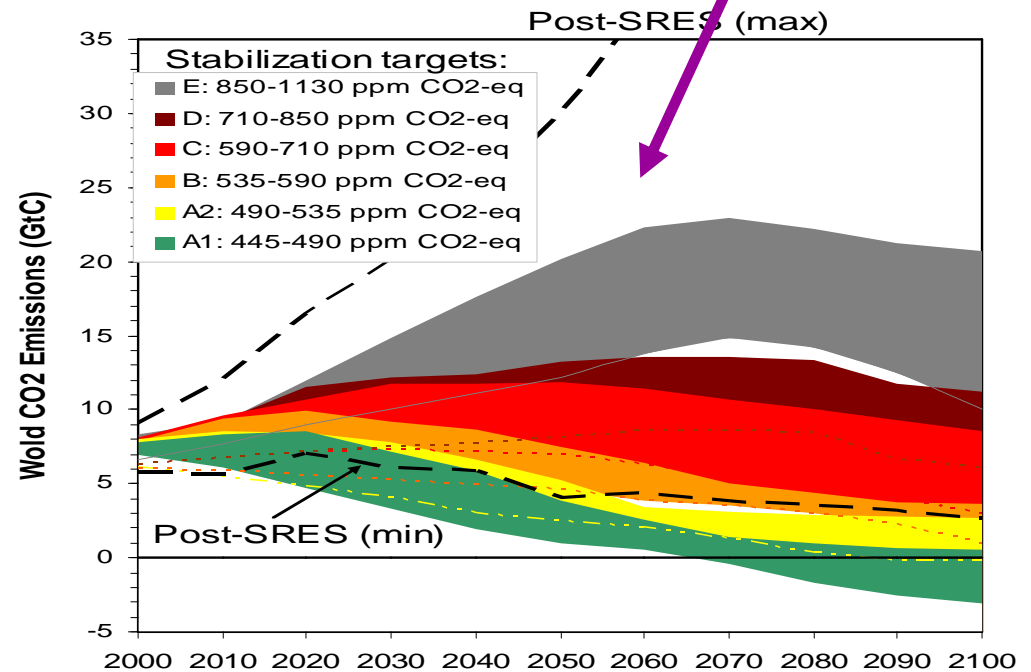
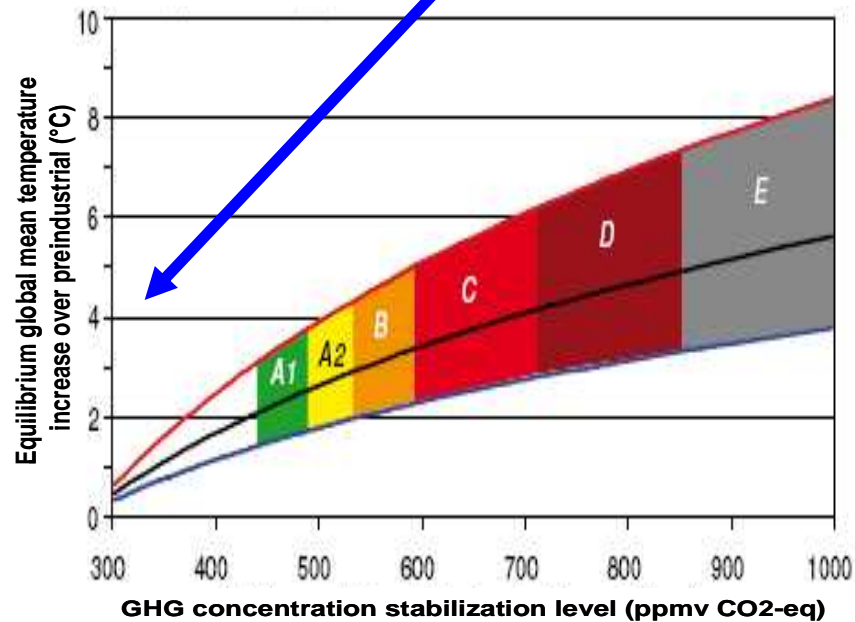
## Key Messages of AR4

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- Ambitious climate protection ( $\leq 550$  ppm CO<sub>2</sub>-eq) costs about 1-2% of global GDP
- Portfolio of mitigation options is necessary: CCS, energy efficiency and renewables have a high economic potential; nuclear energy has a moderate potential.
- All sectors can contribute to GHG reduction. AR4 shows first sectoral assessments
- Pricing of CO<sub>2</sub> is necessary, but needs to be flanked by other measures

## AR4 Result: Goal Determines Measures

The lower the **stabilization levels**, the earlier GHG-emissions must **peak**.



## AR4 Result: Macro-Economic Costs in 2030

Costs are global average for least cost approaches from top-down models

Costs do not include co-benefits and avoided climate change damages

Trajectories towards stabilization levels (ppm CO <sub>2</sub> -eq)	Median GDP reduction <sup>[1]</sup> (%)	Range of GDP reduction <sup>[2]</sup> (%)	Reduction of average annual GDP growth rates <sup>[3]</sup> (percentage points)
590-710	0.2	-0.6 – 1.2	< 0.06
535-590	0.6	0.2 – 2.5	<0.1
445-535 <sup>[4]</sup>	Not available	< 3	< 0.12

<sup>[1]</sup> This is global GDP based on market exchange rates.

<sup>[2]</sup> The median and the 10<sup>th</sup> and 90<sup>th</sup> percentile range of the analyzed data are given.

<sup>[3]</sup> The calculation of the reduction of the annual growth rate is based on the average reduction during the period till 2030 that would result in the indicated GDP decrease in 2030.

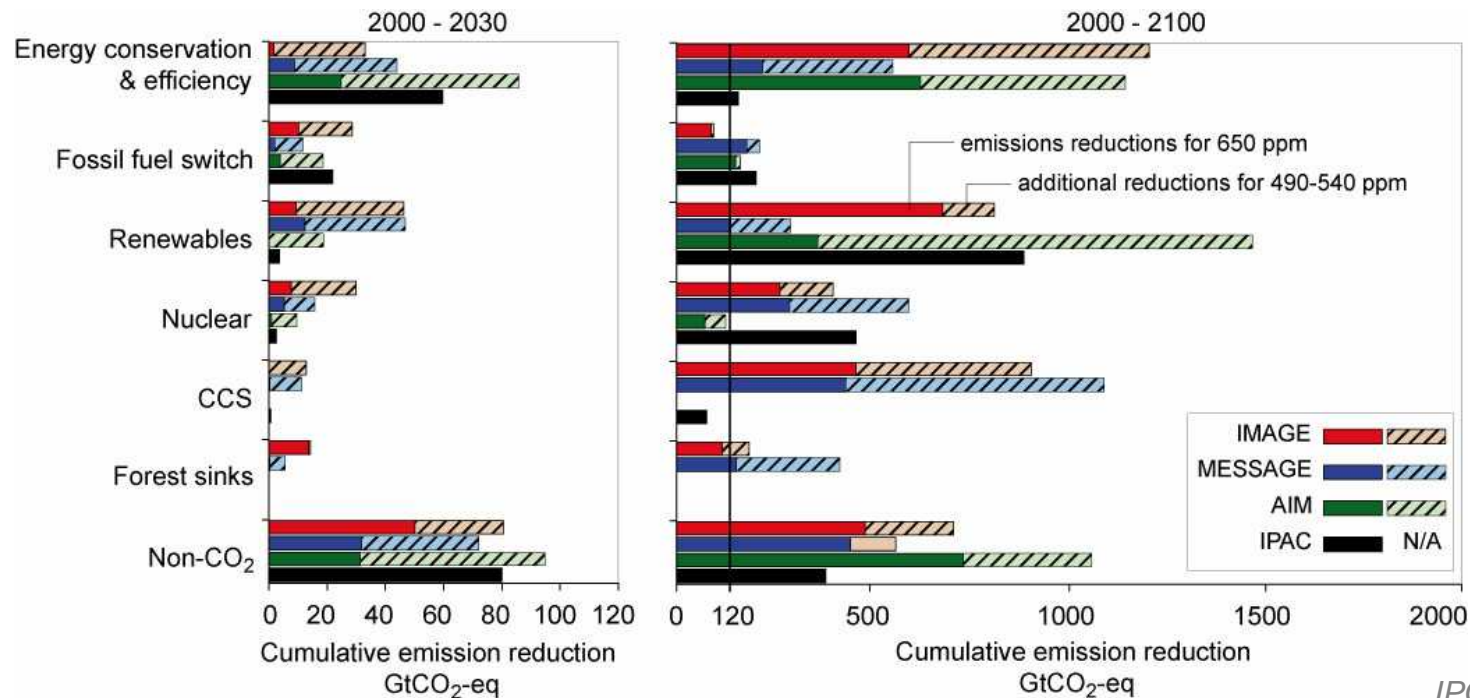
<sup>[4]</sup> The number of studies that report GDP results is relatively small and they generally use low baselines.

## AR4 Result: Portfolio of Mitigation Options is Needed

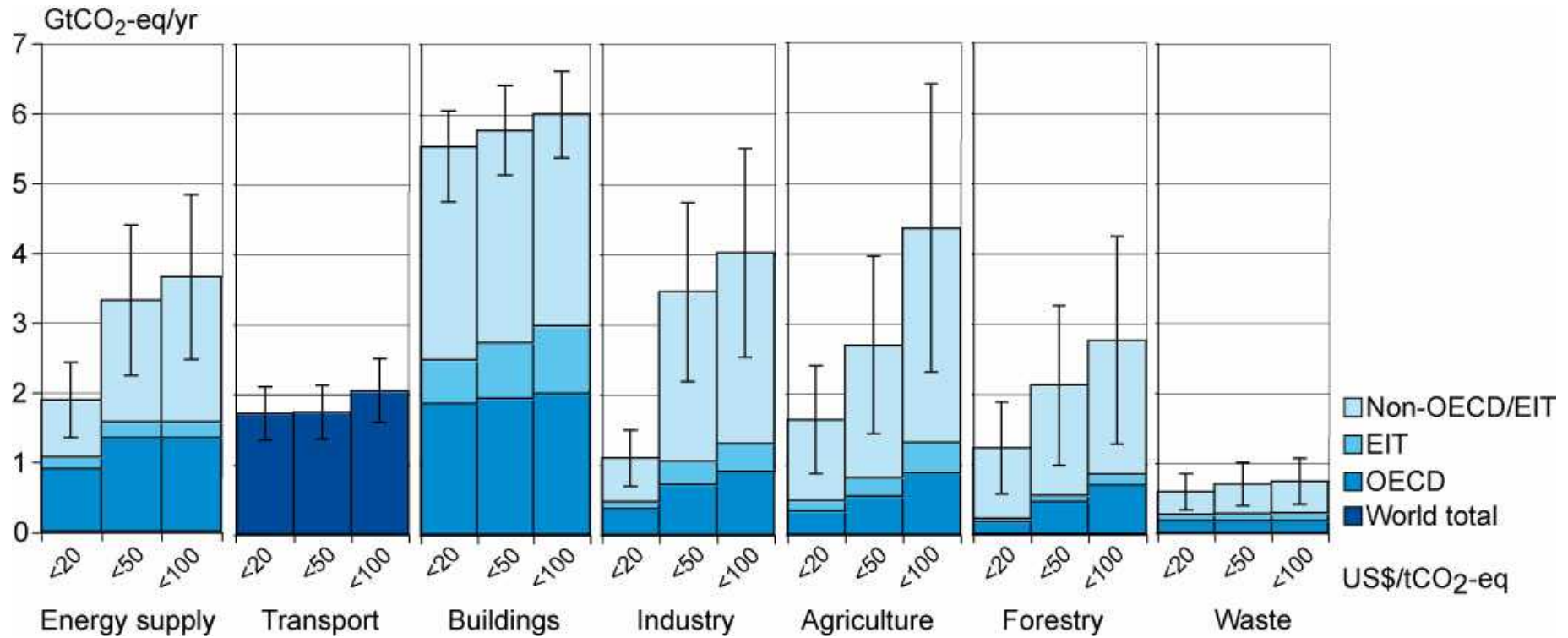
The range of stabilization levels can be achieved by:

- deployment of a portfolio of technologies that are currently available
- technologies that are expected to be commercialised in coming decades

This assumes that appropriate and effective incentives are in place for development, acquisition, deployment and diffusion of technologies and for addressing related barriers.



## AR4 Result: All Sectors Can Contribute



Note: estimates do not include non-technical options, such as lifestyle changes.

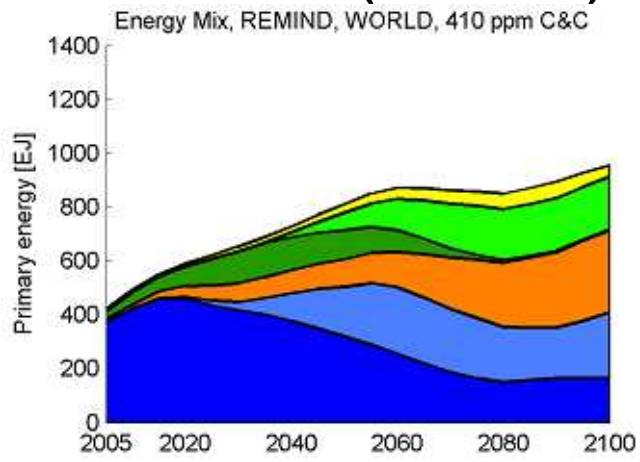


# AR4 Result: All Sectors Can Contribute

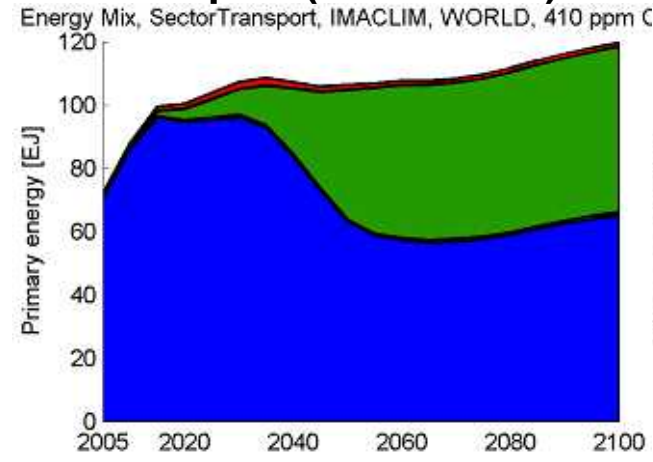
## WORLD, 410ppm CO<sub>2</sub> only

- Fossil Fuels w/o CCS
- CCS Fossil
- Renewables w/o Biomass
- Biomass w/o CCS
- CCS Biomass
- Nuclear
- Electricity

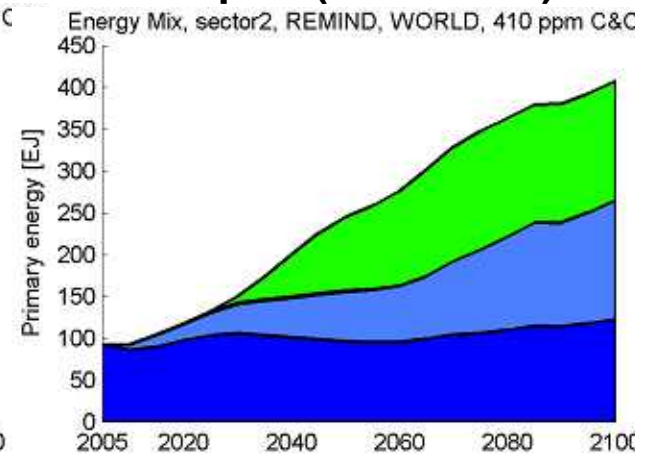
### All Sectors (REMIND-R)



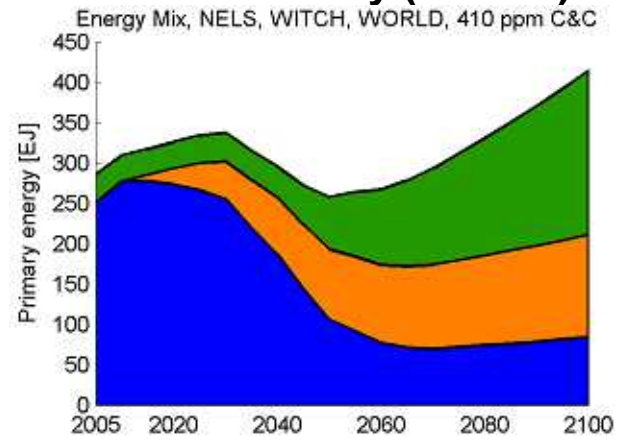
### Transport (IMACLIM-R)



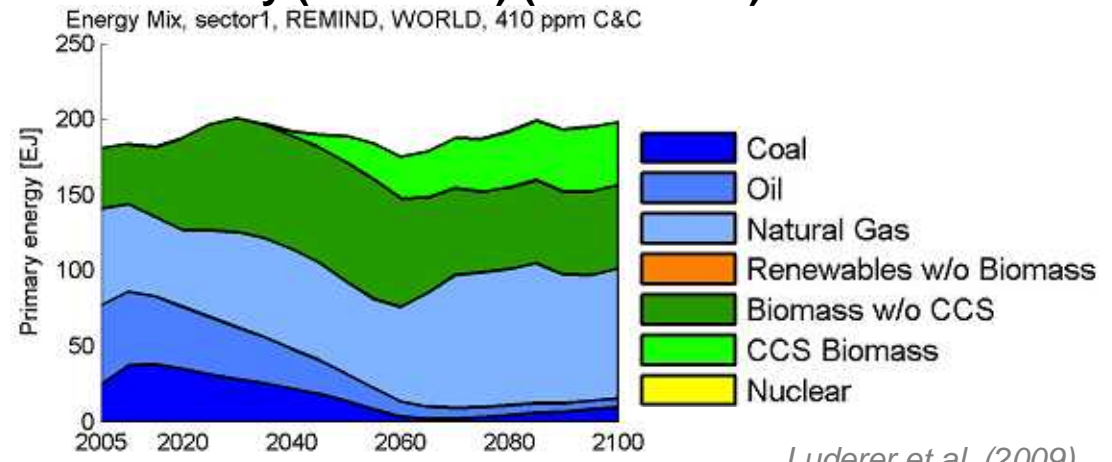
### Transport (REMIND-R)



### Non-Electricity (WITCH)



### Stationary (non elec.) (REMIND-R)

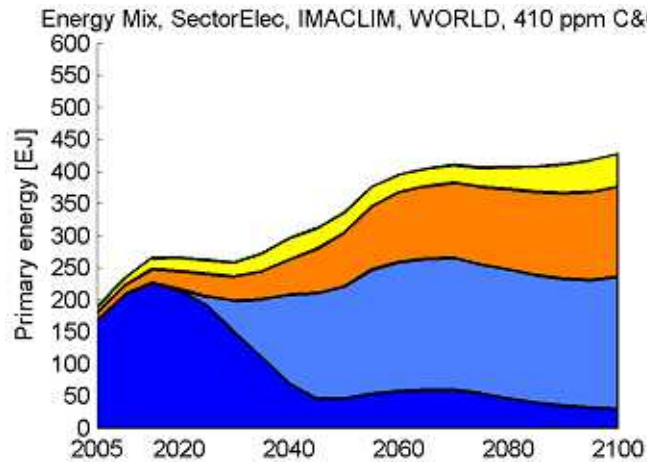


# AR4 Result: All Sectors Can Contribute

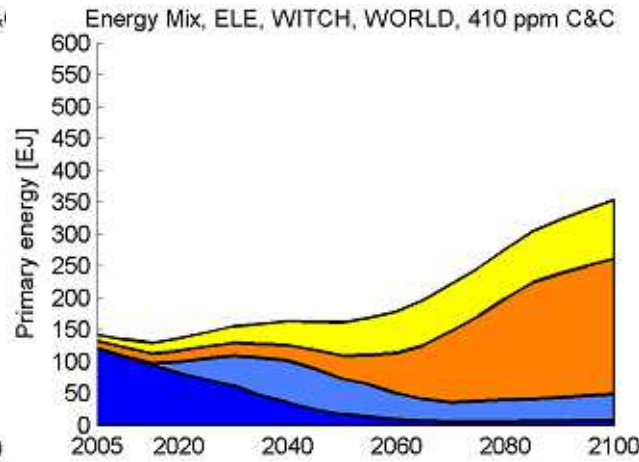
## WORLD, 410ppm CO<sub>2</sub> only



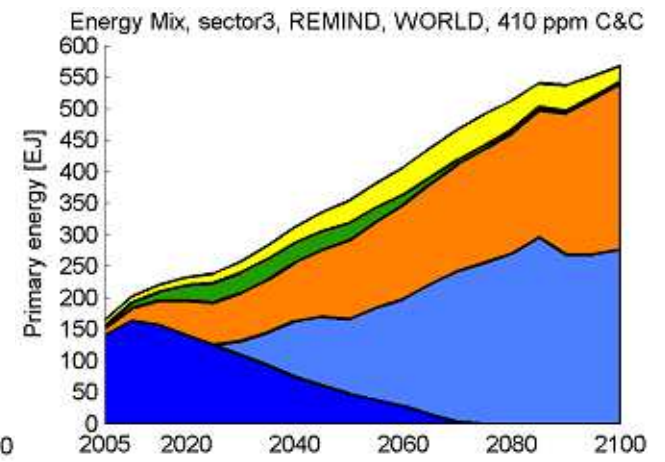
**Power & Heat (IMACLIM-R)**



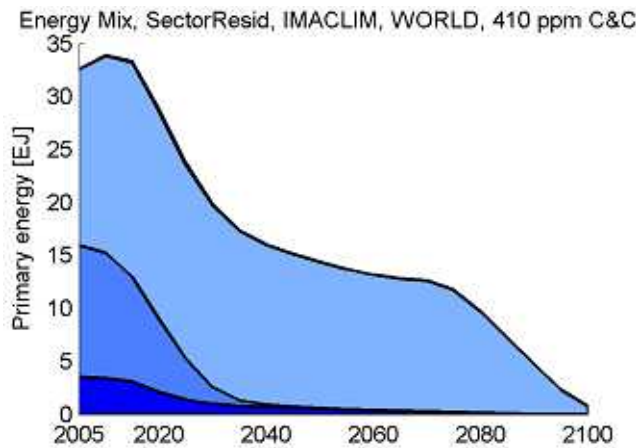
**Power & Heat (WITCH)**



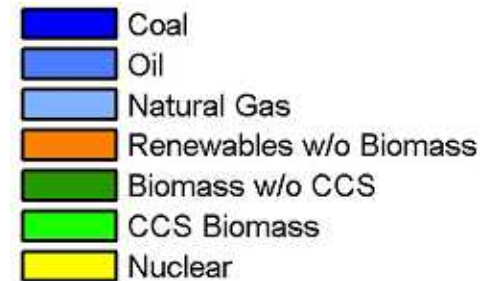
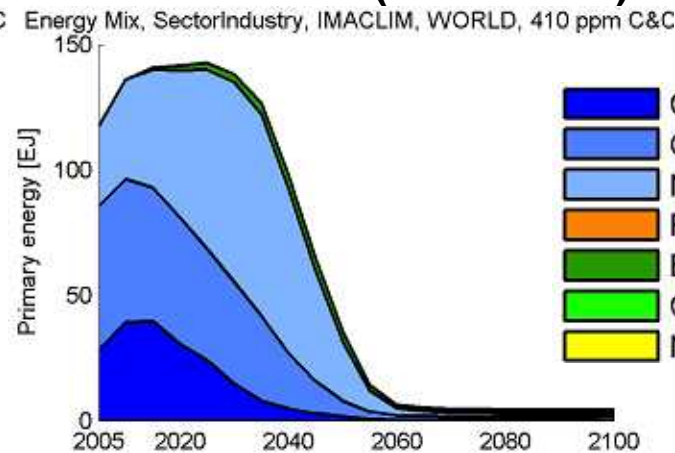
**Power & Heat (REMIND-R)**



**Industry (IMACLIM-R)**

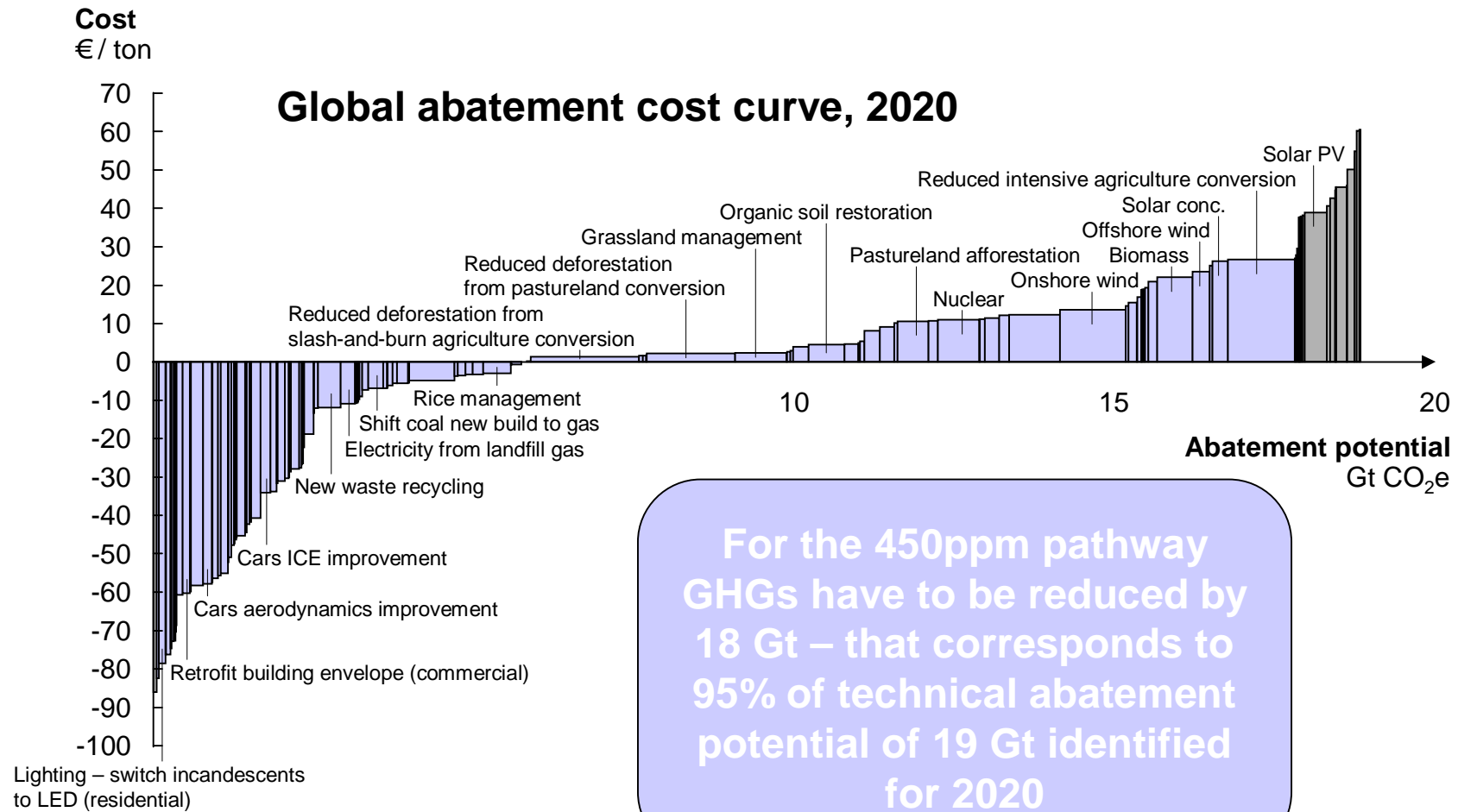


**Residential (IMACLIM-R)**



# Reduction by 18 Gt Corresponds to 95% of Potential

according to McKinsey Cost Curve v2.0



## AR4 Result: **Pricing of CO<sub>2</sub> is Necessary**

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A price for CO<sub>2</sub> should lead to CO<sub>2</sub>-mitigation in all sectors:

- To reach stabilization around 550ppm CO<sub>2</sub>-eq by 2100 a CO<sub>2</sub>-price of 20-80US\$/tCO<sub>2</sub> is necessary by 2030.
- In the above price level might induce a major shift towards low carbon technologies.
- There is more than one method to internalize the social costs of carbon: prices vs. quantities

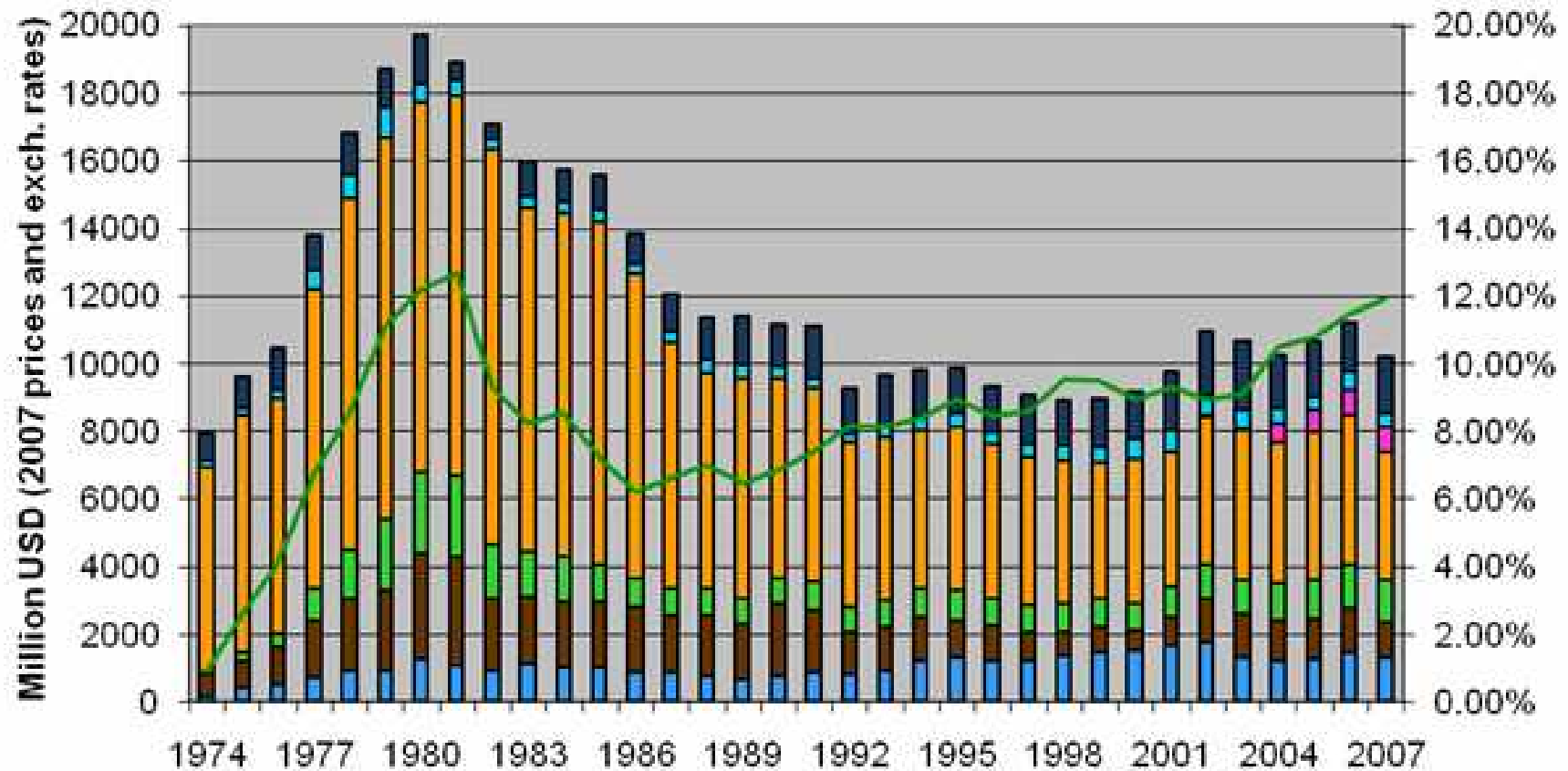
Costs are reduced when all sectors are included.

## AR4 Result: **Importance of Technology Policies**

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- The lower the stabilization levels (550 ppm CO<sub>2</sub>-eq or lower) the greater the need for more efficient RD&D efforts and investment in new technologies during the next few decades (for achieving stabilisation and reducing costs).
- Government support through financial contributions, tax credits, standard setting and market creation is important for effective technology development, innovation and deployment.
- Government funding for most energy research programmes has been flat or declining for nearly two decades (even after the UNFCCC came into force); now about half of 1980 levels. These findings are not in accordance with the required portfolio of mitigation options needed to be pursued.

## AR4 Result: R&D-Investment in Energy Technologies



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## Building upon AR4, WGIII

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- More consistent scenarios: The separation of baseline scenarios and policy scenarios has been done in a somewhat misleading way.
- More important role of „2nd-best“ scenarios in cost assessment
- Clearer handling of uncertainties and risks
- Introduce coherent metrics in top-down and bottom-up analysis
- Design policy chapter to be of more use for policy makers



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## Context of AR5

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**2006:**  
Stern report

**2007:**

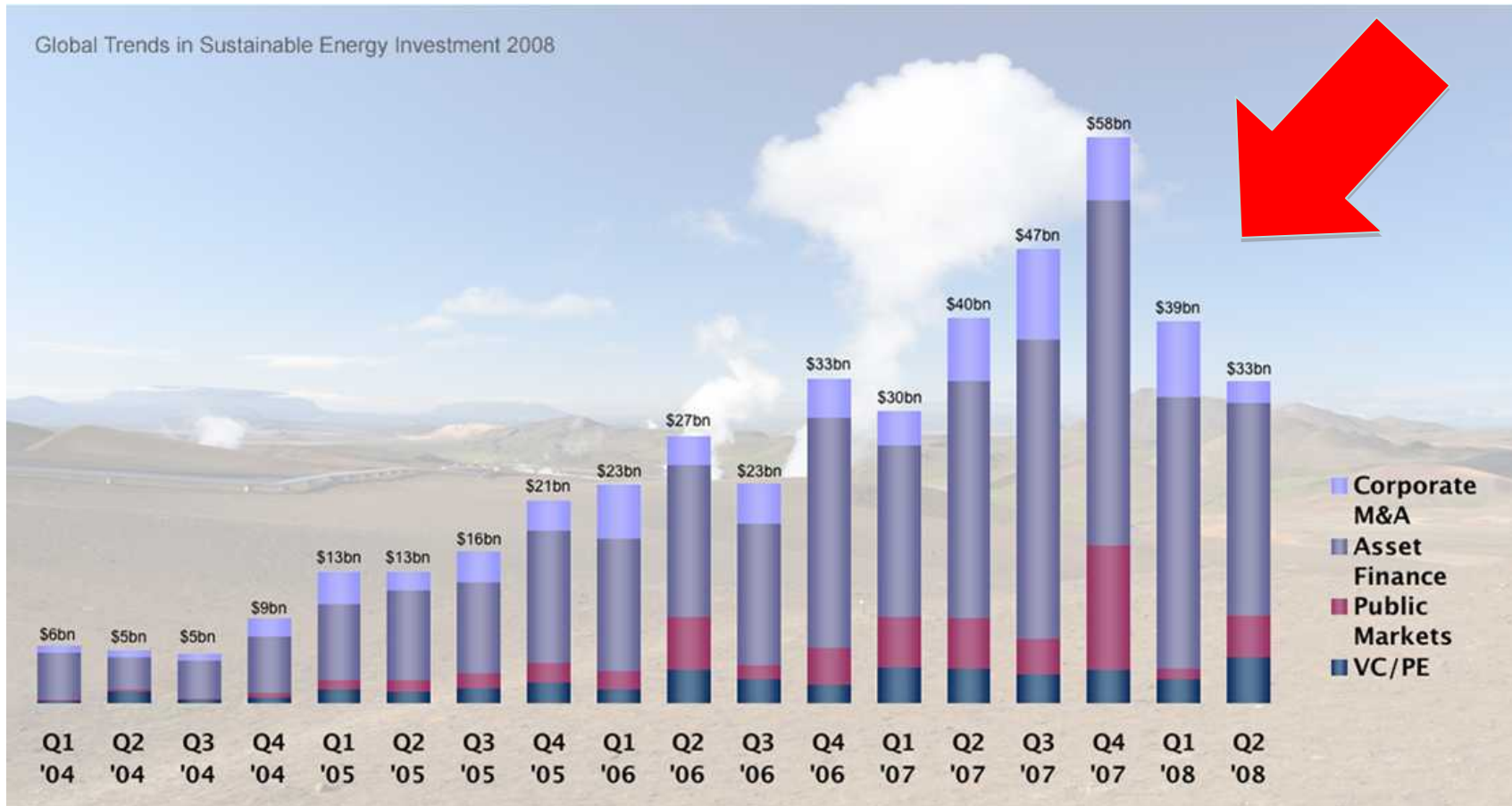
IPCC receives Nobel price



**2008:**  
Obama is elected US-president  
- Steve Chu is designated  
secretary of energy

# AR5 Context: Financial Crisis

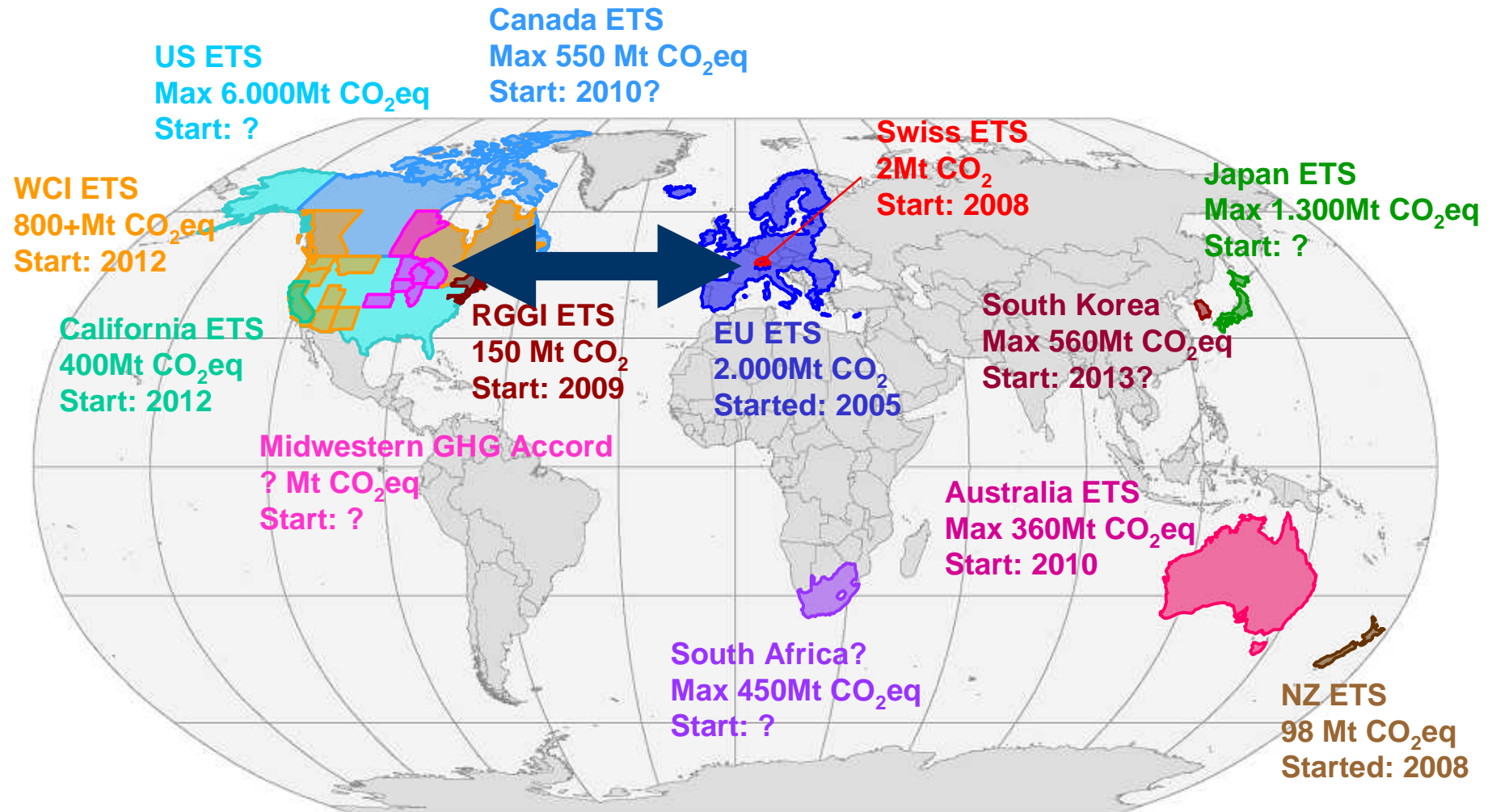
## Investment in Renewable Energies



Source: New Energy Finance

- ➔ The financial crisis and the accompanying economic stimulus packages effect climate policies – especially renewables

# AR5 Context: Transatlantic CO<sub>2</sub>-Market

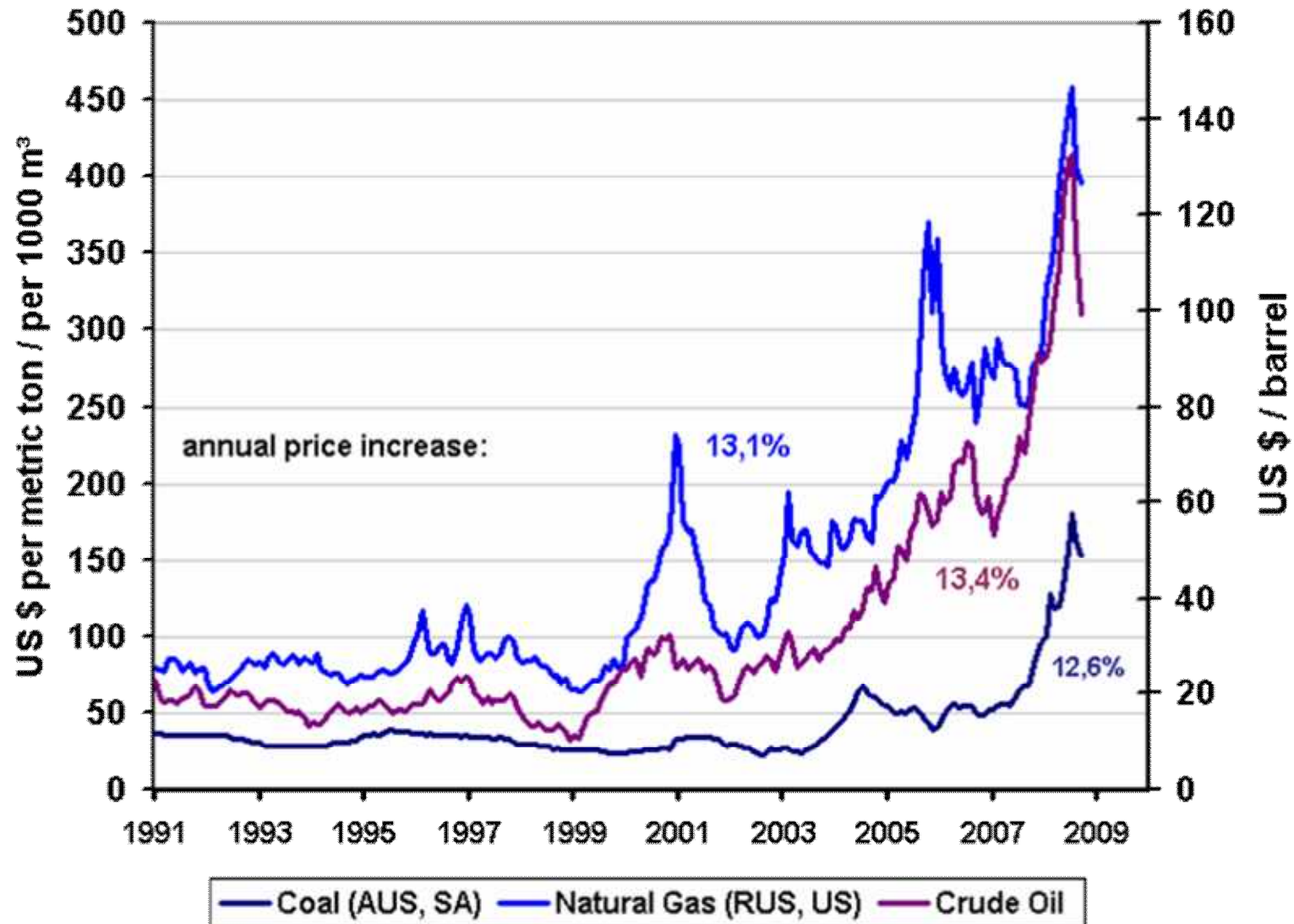


***“The European Commission is preparing to call on the United States to create a trans-Atlantic system of carbon trading”***

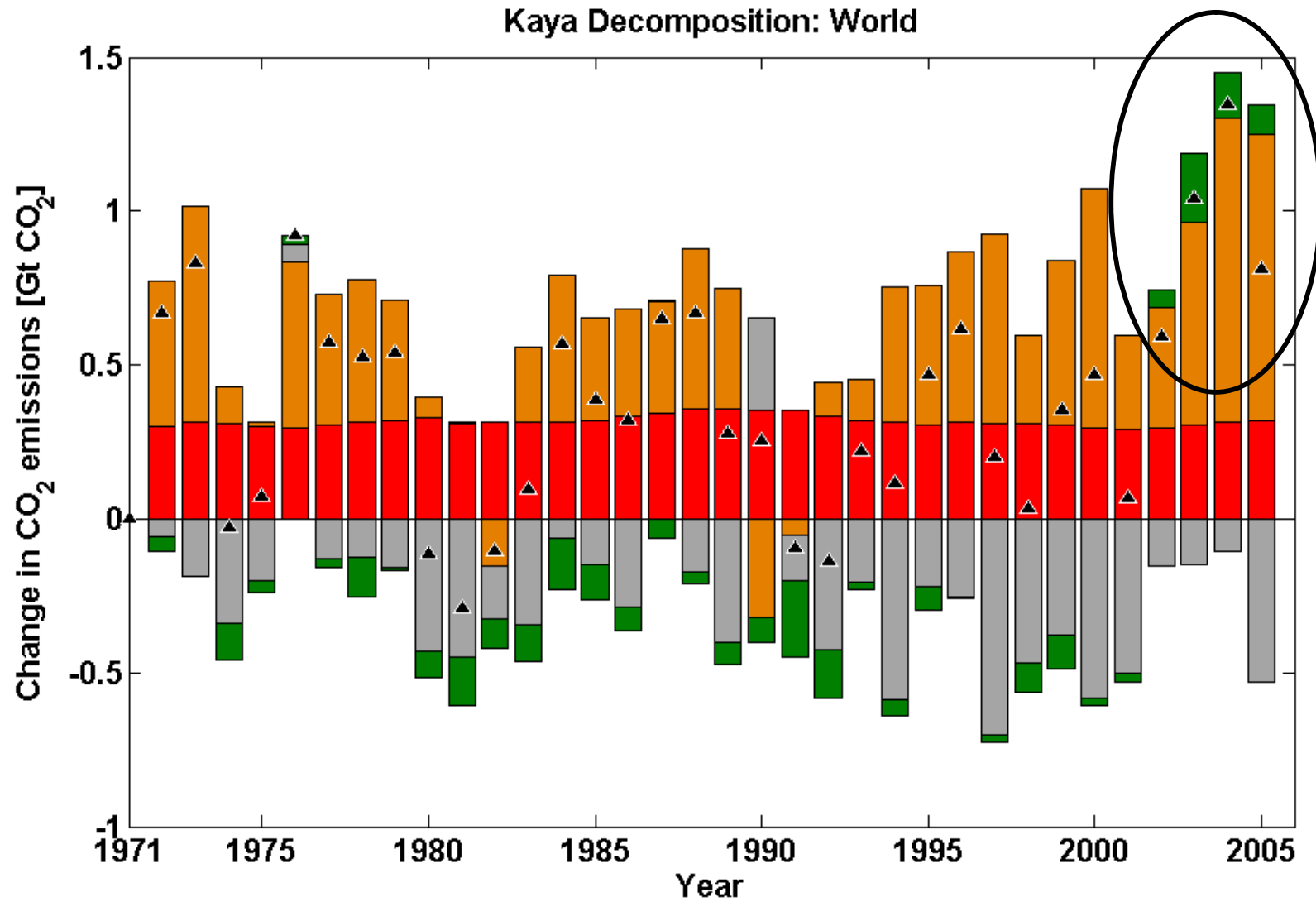
*- Harald Tribune, Friday January 23<sup>rd</sup> 2009*

## AR5 Context: Renaissance of Coal

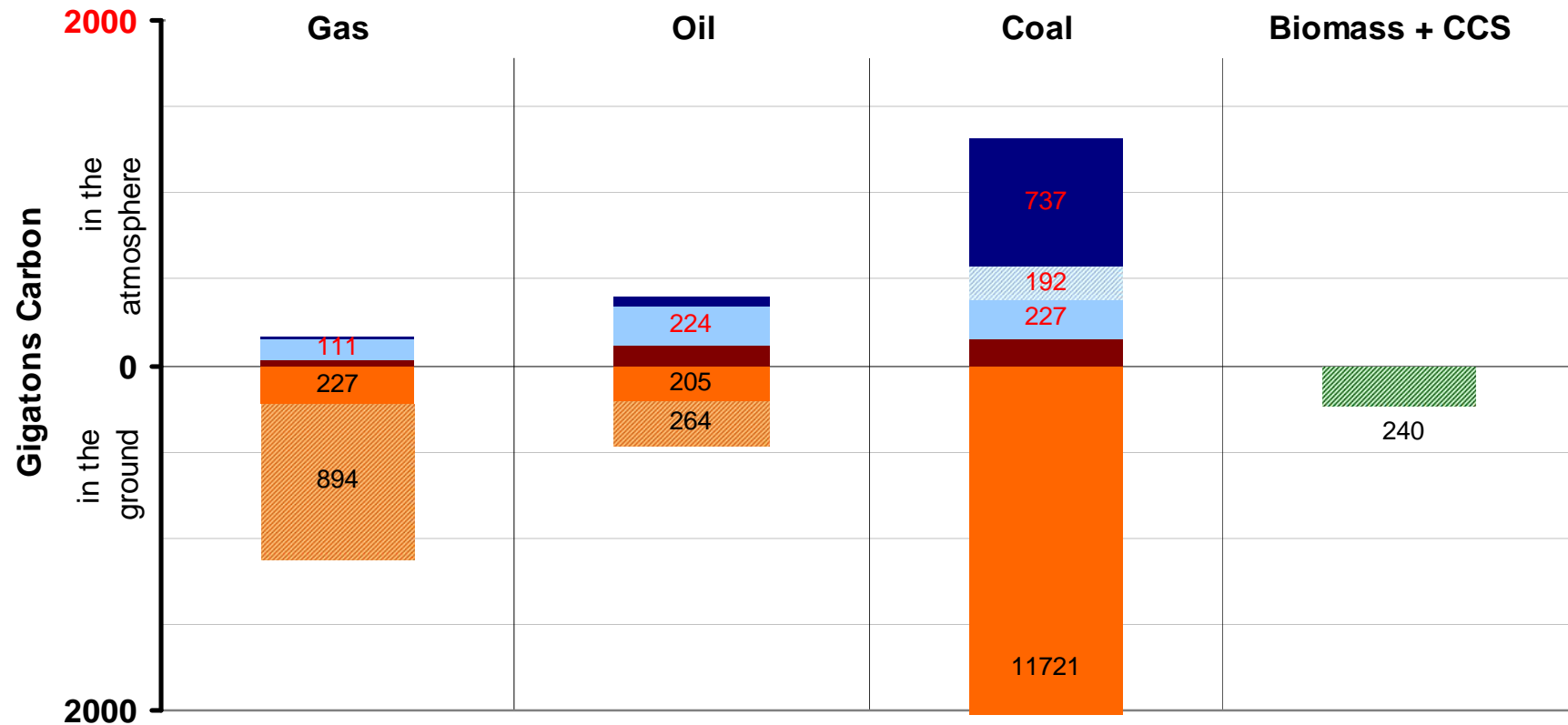
### Global Fossil Fuel Prices 1991 - 2008



## AR5 Context: Renaissance of Coal



# AR5 Context: “Infinite” Exhaustible Resources



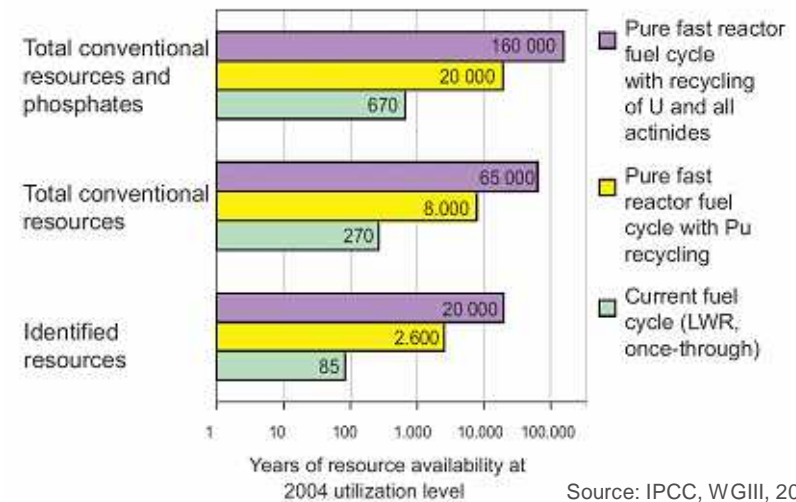
- conventional resources and reserves
- cumulative historical consumption
- coal+CCS (zero-emissions; 400ppm-eq scenario)
- biomass+CCS (negative emissions; 400ppm-eq scenario)
- unconventional resources and reserves
- estimated consumption (400ppm-eq scenario)
- estimated additional consumption (BAU scenario)

Sources: Reserves BGR 2008; Cumulative historical consumption: Marland u. a. 2008; Scenarios: Edenhofer u. a. 2009.

## AR5 Context: Nuclear Energy



Source: Framatome



“Nuclear energy, already at about 7% of total primary energy [16% of world electricity production], could make an increasing contribution to carbon free electricity and heat in the future. The major barriers are: long-term fuel resource constraints without recycling; economics; safety; waste management; security; proliferation, and adverse public opinion”. IPCC, 2007, WG III.



EPR in Olkiluoto, Finland, Source: Framatome



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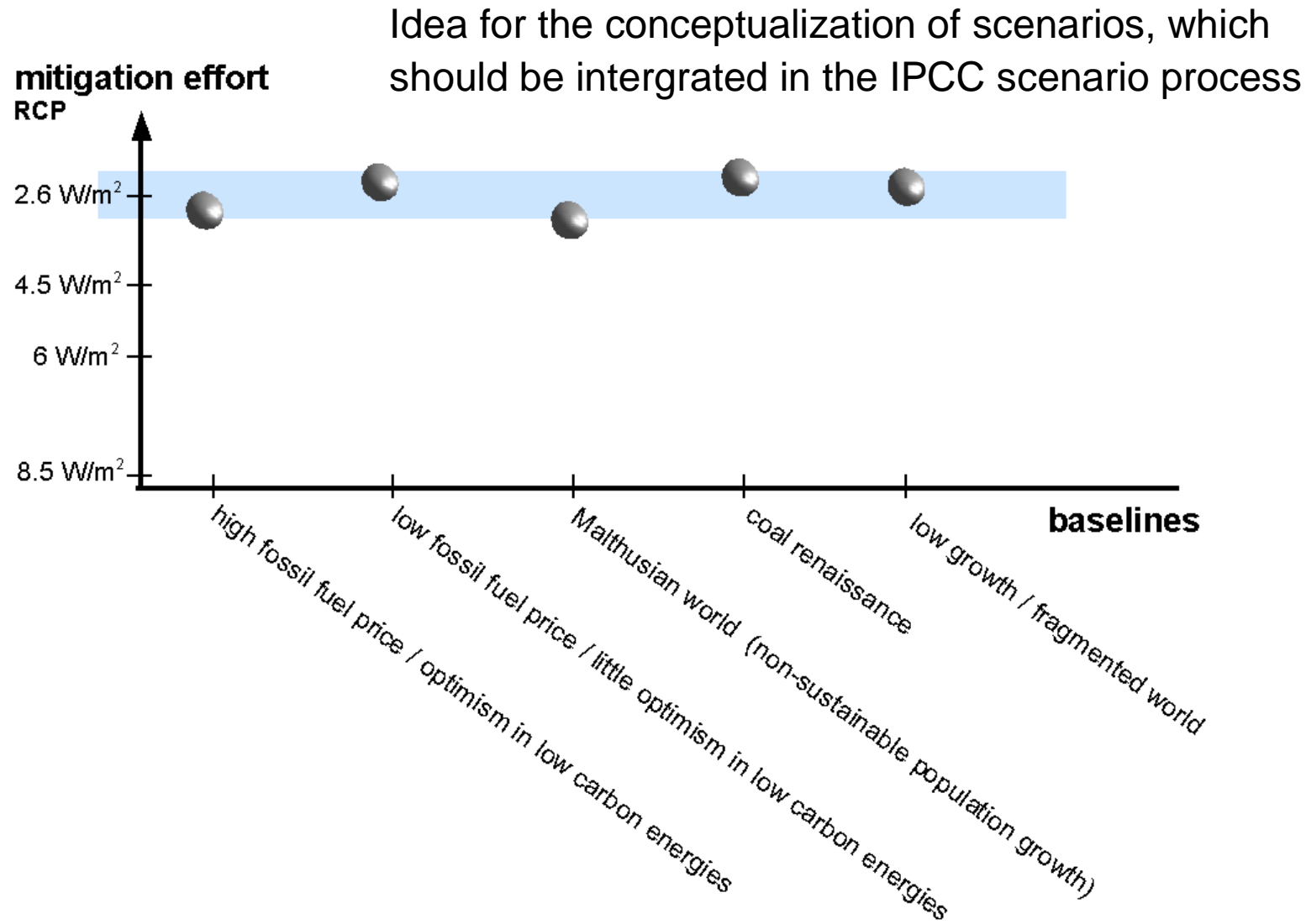
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## Outcomes of Inconsistent Scenarios

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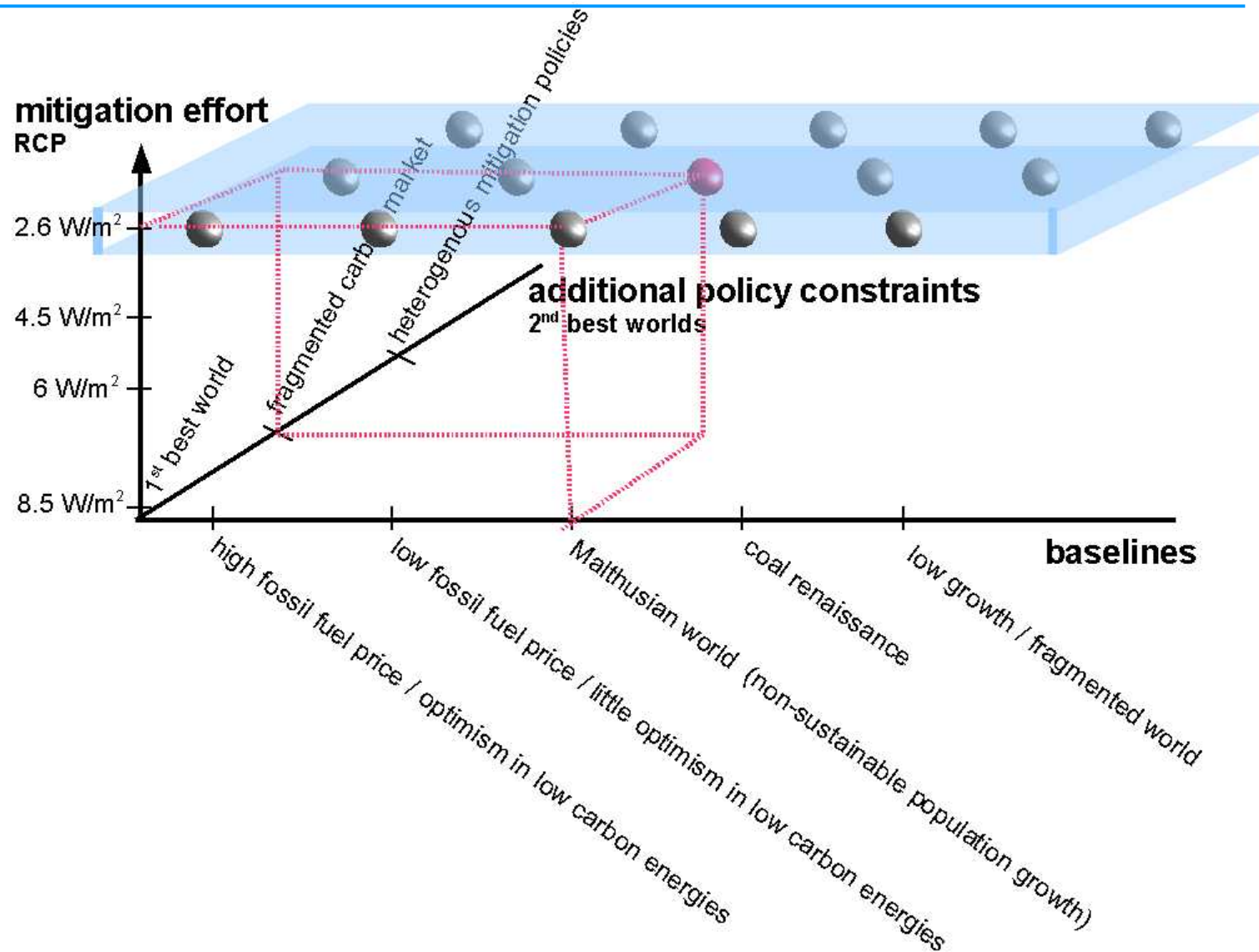
Baseline scenarios being inconsistent with policy scenarios lead to „false“ assessments of strategies and costs of mitigation.

## Comparison of Scenarios in AR5



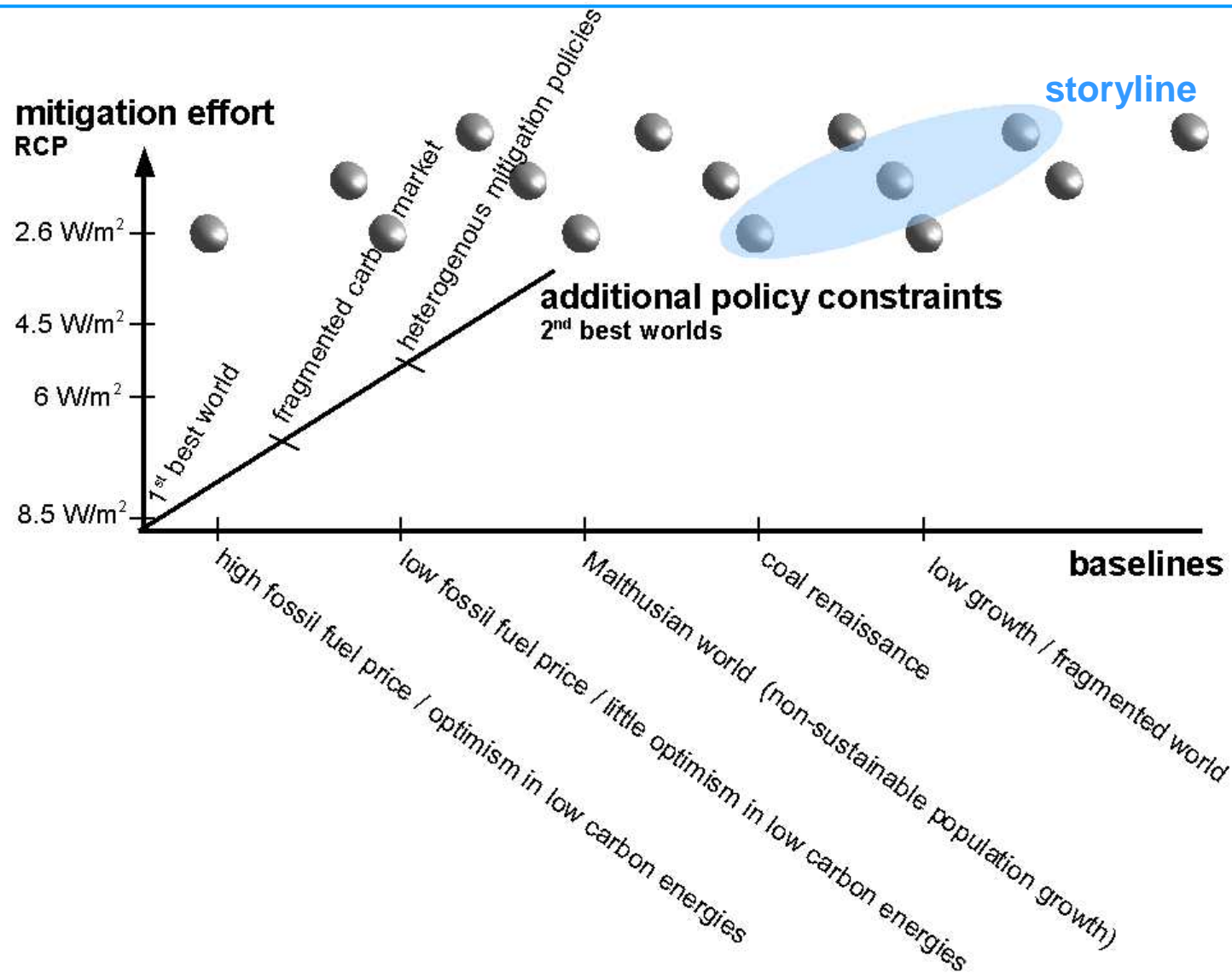
baselines should be self-consistent

# Comparison of Scenarios in AR5



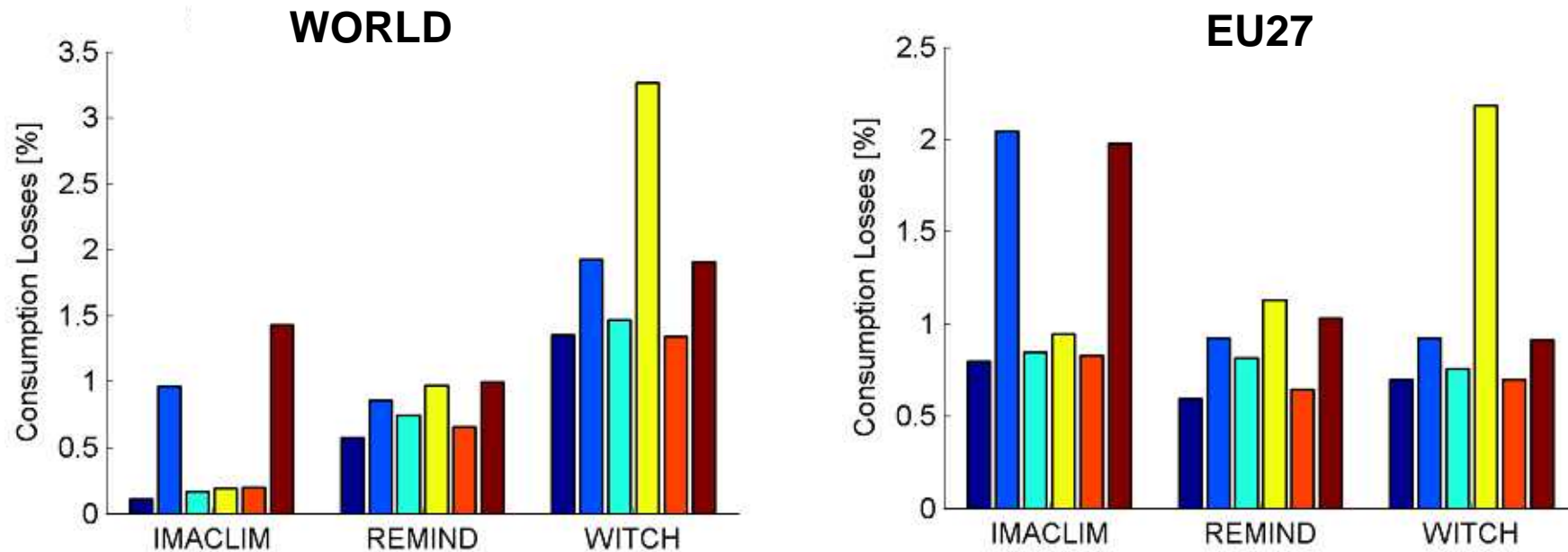
Baselines and policies go together and define scenarios: Scenarios without mitigation (only baseline) or with mitigation (baseline + policy).

## Comparison of Scenarios in AR5



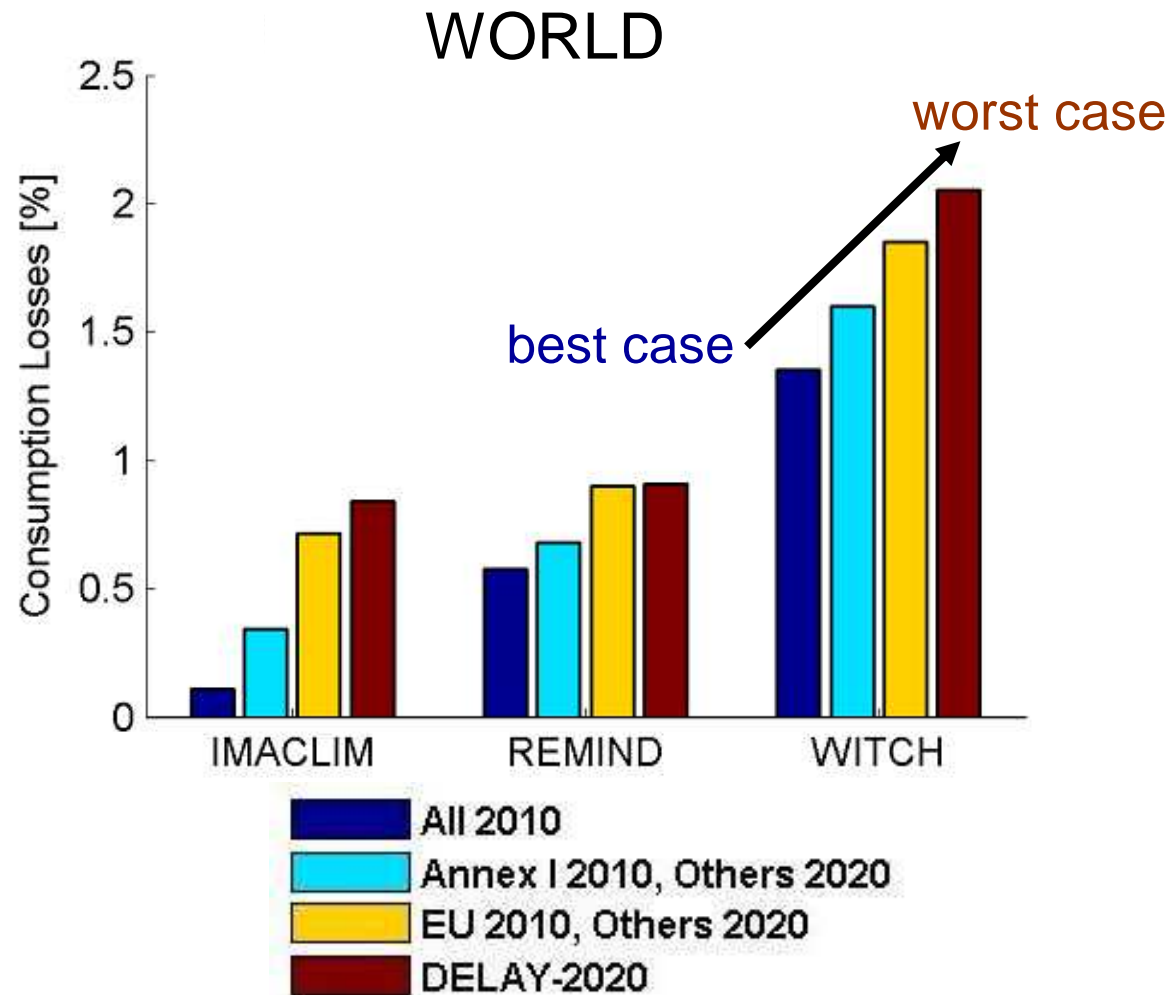
**Ex-post clustering** of scenarios defines a **storyline** for each **cluster**. Clustering is essential to derive policy-relevant messages.

# Model Comparison RECIPE



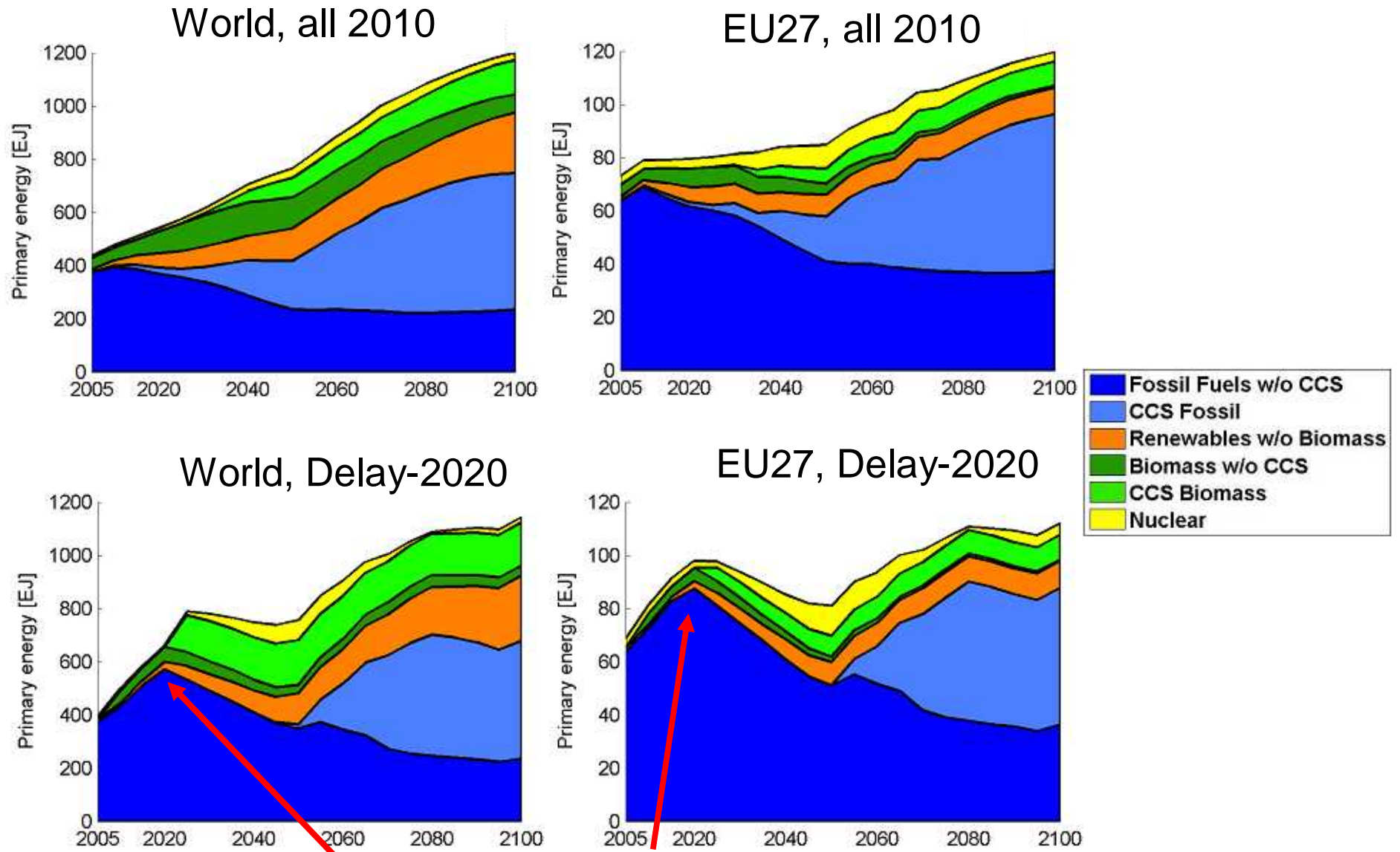
- All options for 450 ppm-only
- No CCS
- No biomass beyond its use in the baseline
- No renewables beyond its use in the baseline
- No nuclear beyond its use in the baseline
- No CCS, no nuclear beyond its use in the baseline

# Delay of Policies Leads to Escalation of Mitigation Costs



- Global costs can be minimized by mitigating as soon as possible with as many participants as possible

# Policy Delay and Energy Mix (REMIND)



**Increase driven by coal**

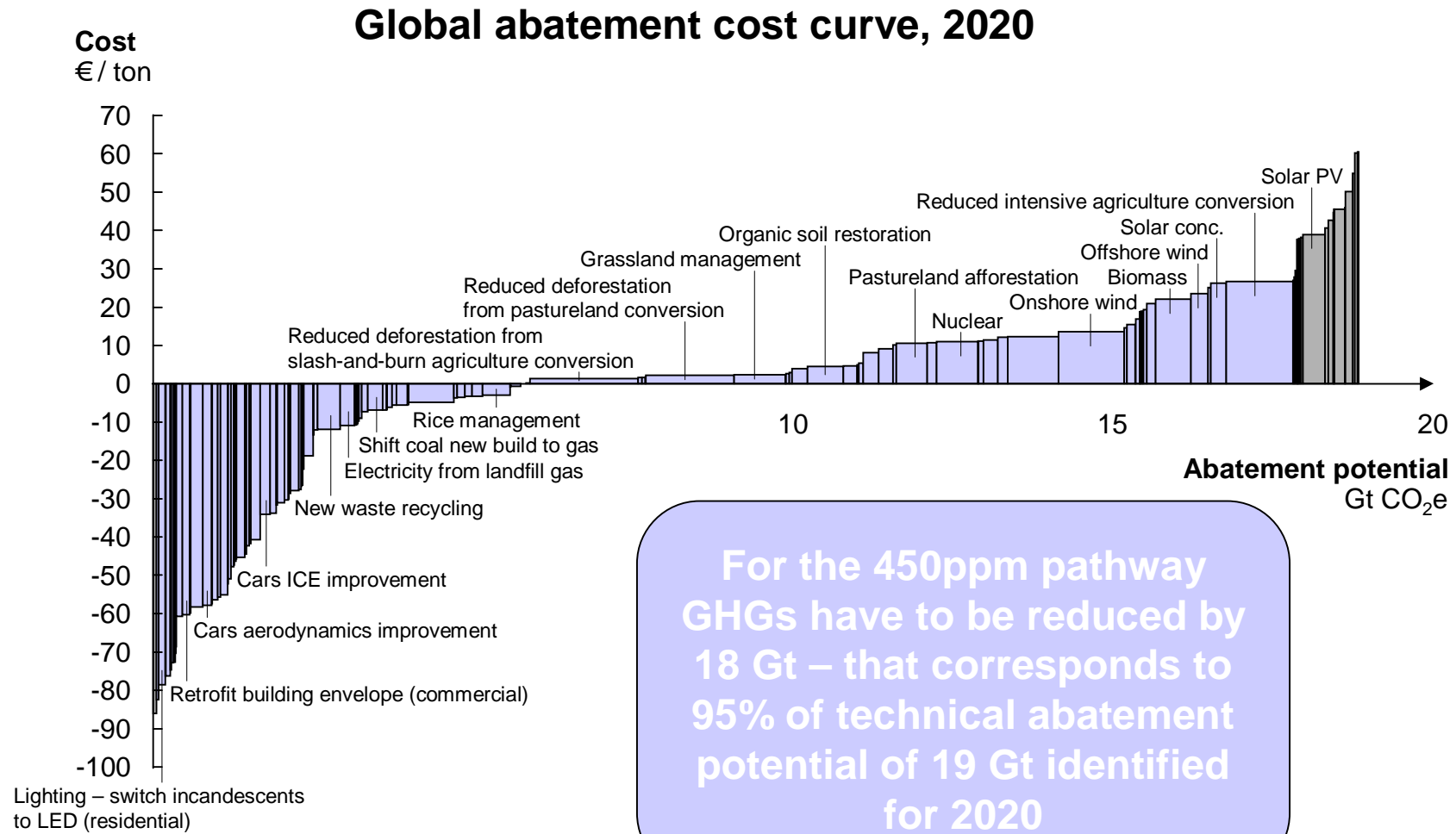


# Lessons to be Learned from Scenarios

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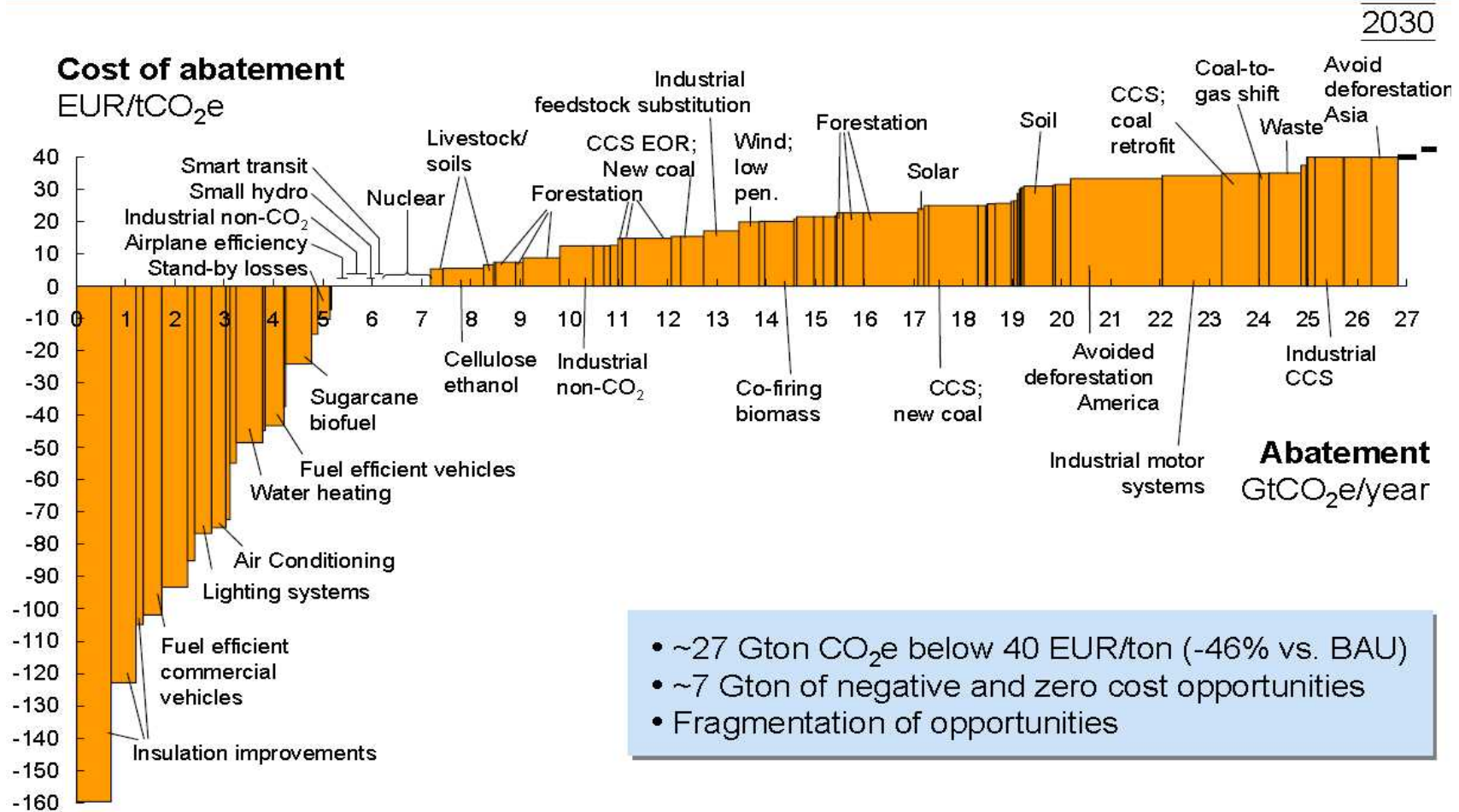
- There is more than one way towards a low carbon economy.
- Scientists are not entitled to defend one „right“ scenario.
- However, scientists can explore self-consistent scenarios and should assess costs, feasibility, social acceptability, trade-offs and risks.
- As a honest broker, the IPCC should offer a set of alternatives without being prescriptive.

# Glamour and Distress of Abatement Cost Curves



# Why Climate Policy Has to Include All Sectors

## Global cost curve of GHG abatement opportunities beyond business as usual



- ~27 Gton CO<sub>2</sub>e below 40 EUR/ton (-46% vs. BAU)
- ~7 Gton of negative and zero cost opportunities
- Fragmentation of opportunities

## Planned Special Reports

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1) Renewable Energy Sources and Climate Change Mitigation [Due to be publish: End of 2010]

2) Infrastructure & Megacities: Adaptaion and Mitigation [In co-operation with WGII]

### **Goal:**

- Aquire missing expertise
- Results to be taken into account by AR5

## **Suggested Structure of AR5**

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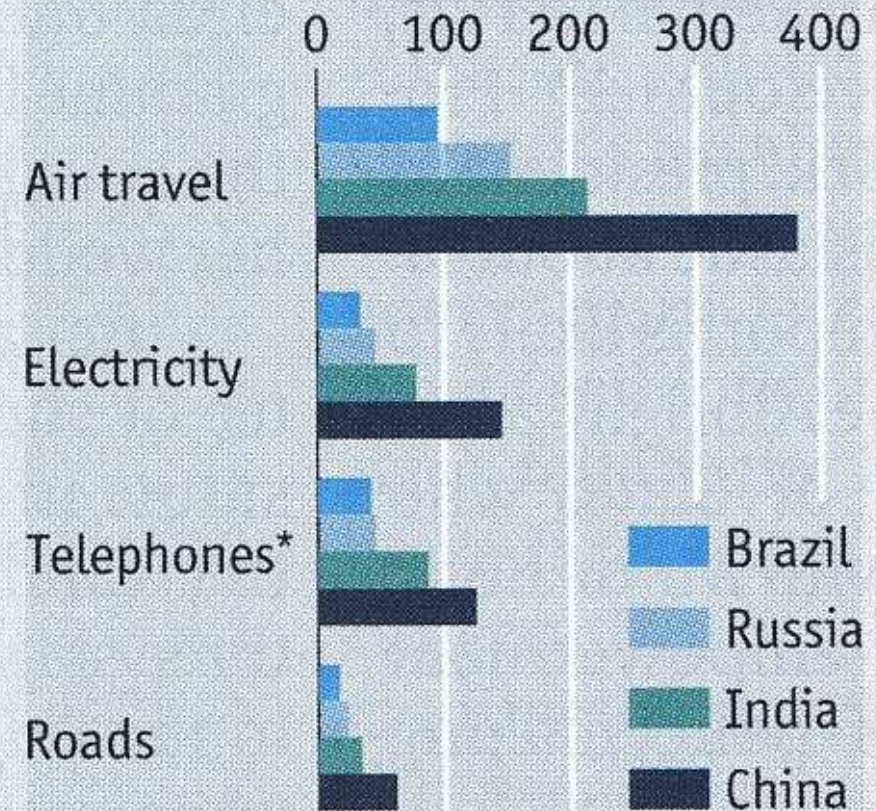
- 1) Stabilization Targets and Costs
- 2) Impacts and Dangers
- 3) Sectors and Technologies
- 4) Sustainability and Risks
- 5) Policy Perspectives

# A Bridge into the Future

Infrastructure investment in emerging markets  
2008-17 forecast, \$trn



Growth in infrastructure demand  
2008-17 forecast, %



Sources: Morgan Stanley; Goldman Sachs; *The Economist*

\*Fixed and mobile

## The Role of Industry

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- Take part in discourse with science, politics and civil society on how to tackle climate change
- Provide empirical data to make out mitigation potentials
- Share expectations about future carbon markets

## The Almost Last Word...

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The IPCC is the honest broker between experts and decision makers in business, politics and civil society.

The IPCC should be policy relevant without being policy prescriptive.