



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

Perspective on the use(fulness) of IAMs in the policy process

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Workshop on Integrated Assessment Modeling for
Informing Policy and Decision Making

Snowmass, July 29, 2010

Ideal role of IAMs in the policy process

Three caricatures of the IAM – policy interface

Policy prescribed modeling

Failure

No interest in knowledge gain available from IAMs
Disregard of value of IAMs for informing policy

Policy informing modeling

Open outcome analysis of real world policy questions across a range of assumptions and policy targets

Policy irrelevant modeling

Failure

Inability or unwillingness to relate to real world policy questions

Role of IAMs: Structuring the climate policy discourse by

- Providing consistent scenarios for transition pathways
- Analyzing policy requirements and limitations for a set of climate targets
- Highlighting sensitivities to underlying assumptions

1st Challenge: Broadening IAM perspective

Embedding IA of climate change in the wider context of development, resource use and environmental protection:

- Connection to land, water, biosphere use
- Co-benefits and disbenefits e.g. relating to air pollution and energy security
- Effect of mitigation on industrial metabolism

- Effect of residual climate change impacts and mitigation on development and economic growth, and vice versa.

1st Challenge: Broadening IAM perspective

Embedding IA of climate change in the wider context of development, resource use and environmental protection:

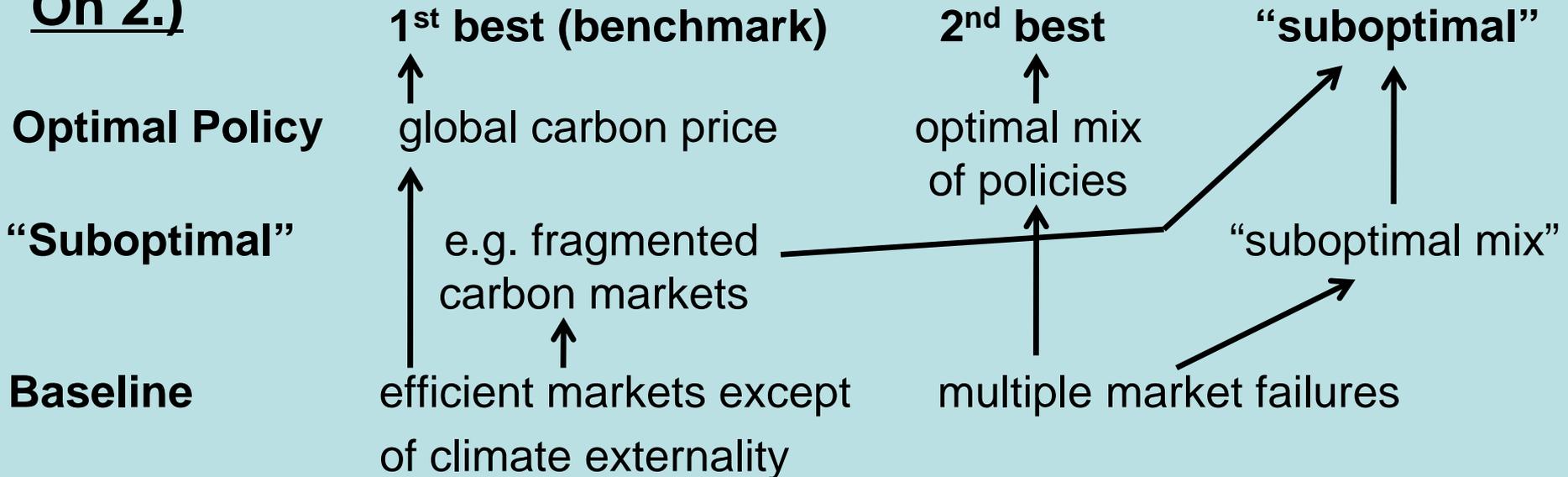
- Connection to land, water, biosphere use
- Co-benefits and disbenefits e.g. relating to air pollution and energy security
- Effect of mitigation on industrial metabolism
 - ➔ How do changes in the energy, industrial & transportation sectors, consumption patterns, infrastructure etc. affect material flows & resource efficiency?
- Effect of residual climate change impacts and mitigation on development and economic growth, and vice versa.
 - ➔ lock-ins, leap frogging, societal “tipping points”

2nd Challenge: Informing policy making

Preconditions:

1. Clarify how model (baseline) relates to real world situation
2. Clarify how policy experiment (comparing policy case with counterfactual no policy case) relates to real world policy question

On 2.)



On 1.) Validation against historical trends and stylized facts

Model validation

Validation of modules in IAMs

- IAM climate modules (see work of Detlef van Vuuren, PBL)

Testing the model system

- ➔ Useful experiments depend on model type (growth model, CGE, partial equilibrium ESM)
- Exploring long term price elasticities
- Hindcasting experiments (careful separation of input variables and output variables to be validated against historic trends)

Reproducing stylized facts and historical trends

- Pace of technology diffusion (Charlie Wilson, IIASA)
- Kaya decomposition of baseline trends in, e.g., CI & EI (e.g., work at PIK)
- Structural changes in the economy, convergence of regions etc.

Thank you



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Backup Slides

Constraints on model validation

- Role of IAMs a policy evaluation tools: First best model world vs. second best vs. real world
- Availability of historical data
- Structural breaks in time series
- Model-exogenous (institutional) constraints/barriers

Economic definition of 1st and 2nd best

1st best setting: Market failures exist, e.g. due to pollution externality
(→ climate change)

1st best policy removes all market failures to re-establish socially optimal market outcome (e.g. Pigouvian tax on pollution)

Example climate change: Globally harmonised carbon tax or global carbon market

2nd best setting: Multiple market failures exist, e.g. imperfect competition plus pollution externality
(→ climate externality plus oligopoly in energy markets)

2nd best policy is optimal welfare improving policy if one of the market failures cannot be cured. It generally differs from a 1st best policy removing all market failures

(Lipsey & Lancaster (1957), The General theory of second best. Rev. Econ. Stud. 24(1): 11-32.)

Example climate change: Emission tax for monopolist differs from Pigouvian tax for perfect competition.



2nd best mitigation policies

In integrated assessment of climate change mitigation, the term „2nd best policies“ is used more loosely.

Applied to situations of multiple market failures in a broader sense, in particular to

- market failures limiting the efficiency of GHG emissions reductions for achieving climate protection targets
- additional efficiency limitations that do not constitute market failures in a strict sense.

2nd best mitigation policies – Research question

What error do we make - in terms of feasibility, costs, and policy - when assuming (falsely) no efficiency limitations on mitigating climate change, and focusing only on 1st best policies to reach climate targets?

Goal: Explore cost-effective mitigation policies under additional efficiency limitations („2nd best policies“)

Examples of relevant additional efficiency limitations:

Market failures:

- Spill-over externalities in technology innovation
- Market power in relevant markets (particularly the energy sector)

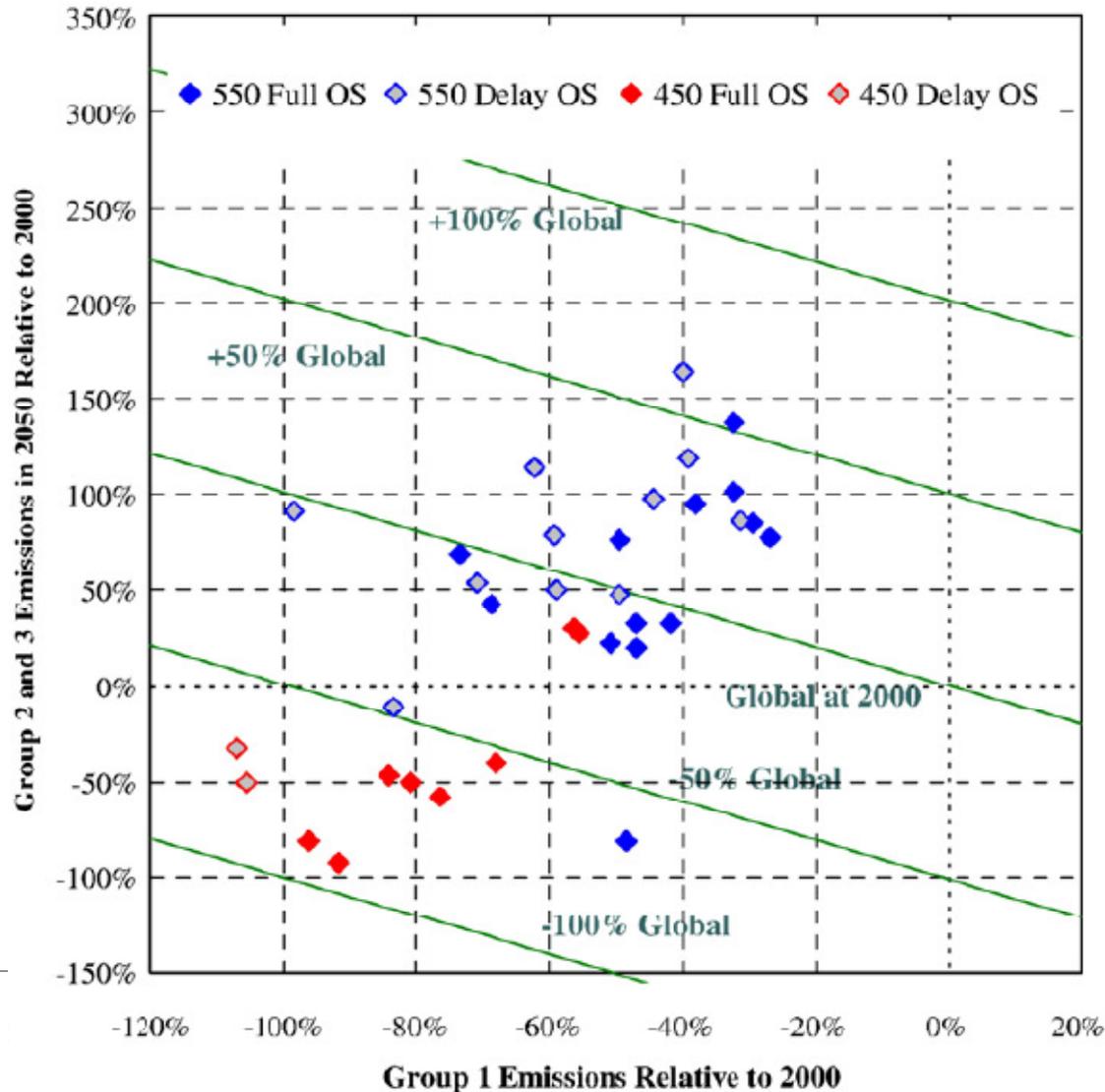
Limitations in a wider sense:

- Limited technology availability (e.g. due to technology failure)
- Limited (regional and sectoral) participation in climate policy regimes

Example from EMF 22: Limited participation

Full: Global participation in reaching climate target from 2012 onwards

Delay: Group 2 (BRIC) / Group 3 (Rest Non-Annex I) adopt climate policy in 2030 / 2050

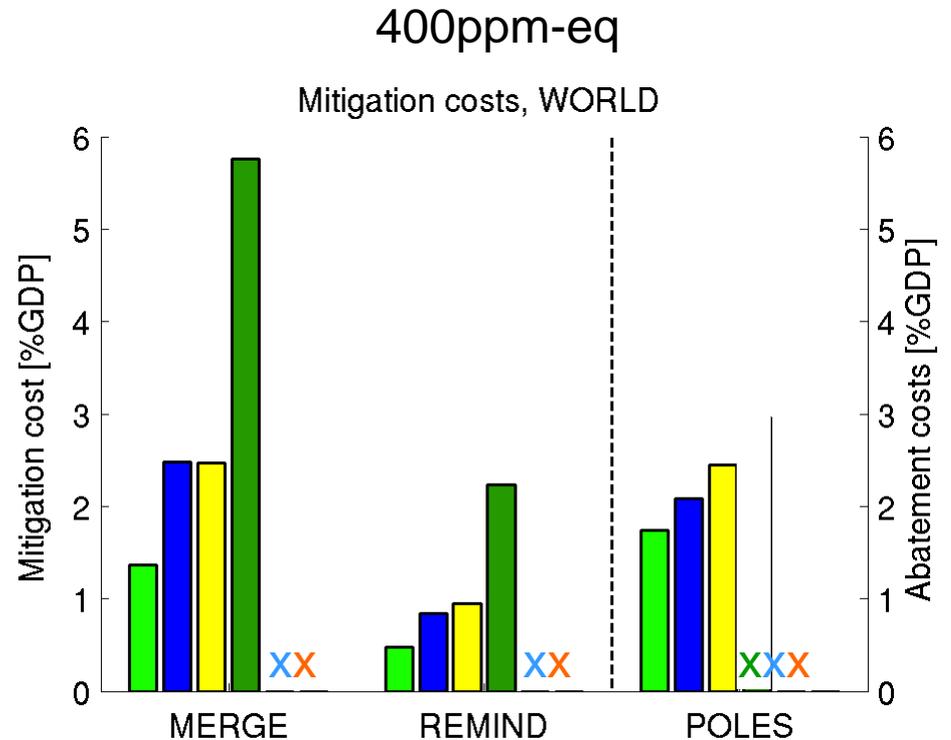


Clarke et al., 2009,
Energy Economics 31

Example from ADAM: Limited mitigation options

Costs & feasibility of ambitious climate protection
as function of technology availability

- high biomass potential
- with all options
- no nuclear beyond baseline
- low biomass potential
- no CCS
- no renewables beyond baseline



Knopf et al., 2009