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MOEJ-IIASA collaborative research projects B

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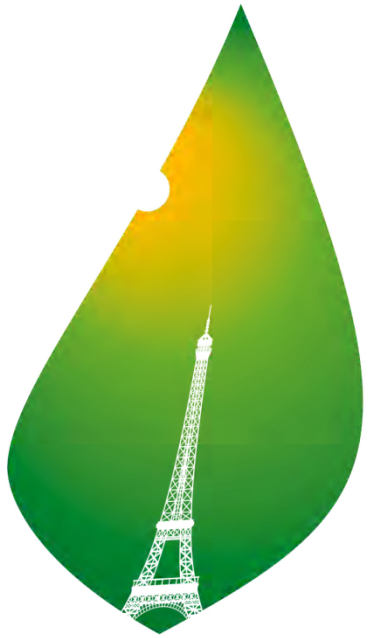
ACP/IIASA International Webinar,
22 February 2022

MOEJ-IIASA – Project B

Paris Agreement and SDGs



COP21 · CMP11

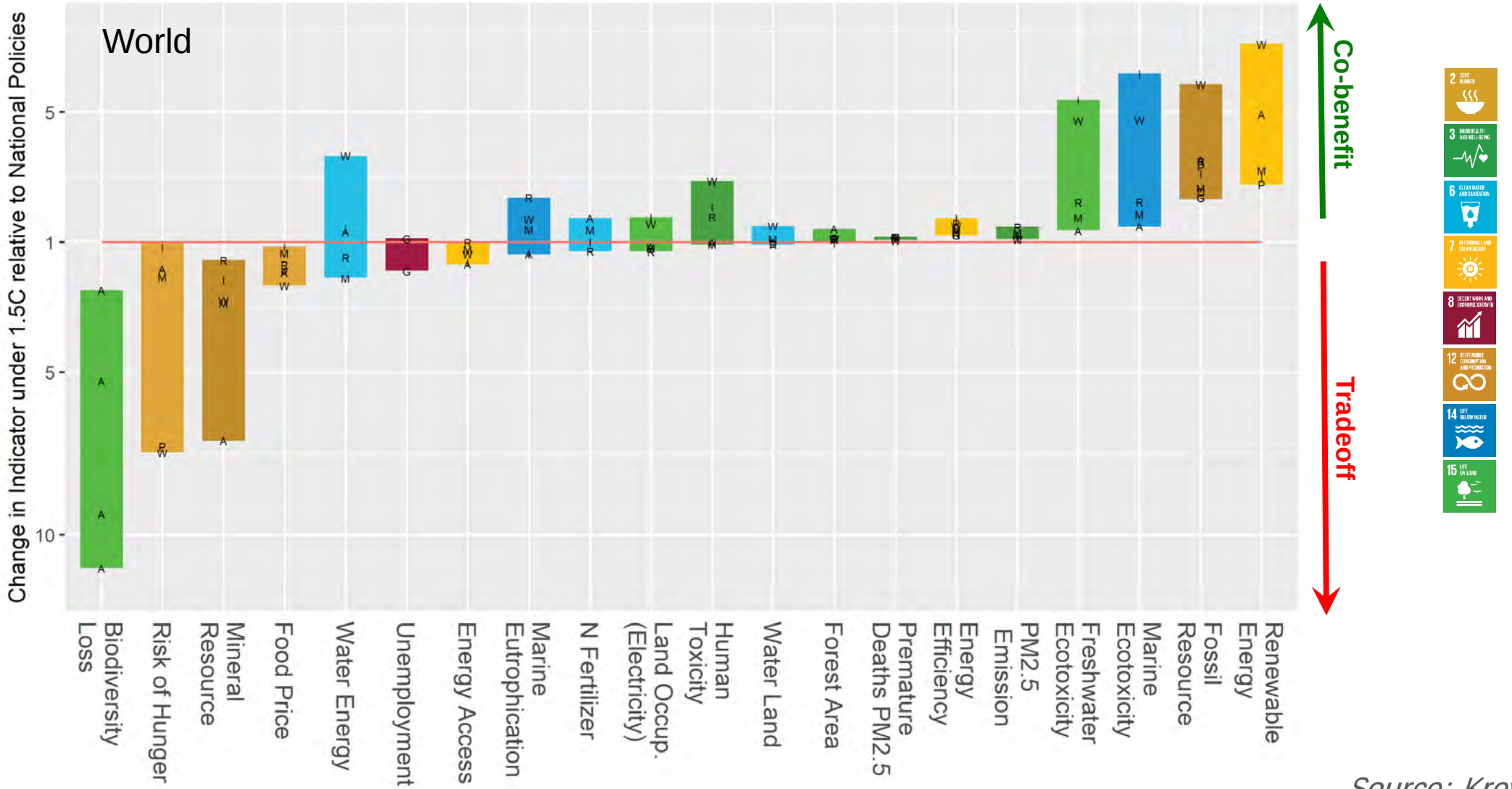
PARIS 2015

UN CLIMATE CHANGE CONFERENCE

SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Climate Policy Impact on SDGs: 1.5°C

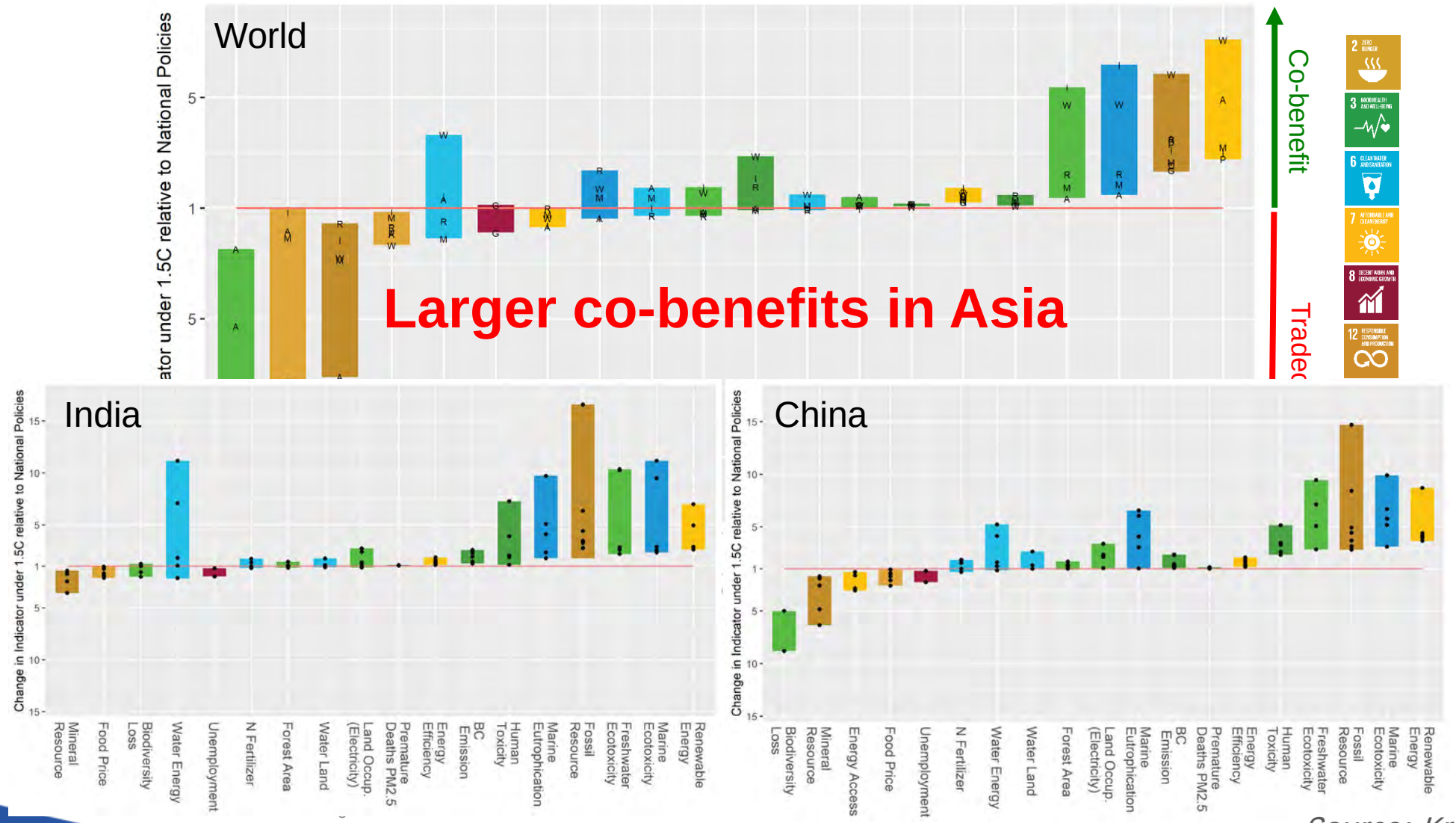
2050



Source: Krey et al. (2021)

Climate Policy Impact on SDGs: 1.5°C

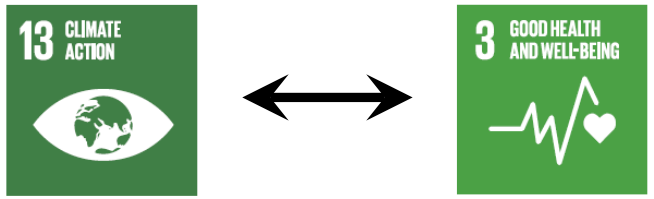
2050



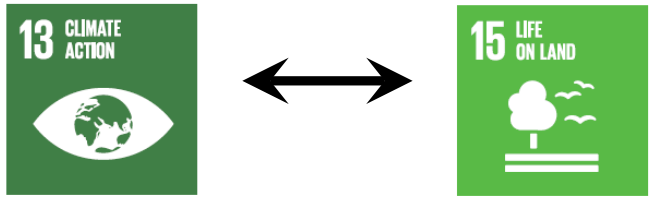
Source: Krey et al. (2021)

MOEJ-IIASA, Project B

- Achieving both the 2030 Agenda and the Paris Agreement requires effective measures that maximize synergies of policies to limit climate change with the SDGs.
- *Project B of MOEJ-IIASA collaboration focuses on two critical linkages:*



Phase 1: Health co-benefits of national climate policies



Phase 2.1: Interactions between climate policies and biodiversity

Phase 2.2: Energy-food-water and health nexus in Bhutan

Phase 2.3: National dashboard for Asia (multi-sector vulnerability & exposure)

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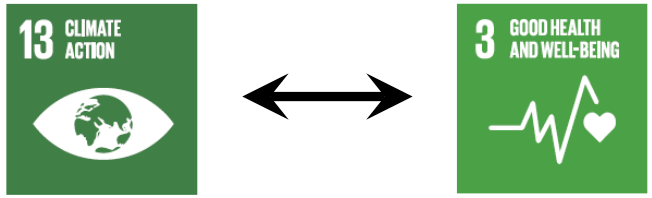


Air quality and health co-benefits of climate policies

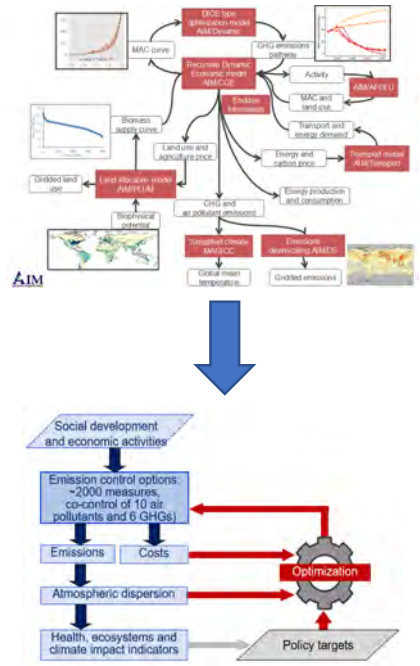
Gregor Kiesewetter[1], Zbigniew Klimont[1], Shinichiro Fujimori[2]

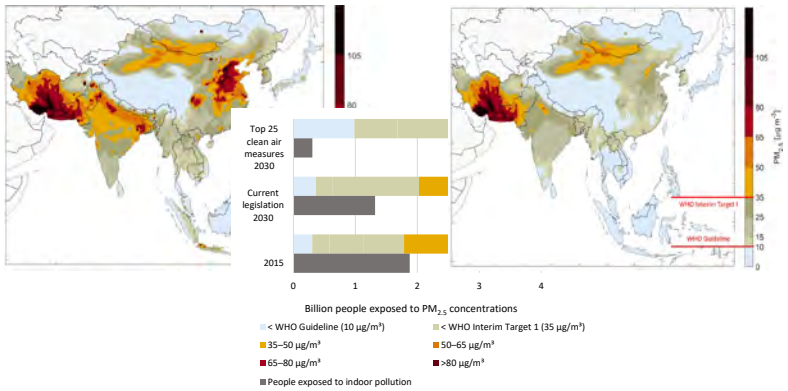
[1] *Pollution Management Research Group, Energy, Climate and Environment program, IIASA, Austria*
[2] *Kyoto University and NIES, Japan*

ACP/IIASA International Webinar, February 22, 2022

Tools and approach

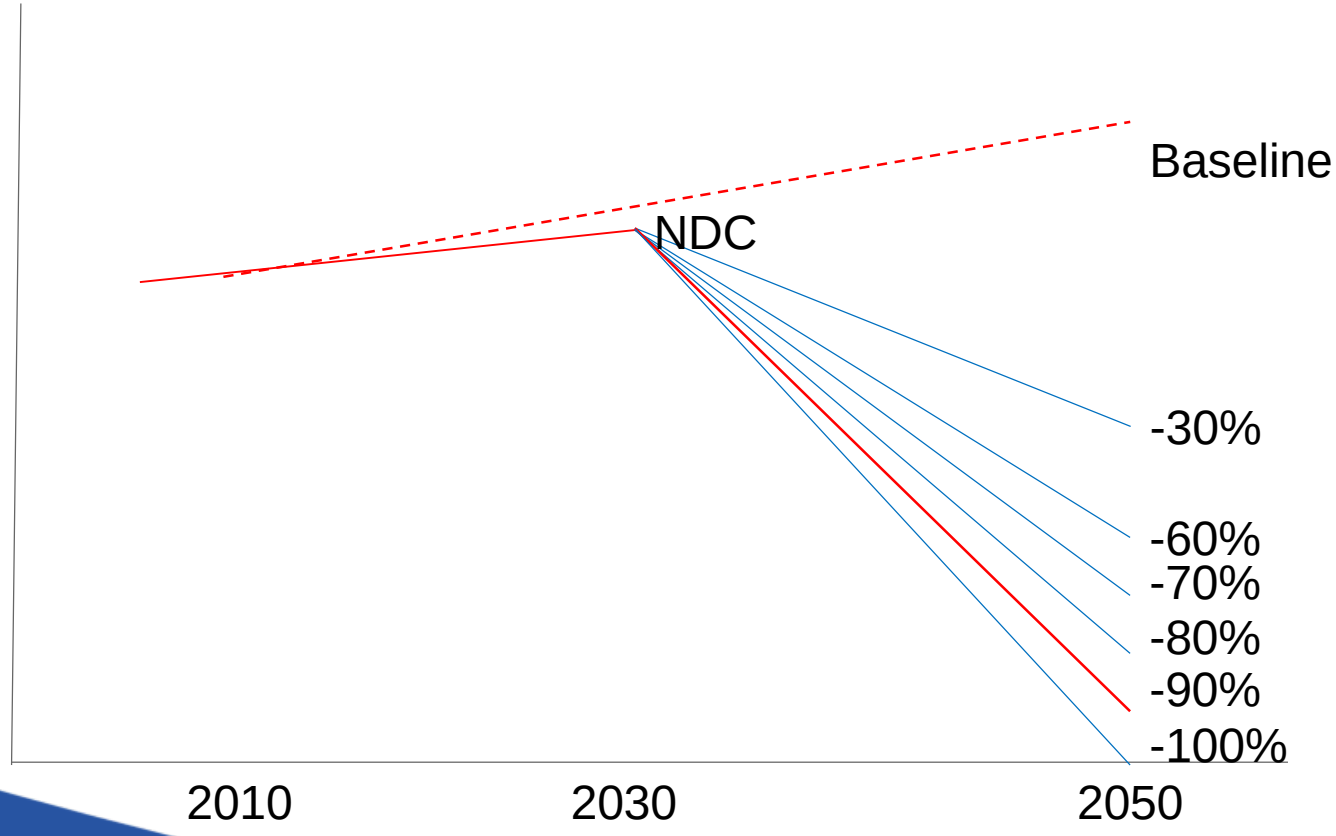
- **AIM** – National decarbonization and climate policy scenarios
- **GAINS** - Air pollution and health benefits
- Build a link between AIM and GAINS to downscale AIM scenarios to be used in GAINS for co-benefit and impact assessment
- Calculate and analyze PM2.5 concentrations, exposure, and health impact indicators at a national/regional scale





Emission scenarios in this study

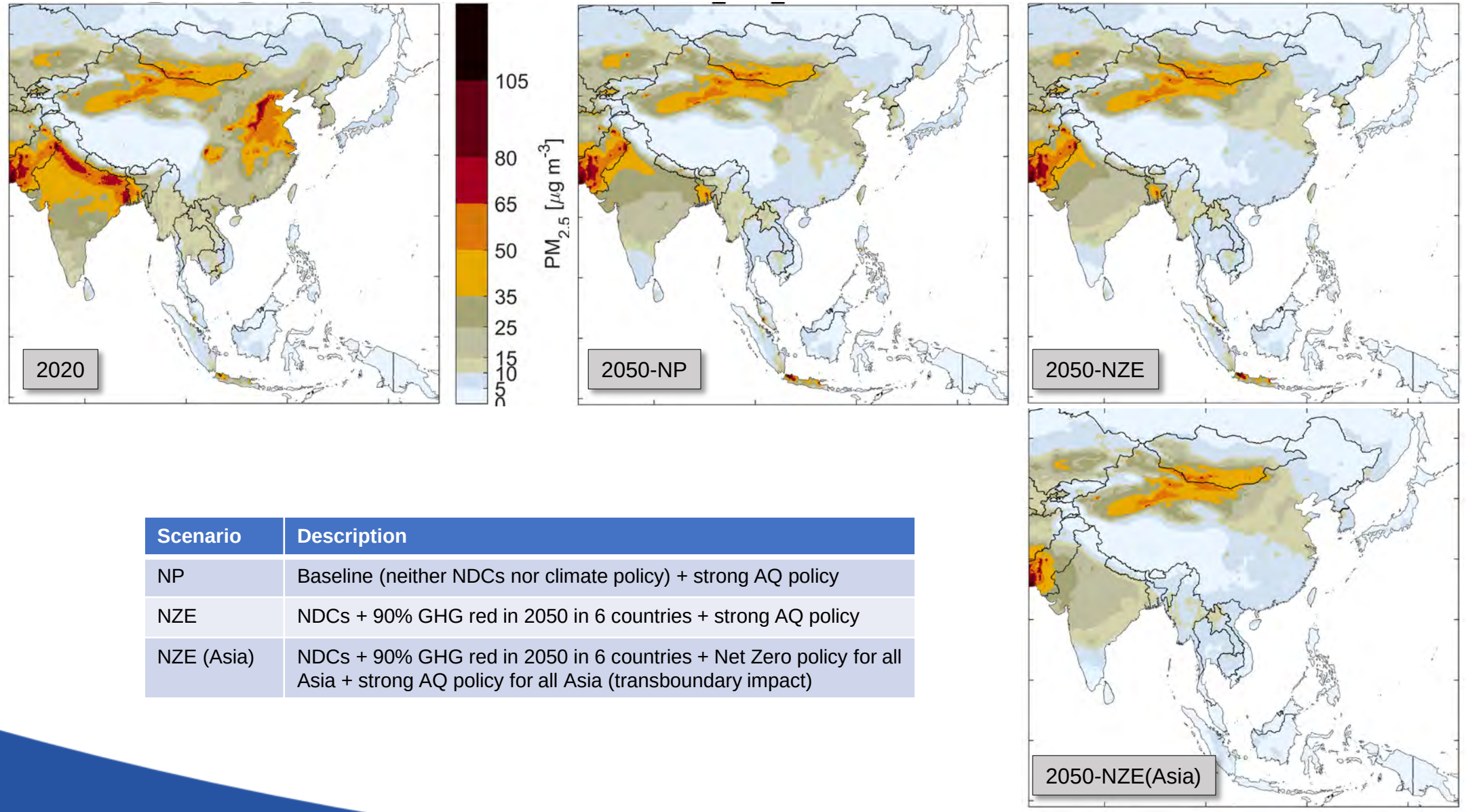
- Baseline: similar to SSP2-4.5
- Policy cases: NDC in 2030, and 0-100% reduction in 2050, relative to the 2010 level of National inventory.
- For all scenarios either current or strong air quality policy assumed (*strong policy examples in today's presentation*)



Scenario	Description
NP	Baseline (neither NDCs nor climate policy) + strong AQ policy (only 6 countries)
NZE	NDCs (6 countries) + 90% GHG reduction in 2050 (6 countries) + strong AQ policy (6 countries)
NZE (Asia)	NDCs (6 countries) + 90% GHG reduction in 2050 (6 countries) + Net Zero policy for all Asia + strong AQ policy for all Asia (transboundary impact)

Illustrative results:

Change in annual mean PM2.5 concentrations



Scenario	Description
NP	Baseline (neither NDCs nor climate policy) + strong AQ policy
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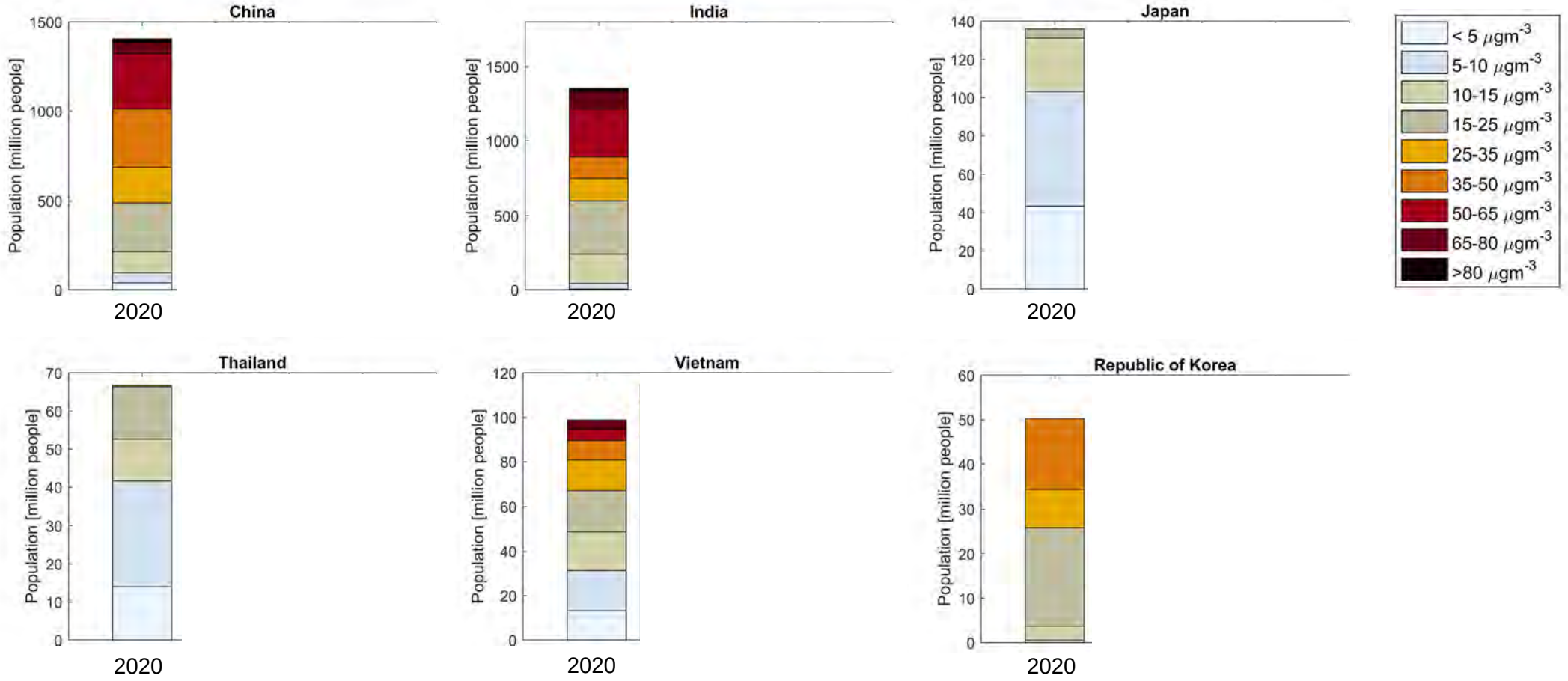
Illustrative results:

Change in population exposure



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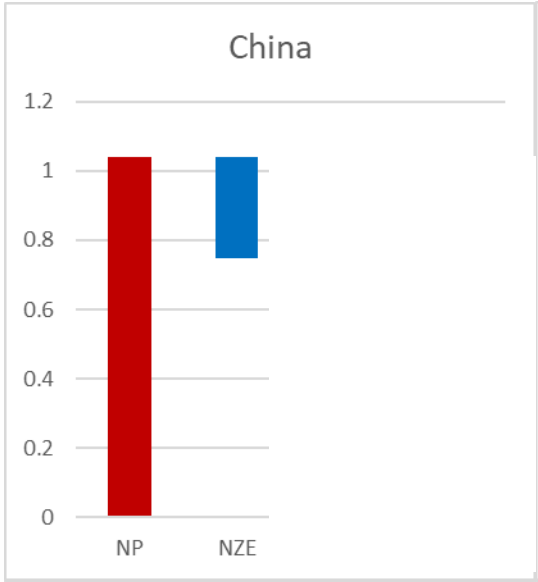
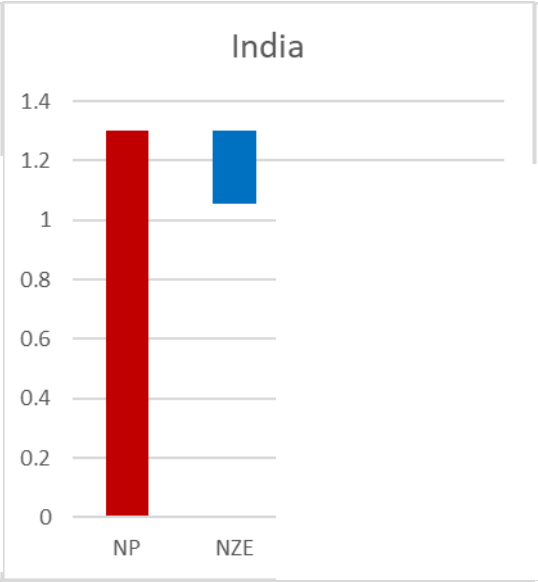
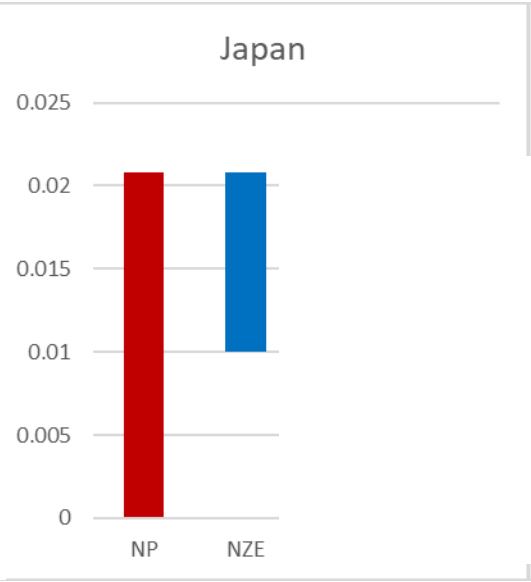
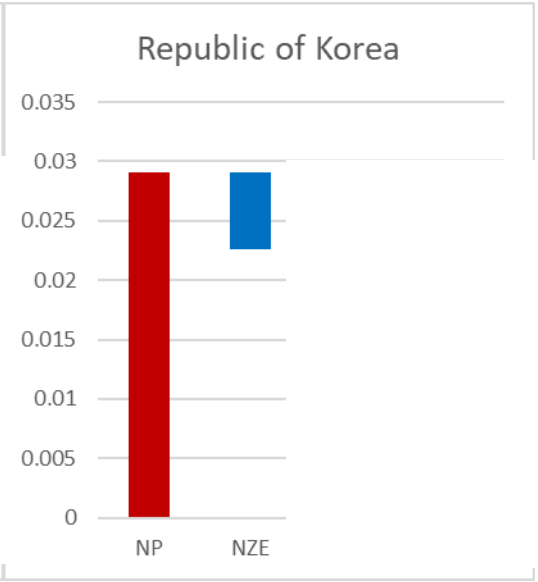
Illustrative results:

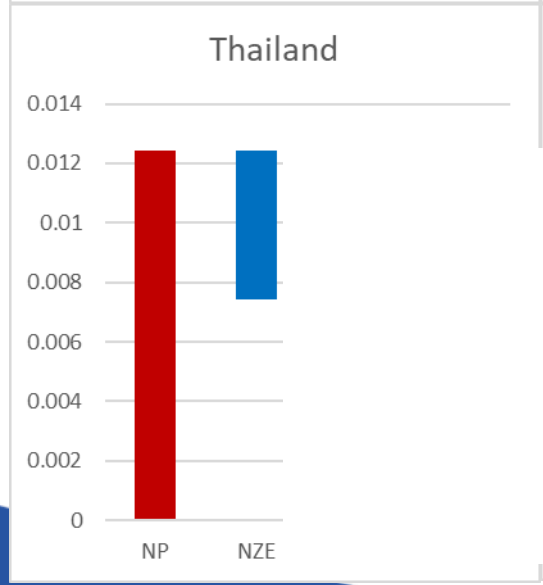
Change in premature mortality due to ambient PM2.5 in 2050 (million people)

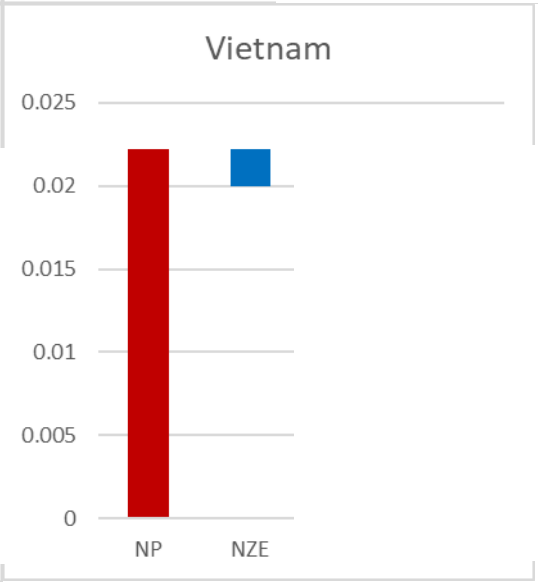












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Summary

PM2.5 EXPOSURE

- Currently, only about 100 million people enjoy clean air* in the 6 countries (China, India, Japan, Korea, Thailand, Vietnam)
- Strong air quality policy could increase that number by over 300 million by 2050
- Ambitious climate policies and further development measures would add another 1200 million, of which about 300 million if such policies were taken across all Asia

PREMATURE DEATHS DUE TO AMBIENT PM2.5

- Strong climate policy in 6 countries prevents some 0.56 million premature deaths in 2050 in these countries
- If all Asia took up similar policy (netzero climate policy and strict air quality) additional 0.26 million could be prevented

* Refers to the 2021 WHO air quality guideline value for PM2.5 of 5 ug/m^3

Work in Progress

- Bhutan Case Study
- Asia Vulnerability Hotspots Explorer
- Climate Biodiversity Assessment

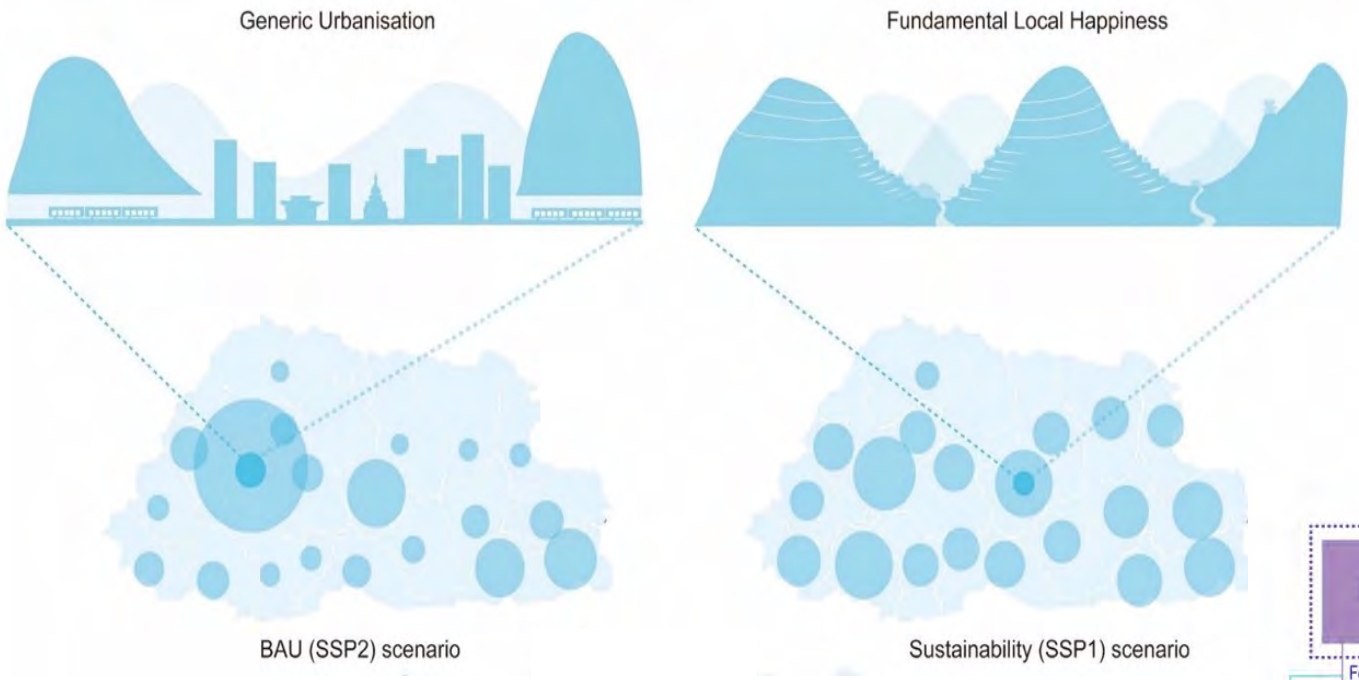
Sustainable energy-food-water and health nexus solutions enhancing regional community-based supply chain systems post-Covid-19 in **Bhutan**

MOEJ – IIASA project B : Bhutan component

Miho Kamei (IGES), Tashi Wangmo (Bhutan), Louise Guibrunet (UNAM), Behnam Zakeri (IIASA), Peter Rafaj (IIASA), Shonali Pachauri (IIASA), Zbigniew Klimont (IIASA), Shuzo Nishioka (IGES), Mikiko Kainuma (IGES), Volker Krey (IIASA), Keywan Riahi (IIASA)

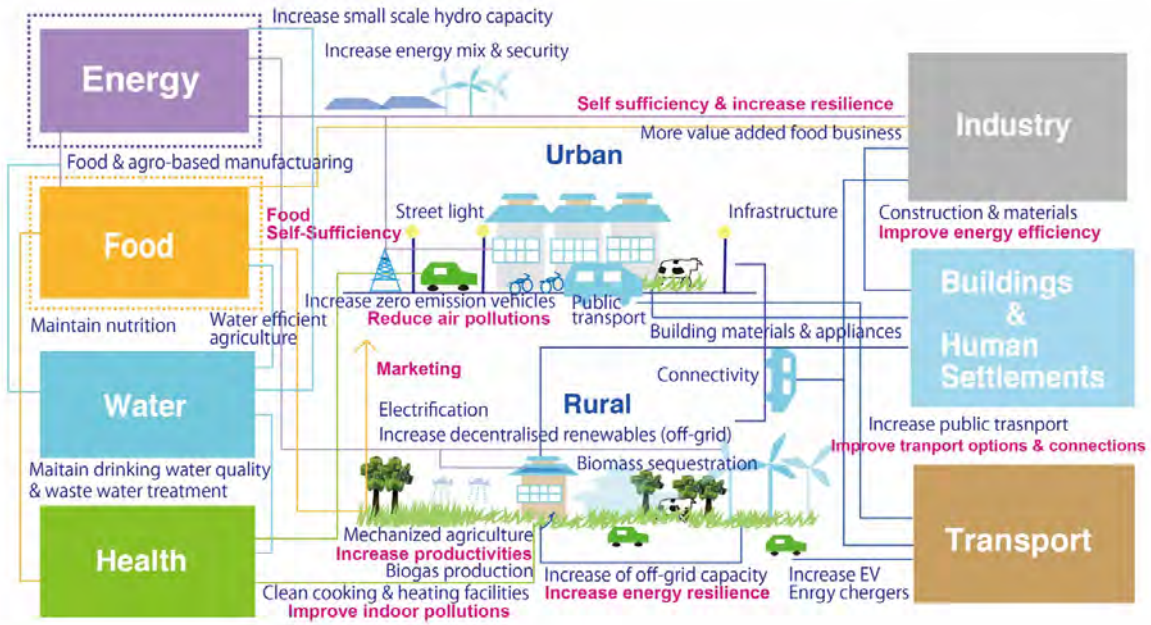
Bhutan Case Study on post-covid energy-food-water and health nexus

Covid-19

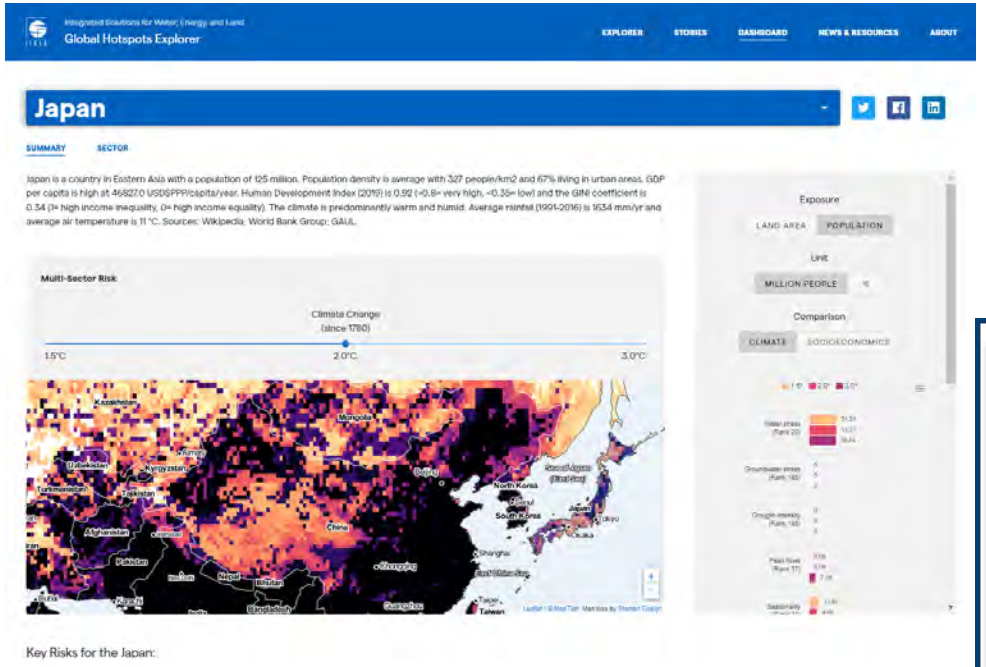


Access to basic needs & services

Key sectors for mitigation



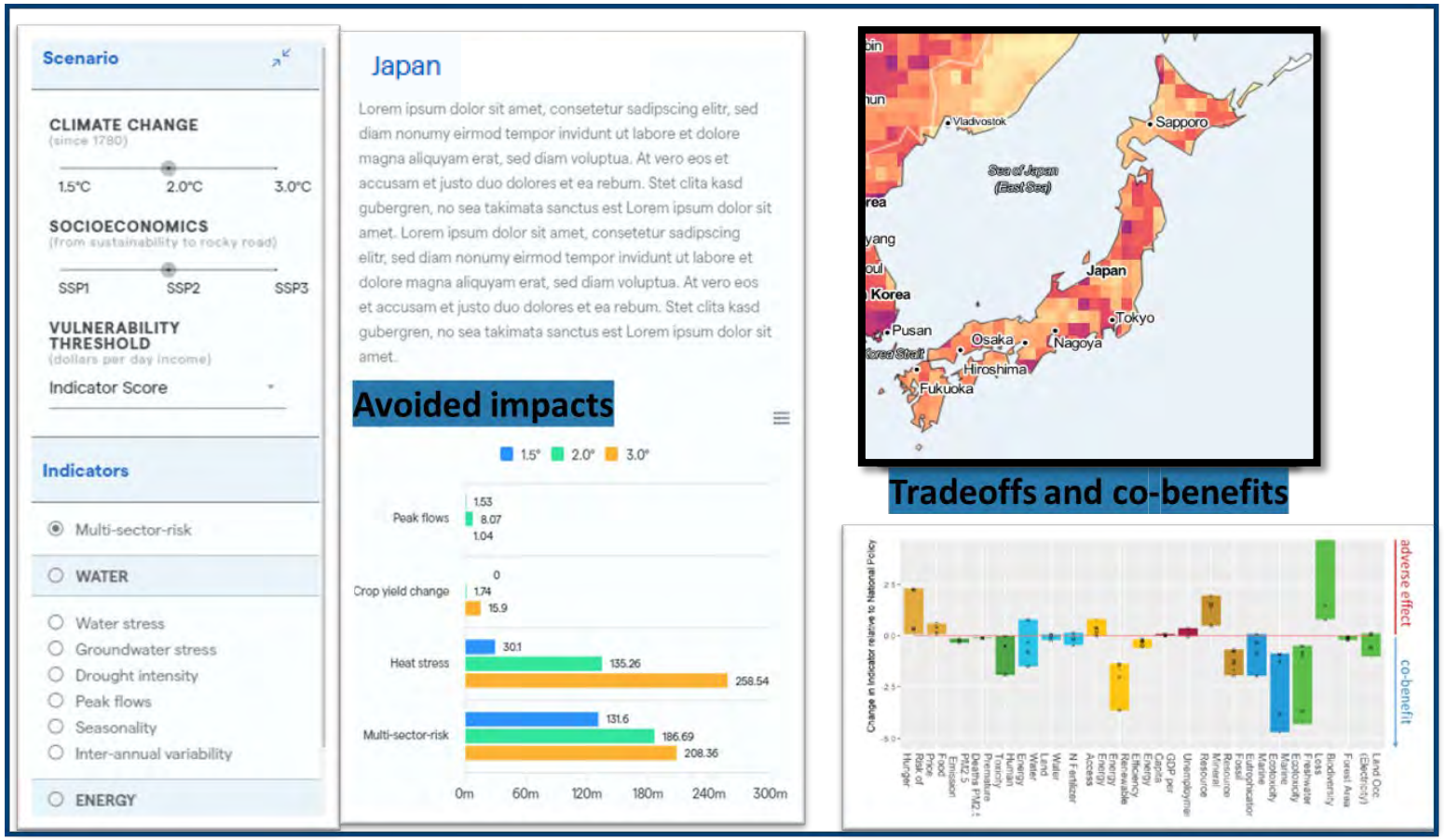
Country-level dashboards



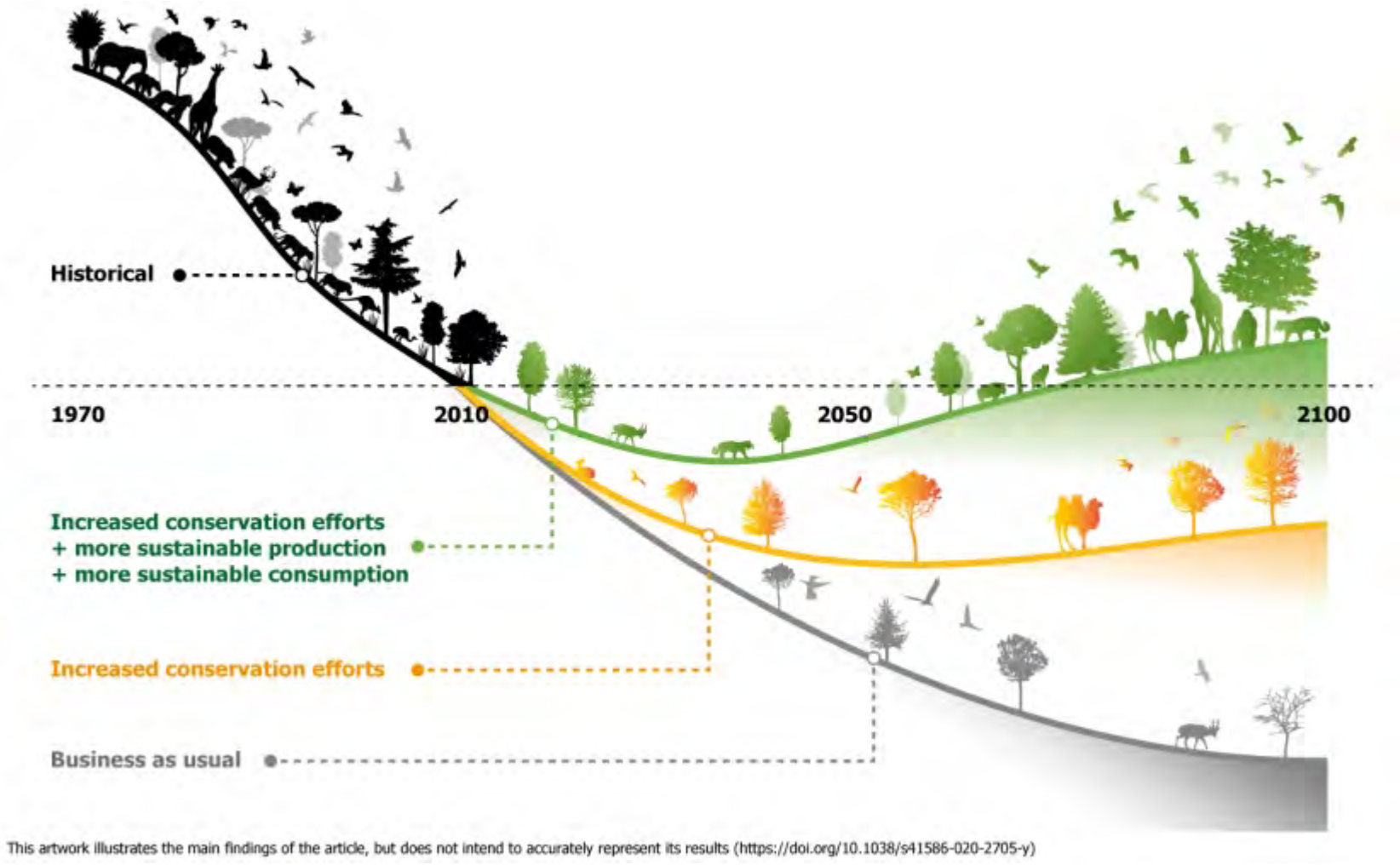
Interactive graphs and visualization
Scenario exploration and comparison
Overview of key impacts by sector
Vulnerable populations

Population exposure to

- Heatwaves
- Droughts
- Water stress
- Peak flows
- Crop yields
- Biodiversity



Hand-shake research between ecosystem modeling and integrated assessment models



This artwork illustrates the main findings of the article, but does not intend to accurately represent its results (https://doi.org/10.1038/s41586-020-2705-y)

Milestone in biodiversity research with IIASA and NIES in leading roles

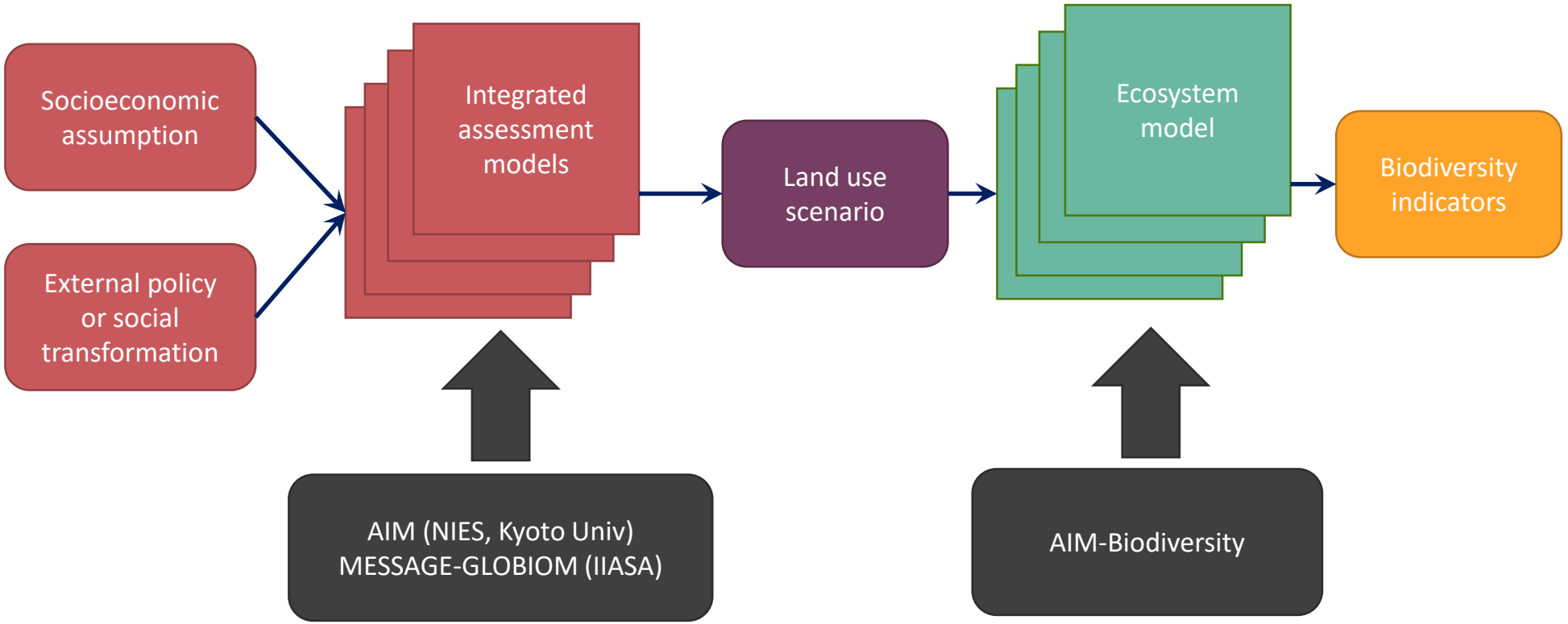
Link to Climate Policy remains underexplored

Leclère et al, 2020

AIM
ASIA-PACIFIC INTEGRATED MODEL

Research framework for Asia

Linking IIASA and NIES/Kyoto University models



Courtesy of Fujimori, 2022

Considerations

- Scenario framework
  - ✓ Explore implications/risks of climate policy for biodiversity
  - ✓ Identify climate policy measures with biodiversity co-benefits
  - ✓ How much other societal transformations needed (e.g. dietary change and CH_4)?
- Model approach
  - ✓ Economic assessment of climate options <-> biodiversity assessment
  - ✓ Tools: AIM-diversity, AIM CGE and MESSAGE-Globiom

Proposed timeline – Project B

Air pollution

- Review of assumptions about air quality policy and completion of simulations for additional scenarios and all countries – April 2022
- A policy report summarizing the results about air quality and health co-benefits in a clear language – June 2022
- Contribution to outreach actives – from the Summer 2022

Biodiversity

- Start of work now - February 2022
- Coupling methods and testing completed – February 2023
- Policy Report – fourth quarter 2023

Dashboard

- Preliminary assessment completed – February 2023
- Policy Report – fourth quarter 2023

Outreach

- SBSTA or COP (Japan pavilion)

Thank you!