USING MODELS FOR ROBUST CLIMATE POLICY INSIGHTS IN DEVELOPING COUNTRIES

Julie Rozenberg, Senior Economist, World Bank Group

Climate policies cannot be assessed separately from broader development objectives

Decision making for development policy is challenging
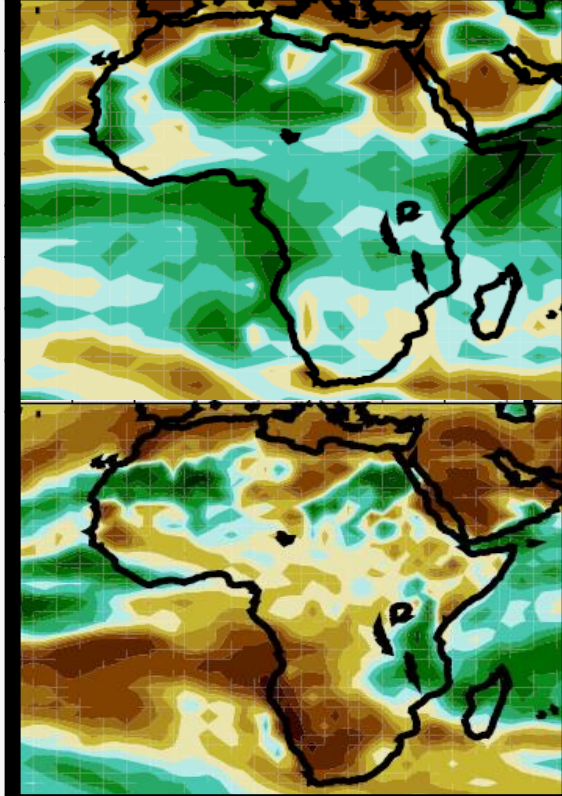
Rapid Changes

Shanghai 1990 vs. 2010

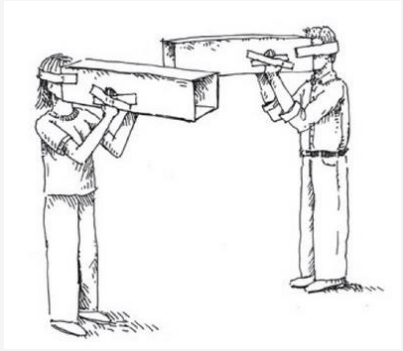

Competing Priorities

Conservation vs. Development

Uncertain Future

Climate Change

Models can be used to make more robust decisions
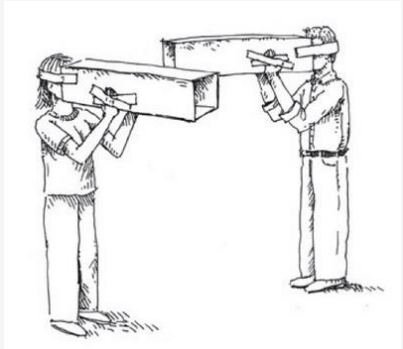
"Predict Then Act"

What will the future be? → What is the best near-term decision? → How sensitive is our decision to our predictions?

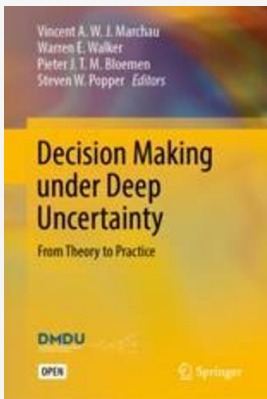# Models can be used to make more robust decisions

"Predict Then Act"

| What will the future be? | → | What is the best near-term decision? | → | How sensitive is our decision to our predictions? |

Decision Making Under Deep Uncertainty (DMDU)
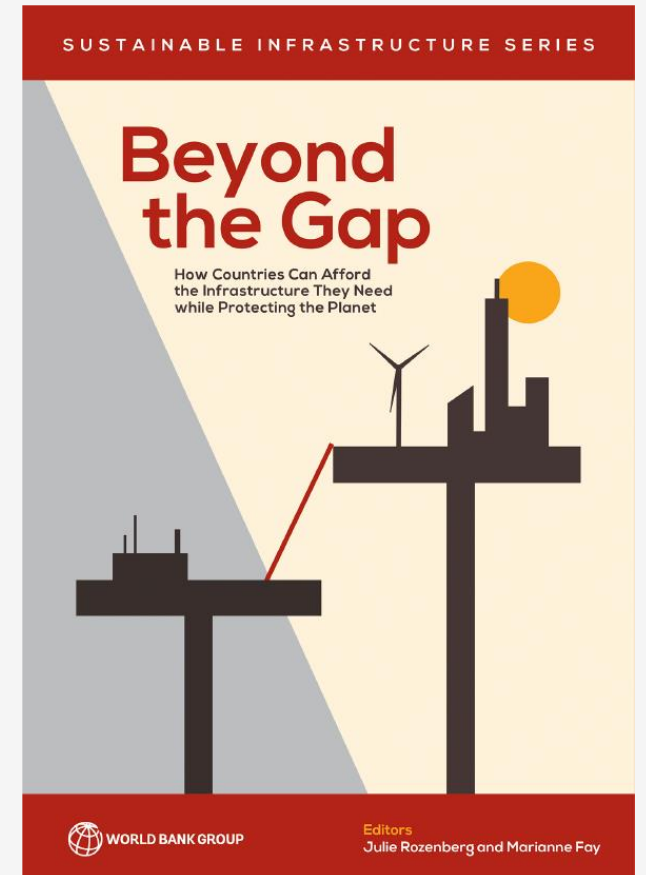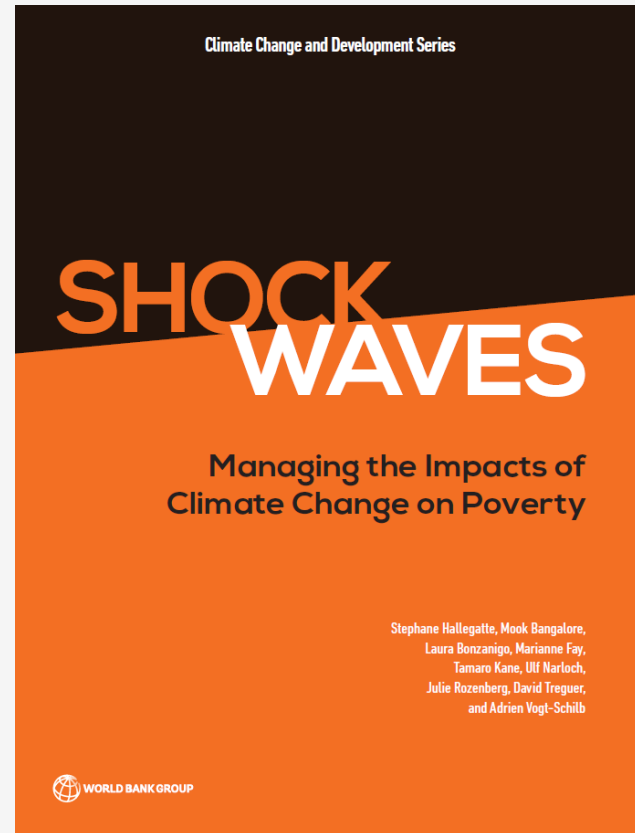
| What are the available strategies? | → | Identify vulnerabilities of these strategies | → | Develop strategy adaptations to reduce vulnerabilities |

We use models to assess climate policies within the broader development agenda using a DMDU approach

Climate Change and Development Series

SHOCK WAVES

Managing the Impacts of Climate Change on Poverty

Stephane Hallegatte, Mook Bangalore, Laura Bonzanigo, Marianne Fay, Tamaro Kane, Ulf Narloch, Julie Rozenberg, David Treguer, and Adrien Vogt-Schilb

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SUSTAINABLE INFRASTRUCTURE SERIES

Beyond the Gap

How Countries Can Afford the Infrastructure They Need while Protecting the Planet

WORLD BANK GROUP

Editors
Julie Rozenberg and Marianne Fay

Shockwaves: modeling the impacts of climate change on poverty in 2030

- We model impacts directly on households instead of using GDP (micro-simulation)

- We systematically explore the uncertainty pertaining to future demographic and socio-economic changes

We project households in 2030 in hundreds of scenarios combining assumptions on uncertain variables
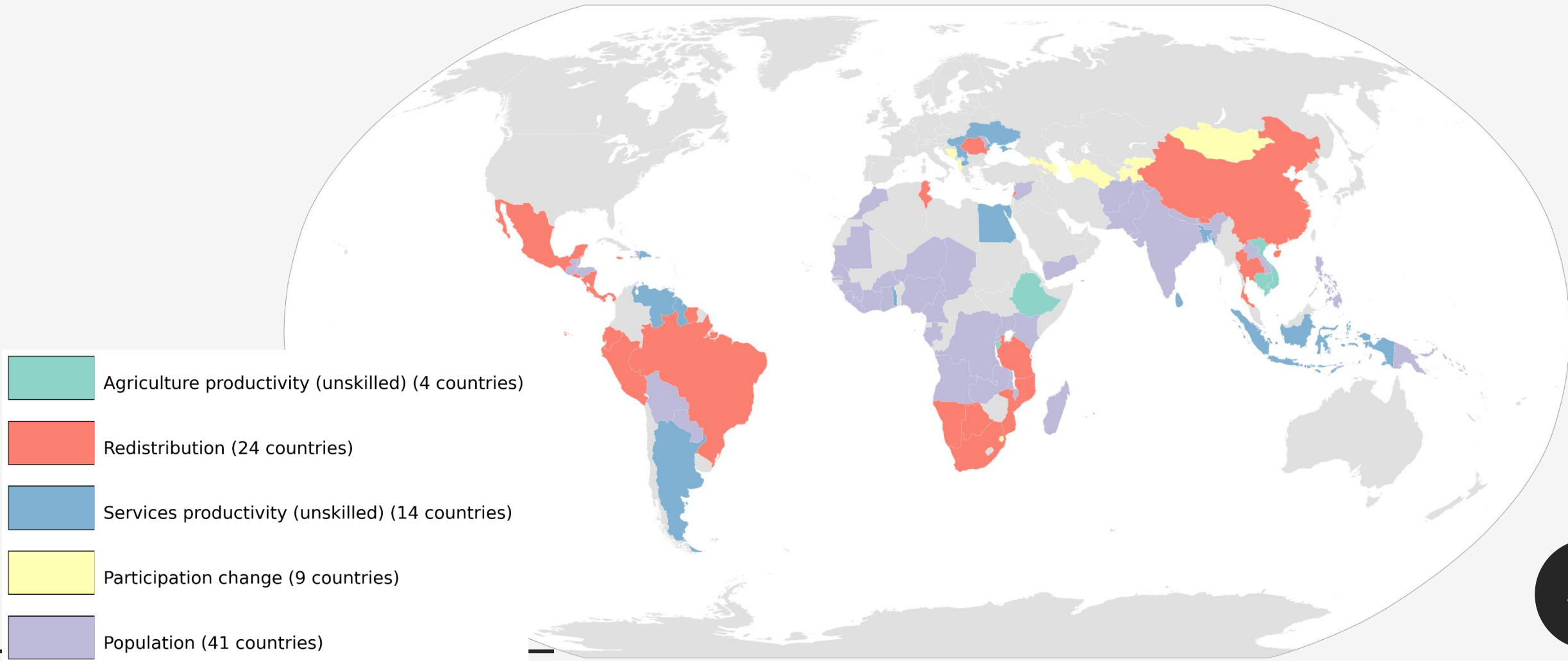

Structural change

Demography

Productivity growth

Redistribution

We identify the main drivers of poverty reduction in each country

Legend:
- Agriculture productivity (unskilled) (4 countries)
- Redistribution (24 countries)
- Services productivity (unskilled) (14 countries)
- Participation change (9 countries)
- Population (41 countries)

We build two global scenarios

In the absence of climate change, we can imagine two
different ways for the world to evolve

Prosperity
More optimistic on:
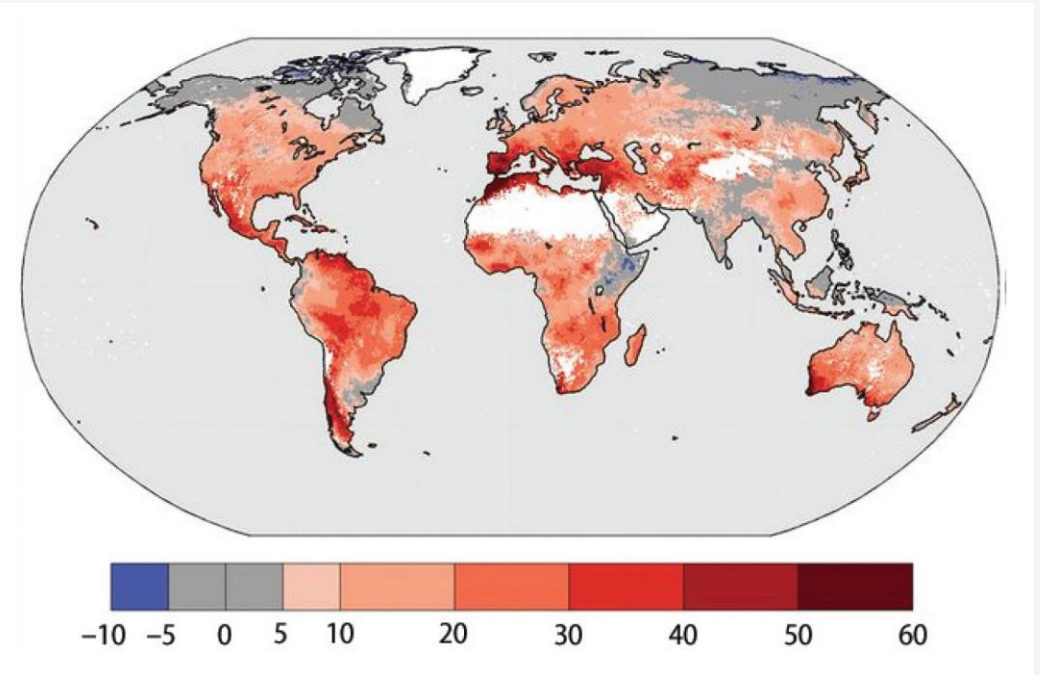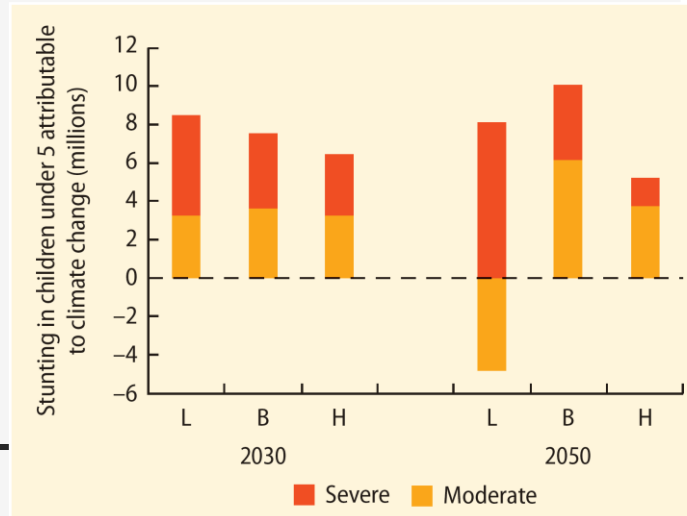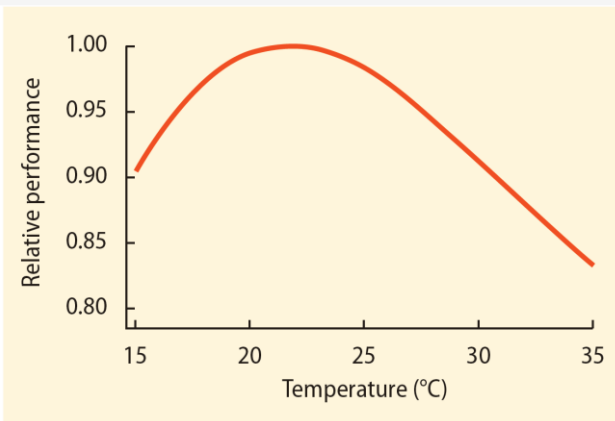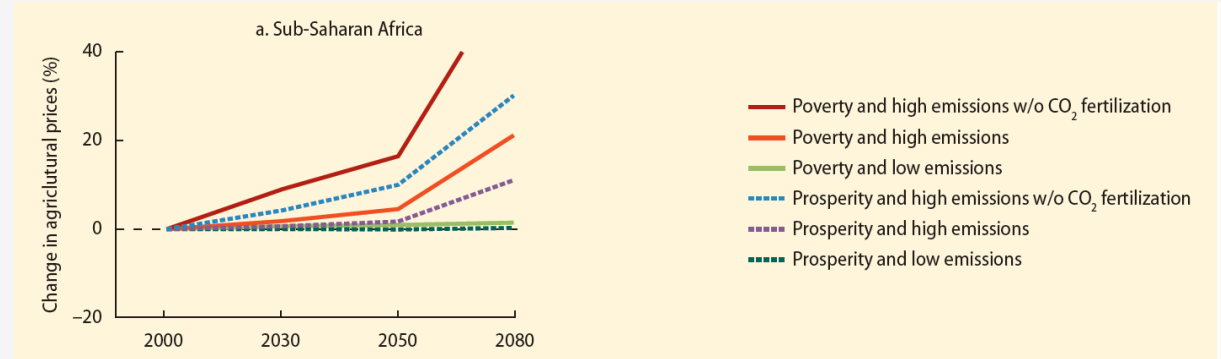• Economic growth
• Poverty
• Inequality
• Basic services

Poverty
Less optimistic on:
• Economic growth
• Poverty
• Inequality
• Basic services

We add climate change impacts in 2030
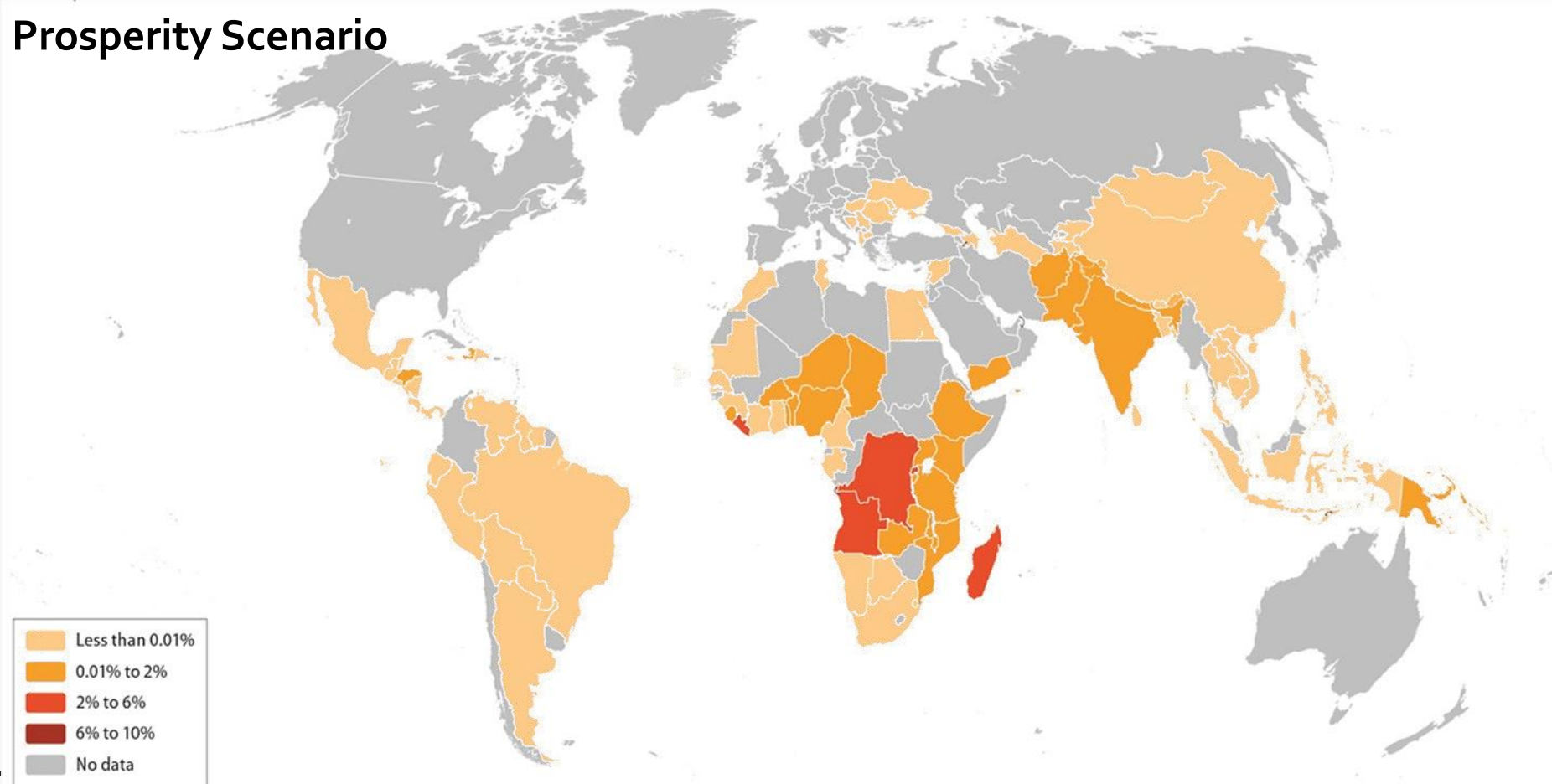
- Agriculture prices & revenues

- Natural disasters

- Health: stunting, malaria, diarrhea

- Temperature impact on labor productivity

a. Sub-Saharan Africa

Poverty and high emissions w/o CO_2 fertilization
Poverty and high emissions
Poverty and low emissions
Prosperity and high emissions w/o CO_2 fertilization
Prosperity and high emissions
Prosperity and low emissions

Good development – rapid, inclusive and climate-informed – can prevent most of the impact of climate change on poverty

Prosperity Scenario

Total: 16 million for the high impact climate scenario

Less than 0.01%
0.01% to 2%
2% to 6%
6% to 10%
No data

Additional people below the poverty line in 2030 due to climate change (% of population)

Absent good development, climate change could push 122 million people into poverty, especially in Sub-Saharan Africa and South Asia

Poverty Scenario

Less than 0.01%
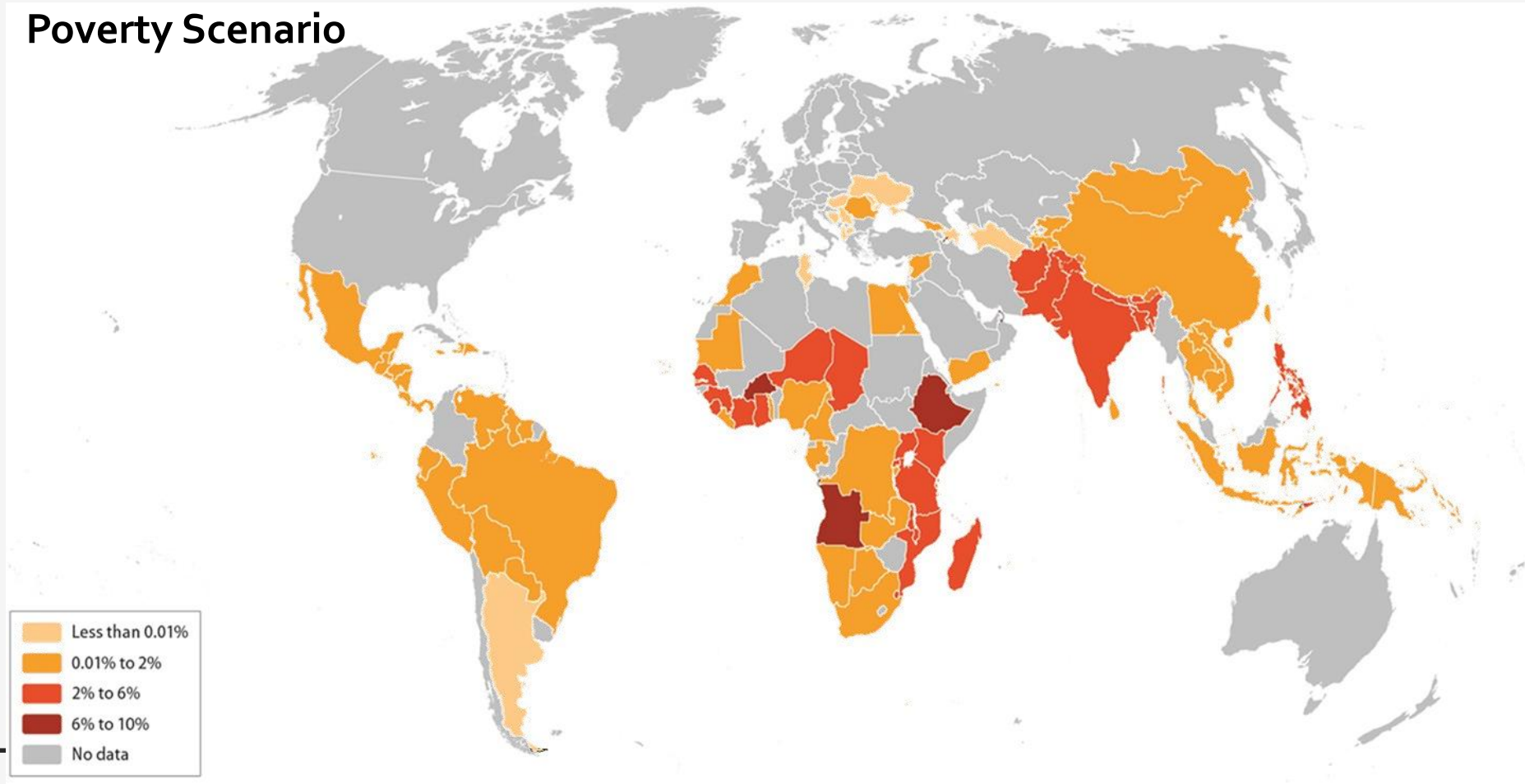0.01% to 2%
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Total: 122 million for the high impact climate scenario

Additional people below the poverty line in 2030 due to climate change (% of population)

Lessons learnt

- Most of the uncertainty is in the baseline. But communicating this is difficult

- In some countries the incremental impact of climate change is not correlated with absolute poverty in the climate change scenario

- The most interesting part of the analysis is on the drivers of poverty reduction. More interesting policy question: do these interact with climate change impacts/policy?
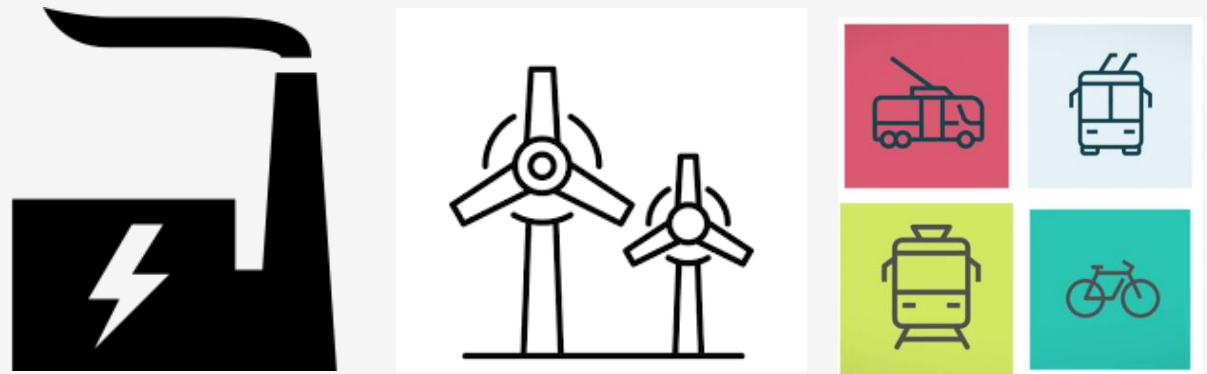
Beyond the Gap
Assessing how much countries need to spend in infrastructure by 2030

1. Objectives
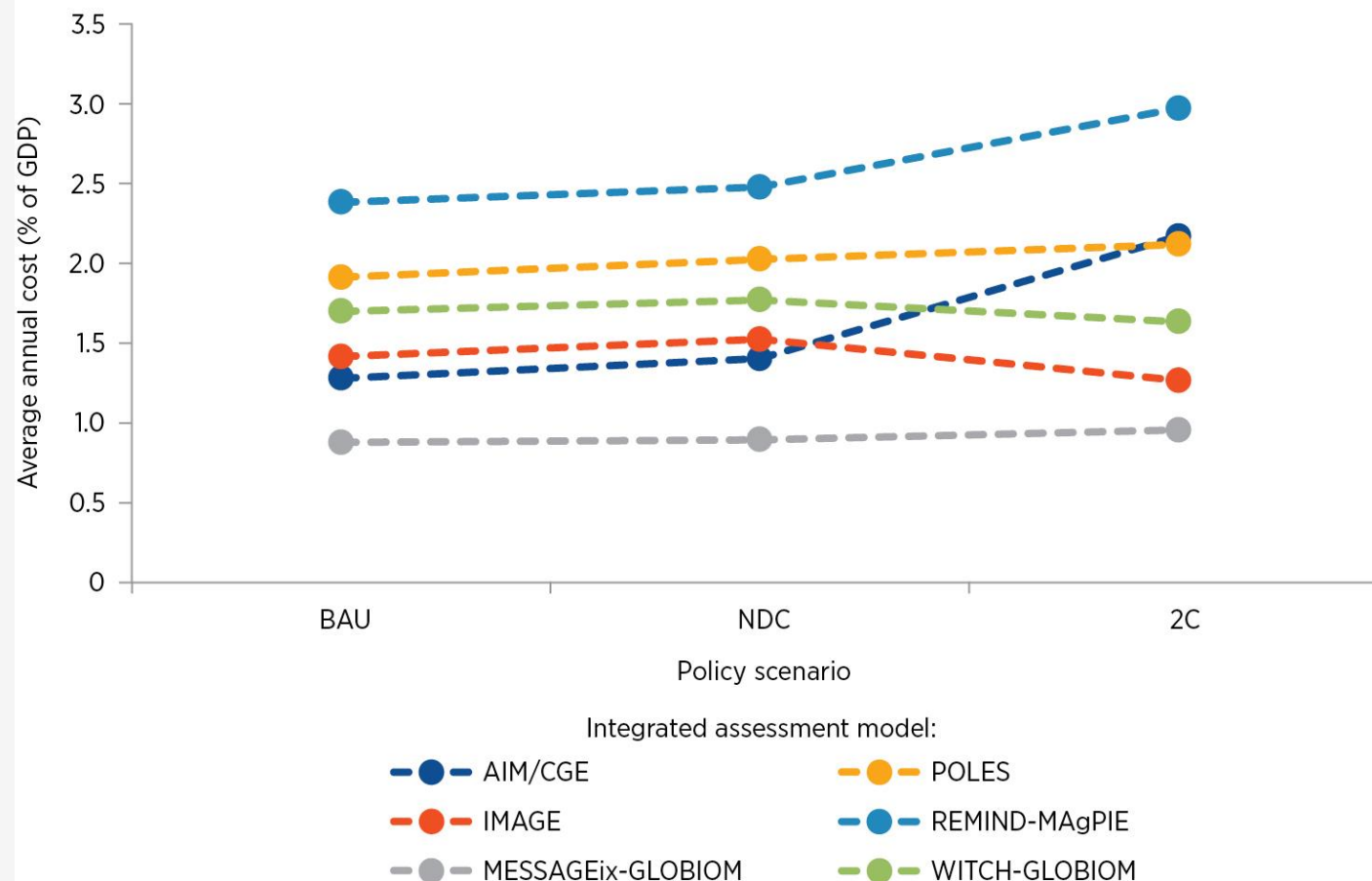

2. Options

3. Uncertainties

Model uncertainty is sometimes much bigger than the difference between climate objectives

What are the assumptions made by the different models that explain the difference between investing 1% of GDP per year or 3% of GDP per year for electrification in a 2C world? Are these assumptions relevant for policy decisions?

FIGURE 3.9 **A 2C world may cost less than the business-as-usual one—or a lot more**

Average annual cost of investment in the power sector, by policy scenario and integrated assessment model used, 2015–30

Integrated assessment model:
- AIM/CGE
- IMAGE
- MESSAGEix-GLOBIOM
- POLES
- REMIND-MAgPIE
- WITCH-GLOBIOM

Source: Rozenberg, Julie, and Marianne Fay, eds. (2019). *Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet*. Sustainable Infrastructure Series. Washington, DC: World Bank.
Note: Results exclude high-income countries. BAU = business as usual; NDC = nationally determined contribution; 2C = 2°C.

In sum

- Need to explore more – and communicate better – the interactions between climate objectives and the "baseline" (other objectives, policies and uncertainties)

- Focus on absolute outcomes rather than incremental changes compared to a counterfactual?

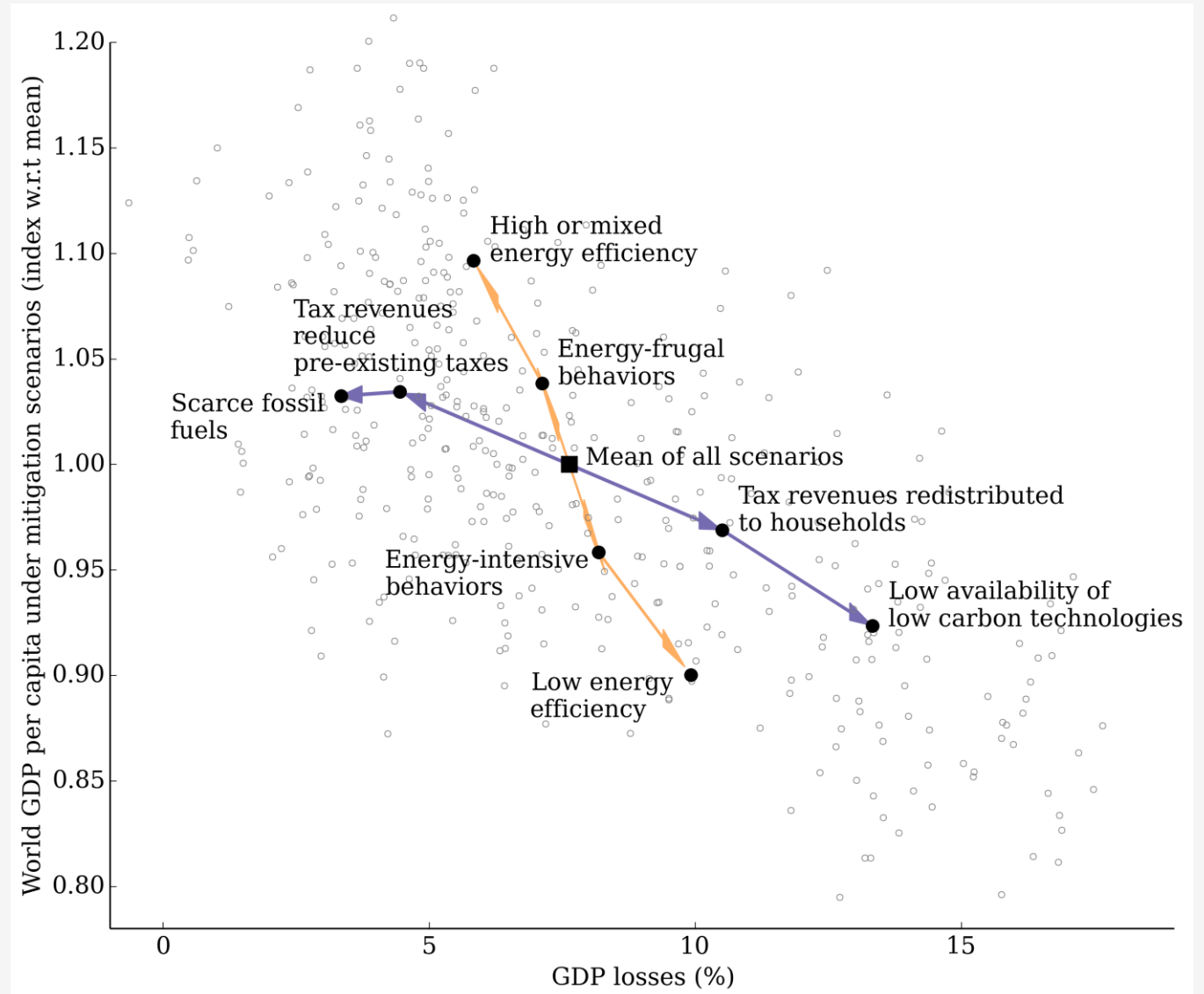- What are the "hidden" assumptions in models that drive results and could be policy relevant?

Back up

Focusing on incremental costs of mitigation policies gives different insights from looking at absolute outcomes

Models run with IMACLIM-R. Each dot is one scenario

The drivers of GDP in a low carbon world are different from the drivers of GDP losses compared to a baseline scenario

Source: Rozenberg (2014), Some aspects of the robustness of climate change mitigation policies (thesis manuscript) – work with Céline Guivarch