THE ECONOMIC CONSEQUENCES OF OUTDOOR AIR POLLUTION

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Task Force on Integrated Assessment Modelling (TFIAM)
2 May 2017, Paris

Objectives and scope

- Quantify how changes in outdoor air quality affect the economy, and prospects for long-term growth (costs of inaction)

- Regional and sectoral quantitative approach where possible, coupled with more general insights where needed
  - Market impacts: production function approach
  - Non-market impacts: valuation approach

- Global assessment, 2060 time horizon

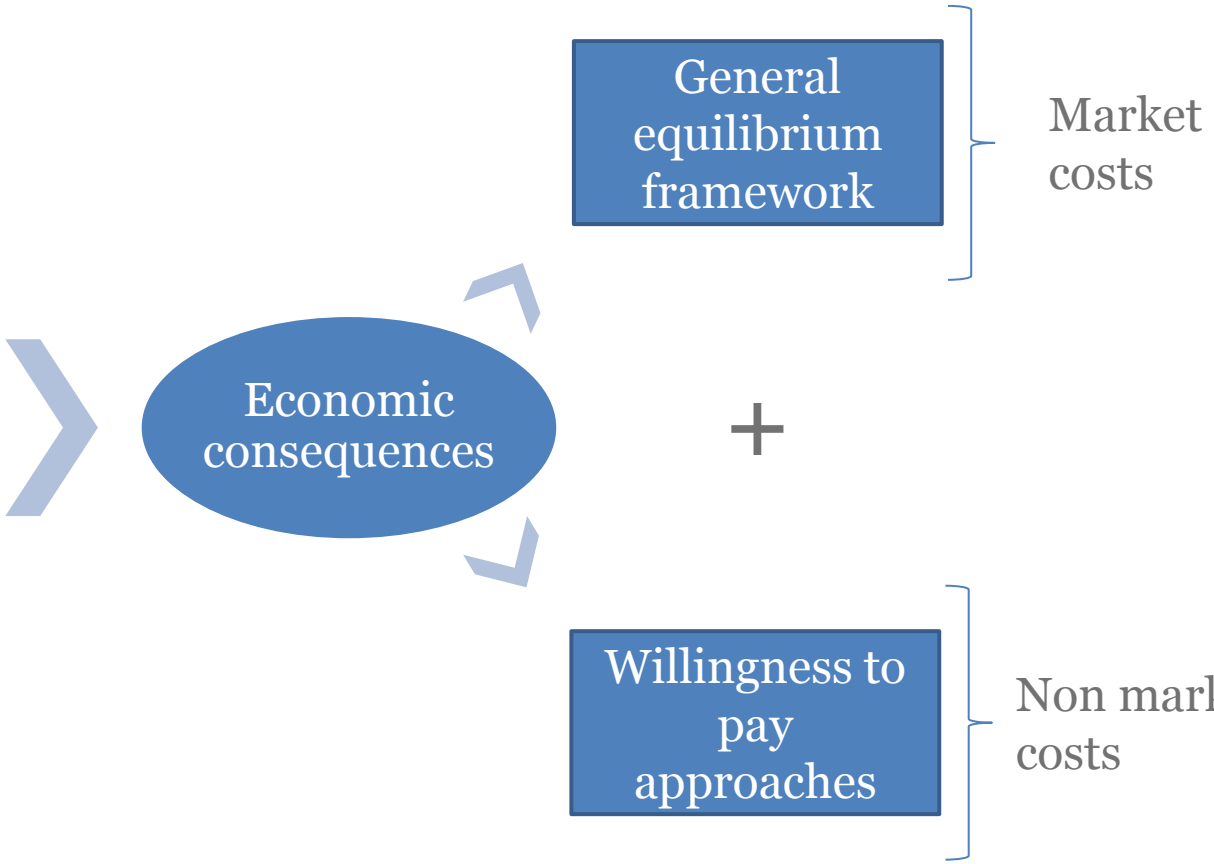
Impacts of air pollution

Health impacts

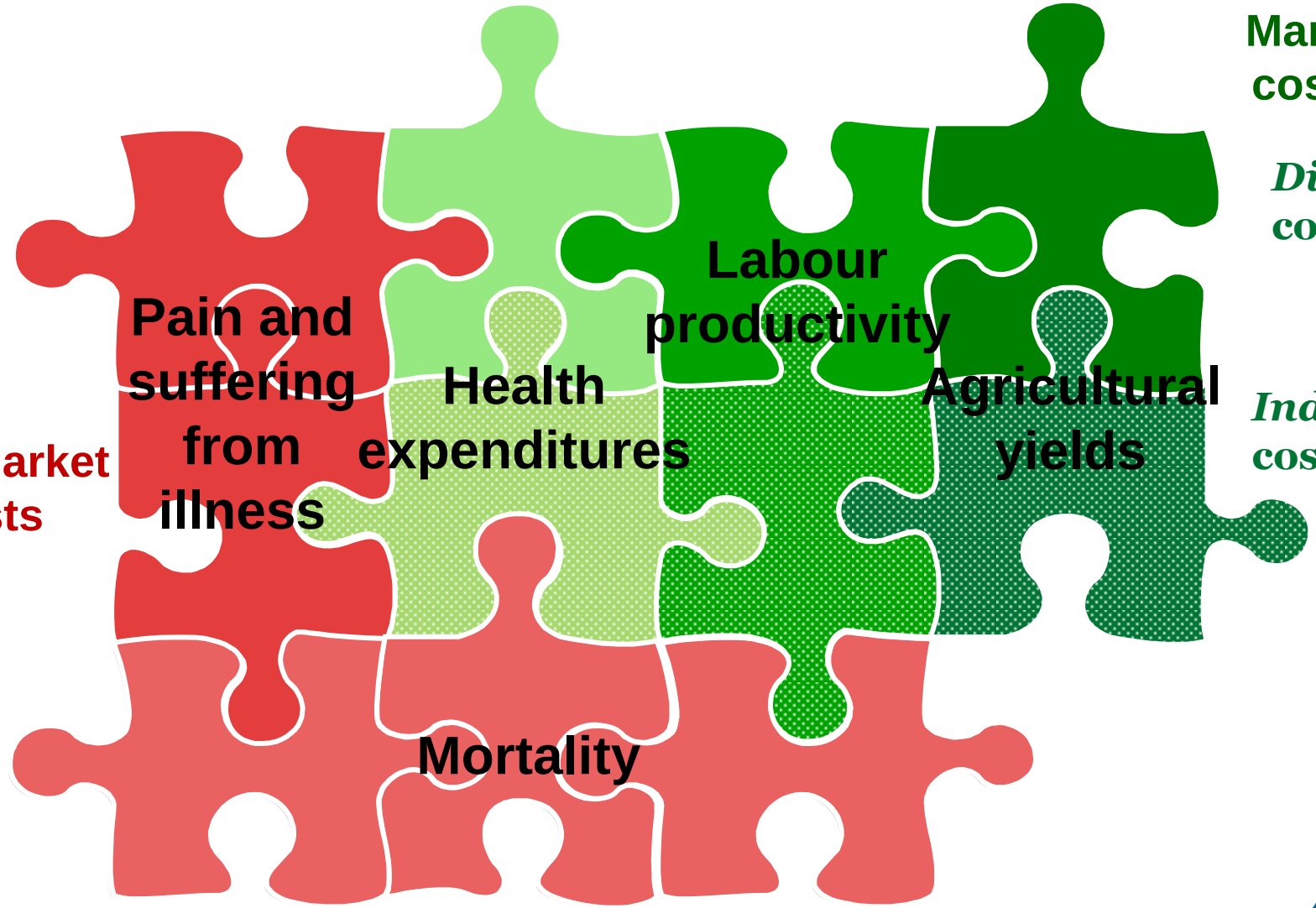
- Mortality
- Morbidity: illness (especially respiratory and cardiovascular diseases)

Other impacts

- Agriculture
- Biodiversity and ecosystems
- Buildings and cultural heritage
- Visibility



Types of costs



Methodological steps

Effects of air pollution impacts on economic growth to 2060

Economic activity	• ENV-Linkages model
Emissions	• ENV-Linkages model • Emission coefficients from IIASA's GAINS model • Projections for SO2, NOx, BC, OC, CO, VOCs, NH3
Concentrations	• EC-JRC's TM5-FASST model for PM2.5 and O3
Biophysical impacts	• Impacts on crop yields with TM5-FASST model • Health impacts using functions based on GBD
Economic costs	• Economic feedbacks using ENV-Linkages model • Non-market costs calculated based on results of valuation studies

Market costs

- Study economic feedbacks in ENV-Linkages (production function approach)
  - Health expenditures
    - Cases of bronchitis in children
    - Cases of chronic bronchitis in adults
    - Hospital admissions (respiratory and cardiovascular diseases)
  - Labour productivity
    - Linked to increasing number of work days lost
  - Agriculture
    - Reduced crop yields

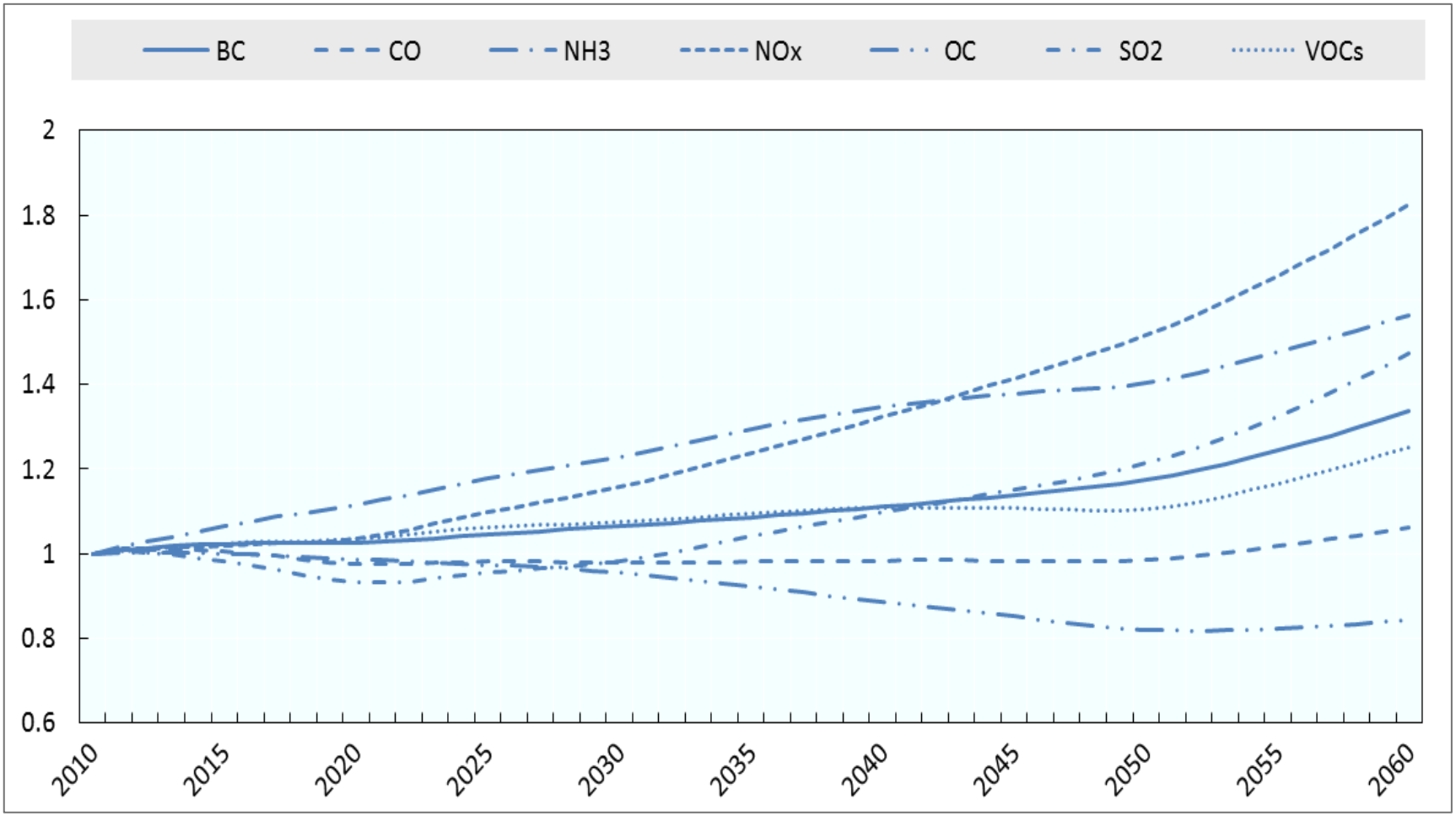
Non-market costs
Valuation of non-market health impacts

- Cost of premature deaths
  - OECD method for calculating country-specific VSL based on income levels

- Costs of pain and suffering from illness
  - E.g. bronchitis in adults and children, respiratory and cardiovascular diseases, asthma
  - Disutility or welfare costs are evaluated based on willingness to pay results from stated preference studies (Holland, 2014 – report for the European Commission)

RESULTS

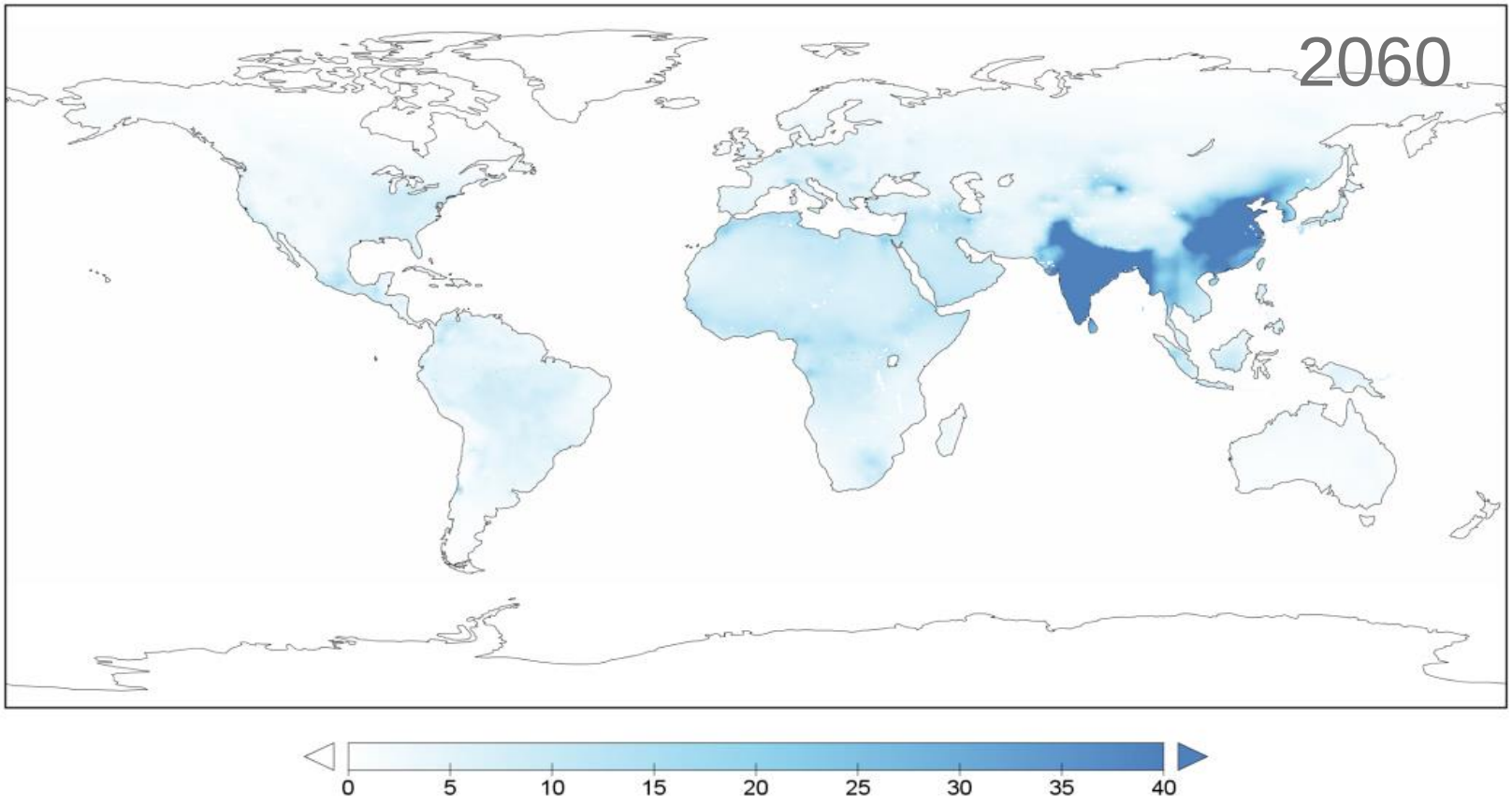
Projections of air pollutants emissions



Source: OECD (2016), The economic consequences of outdoor air pollution

Concentrations of air pollutants

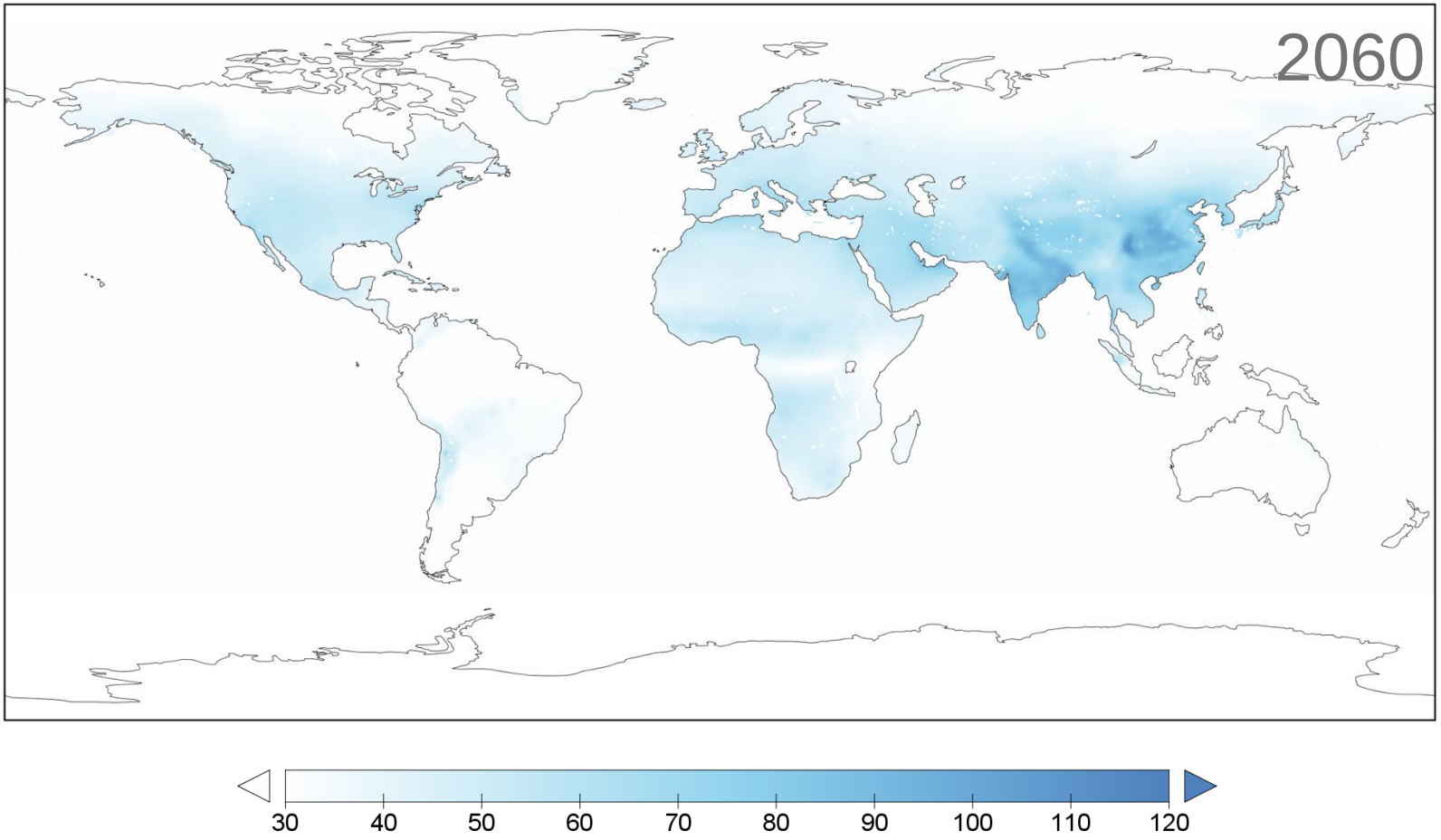
Annual average total anthropogenic PM2.5 (µg/m3)



Source: OECD (2016), The economic consequences of outdoor air pollution

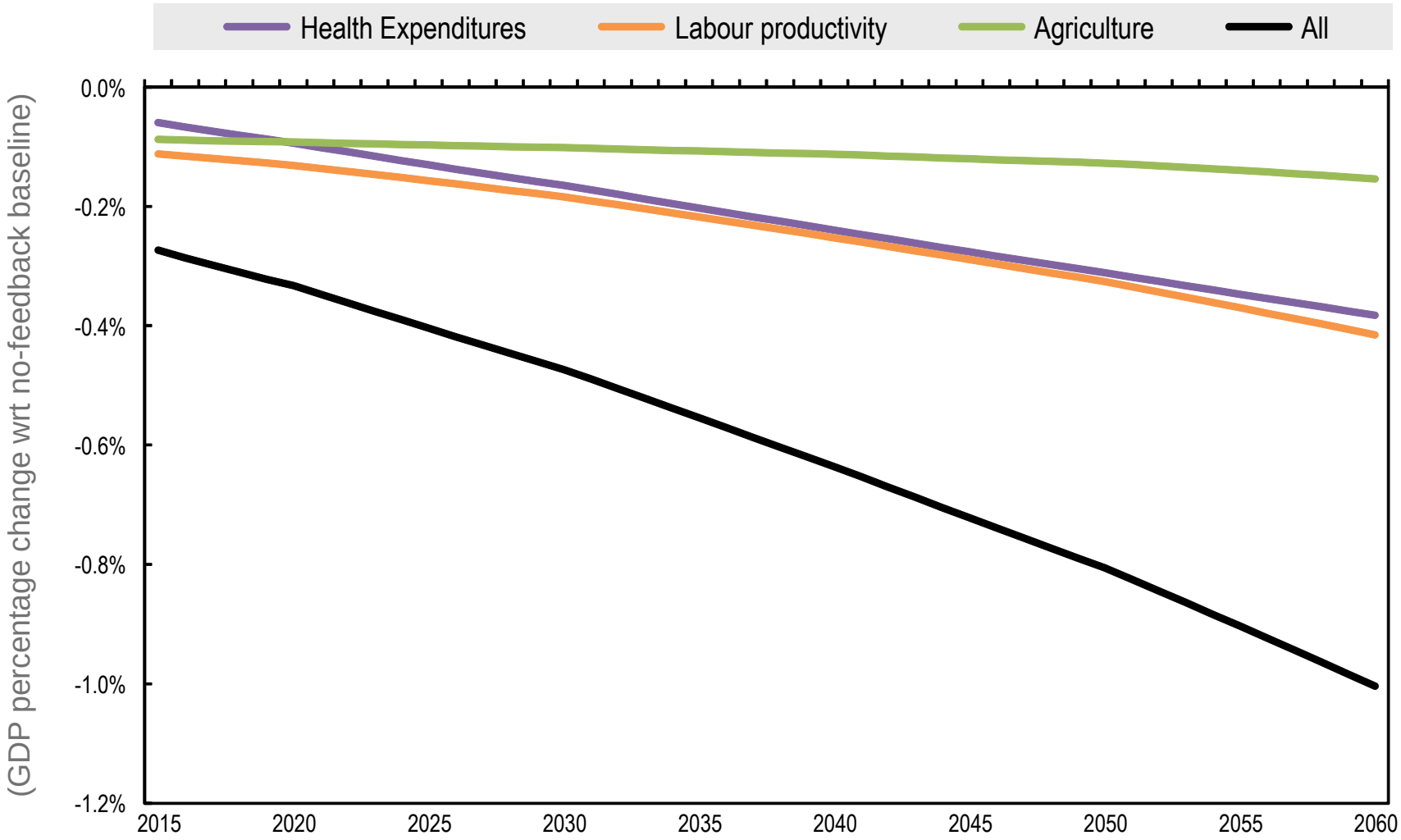
Concentrations of ozone

Maximal 6-month mean of daily maximal hourly ozone, M6M, in ppb



Source: OECD (2016), The economic consequences of outdoor air pollution

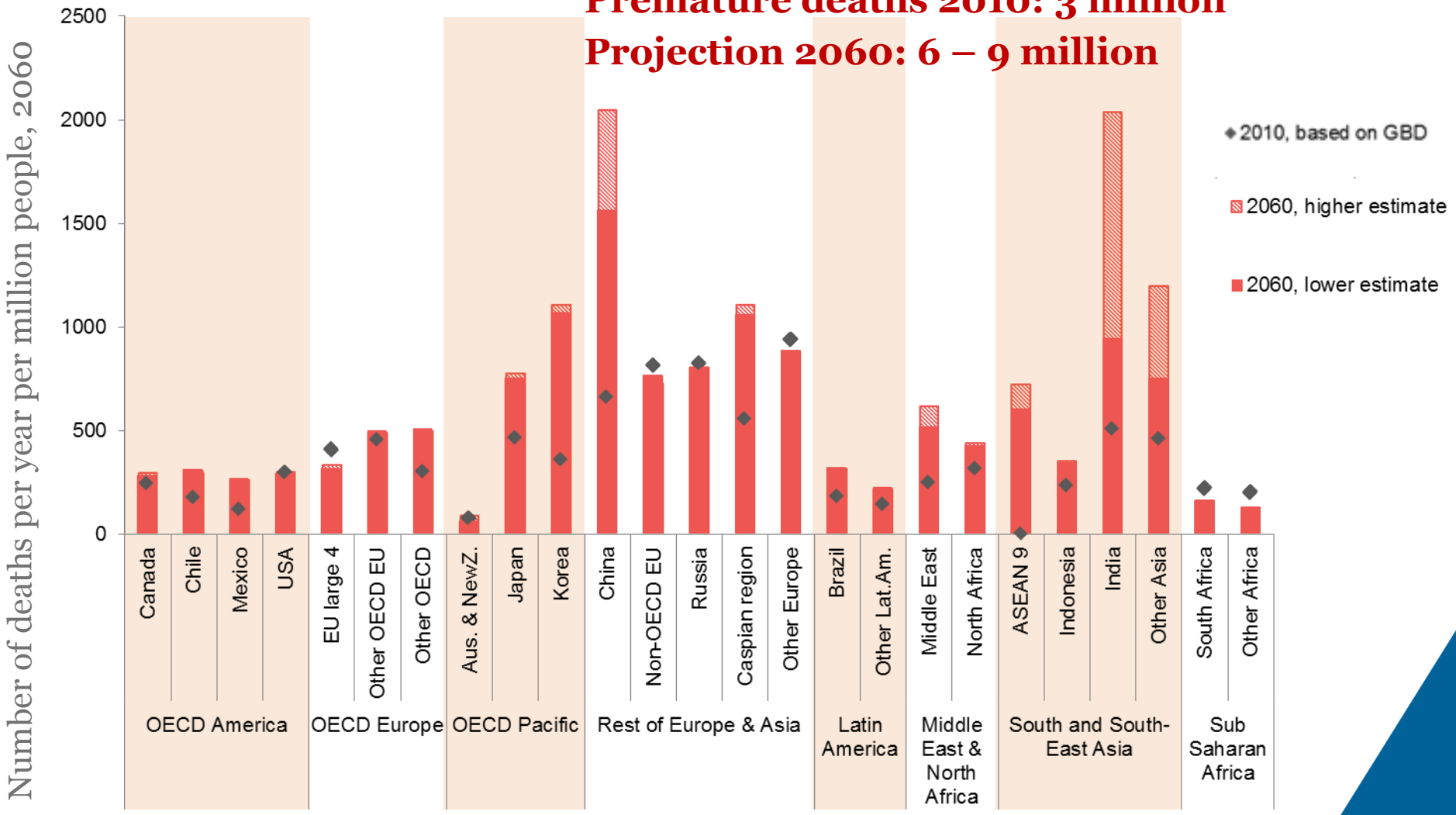
Market costs: global GDP changes over time



Source: OECD (2016), The economic consequences of outdoor air pollution

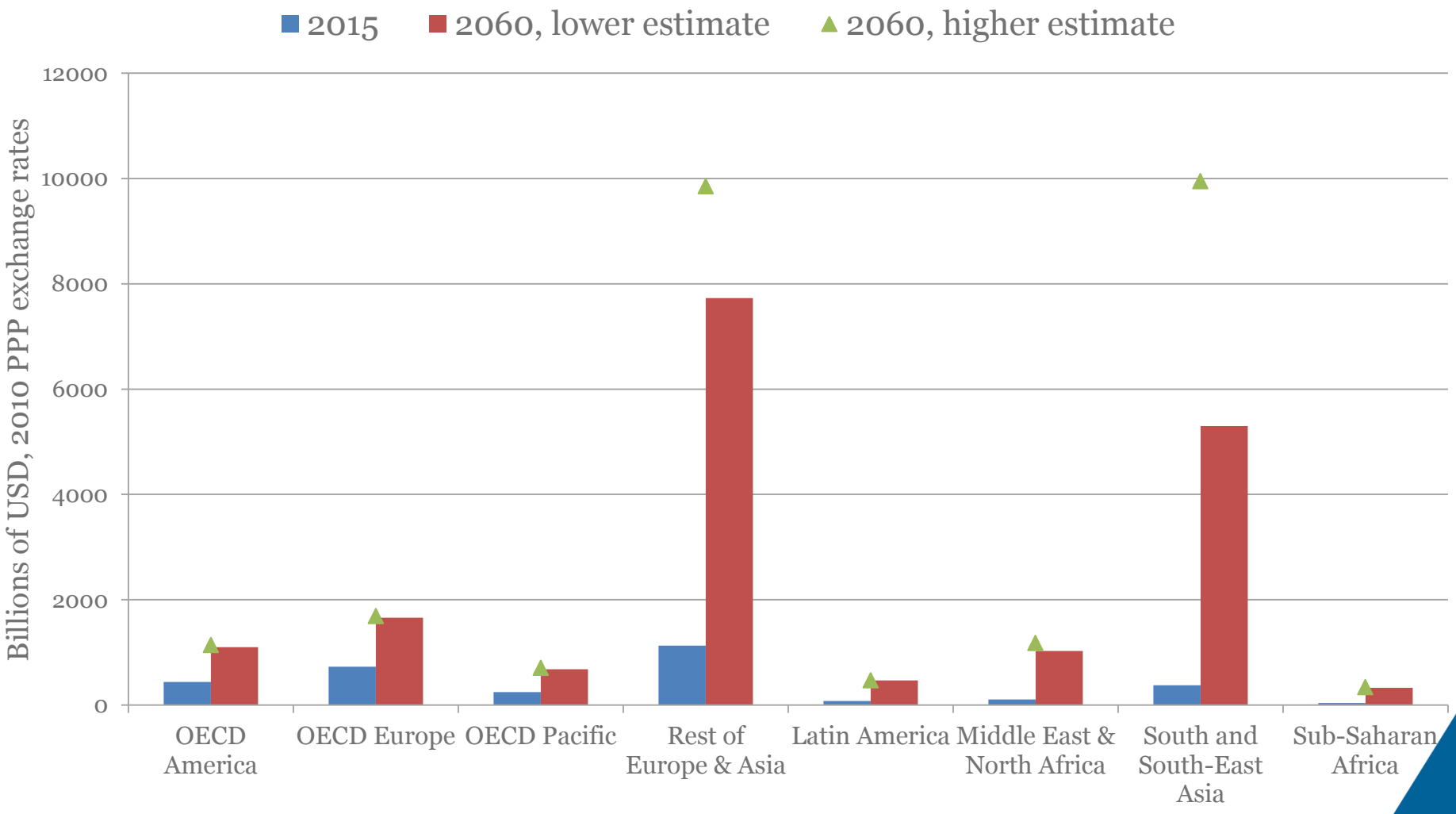
Premature deaths caused by outdoor air pollution

Premature deaths 2010: 3 million
Projection 2060: 6 – 9 million



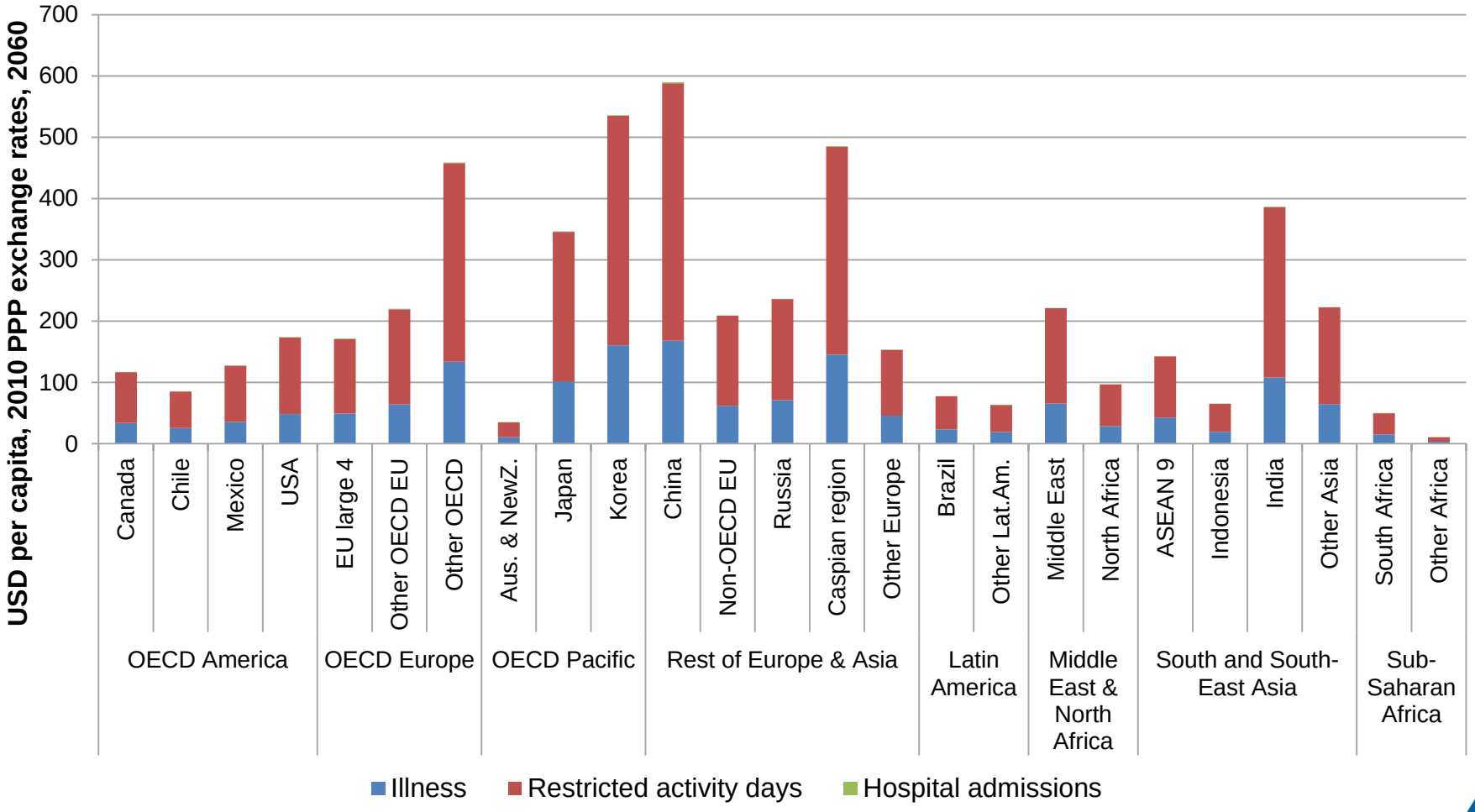
Source: OECD (2016), The economic consequences of outdoor air pollution

Welfare costs of mortality



Source: OECD (2016), The economic consequences of outdoor air pollution

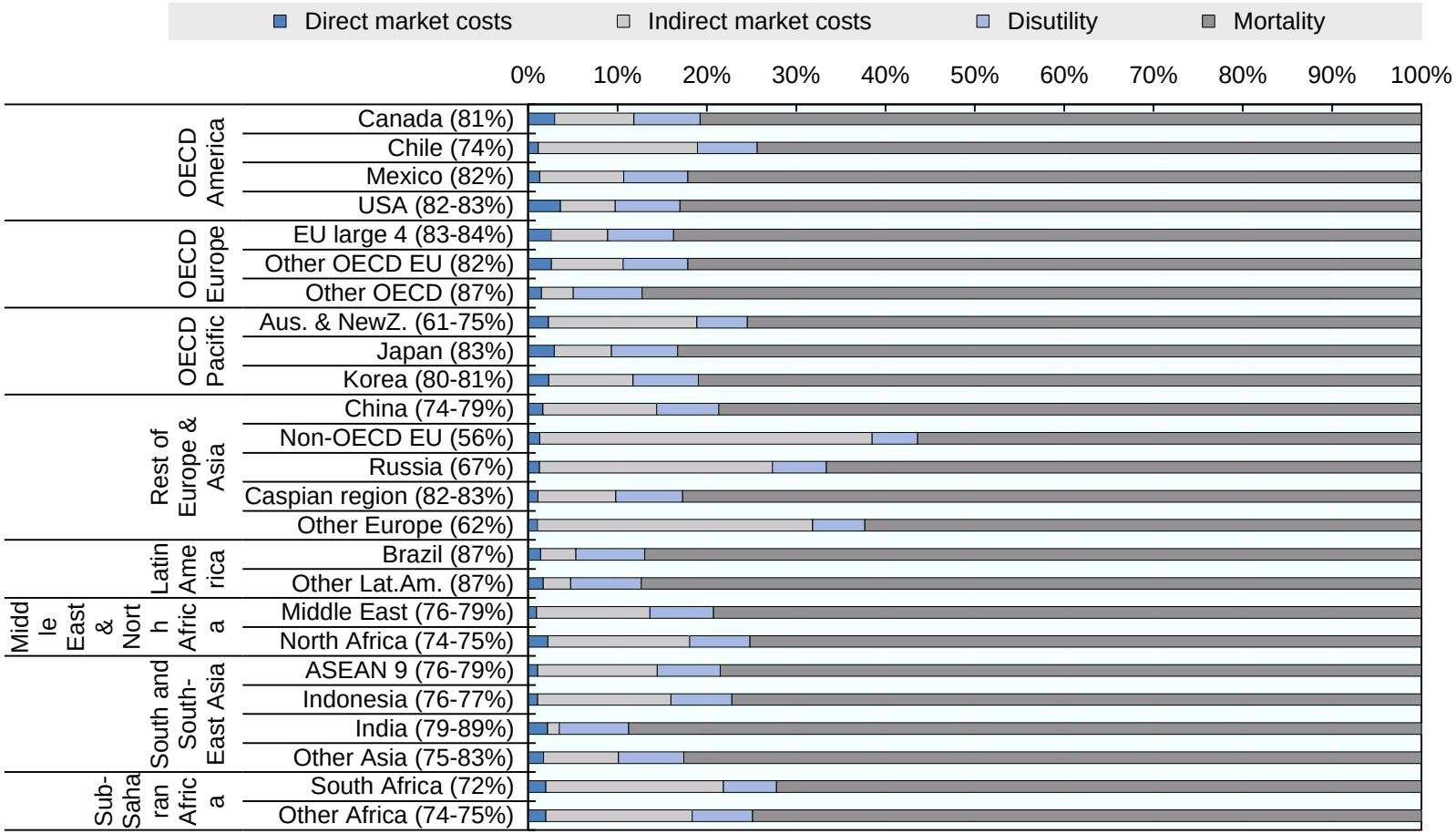
Welfare costs of morbidity



Source: OECD (2016), The economic consequences of outdoor air pollution

Components of regional welfare costs of outdoor air pollution

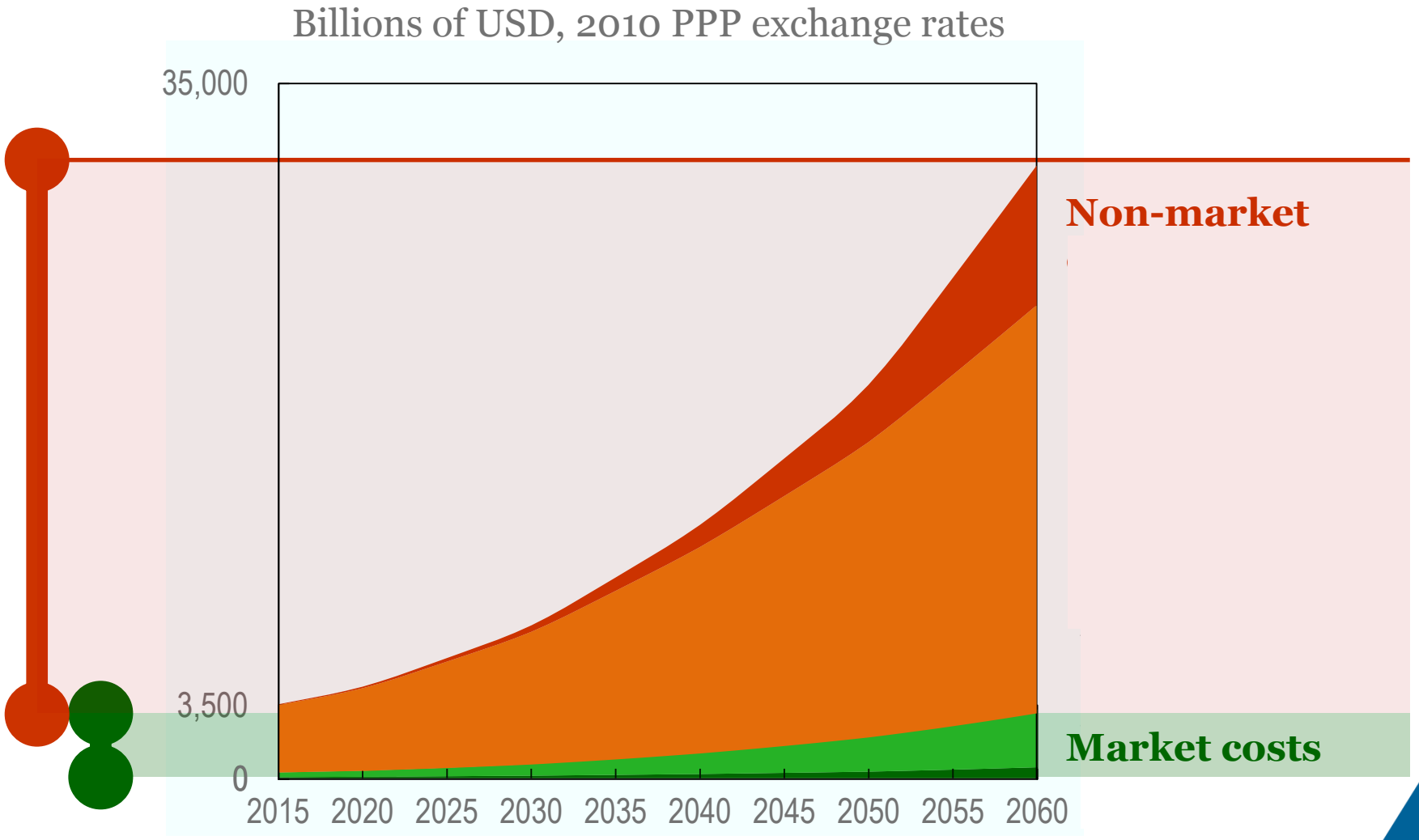
Shares in total welfare costs based on linear values for mortality, 2060



Note: numbers in brackets represent the share of mortality costs for the range of linear and non-linear values

Source: OECD (2016), The economic consequences of outdoor air pollution

Welfare costs of outdoor air pollution: evolution over time



Source: OECD (2016), The Economic Consequences of Outdoor Air Pollution

Main insights

- The total welfare costs of outdoor air pollution (the "costs of inaction") will increase significantly in OECD, and may explode globally, in the absence of more stringent policies
- Overall, largest component of welfare costs is the value of premature deaths (80-90% of total costs, depending on region). These losses are the highest in China and India.
- Indirect economic consequences as induced by the market impacts play an increasingly dominant role in the long run, relative to the direct market impacts
- These economic consequences imply a strong call for policy action, not only in China and India, but also in OECD countries

Thank You

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