

The Economic Costs of Climate Change Impacts and Adaptation

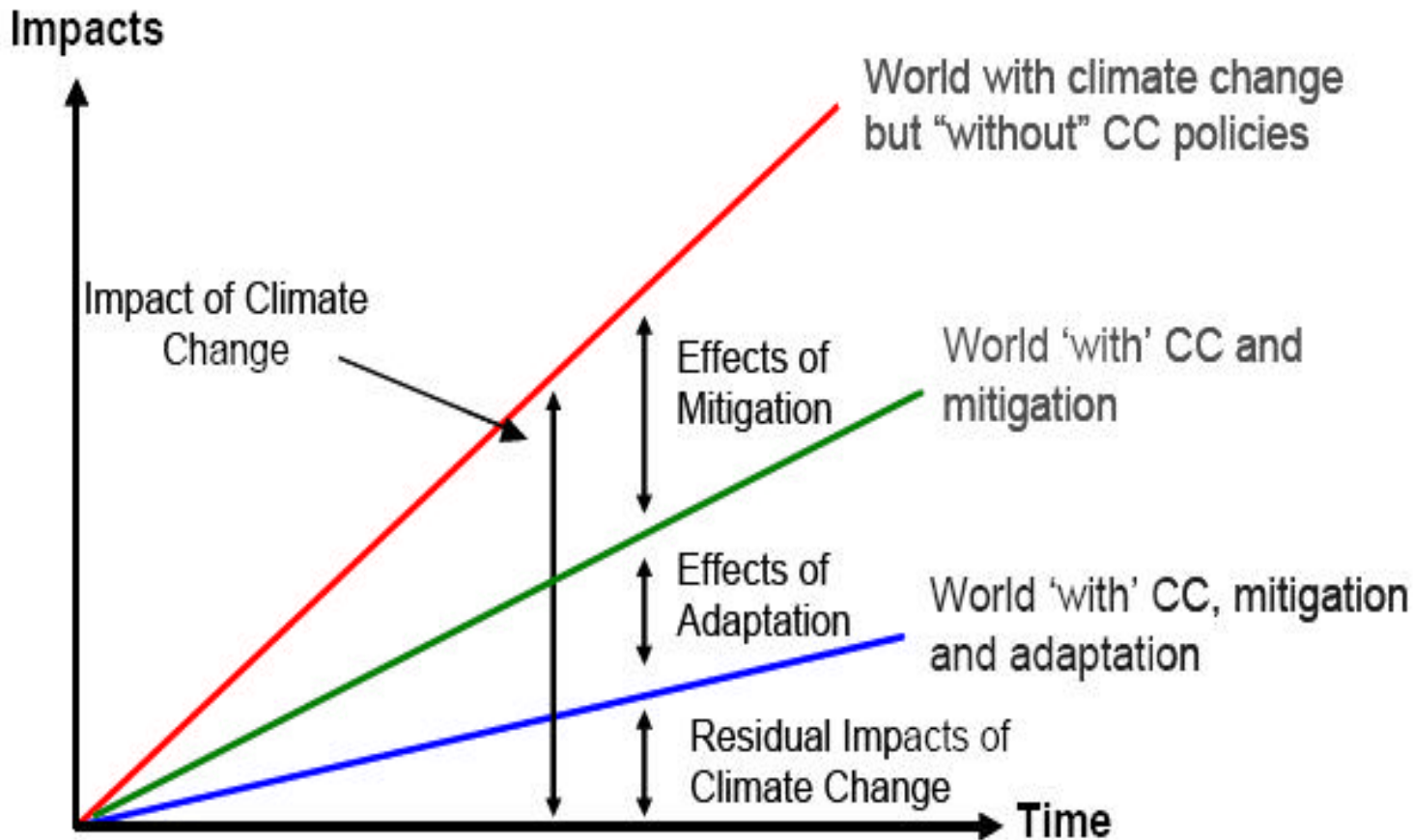
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Impacts over time with different policy Interventions

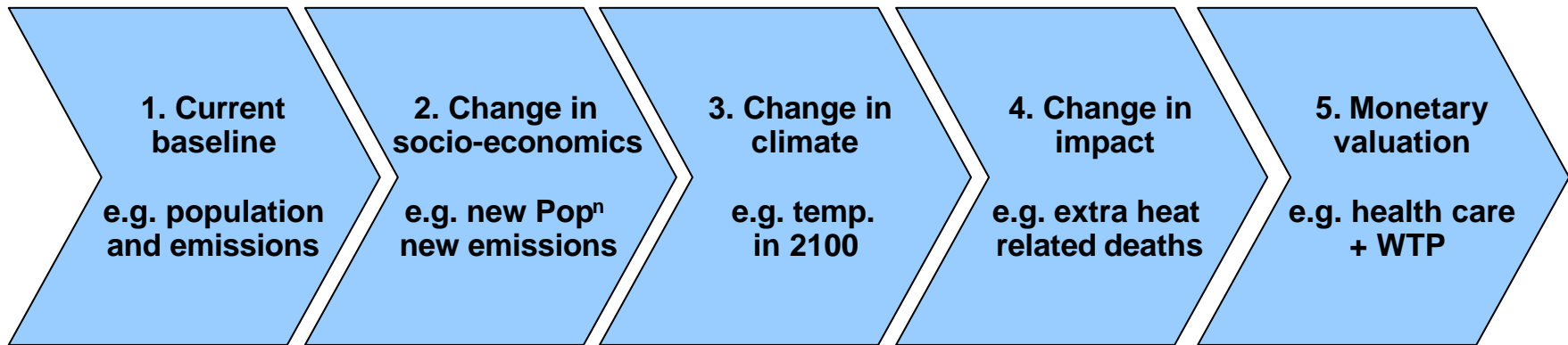


Costs of Climate Change = Costs of Mitigation + Costs of Adaptation + Residual Costs

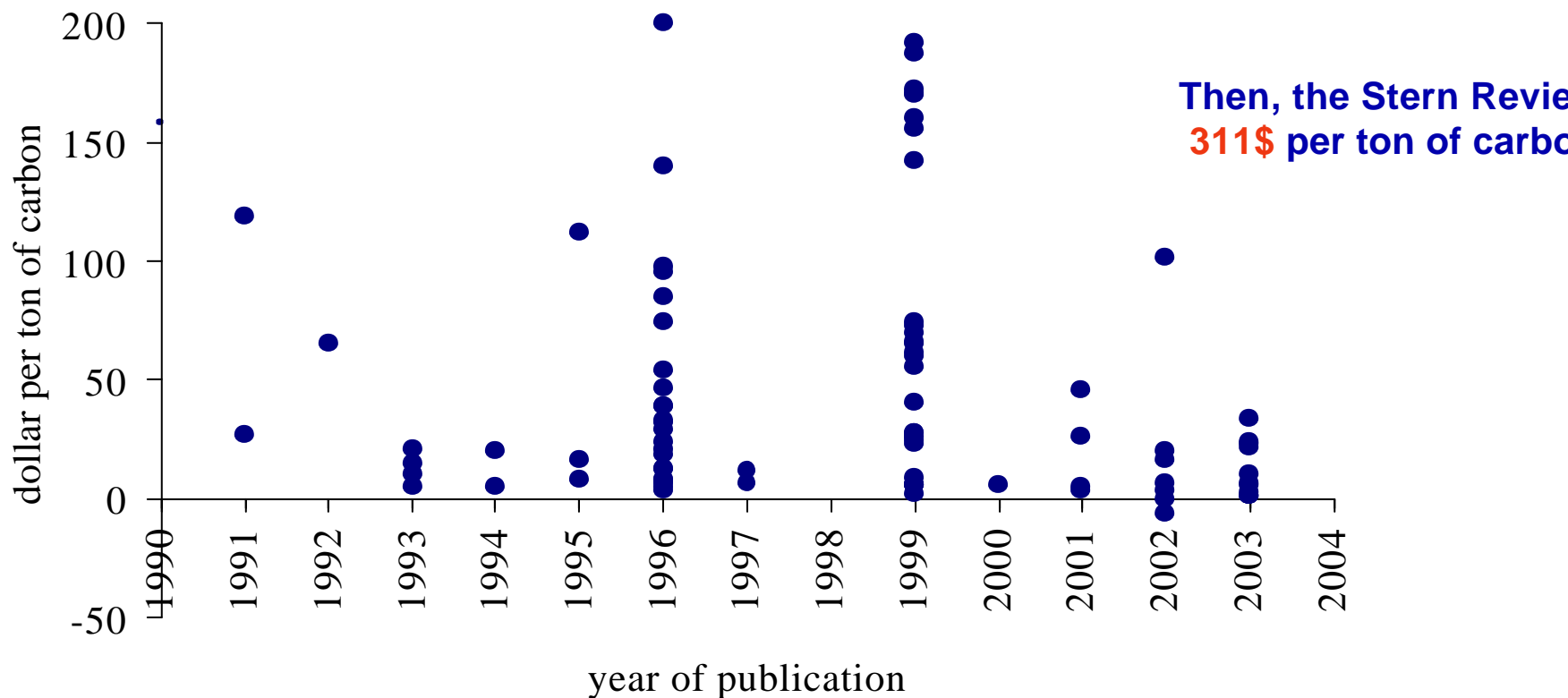


Costs of inaction: integrated steps

Potential Steps in the Assessment of the Costs of Climate Change Impacts (no adaptation)



Estimates of the Marginal Costs of Inaction



Source: Tol (2005).

WHY ESTIMATES ARE VERY DIFFERENT

Methodological Issues in Cost of Inaction

Scenarios

Estimation

Valuation

Time and space

Uncertainty and irreversibility

Coverage/Completeness

Adaptation

Methodological Issues in Cost of Inaction

Scenarios

Climate scenarios

- Scenarios of extreme weather events and low-probability high-impact events

Non-climate scenarios: socio-economic scenarios (and Land Use LandCover)

- describe the changes in the “stock at risk”, with respect to size, and subsequent sensitivity to climate change, adaptive capacity and vulnerability.

Methodological Issues in Cost of Inaction

Valuation approach

A wide range of approaches are needed for the full monetary valuation of climate change. Some values can be directly based on market values (e.g. crops)

Non-Market Valuation;

- WTP/ WTA
- Benefit Transfers

Methodological Issues in Cost of Inaction

Direct and Indirect Effects

Direct impacts concern the direct effects on climate change on production or consumption

Indirect impacts concern the indirect effects of changes in production or consumption on the rest of the economy through their effects on relative prices, including factor prices (income).

- Partial/ General Equilibrium Approach

Methodological Issues in Cost of Inaction

Temporal Aggregation (Discounting)

- The economic costs of climate change, and also the costs of mitigation and adaptation, all occur at different times in the future.
- A discount rate is used to convert economic costs to so called 'present values'. The choice of discount rate dramatically affects the economic costs of climate change.
- A higher discount rate therefore leads to lower economic costs (as larger future negative effects are reduced through discounting).
- **Constant or Declining:** The marginal damage costs of carbon dioxide are higher with declining discount rates.



Methodological Issues in Cost of Inaction

Spatial Aggregation (Equity and Distributional Effects)

- How best to compare economic damages from climate change across countries with very different levels of impacts and also very different income levels.
- How effects in different regions aggregated
- Poorer countries likely to be net losers, as more vulnerable
- Adjusting impacts across regions makes big difference to results . **Equity Weighting**

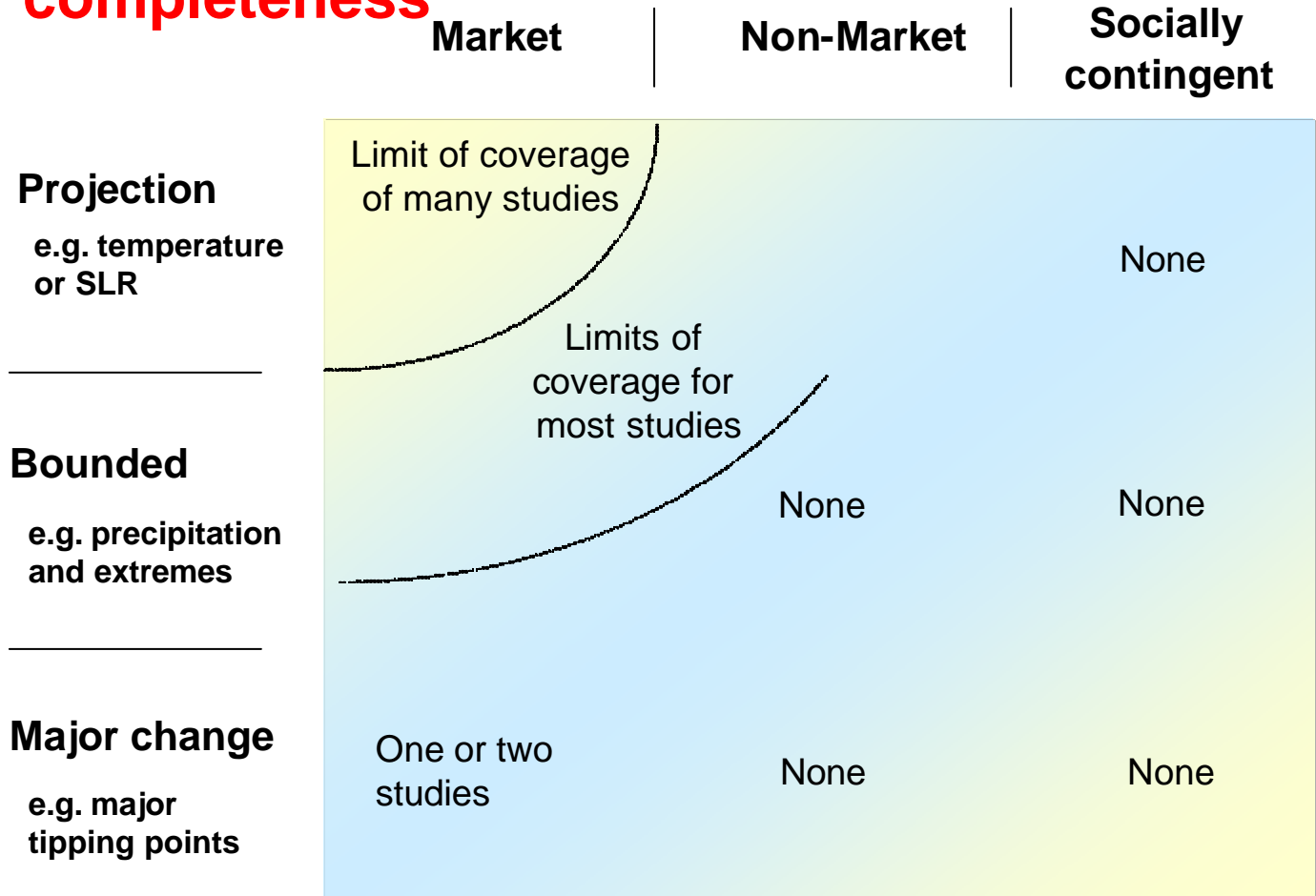
Methodological Issues in Cost of Inaction

Uncertainty and irreversibility

- Climate change is uncertain.
- data uncertainty, knowledge uncertainty, and model uncertainty
- no single method, model or tool to adequately capture all the uncertainties

Methodological Issues in Cost of Inaction

Coverage / completeness



Sources of impacts and the impacted sector

Methodological Issues in Cost of Inaction

Adaptation

- How did studies on costs of impact (inaction) treat adaptation?
- Has adaptation been disentangled from the impacts?
- What kind of adaptation we consider (autonomous, planned)?
- Adaptation vs. Mitigation

Methodological Issues...

**How existing costs of inaction studies
handled these issues????**

Post-2000 Selected studies	Dynamic scenario	Valuation approach	Estimation Approach	Adaptation costs		Temporal aggregation	Spatial aggregation	Uncertainty and risk	Completeness	
		Benefit transfer	Direct / indirect impacts	Disentangled	Lumped together	Discount rate Constant (C) Declining (D)	Equity weighting Yes/ No	Sensitivity analysis	Source of impact	Impacted sector
STERN REVIEW	X	X	D / I		X	C	No / Yes	X	SLR/EE/ TI/LPHI/ Pr.	All market and non-market sectors
Bosello et al., 2004a,b		X	D / I		X		No	X	SLR/ EE/ TI	Tourism/ Health
Bosello, 2005	X		D / I	X	X		Yes	X	TI	
Darwin and Tol, 2001		X	D / I	X	X	C	Yes	X	SLR	Land capital lost
Newell and Pizer, 2004					X	C / D	Yes	X X	CO2 emissions	
Nordhaus and Boyer, 2000	X		D / I		X	D	Yes	X	TI	
Rive et al, 2005		X	D / I		X		Yes		TI /Pr.	Forestry
Tol, 2005					X	C / D	Yes / No	X		
Tol and Dowlatabadi, 2001	X	X	D / I	X			Yes	X	TI	Health (vector-borne diseases)

SLR: Sea Level rise
EE: Extreme Events

LPHI: Low Probability High Impact
TI: Temperature Increase

Pr: Precipitation



Costs of Adaptation: Issues

- Many of the factors for the costs of inaction are also relevant to adaptation – though differences also occur.
- Defining the type of adaptation (autonomous or planned, public private)
 - How costs differ with the definition?
- How do adaptation costs differ across sectors?
 - For which types of impacts and for which sectors studies have considered adaptation and why other impacts and sectors were ignored?



Costs of Adaptation: Issues

- The level and timing of adaptation (facilitating or implemented, anticipatory or reactive)
- The types of costs of adaptation (including direct costs and transition costs)
- The ancillary benefits of adaptation (both in reducing current climate variability, and in wider socio-economic areas)
- The distributional aspects of adaptation (and the issues on ensuring adaptation capability is evenly distributed between countries or regions with different incomes).



Mitigation vs adaptation

Operational Differences?

How adaptation costs changes when there is more (less) mitigation ?

- Are they Complements or Substitutes (in economic terms)
- Is it useful to categorise them in this way.
- Is there optimal mix of Mitigation and Adaptation

CHALLENGES

The research challenges in costs of inaction studies;

- Incomplete understanding of climate change itself, in particular the regional details of climate change, but also the coverage across the range of climate change effects.
- Current climate change scenarios and current climate change impact studies use crude spatial and temporal resolutions.
- Differences in assumptions often make it difficult to compare case studies.
- Non-market damages, indirect effects, horizontal inter-linkages, and the socio-political implications of change are also still poorly understood.
- Major advances are needed in the economic analysis of adaptation



Thank you for your attention.