POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

A conceptual framework for cost-benefit decomposition

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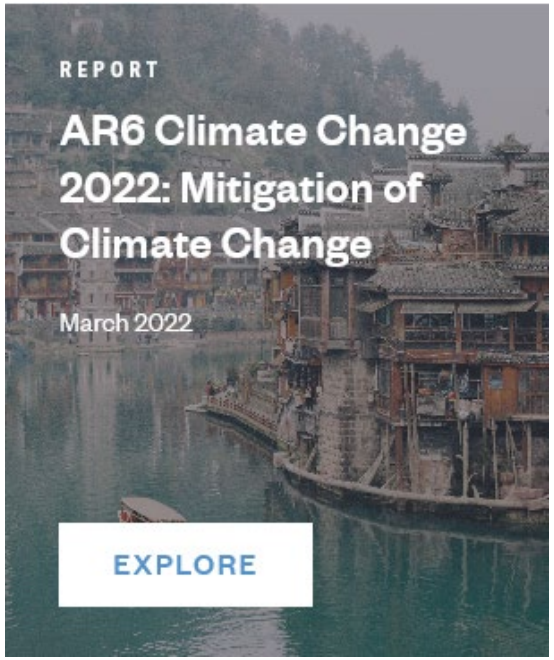
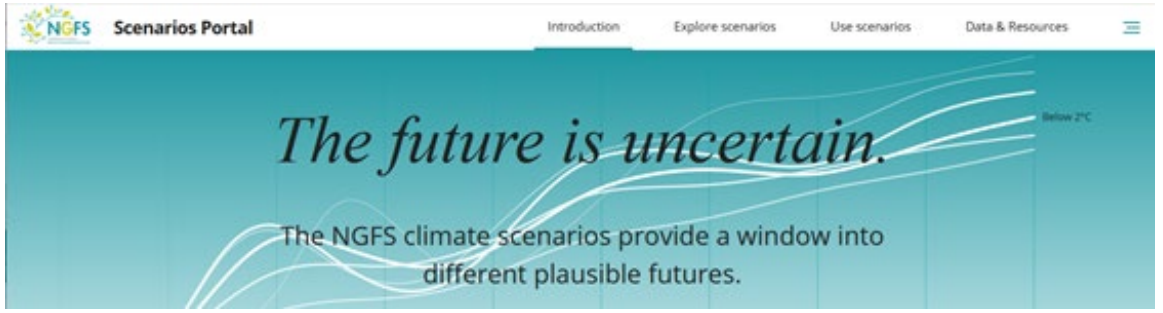
Leibniz Association

Motivation: demand for integrated scenarios from process-based IAMs



Benefits of mitigation?



Interaction of physical and transition risks for finance community

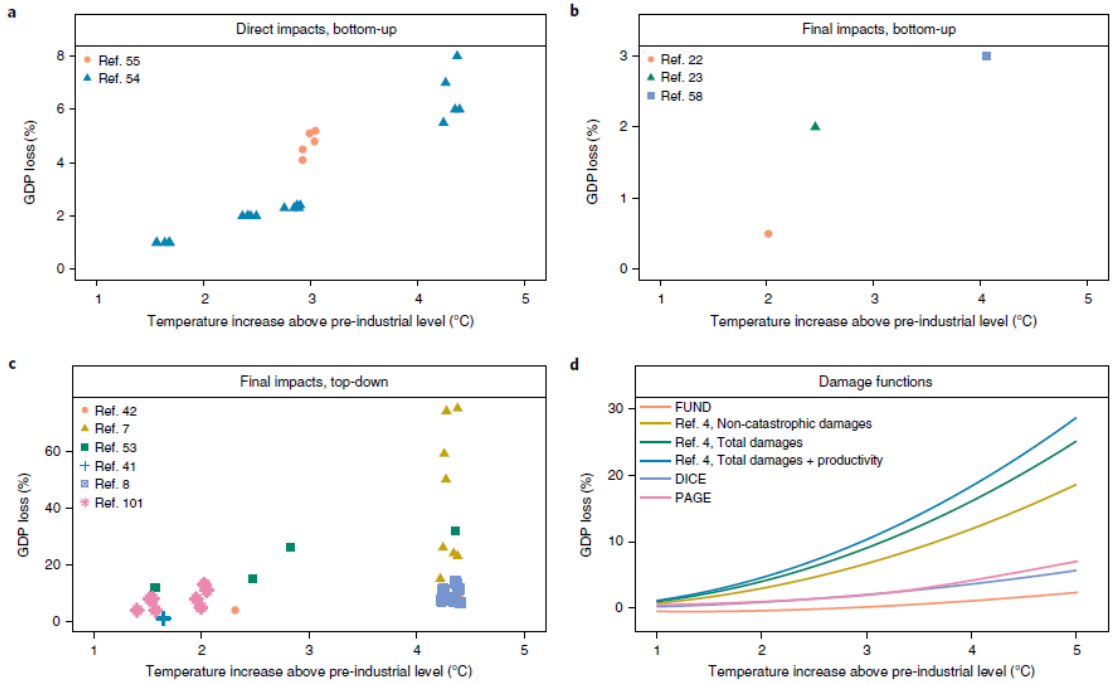
COACCH
CO-DESIGNING THE ASSESSMENT OF CLIMATE CHANGE COSTS

Effect of damages on policy pathways?

PIK

Background 1: Improved basis of damages and their application in IAMs

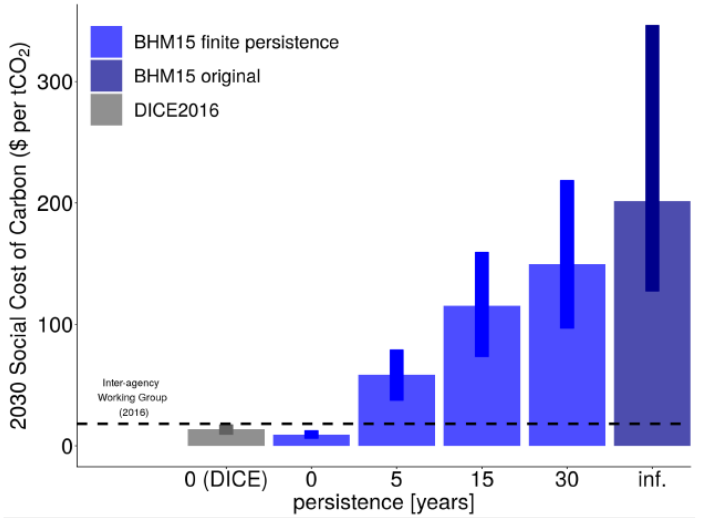
Richer picture of aggregate economic damages



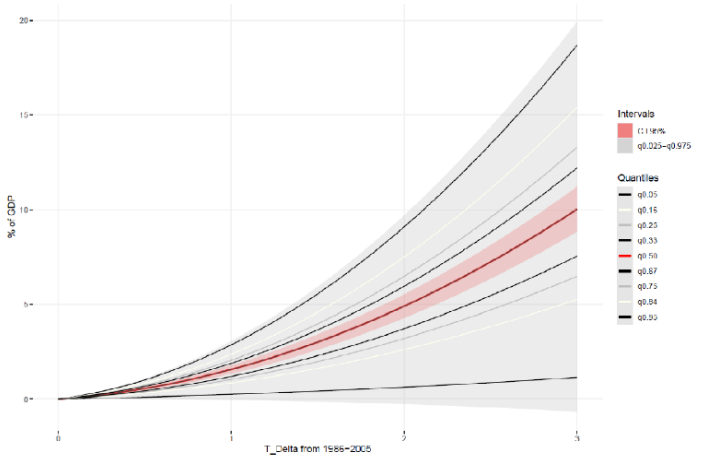
Piontek et al. 2021

Empirical damage functions (Burke, Kalkuhl & Wenz), varying the degree of persistence, in IAMs

Schultes et al. 2021

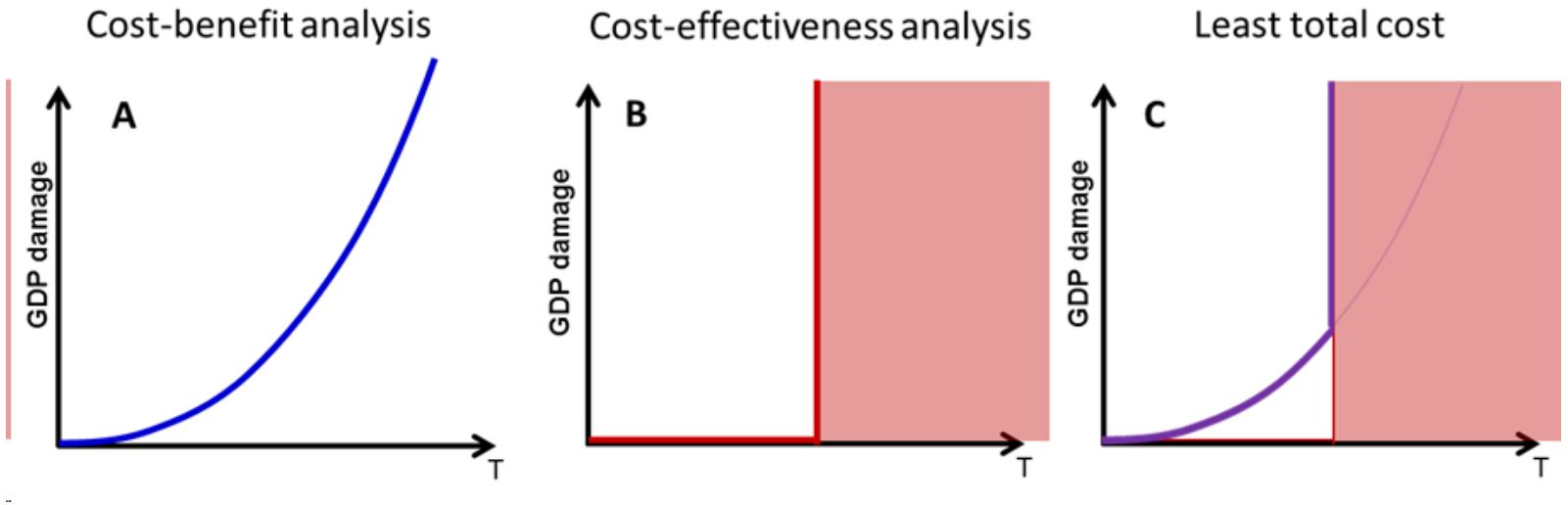


Improved bottom-up damage functions, e.g. COACCH project



Van der Wijst et al. 2021

Background 2: Least total cost analysis

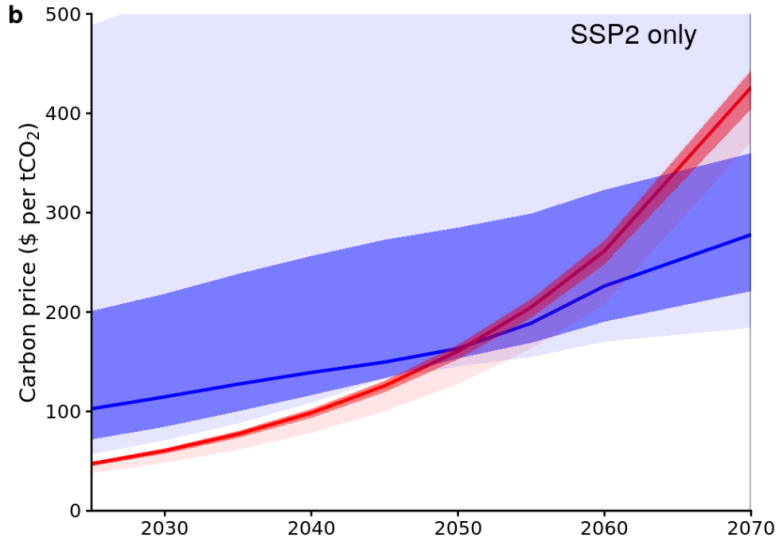


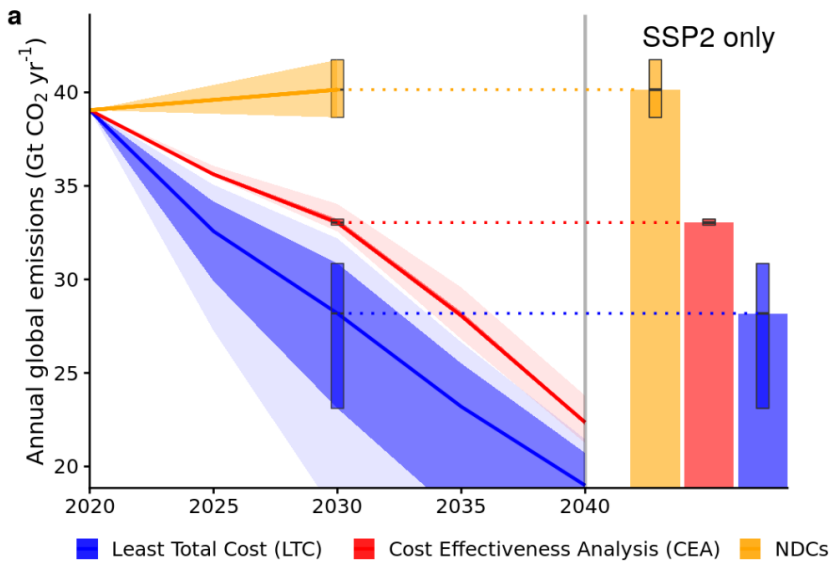
Schultes et al. 2021, https://doi.org/10.1088/1748-9326/ac27ce

Why?

- More realistic mitigation pathways because emerging damages are included
- Hedge against missing risks in available damage functions

Motivation 2: Least total cost analysis





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It matters, because:

- More stringent near-term mitigation efforts
- Robust to varying assumptions about damages, socioeconomic scenarios, climate sensitivities, discount rates

Research questions for integrated scenarios

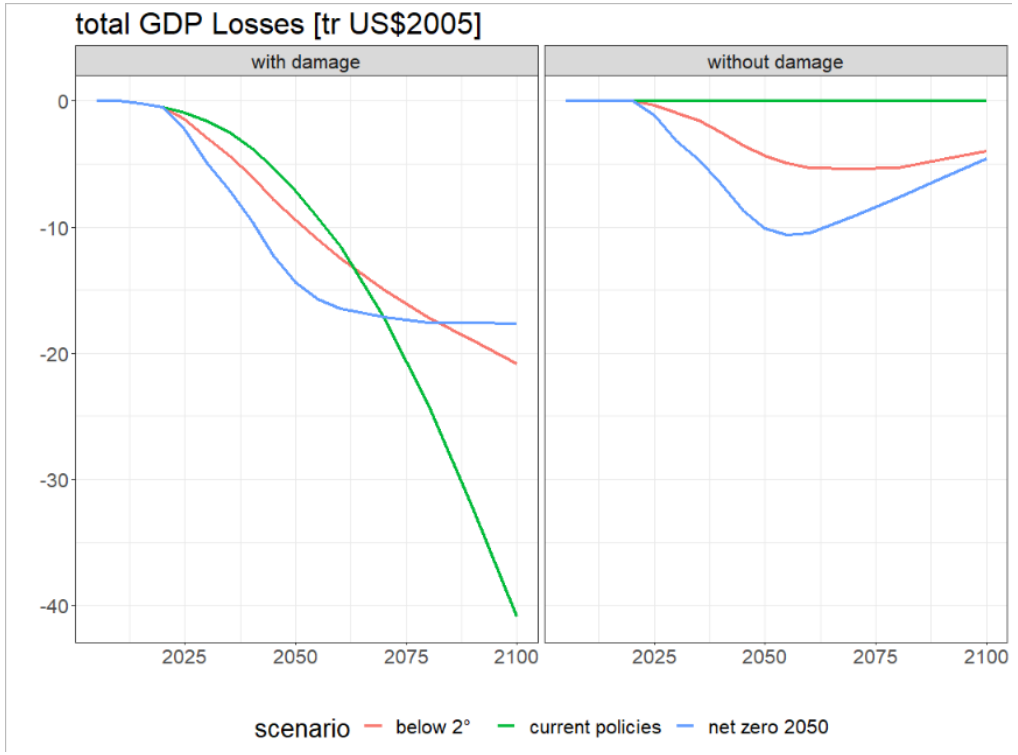
What are costs and benefits of mitigation under different (climate, damage, policy) assumptions?

What are mitigation costs and damage costs in total loss?

Decompose GDP loss in mitigation costs and damages

- Requires additional model runs for process-based IAMs
- Mitigation to guardrail plus response to internalized damages
- Direct and indirect damages

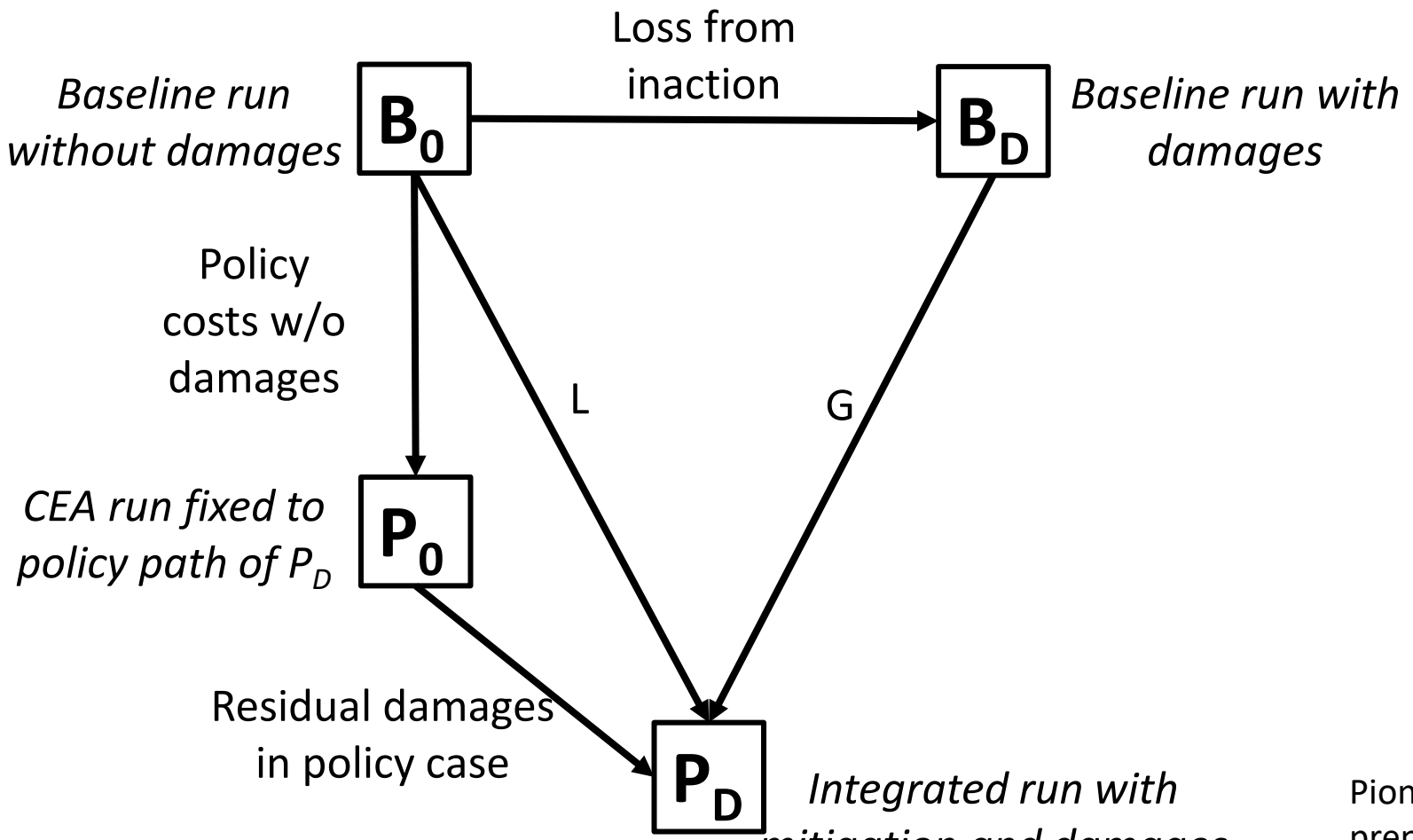
NGFS scenarios from REMIND model



https://ngfs-scenario-portal.netlify.app/

Decomposition of total costs

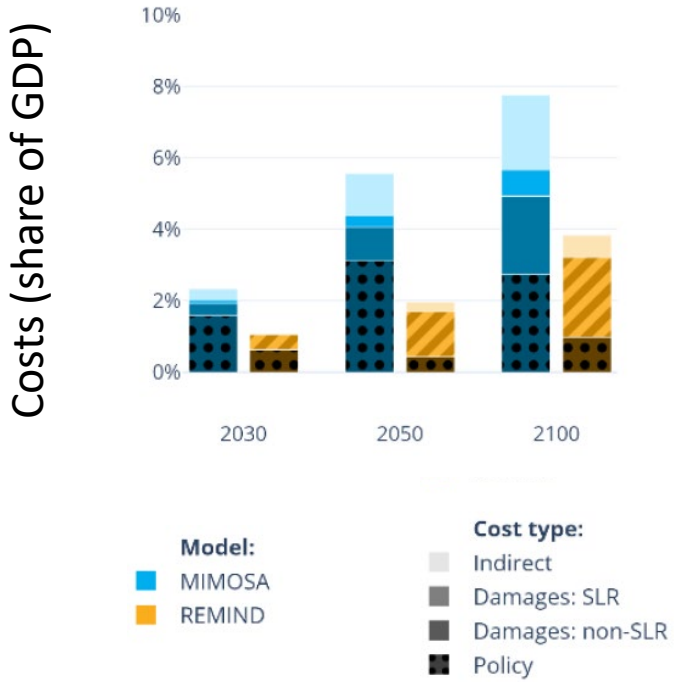
L = loss from policy intervention
G = gain from policy intervention



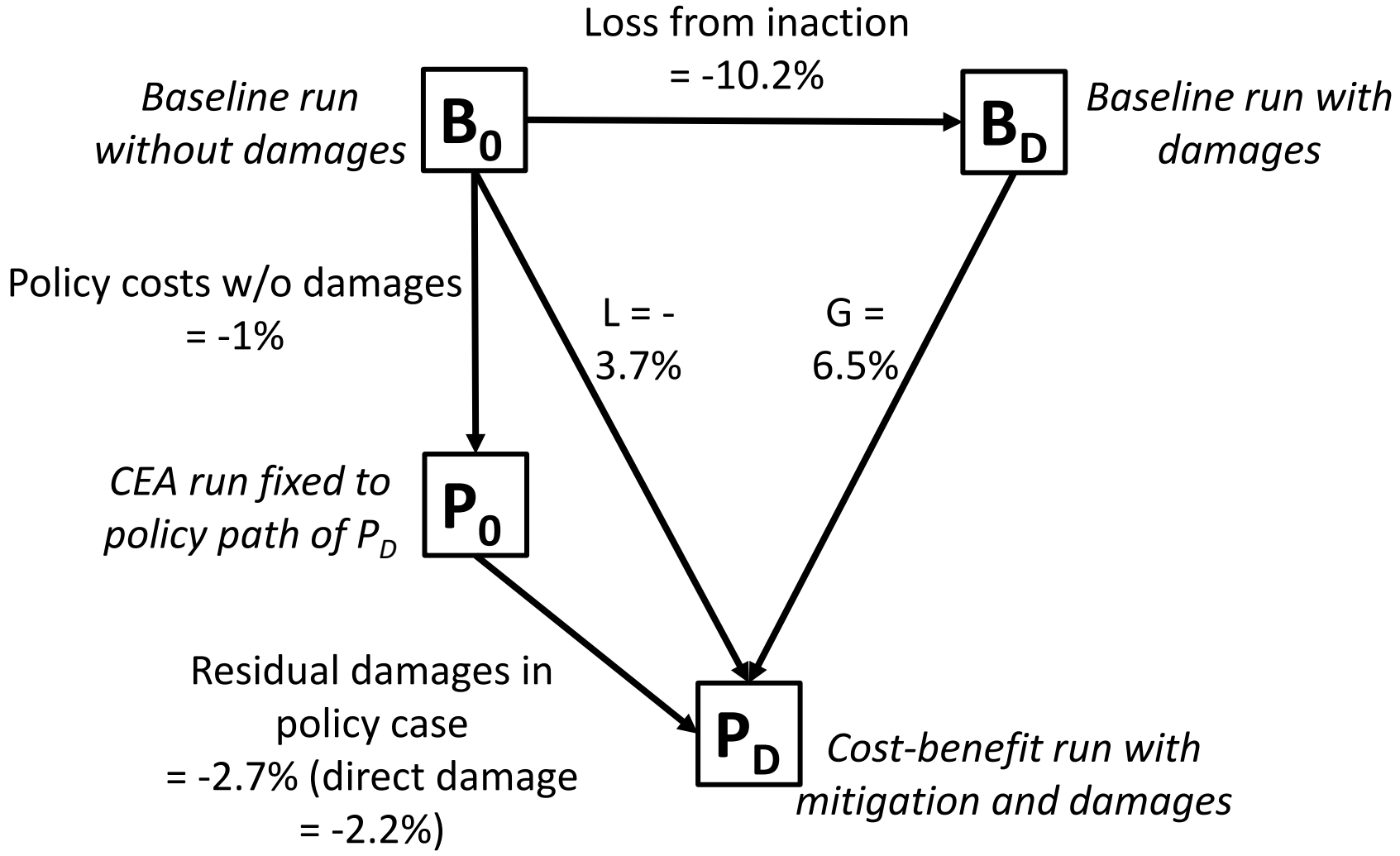
Based on von Stechow et al. 2015

Piontek et al., in preparation

Application for REMIND for model intercomparison in COACCH



Van der Wijst et al. 2021



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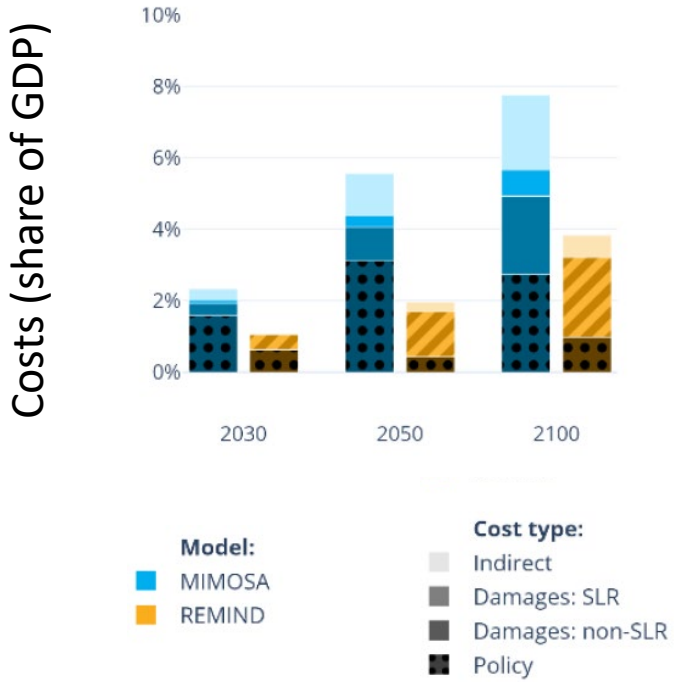

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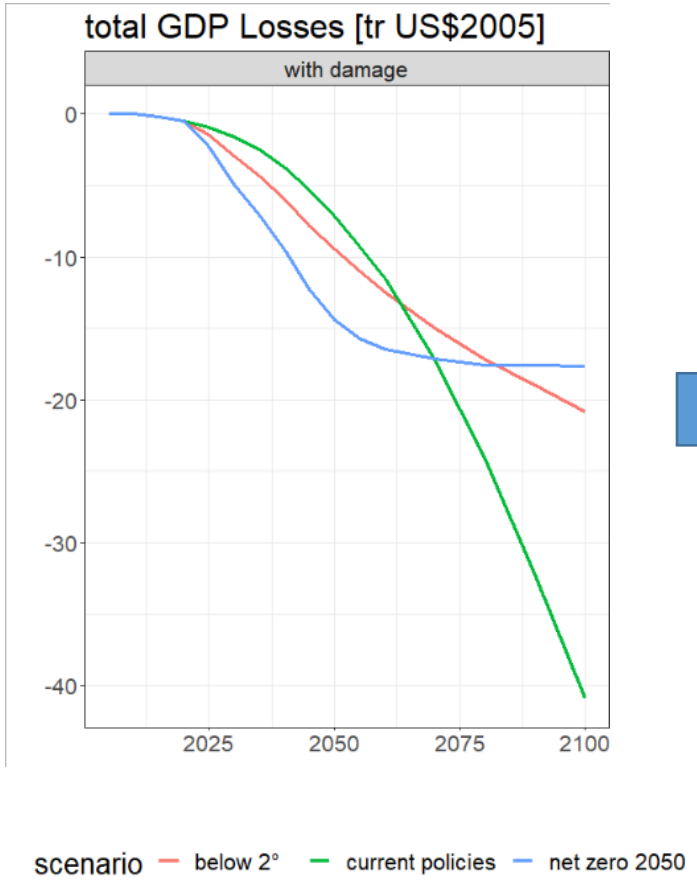
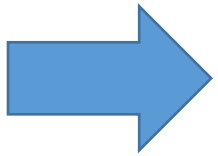
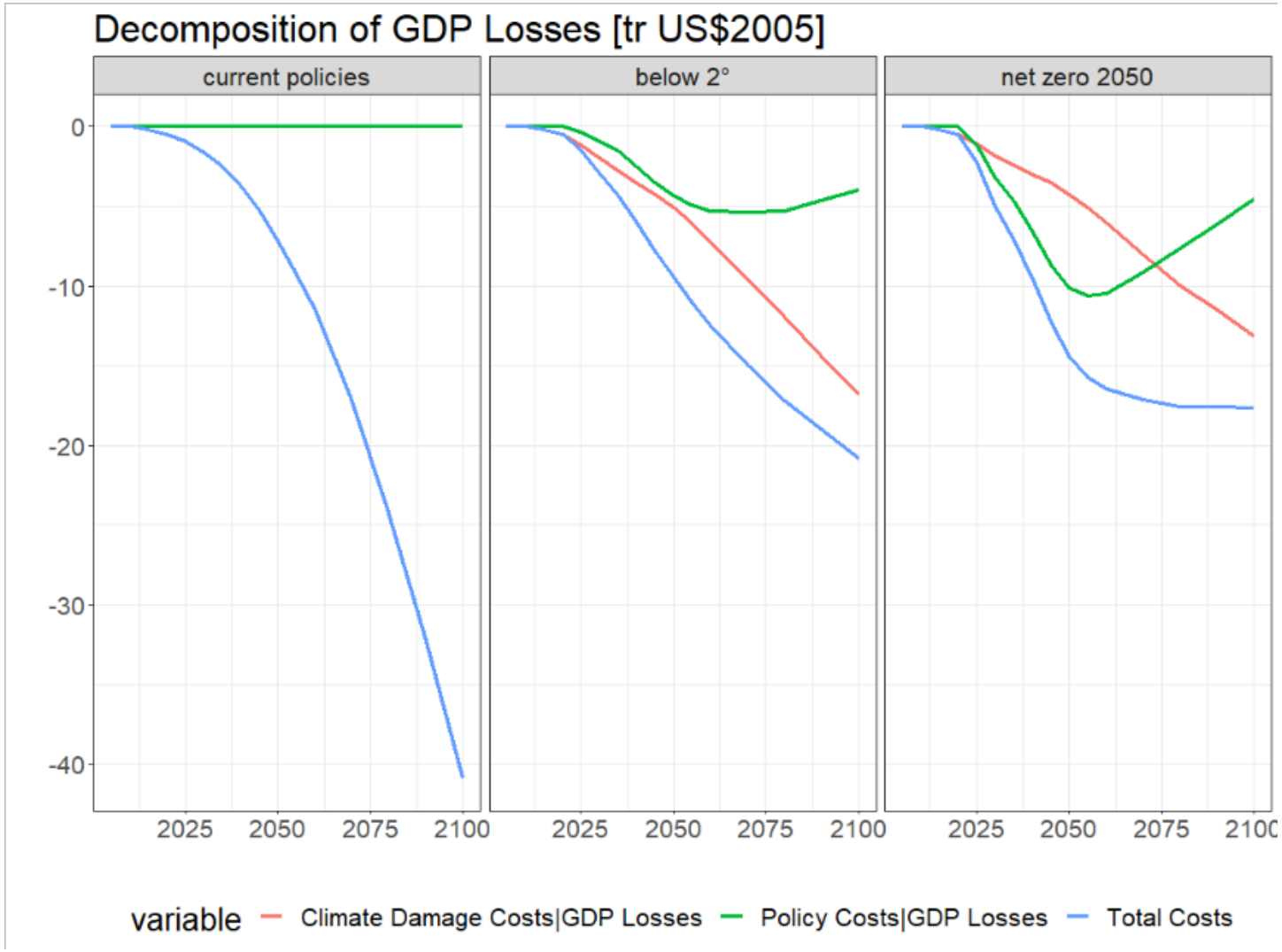
- Additional scenario requirements – total number of runs with uncertainty analyses multiplies
- Common baseline beyond SSP → policies included, starting temperature, reference period for temperature increase
- Different climate modules → similar emission pathways may translate into different temperature increases = different damages

→ opportunity of comparative advantages – detailed representation of mitigation vs. ability to capture wider uncertainty space

Planned analysis of the integrated NGFS scenarios







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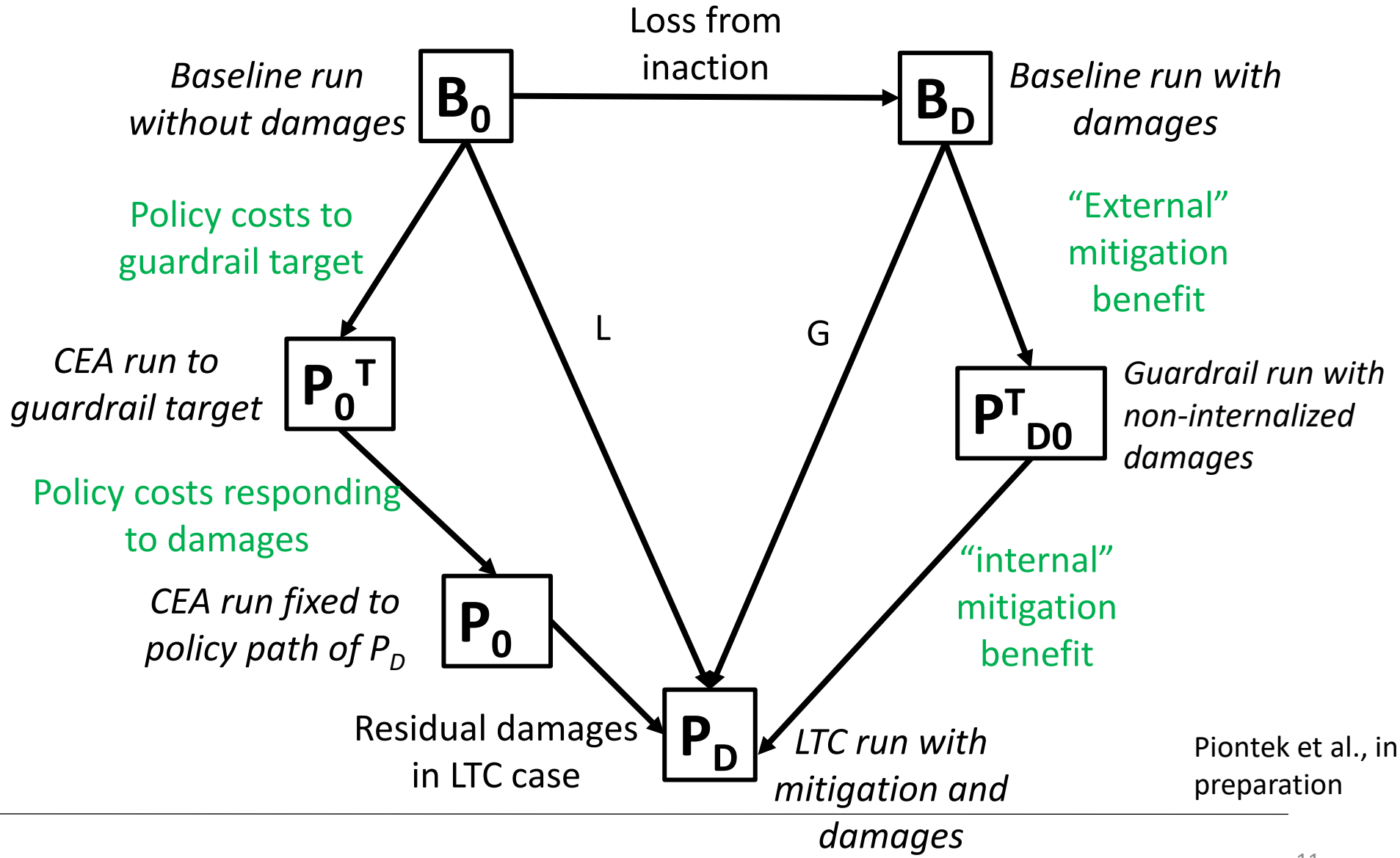
Decomposition for least total cost setting

- What are the costs and benefits from adhering to the guardrail temperature?
- What additional costs and benefits are incurred when internalizing damages below the guardrail?



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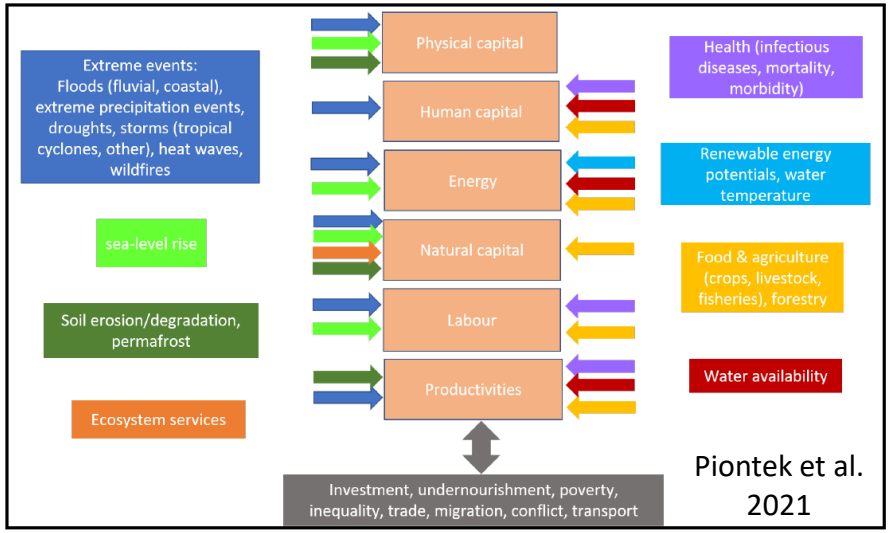
Conclusions and next steps

- Expansion of decomposition framework to account for uncertainties → certainty and balanced growth equivalents
- Finalize, test and provide the decomposition framework for use in the community – facilitate integrated scenarios with damage/climate uncertainty
- Detailed model intercomparison with damages needed
- Explore ways to combine aggregate and sectoral damages
- Identify priorities for channels captured



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