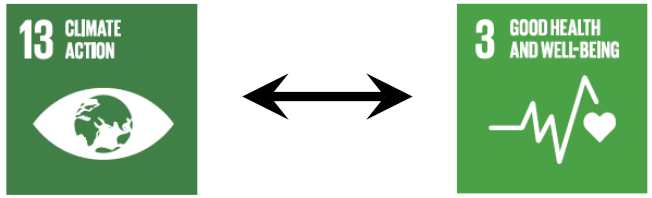
International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at



Air quality and health co-benefits of coordinated environmental and climate policies in Asia

Zbigniew Klimont[1], Gregor Kiesewetter[1], Daniel Hooke[1], Shinichiro Fujimori[2], Jessica Slater[1]

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

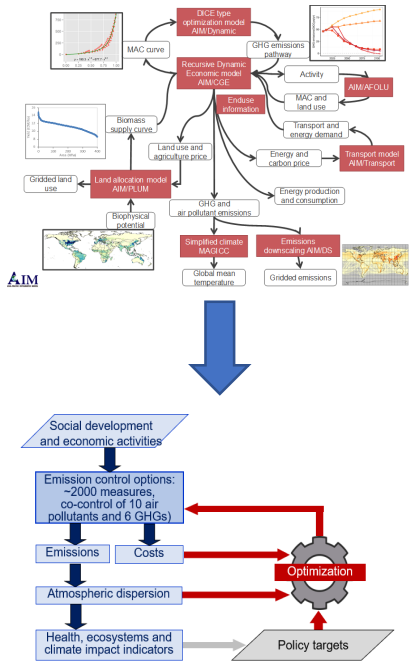
BAQ Conference, Manila, November 15-17, 2022

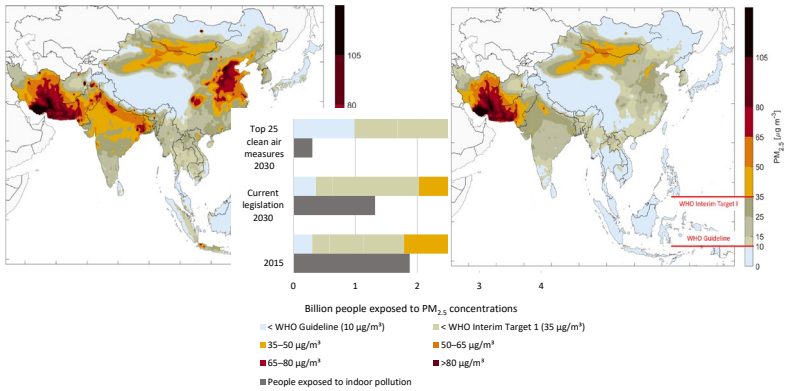
National Institute for Environmental Studies, Japan

IGES Institute for Global Environmental Strategies

Tools and approach

- **AIM** – National decarbonization and climate policy scenarios for six countries (Kyoto University, Japan)
- **GAINS** - Air pollution and health benefits (IIASA)
  - Build a link between AIM and GAINS to downscale AIM scenarios to be used in GAINS for co-benefit and impact assessment
  - Develop Asia-wide scenario set
  - Calculate and analyze $PM_{2.5}$ concentrations, exposure, and health impact indicators at a national/regional scale



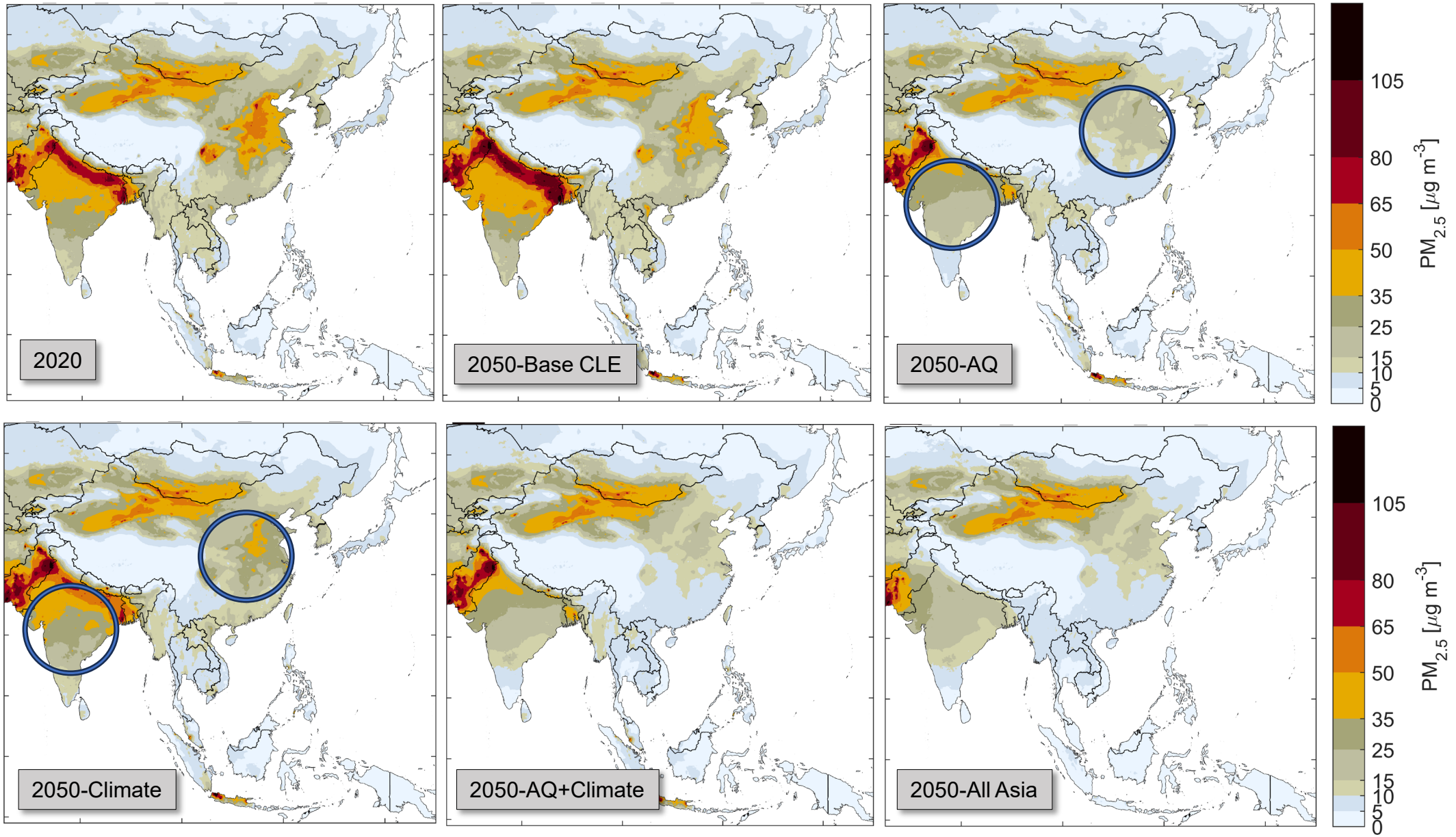


Scenarios

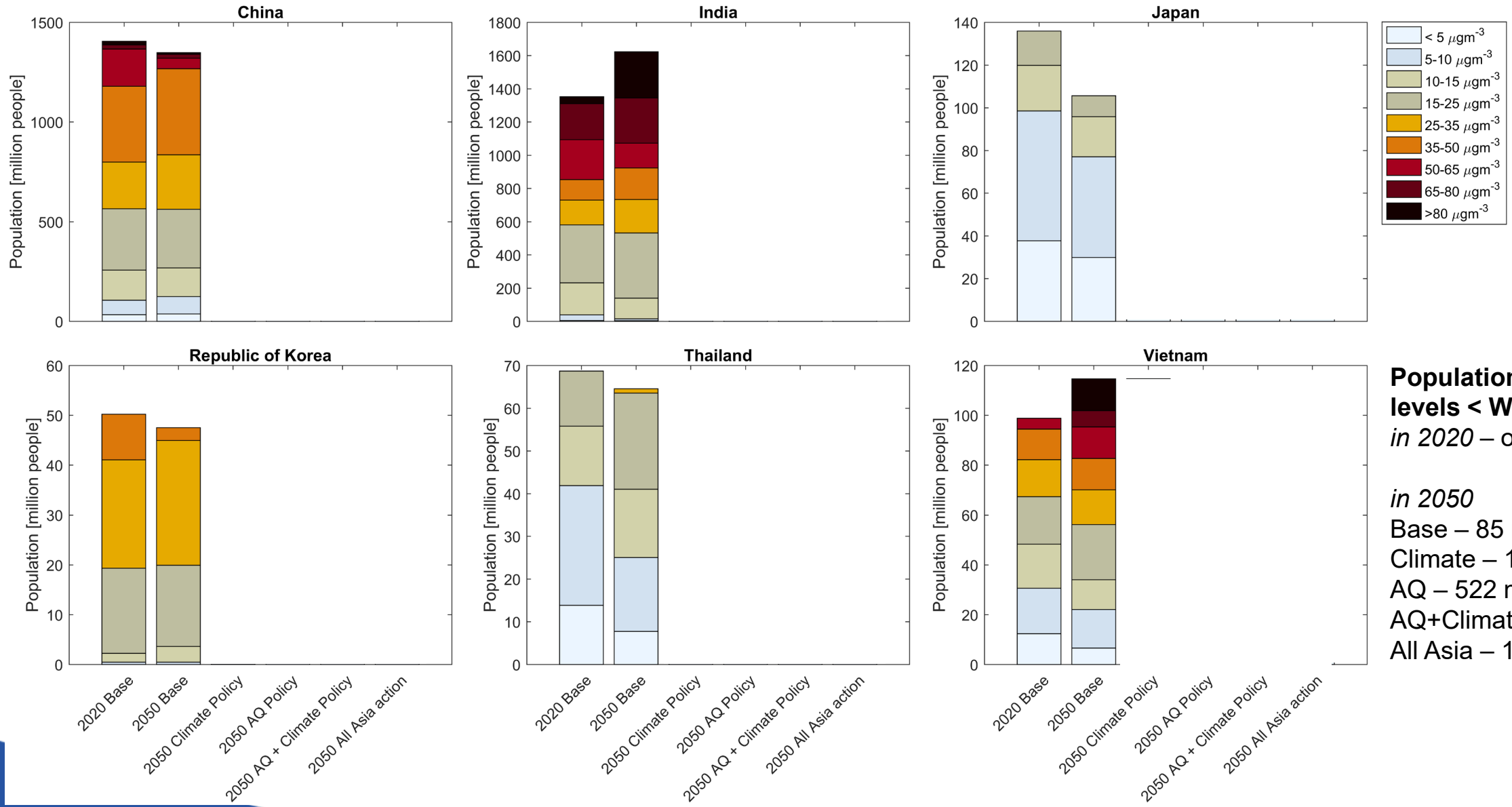
Focus on six countries
(China, Korea, Japan, Inida, Thailand, Vietnam)

- ***Base CLE***: Effective implementation of current legislation
- ***AQ***: Priority -> Air Quality improvement: implementation of all, included in the GAINS model, technical mitigation measures, considering their feasibility
- ***Climate***: Priority -> Climate mitigation: implementation of policies represented in the recent NDCs and further measures (beyond 2030) to achieve 90% reduction of CO_2 emissions by 2050, compared to 2010
- ***AQ+Climate***: Ambitious air quality (AQ) and climate policies (Climate)
- ***All Asia***: Ambitious AQ + Climate policies are implemented across the whole of Asia

Change in annual mean $PM_{2.5}$ concentrations



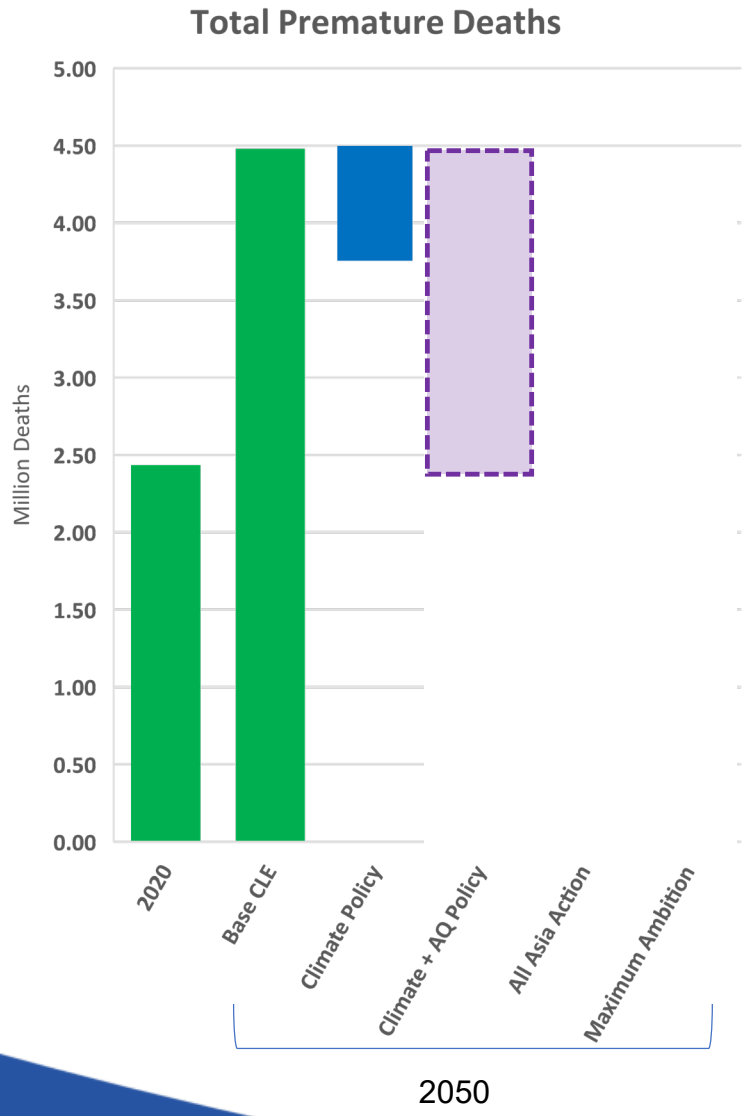
Change in population exposure to $PM_{2.5}$



Population exposed to levels < WHO AQG:
in 2020 – only 103 mln

in 2050
Base – 85 mln
Climate – 150 mln
AQ – 522 mln
AQ+Climate – 776 mln
All Asia – 1145 mln

Change in the number of premature deaths* due to ambient $PM_{2.5}$

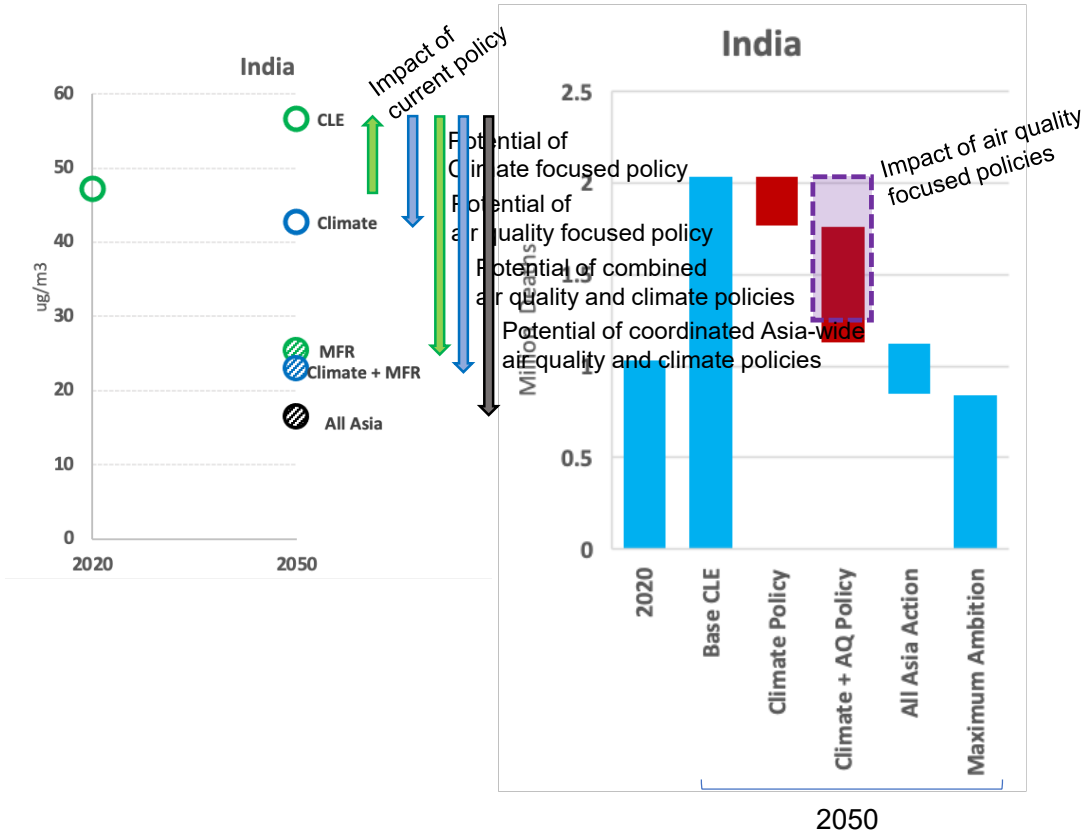


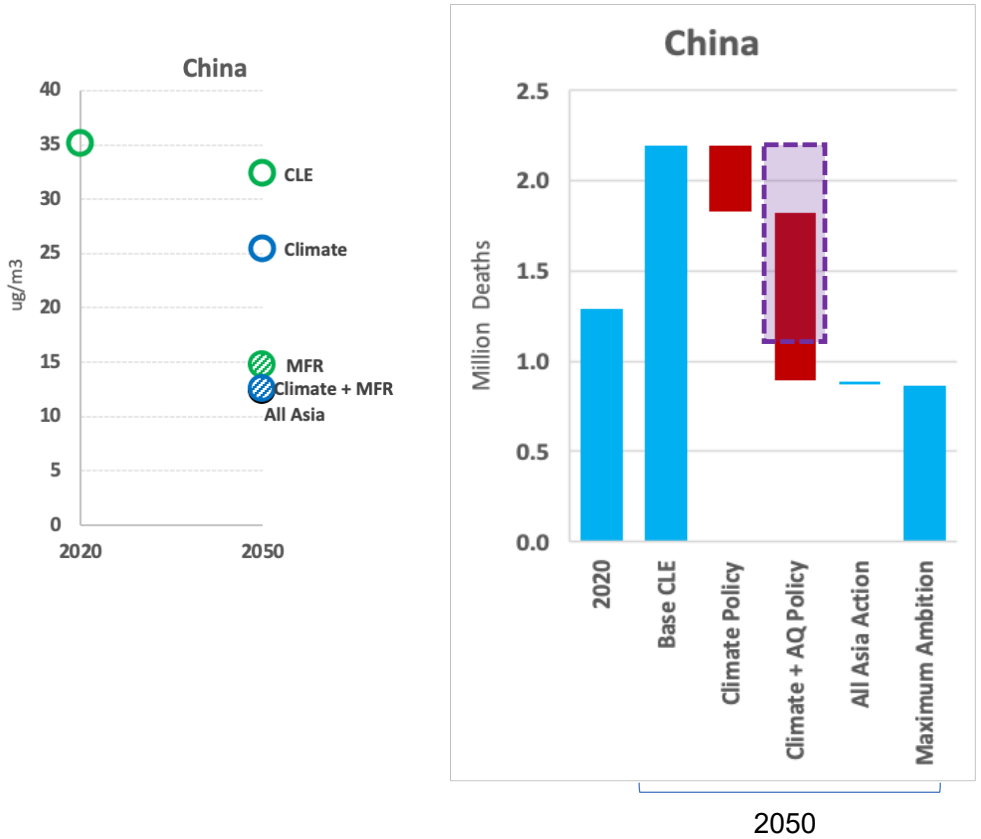
- Nearly 2.5 million premature deaths in the six Asian countries** in 2020
- Current policies appear insufficient to reduce death toll from air pollution in the region; by 2050, premature deaths could increase to 4.5 million
- Climate policy air quality co-benefits would result in about 0.7 million, less premature deaths (-15%), however…
- *Proven and well understood air quality measures could deliver reduction of premature deaths by over 2 million (- 45%)*
- Combined air quality and climate policies could reduce premature deaths by about 50%
- Coordinated ambitious climate and air quality policy across all Asia could reduce premature deaths over 60% compared to the current policy case

* China, India, Japan, Korea, Thailand, Vietnam

** The population of these six countries represent nearly 70% of total Asian population

Change in $PM_{2.5}$ concentrations and number of premature deaths, due to ambient $PM_{2.5}$, for selected countries





Current policies insufficient to reduce concentrations of $PM_{2.5}$ by 2050 and number of premature deaths doubles. Further mitigation potential exists to reduce concentrations and mortality well beyond current levels. Sizable benefit from action in the rest of Asia.

Current policies result in reduction in concentrations of $PM_{2.5}$ by 2050, however, number of premature deaths increases. Further mitigation potential exists to reduce concentrations and mortality well beyond current levels. Little benefit from action in the rest of Asia.

Summary

- Currently, only about 100 million people enjoy clean air* in the countries in focus of this study (China, India, Japan, Korea, Thailand, Vietnam) …about 3%

- Current policies appear insufficient to reduce death toll from air pollution in the region; by 2050, premature deaths could increase to 4.5 million (80% more than in 2020)

- While climate policy would bring air quality co-benefits and reduce premature deaths by about 0.7 million, ambitious air quality policy could increase that number to 2 million and over 520 million (about 15%) would breathe clean air

- Ambitious climate policies and further development measures implemented across Asia could reduce premature mortality by about 60%, compared to current policy, and
  - More than a third of population (or 1145 million) would be exposed to concentrations below WHO AQG,
  - All population would enjoy at least WHO Tier I standards (< 35 ug/m^3) or better, in compliance with national legislation

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

Slides from Dan Hooke, in case he cannot connect

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Asia Clean Air and Climate Explorer

環境省
Ministry of the Environment

IGES
Institute for Global Environmental Strategies

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Better Air Quality Conference, Manila

Access the site here!

https://asia-climate-explorer.org/

Asia Clean Air and Climate Explorer structure

Impacts Explorer

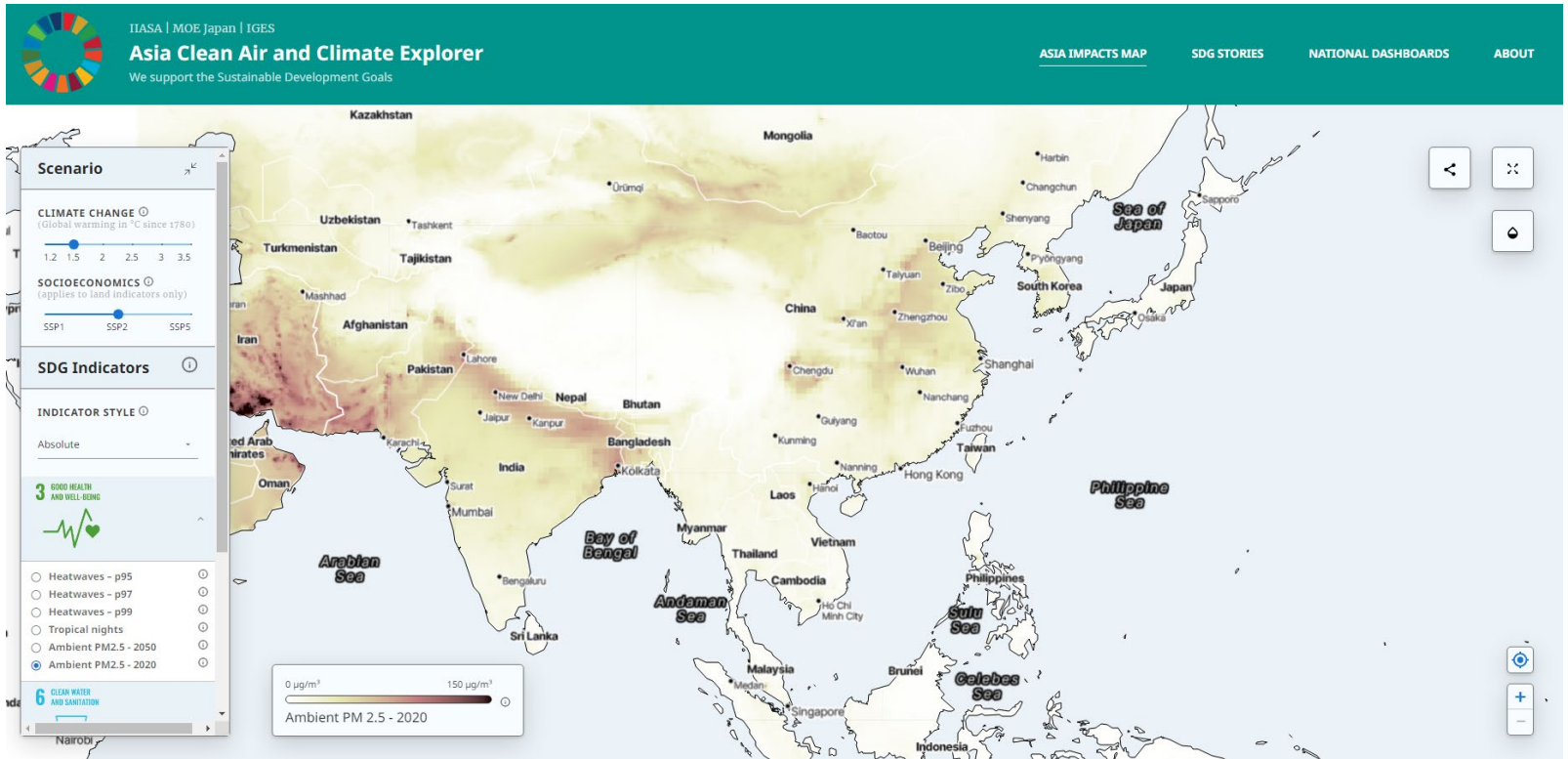
- Interactive Maps
- Ordered by SDG

SDG Stories

- Articles with interactive charts
- Policy briefs

National Dashboards

- Country level
- Mitigation pathways and impacts



Asia Clean Air and Climate Explorer structure

Impacts Explorer

- Interactive Maps
- Ordered by SDG

SDG Stories

- Articles with interactive charts
- Policy briefs

National Dashboards

- Country level
- Mitigation pathways and impacts

Asia Clean Air and Climate Explorer structure

Impacts Explorer

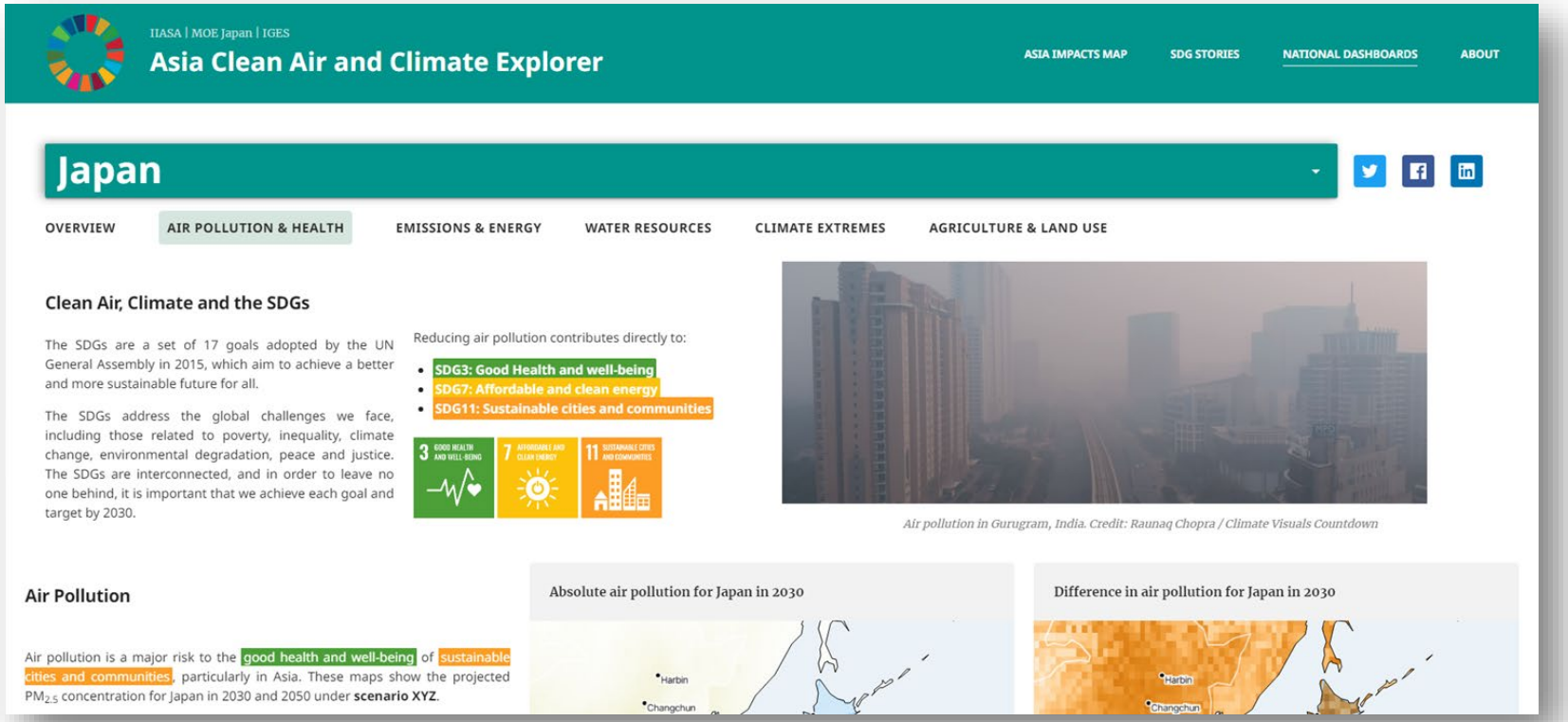
- Interactive Maps
- Ordered by SDG

SDG Stories

- Articles with interactive charts
- Policy briefs

National Dashboards

- Country level
- Mitigation pathways and impacts



Three sources of data

1. Pollution Indicators	2. Climate Indicators	3. Mitigation Pathways

• $PM_{2.5}$
  • All Asia
• Population Exposure
  • 6 countries
• Premature mortality
  • 6 countries
	• Precipitation & Temperature extremes
	• Heat stress events and Tropical nights
	• Hydrology & water resources
	• Energy demands for cooling
	• Land use change & crop yields
		• Emissions
		• Energy supply & demand
		• Carbon Sequestration variables

IIASA GAINS model	CMIP6/ISIMIP3b, IAMs, Hydrological models, land system models	$MESSAGE_{ix}$-GLOBIOM IAM
5 policy scenarios: *- Current Policies* *- AQ policies only* *- Climate policies only* *- AQ policies + climate policies* *- All Asia AQ + climate policies*	*6 GMT thresholds:* *- 1.2°C, 1.5°C, 2.0°C, 2.5°C, 3.0°C, 3.5°C*	*4 scenarios:* *- Current Policies* *- NDC delayed action 2030* *- Glasgow* *- Glasgow++ (1.5 °C)*

Exploring Asia Air Quality Scenarios

IIASA | MOE Japan | IGES

Asia Clean Air and Climate Explorer

We support the Sustainable Development Goals

ASIA IMPACTS MAP | SDG STORIES | NATIONAL DASHBOARDS | ABOUT

Japan

OVERVIEW | AIR POLLUTION & HEALTH | EMISSIONS & ENERGY | WATER RESOURCES | CLIMATE EXTREMES | AGRICULTURE & LAND USE

Clean Air, Climate and the SDGs

The SDGs are a set of 17 goals adopted by the UN General Assembly in 2015, which aim to achieve a better and more sustainable future for all.

The SDGs address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The SDGs are interconnected, and in order to leave no one behind, it is important that we achieve each goal and target by 2030.

Reducing air pollution contributes directly to:

- SDG3: Good Health and well-being
- SDG7: Affordable and clean energy
- SDG11: Sustainable cities and communities

In this section, explore the data for Japan on:

Air Pollution Distribution
Pollution Exposure
Premature Mortality
Tropical Nights

3 GOOD HEALTH AND WELL-BEING

7 AFFORDABLE AND CLEAN ENERGY

11 SUSTAINABLE CITIES AND COMMUNITIES

Industrial air pollution in Heilongang, China. Credit: Ziang Guo/Unsplash

Air Pollution

Air pollution is a major risk to the good health and well-being of sustainable cities and communities, particularly in Asia. While the issues of air pollution and climate change are also strongly interlinked. Some air pollutants, known as short lived climate pollutants, directly warm the atmosphere and contribute to climate change. While due to the overlapping

Absolute air pollution for Japan in 2020

Difference in air pollution for Japan in 2050 under Current Policies compared to 2020

環境省
Ministry of the Environment

IGES
Institute for Global Environmental Strategies

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Visit the

Asia Clean Air and Climate Explorer!

https://asia-climate-explorer.org/

環境省
Ministry of the Environment

IGES
Institute for Global Environmental Strategies

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at