

# Key Insights from CLIMATE CHANGE 2014

## *Mitigation of Climate Change*

### Co-benefits – Aligning Domestic and Global Perspectives on Climate Change Mitigation

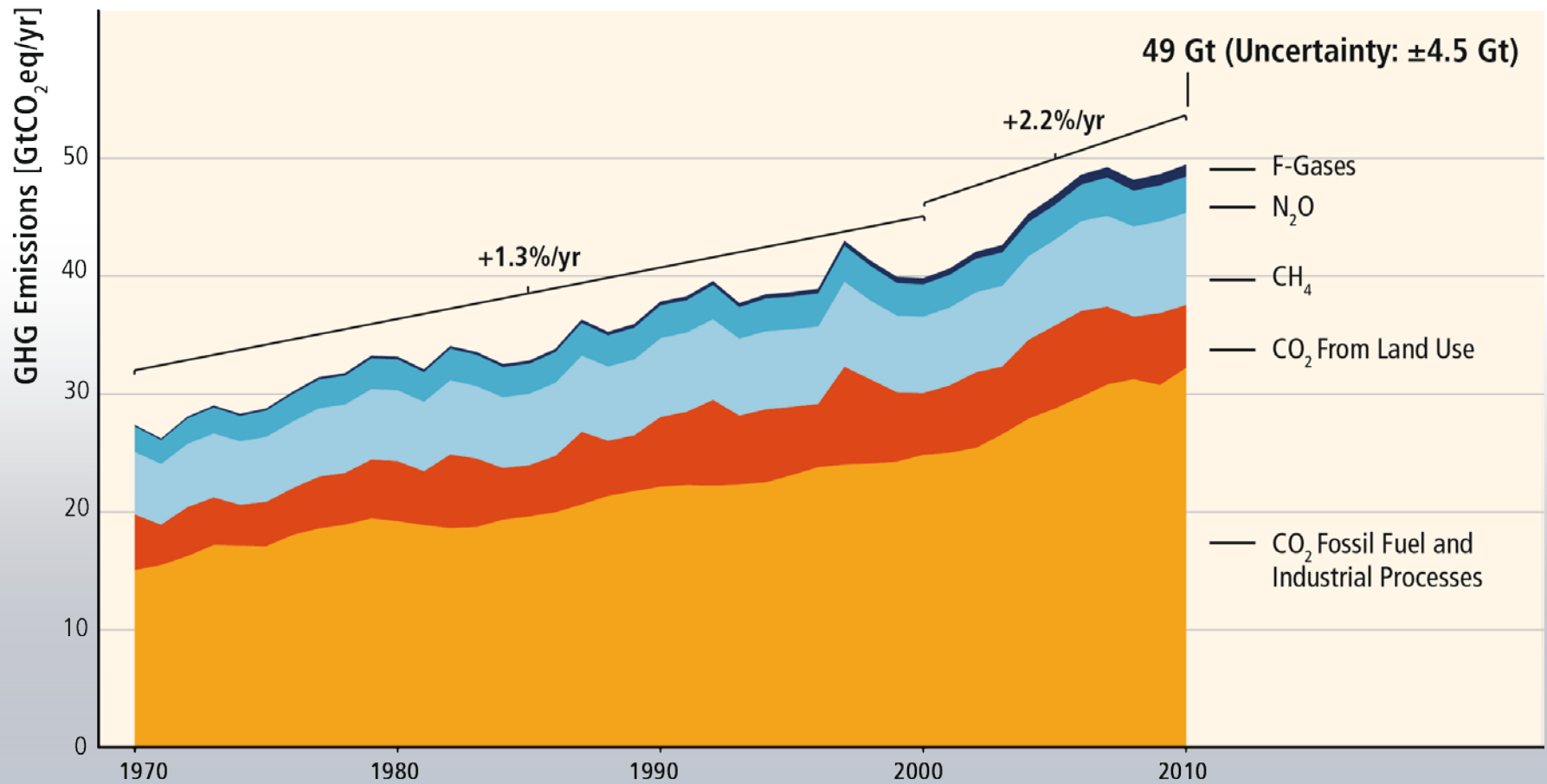
**Prof. Dr. Ottmar Edenhofer**

Co-Chair, IPCC Working Group

LIMITS Workshop, Brussels

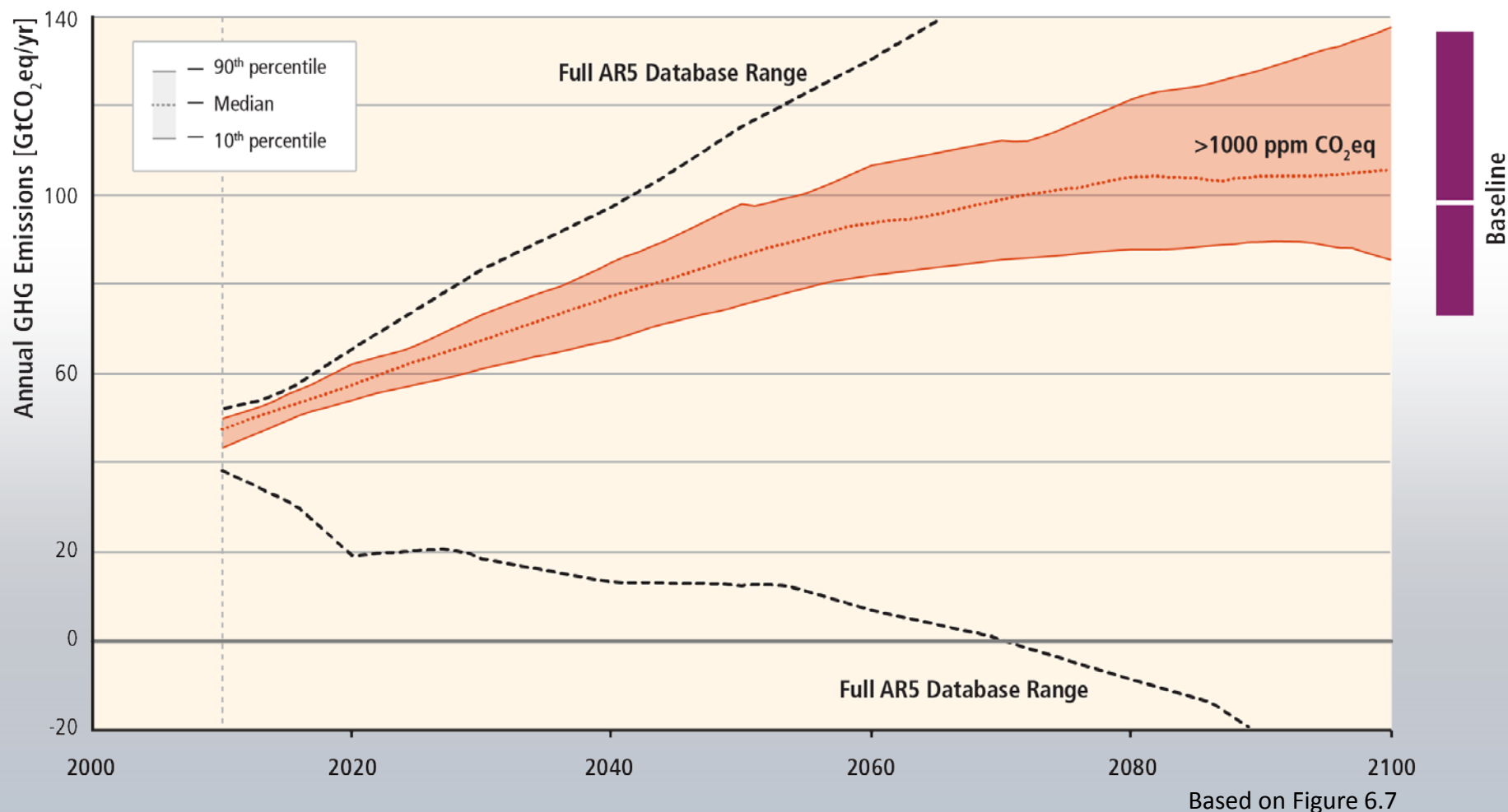
25 September 2014

# GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades.

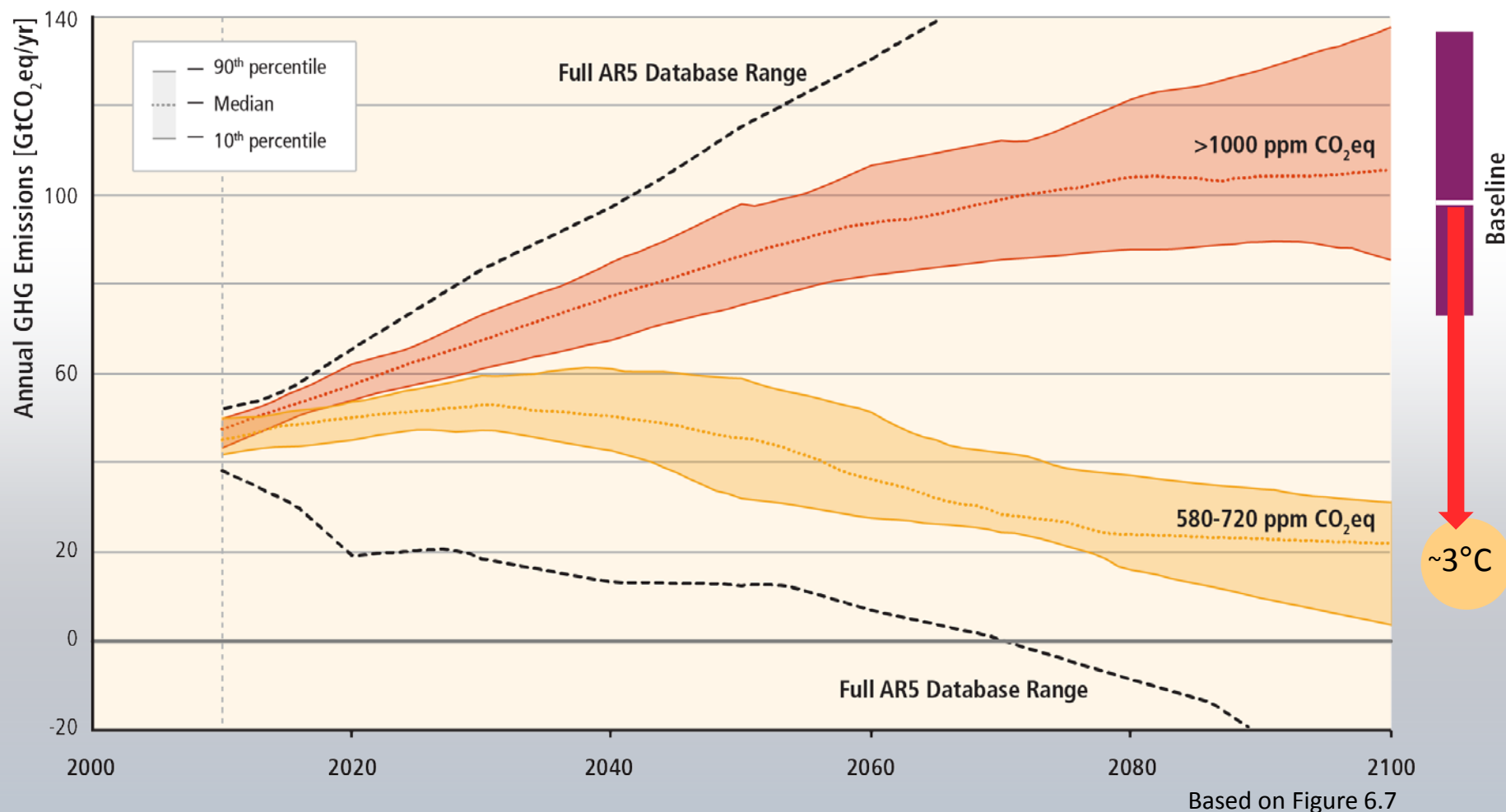


Based on Figure 1.3

# Stabilization of atmospheric GHG concentrations requires moving away from the baseline, regardless of the mitigation goal.

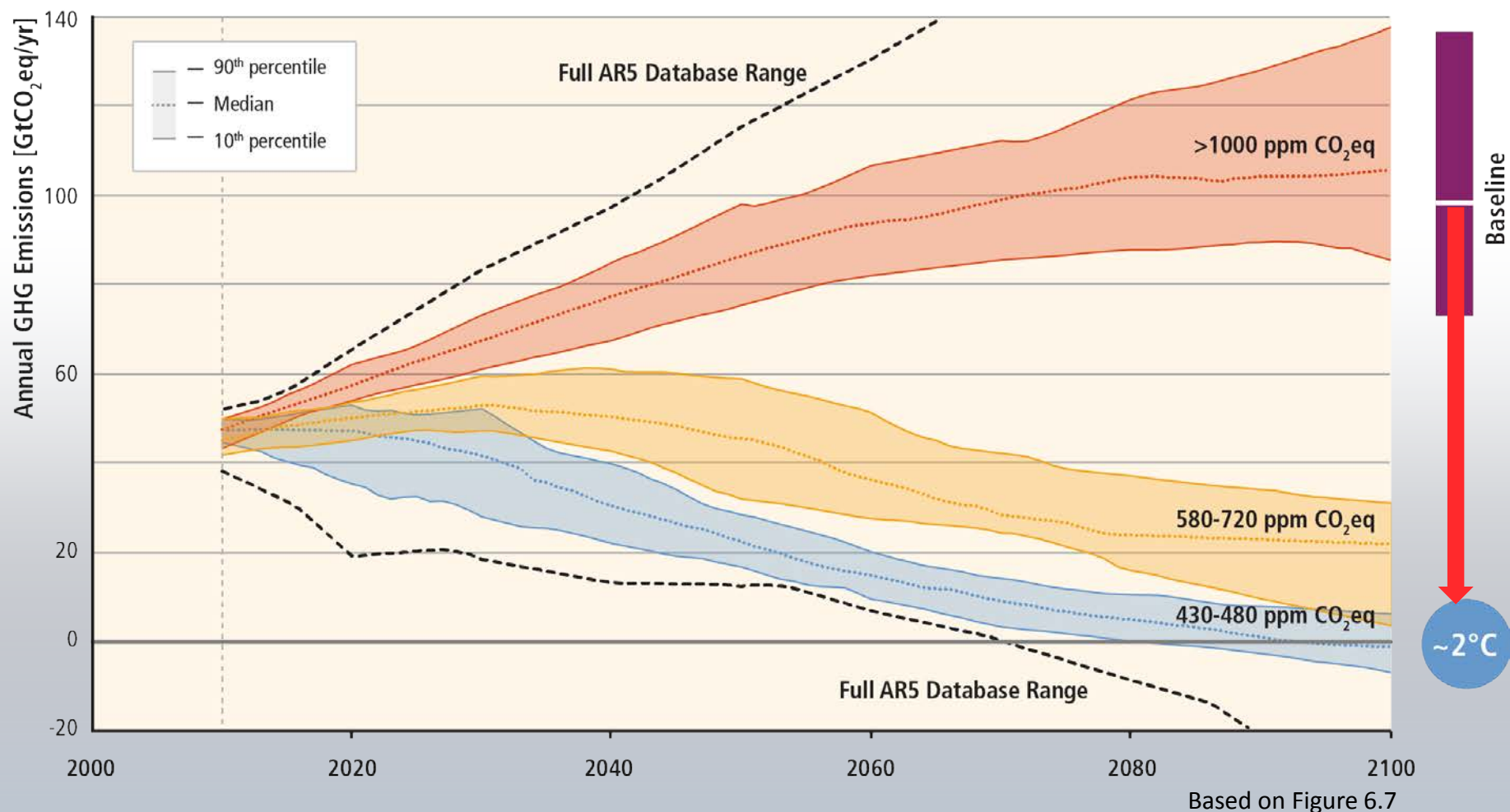


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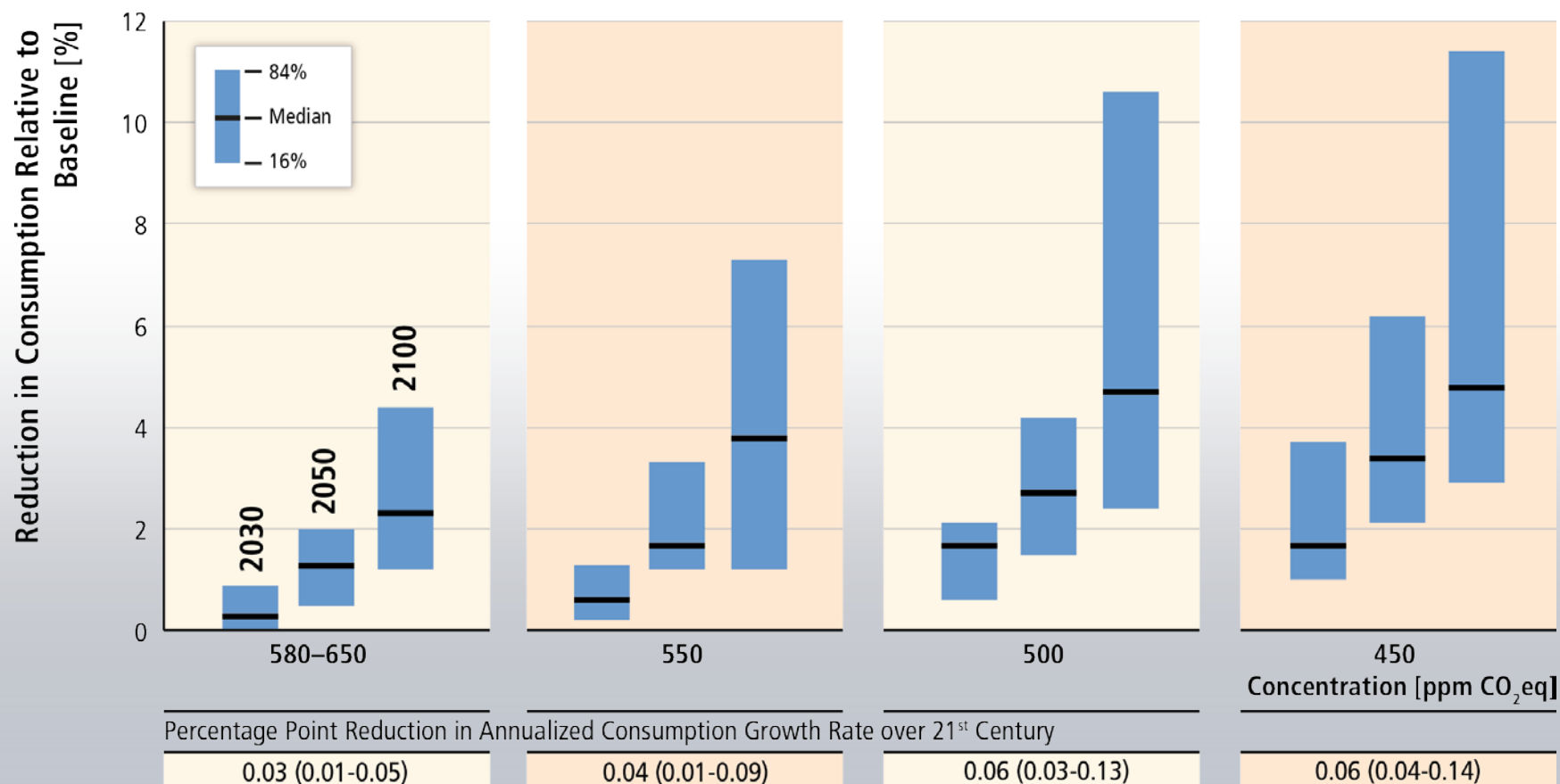




# Stabilization of atmospheric GHG concentrations requires moving away from the baseline, regardless of the mitigation goal.



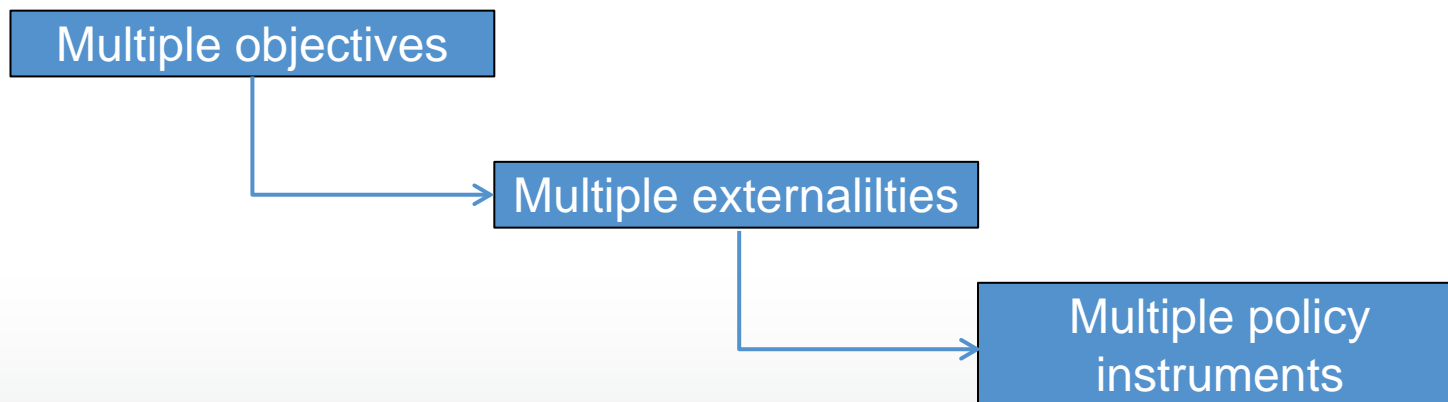
# Global costs rise with the ambition of the mitigation goal.



Based on Table SPM.2

# Co-benefits need to be integrated in a public policy framework

Social  
perspective  
Market  
perspective  
Government  
intervention



Edenhofer et al. (2014), Figure 2

- Determining the “value” of co-benefits from mitigation requires...
  - Identifying synergies and tradeoffs between multiple objectives,
  - Exploring the multiple externalities,
  - Evaluating the interaction between different policy instruments.

The „value“ of co-benefits are largest when...

$$\frac{dW}{dp_1} \gg 0$$

$$dW = \sum_{i=1}^m \frac{\partial W}{\partial z_i} \frac{\partial z_i}{\partial p_1} dp_1$$

$$dW = \sum_{i=1}^m (t_i - \mu_i) \frac{\partial z_i}{\partial p_1} dp_1$$

Based on Equations 3.6.6 and 3.6.7

$W$ : Social Welfare

$z_i$ : Objective  $i$

$p_1$ : Climate policy instrument

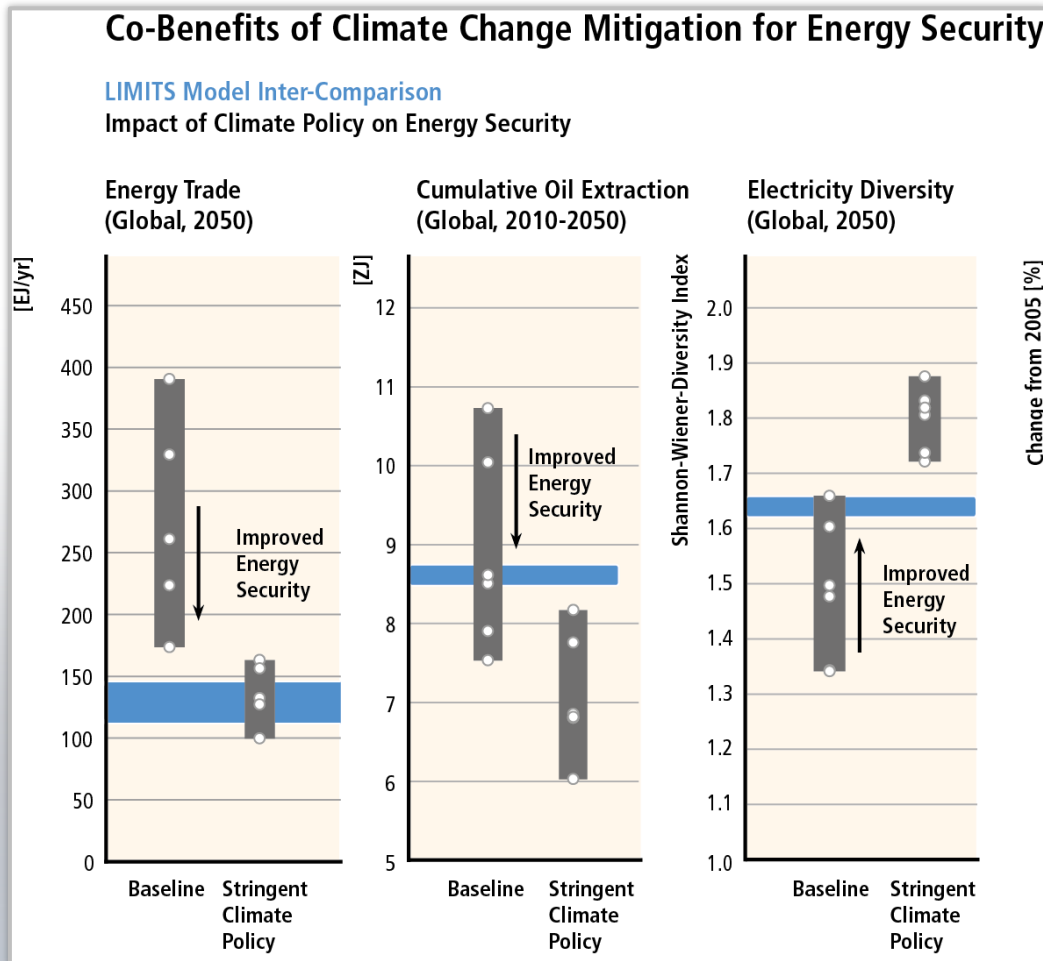
$t_i$ : Tax for good/bad  $i$

$\mu_i$ : Shadow price for good/bad  $i$

- ... there are strong synergies between policy objectives (e.g. local air pollution) and climate policy instruments (e.g. carbon taxes) ( $\frac{\partial z_i}{\partial p_1} \ll 0$ ),
- ... the non-climate externalities (e.g. local air pollution) are not regulated ( $t_i = 0$ ),
- ... the social benefits (e.g. reduction of local air pollution) are huge ( $\mu_i \gg 0$ ).

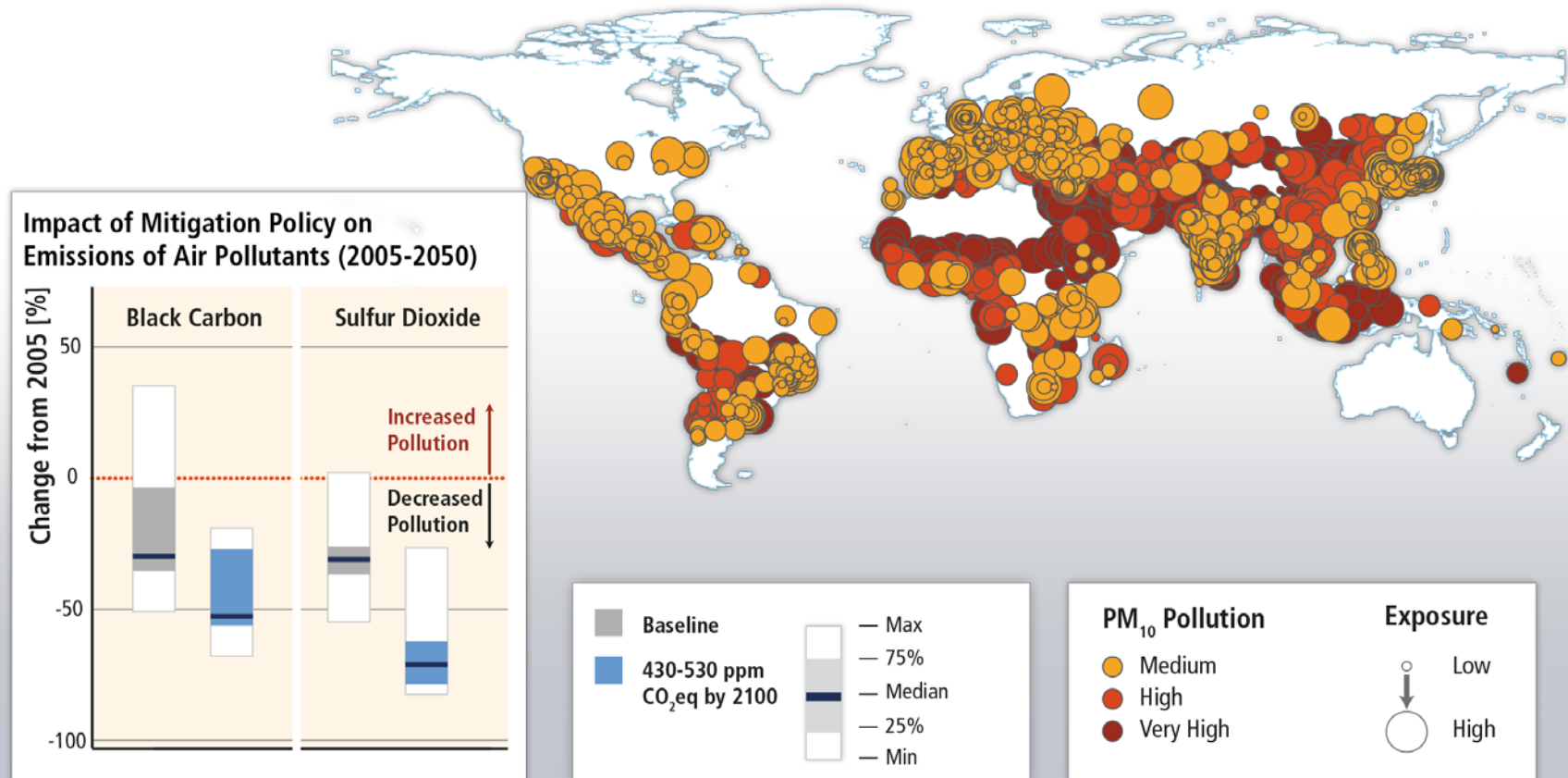


# Social perspective: There are large synergies between mitigation and energy security and air pollution.



Based on Figure 6.33

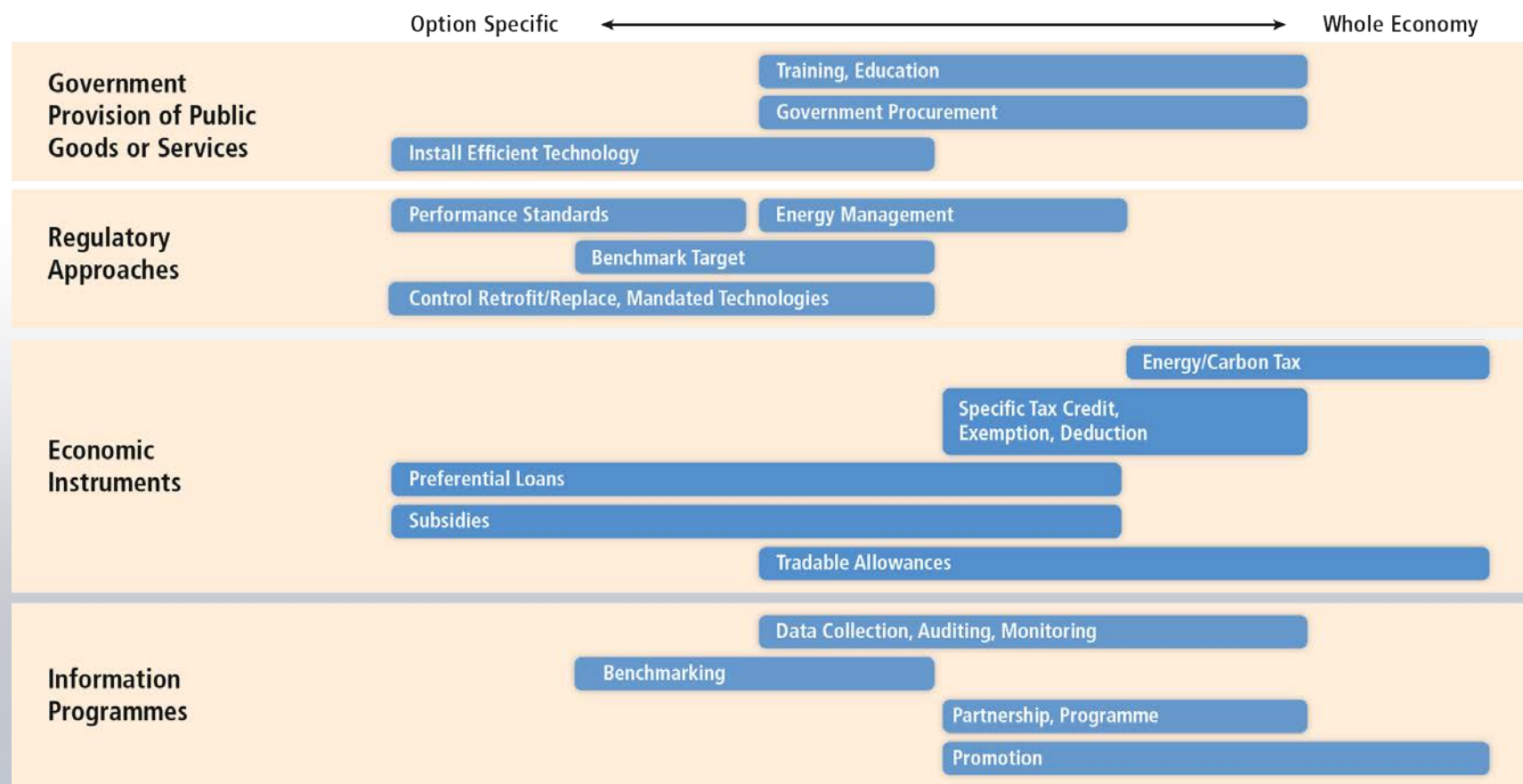
# Market perspective: Non-climate externalities (e.g. urban air pollution) are not optimally regulated (2<sup>nd</sup> best)



Based on Figures 6.33 and 12.23

# Multiple policy instruments: There are large knowledge gaps on the interaction of multiple policy instruments

## Need to understand interaction to evaluate welfare effects



Based on Figure 10.15

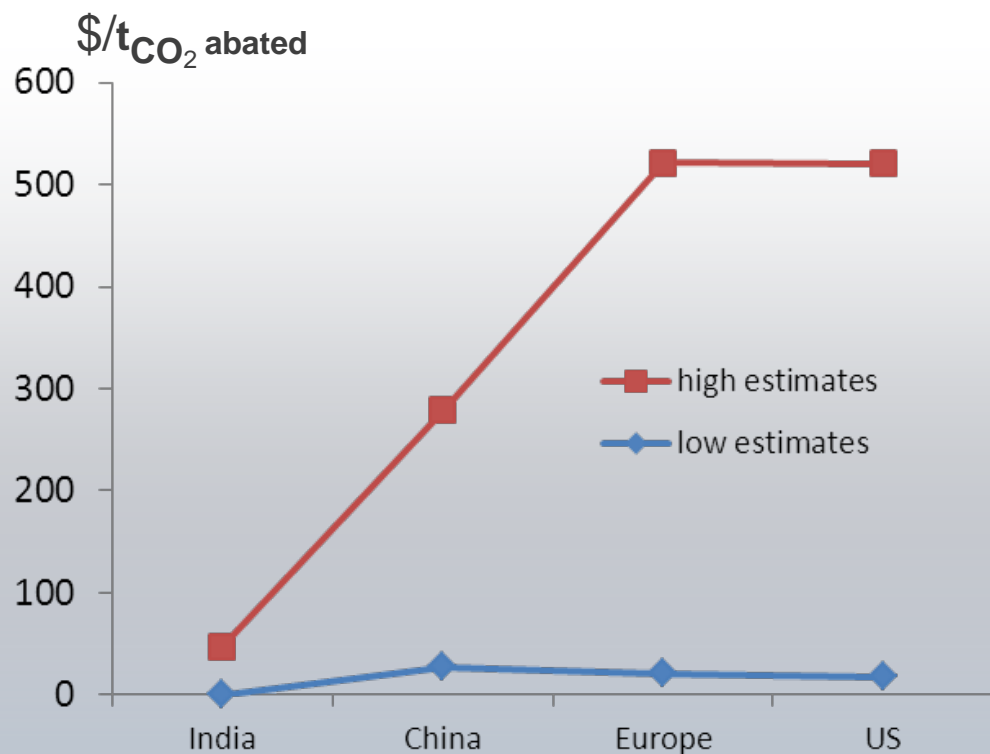
# Towards a more comprehensive “Sustainable Development Diagnostic”

Many studies in the literature evaluating the „value“ of co-benefits are conceptually confusing because they usually focus on only one of the three distinct levels:

- Synergies and tradeoffs across multiple objectives
- Social costs associated with remaining externalities – determined by already implemented policies  
→ many studies on sector/local scale, but few global studies
- Welfare effects of the interaction of multiple policy instruments – determined by a society’s social welfare function  
→ few studies related to co-benefits, mostly conceptual

# Overview of studies on monetized co-benefits

- It seems that this conceptual confusion leads to a wide range of estimates in the literature – in addition to different mitigation goals, sectors, exposures, pollutants, VSLs, etc. considered



The most recent estimates for India, China, Europe, the US for 2030

Based on: Burtraw et al. (2003); Aunan et al. (2004); Markandya et al. (2009); Holland et al. (2011); West et al. (2013)



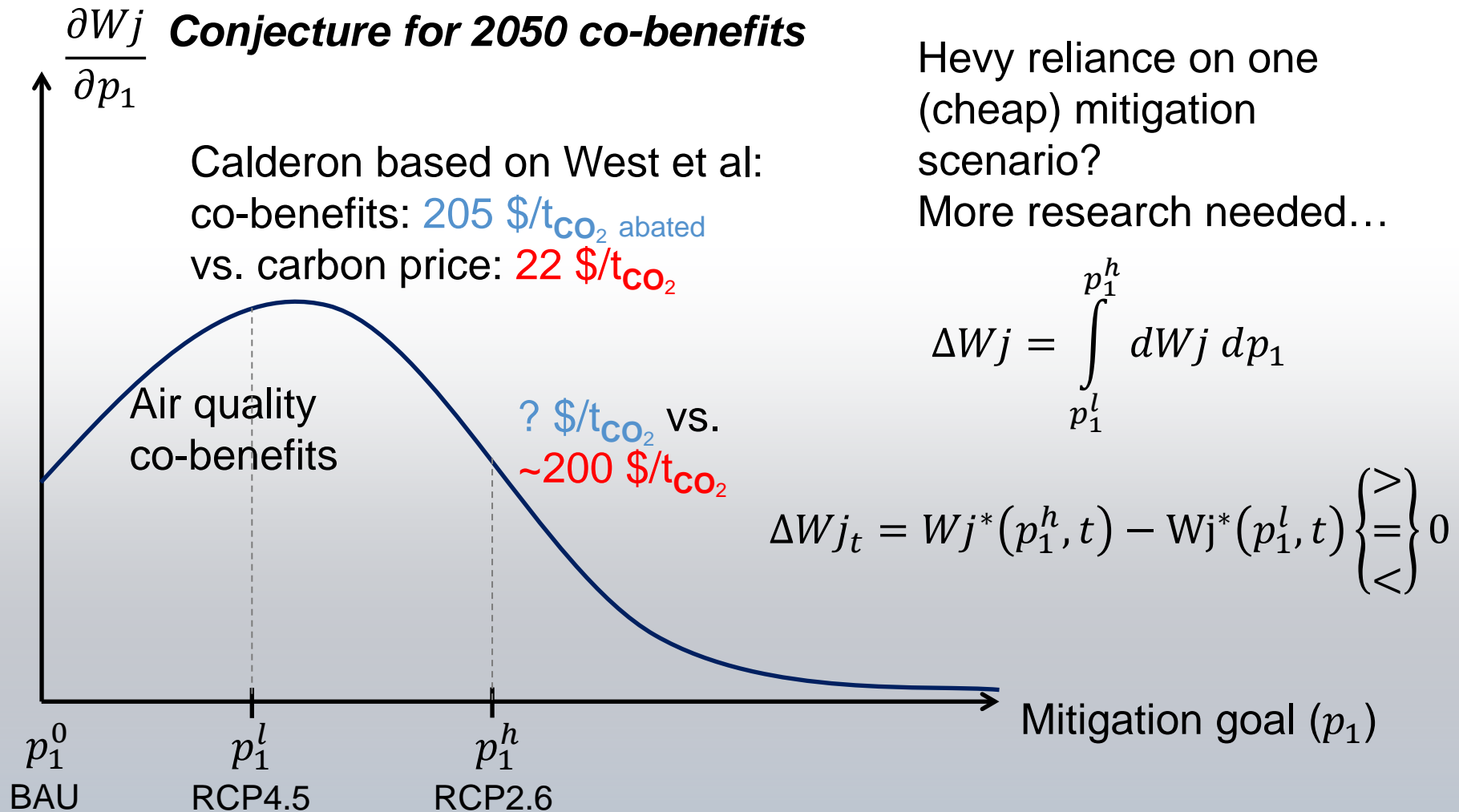
# “Sustainable Development Diagnostics” require new analytical tools

$$dW = \sum_{i=1}^m (t_i - \mu_i) \frac{\partial z_i}{\partial p_1} dp_1$$

- Identify all **relevant social objectives** ( $z_1, \dots, z_n$ ) and their possible trade-offs and synergies!
- Target the **largest distortions** ( $t_i - \mu_i$ )!
- Focus on **policies** with the largest **positive & negative impacts** on societal goals ( $\frac{\partial z_i}{\partial p_1}$ )!
- Be **comprehensive** – all relevant interactions matter ( $\sum_{i=1}^m$  )!

# Towards a “Sustainable Development Diagnostic Tool”

## Non-marginal changes of co-benefits

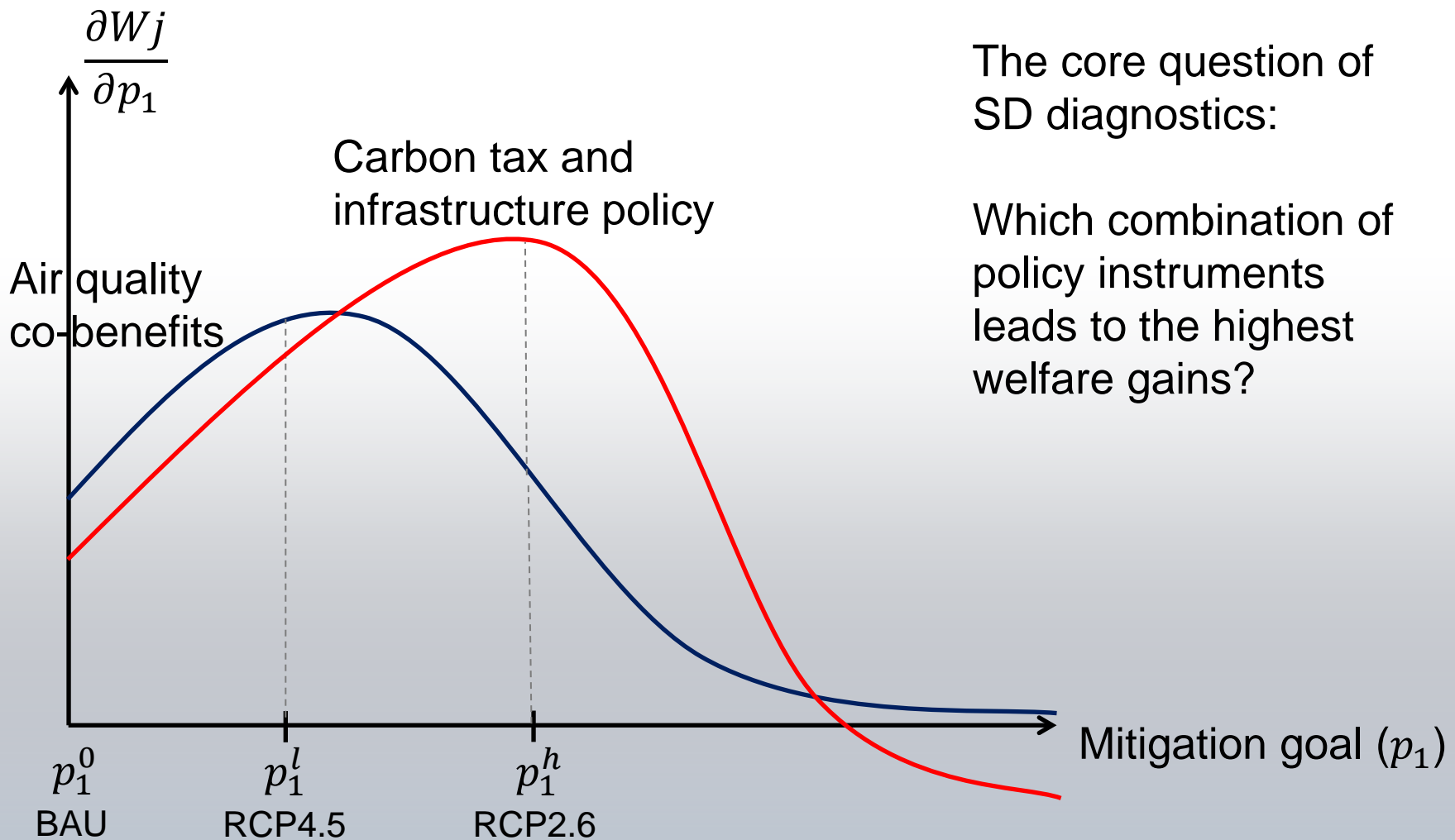


Heavy reliance on one  
(cheap) mitigation  
scenario?

More research needed...

# Towards a “Sustainable Development Diagnostic Tool”

## Dynamic co-benefits



# Possible results from a „Sustainable Development Diagnostic Tool“

- Introducing climate policy has huge short-term potential for local air quality and health
- CO<sub>2</sub> taxation has the potential to increase energy security
- Reducing subsidies for fossil fuels can reduce inequality
- Reducing distortionary taxes can lead to a ‘double dividend’
- Boosting investment in (underprovided) public infrastructure has a high social benefit in developing countries
- Taxing rents on land and carbon can help to avoid unproductive bubbles.
- CO<sub>2</sub> taxation allows for paying back public debt and tame capital tax competition
- Broadening the tax base in countries with large informal sector is a benefit for emerging economies

# CLIMATE CHANGE 2014

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[www.mitigation2014.org](http://www.mitigation2014.org)