Asia-Pacific Integrated Model (AIM) and local environment

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LoCARNet 3rd Annual Meeting
ASTON BOGOR HOTEL and RESORT, Bogor, Indonesia
24-26 November 2014

The research in this presentation is supported by the Environment Research and Technology Development Fund (S-12-2) of the Ministry of the Environment, Japan, and Climate Change Research Program of NIES.

Asia-Pacific Integrated Model (AIM)

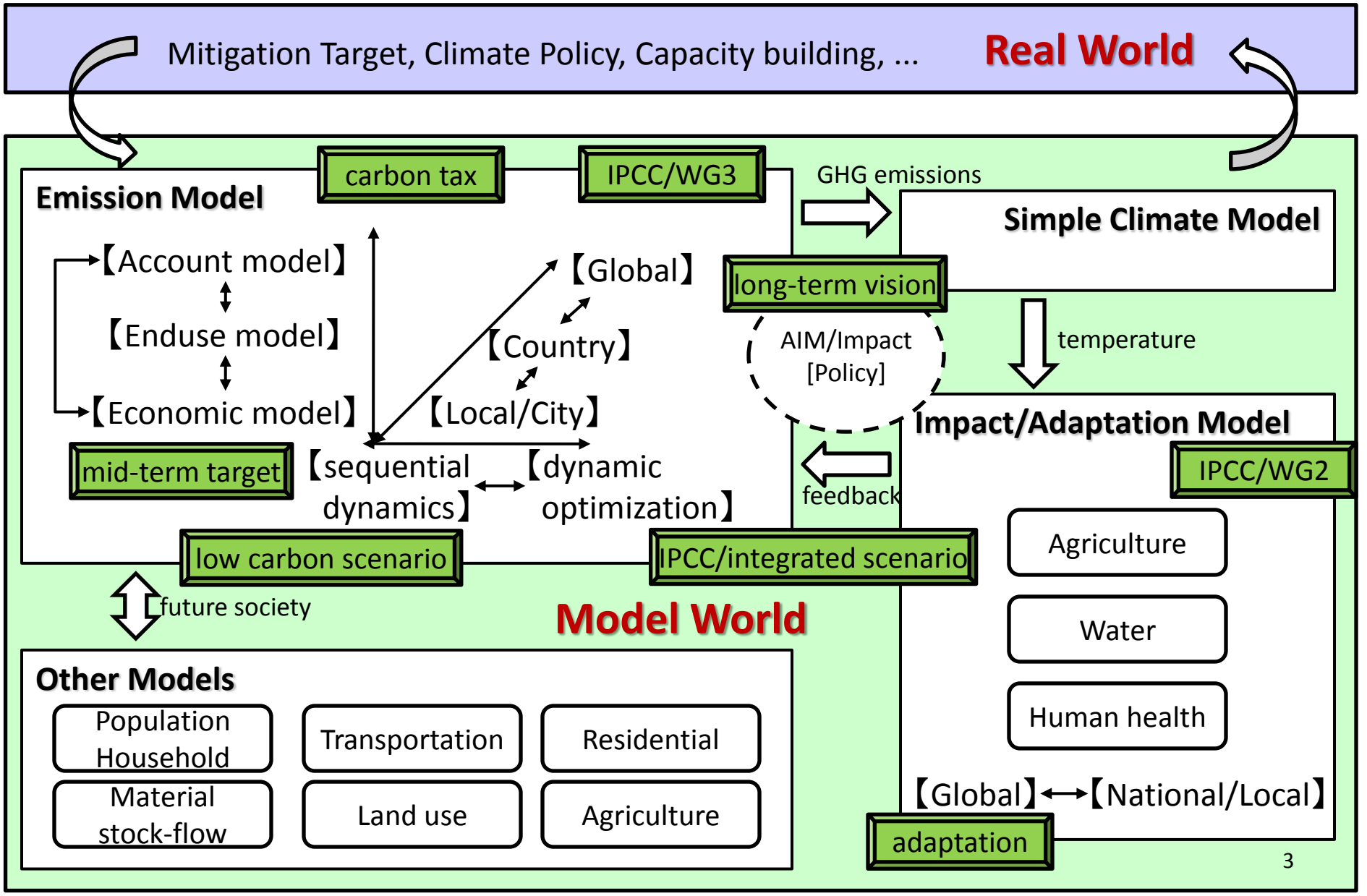
Asia-Pacific Integrated Model (AIM) is an integrated assessment model to assess mitigation options to reduce GHG emissions and impact/adaptation to avoid severe climate change damages.

The various types of models have been developed since 1990, and nowadays the research field is extended to sustainable development with Asian researchers.

http://www-iam.nies.go.jp/aim/

AIM
ASIA-PACIFIC INTEGRATED MODEL

Contents of Present AIM



Capacity building related to AIM

Training Workshop at NIES, Oct 27-Nov 7, 2014

In this presentation

- Our new research topic on reduction scenarios of both GHG emissions and air pollutant (SLCP) emissions is introduced.
  - The Environment Research and Technology Development Fund (S-12-2) of the Ministry of the Environment, Japan
  - Application of Enduse model and CGE model to local area in China, India, Korea & Japan
- Japan's experiences on mitigation target discussion will be introduced tomorrow.
  - Application of Enduse model and CGE (Computable General Equilibrium) model
  - Activities related to DDPP (Deep Decarbonization Pathway Project)

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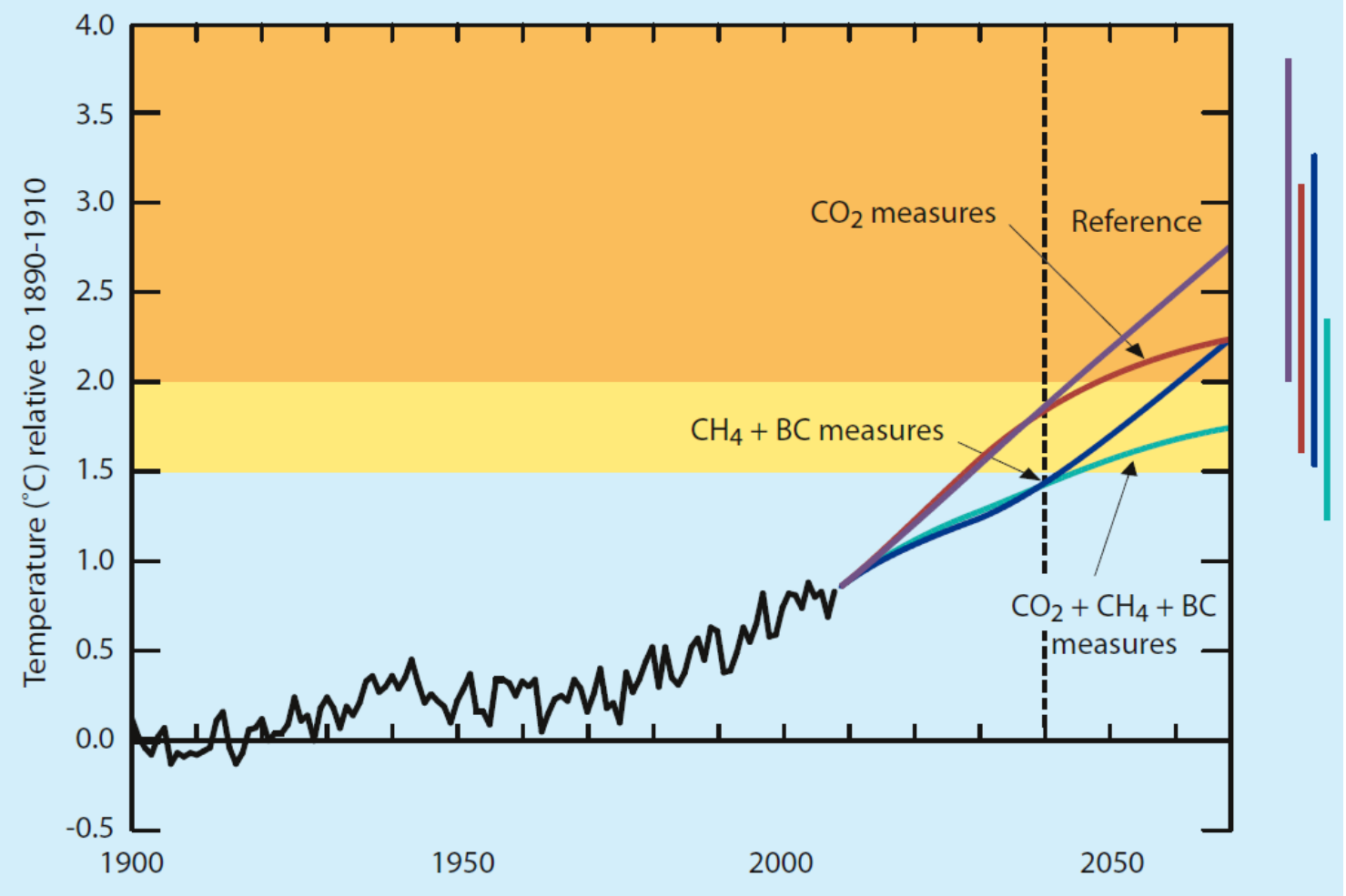
Importance of SLCP (Short-Lived Climate Pollutants)



UNEP & WMO(2011) Summary for Decision Makers, Integrated Assessment of Black Carbon and Tropospheric Ozone, http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_SDM.pdf

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LLGHG and SLCP

- Climate change is global scale issue.
- SLCP and air pollution are local issue.
  - Socio-economic features are different among local areas.
  - Impacts due to pollutants are different among areas.

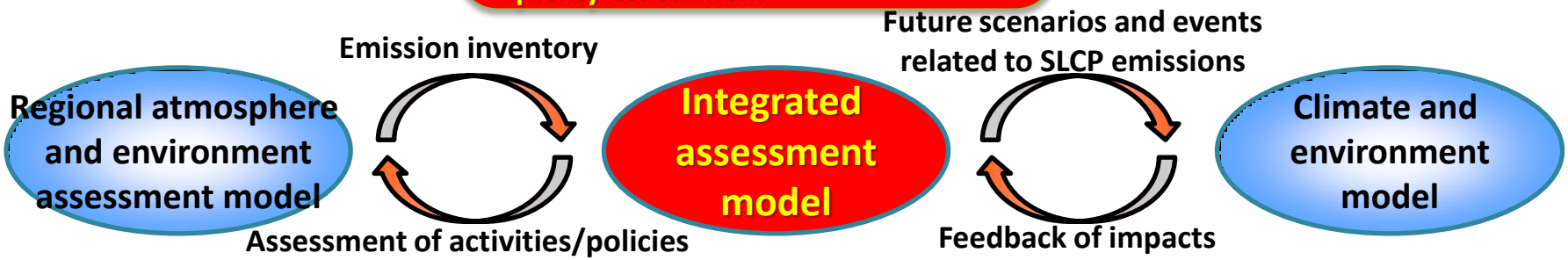
- AIM team tries to develop the local scale Enduse model and CGE model to assess both GHG and SLCP emission reductions.

Promotion of climate policies by assessing impacts of SLCP and LLGHG emission pathways S-12, MOEJ

Theme1:
- Analysis on regional atmospheric quality change
- Emission inventory
- Inverse model to estimate emissions

Theme2:
- Socio-economic and global emission scenarios
- National & local emission scenarios
- Urban & household emission and air quality assessment

Theme3:
- impact assessment of aerosol and GHG
- Assessment of health, agriculture, water and sea level rise



Chemical transfer model and emission inventory in Asia

Enduse model
Socio-economic and emission scenario

Climate model, earth system model climate change impact and adaptation

Theme 4: Tool kit and data archive (synthesis system)

Science — model upgrading

Policy maker Stakeholder — system utilization

Society — information transmission

Regional strategies ⇅ **Global strategies**

Definition of metric
Database
Solution of issues

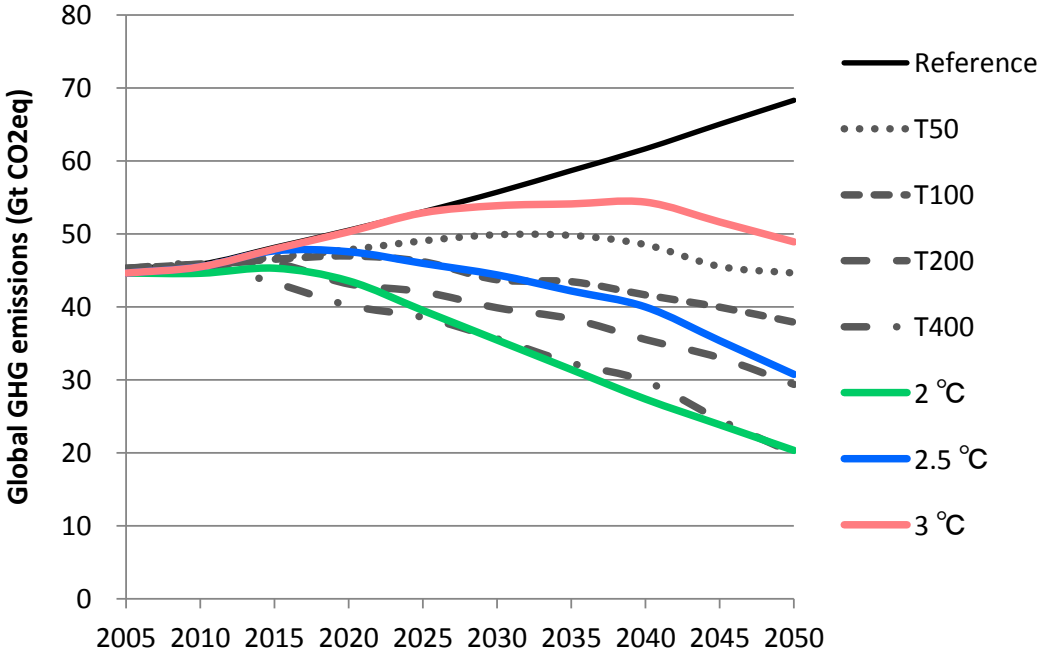
CCAC, UNFCC, IPCC, EANET
Proposal and assessment of climate and air pollution policies

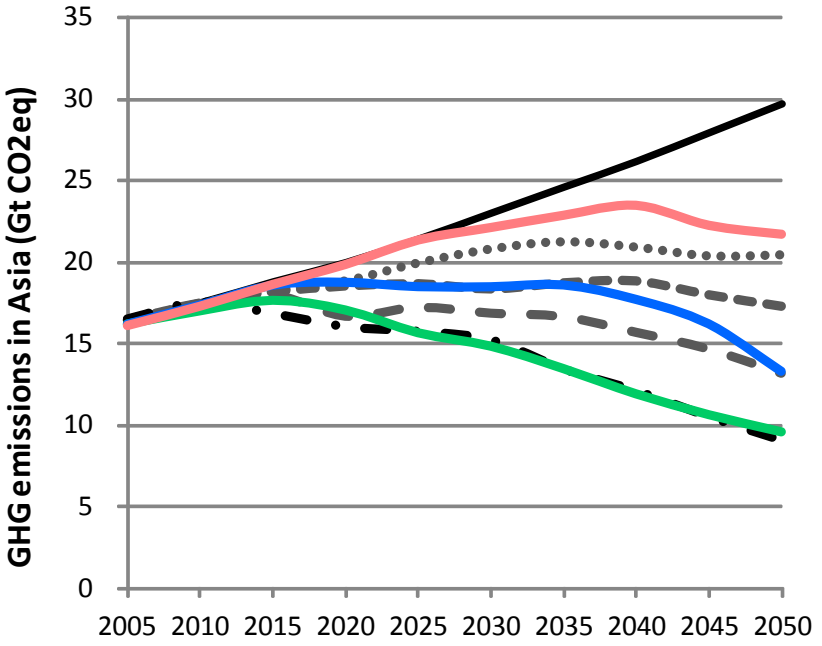
MDG, SDG, Future Earth

GHG emissions pathways to achieve 2 ℃ target from Global Enduse model analysis

- 2℃ target requires high carbon price around **400 US$/tCO$_2$ in 2050 (T400 scenario)**, which is necessary to consider comprehensive strategies to promote mitigation technologies to achieve the maximum potentials of energy savings.
- In **T400 scenario, GHG emissions in Asia in 2050** are largely reduced
  - at 20.5Gt CO$_2$eq which correspond to **69% reductions from baseline**.

  (at 7.5 Gt CO$_2$eq which correspond to **45% reductions from the levels in 2005.**)





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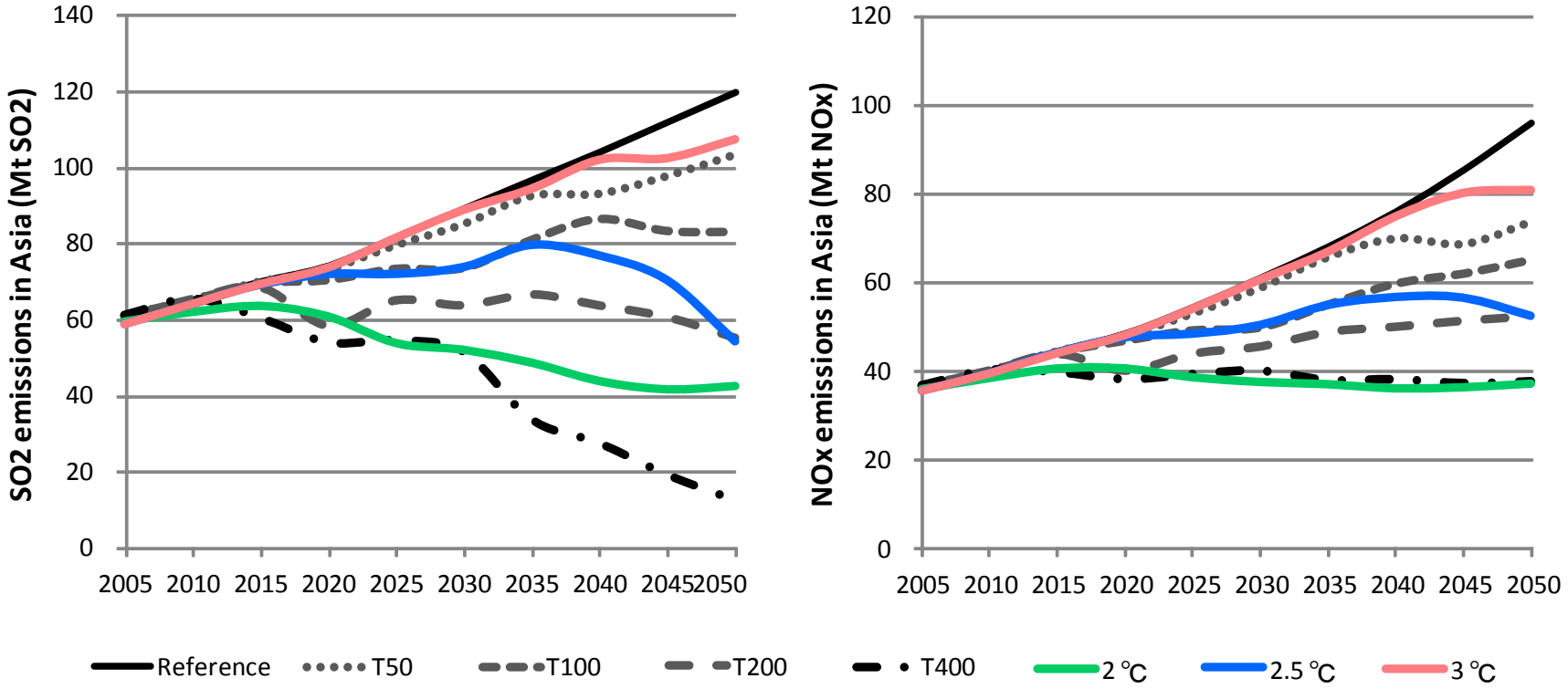
Source) modified from Hanaoka et al, Environmental Pollution, 2014

SO_2 & NOx emissions pathways in Asia
- Co-benefits of implementing CO2 mitigation policies-

- In order to focus on co-benefits of reducing air pollutants by introducing GHG mitigation measures, **air pollutant removal devices are not considered**
- **SO_2 and NOx emissions in Asia will be significantly reduced as co-benefits** of achieving the GHG emissions pathways of 2℃ target scenarios.

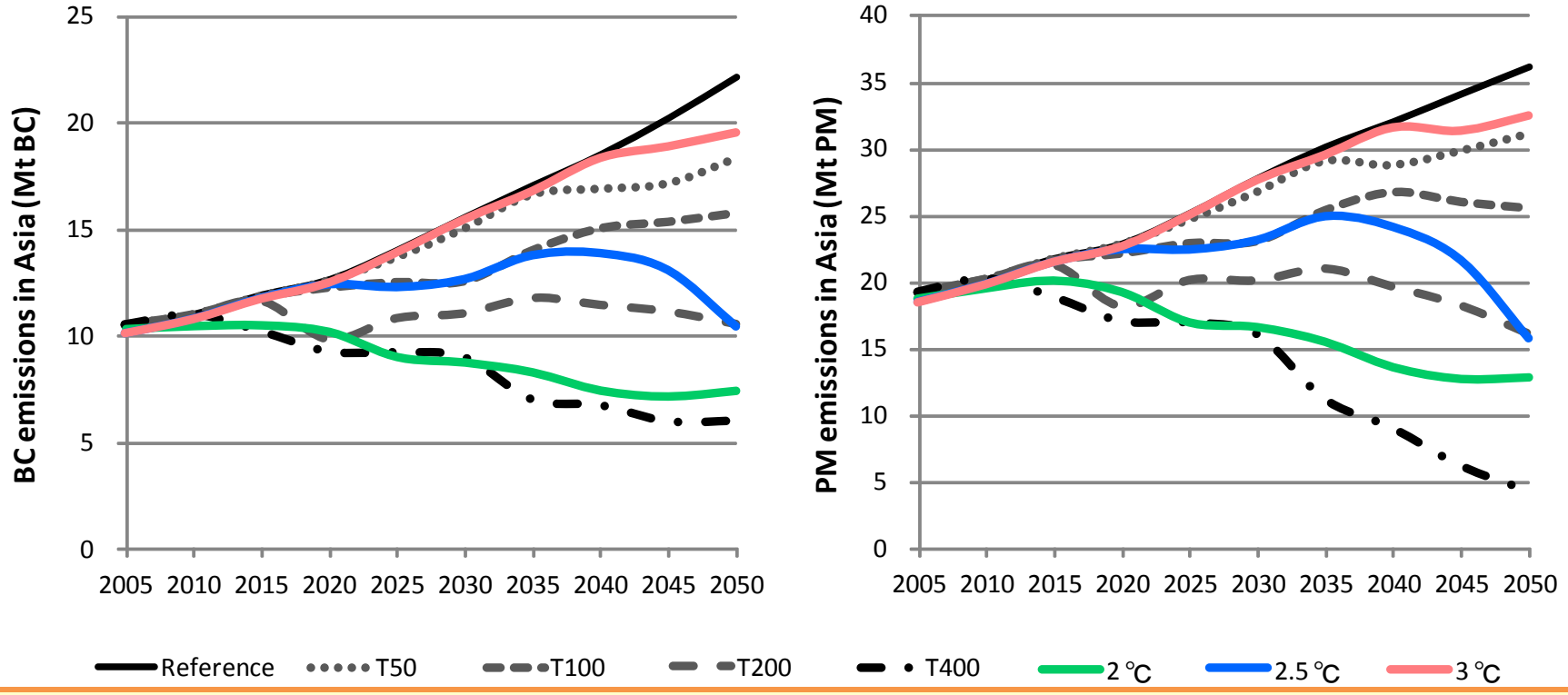


Demonstrating cobenefits may help to overcome various barriers for achieving LCS?

Source) modified from Hanaoka et al, Environmental Pollution, 2014

BC & PM emissions pathways in Asia
- Co-benefits of implementing CO2 mitigation policies-

- **BC and PM emissions in Asia will be significantly reduced as co-benefits** of achieving the GHG emissions pathways of 2℃ target scenarios.
- These are due to measures of energy efficiency improvement on the demand side and also a drastic energy shift on the supply side.

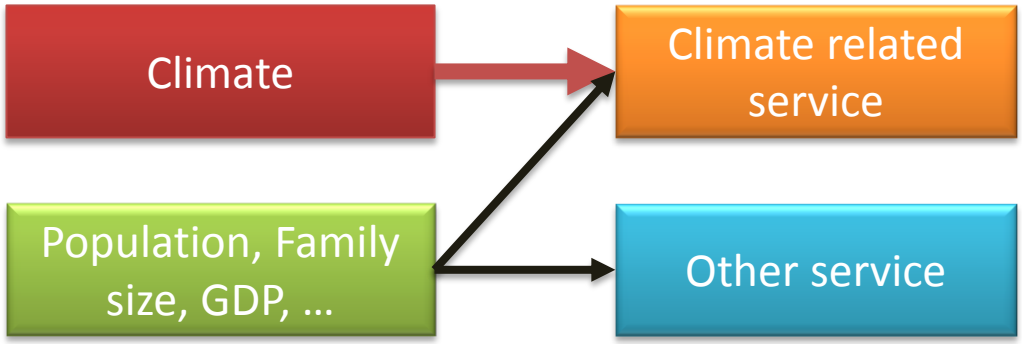


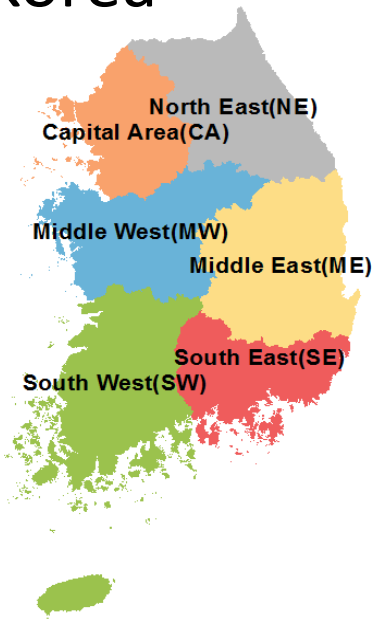
Demonstrating cobenefits may help to overcome various barriers for achieving LCS?

Source) modified from Hanaoka et al, Environmental Pollution, 2014

Multi-region Enduse Model for Korea

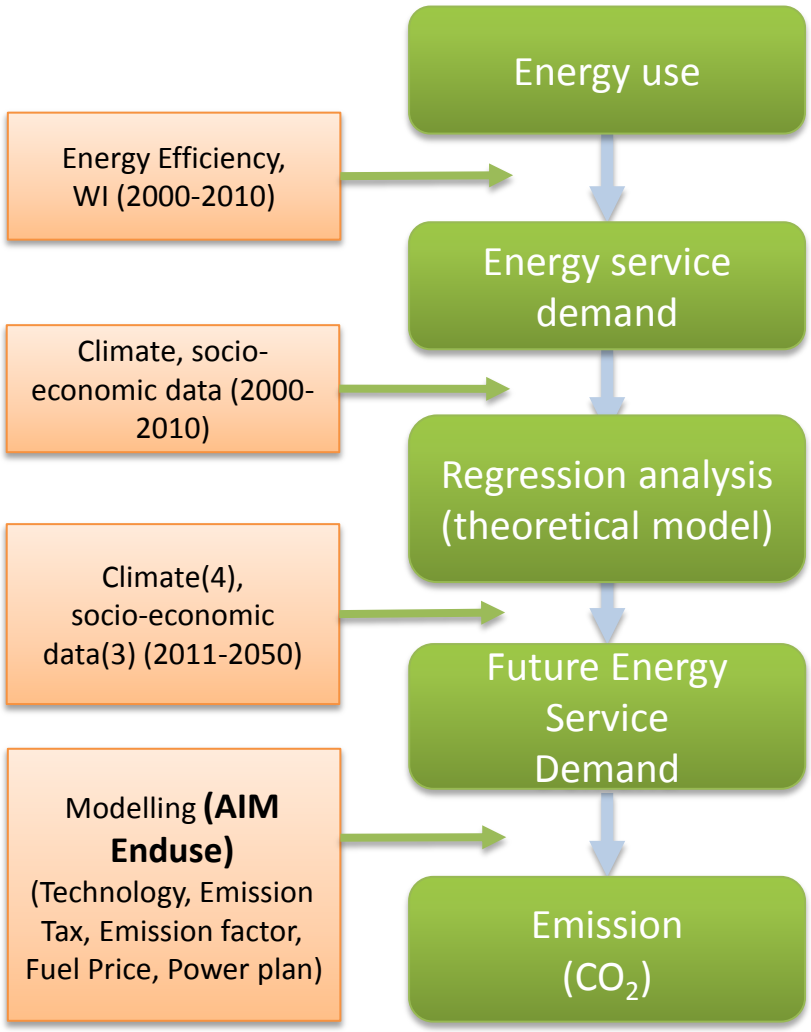
Decomposition and disaggregation

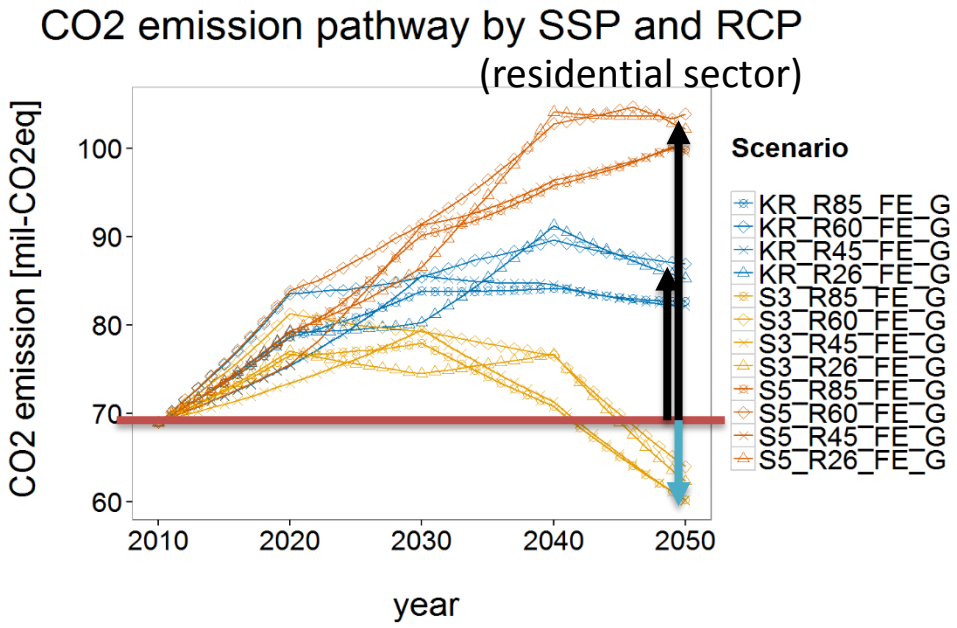


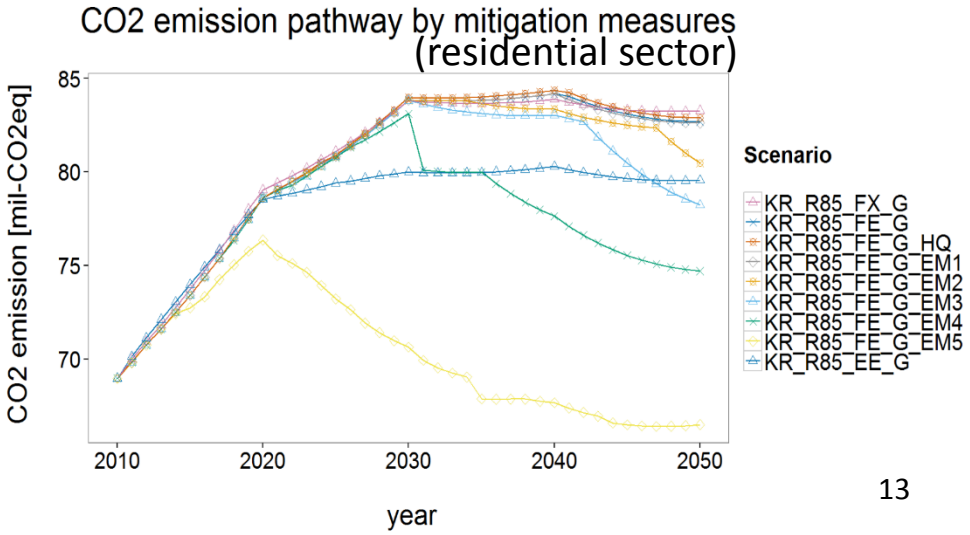


Energy service		Activity	Structure	Intensity
Climate related service	Heating	Household	Floor area/Household	Energy service demand/Floor area
	Cooling	Household	Floor area/Household	Energy service demand/Floor area
	Hot-water	Household	Population/Household	Energy service demand/Population
Other service	Lighting	Household	Population/Household	Energy service demand/Population
	Cooking	Household	Population/Household	Energy service demand/Population
	Refrigerator	Household	Population/Household	Energy service demand/Population
	ICT	Household	-	Energy service demand/household
	Others	Household	-	Energy service demand/household

Methodology for Korea analysis







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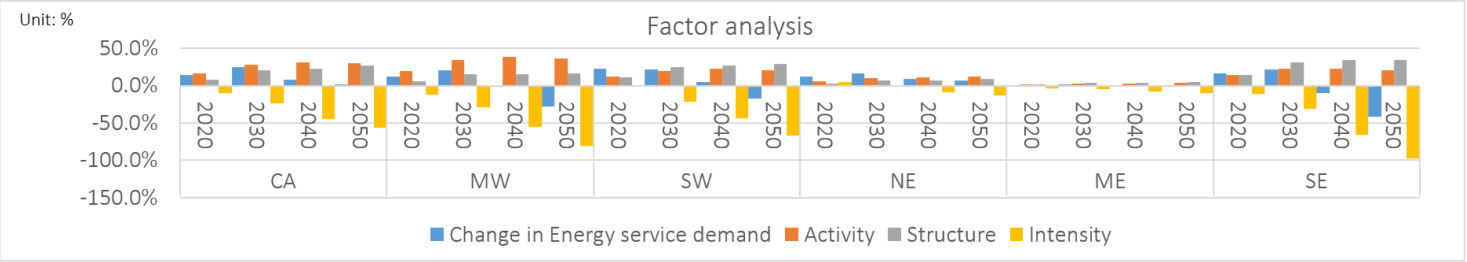
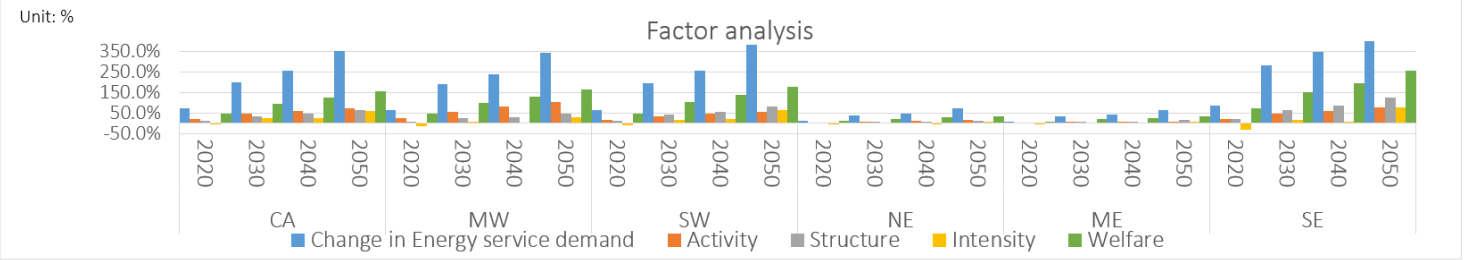
Energy service demand in residential sector in Korea

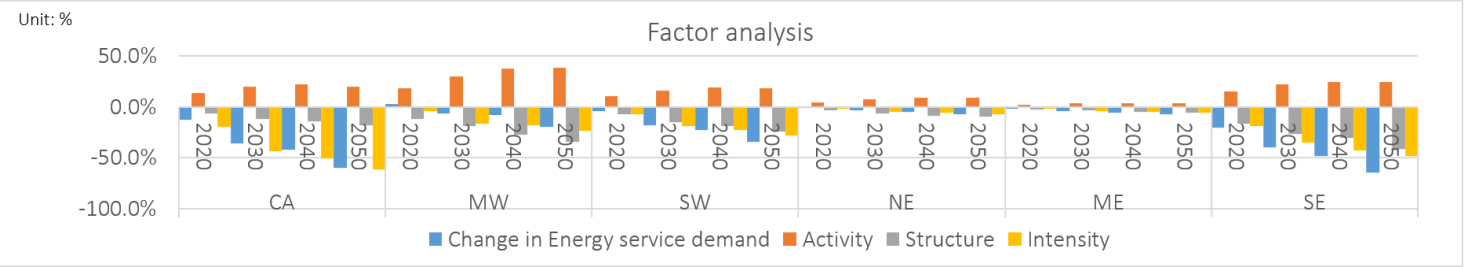
Heating service



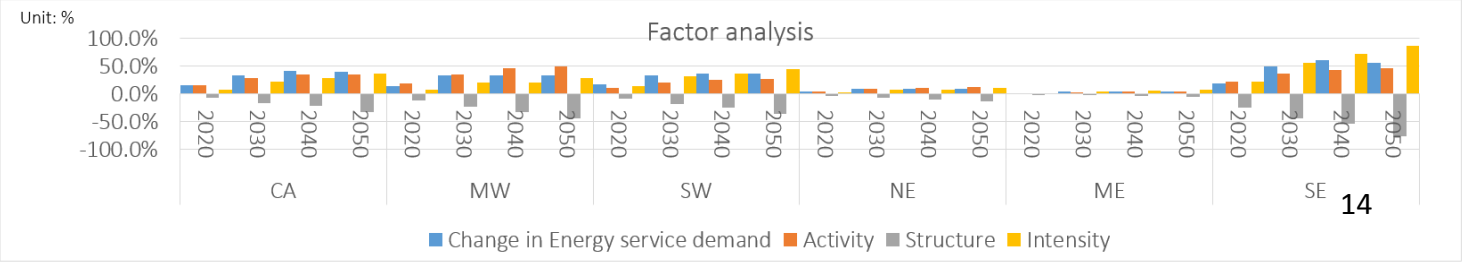
Cooling service



Cooking service



Lighting service



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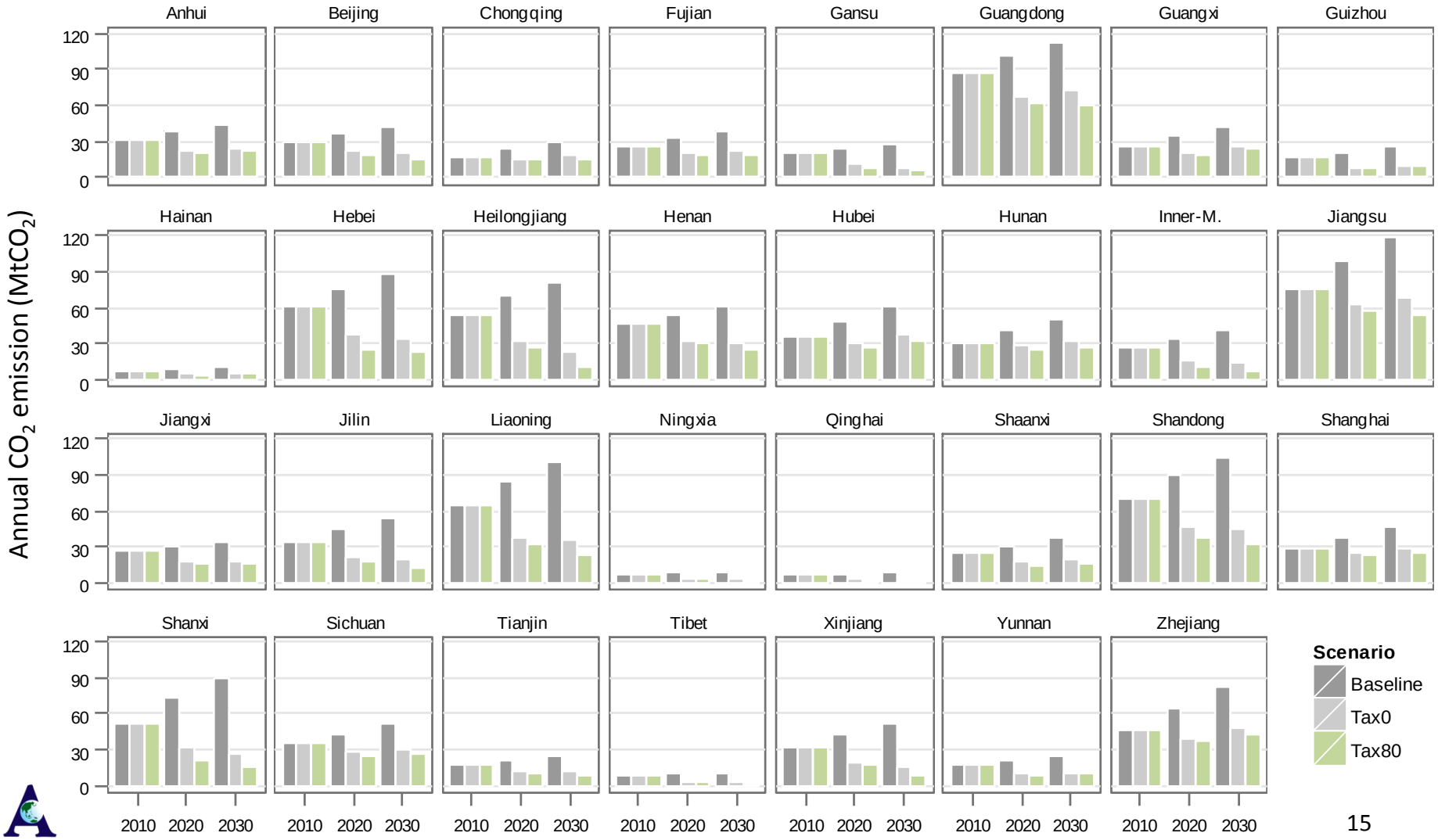
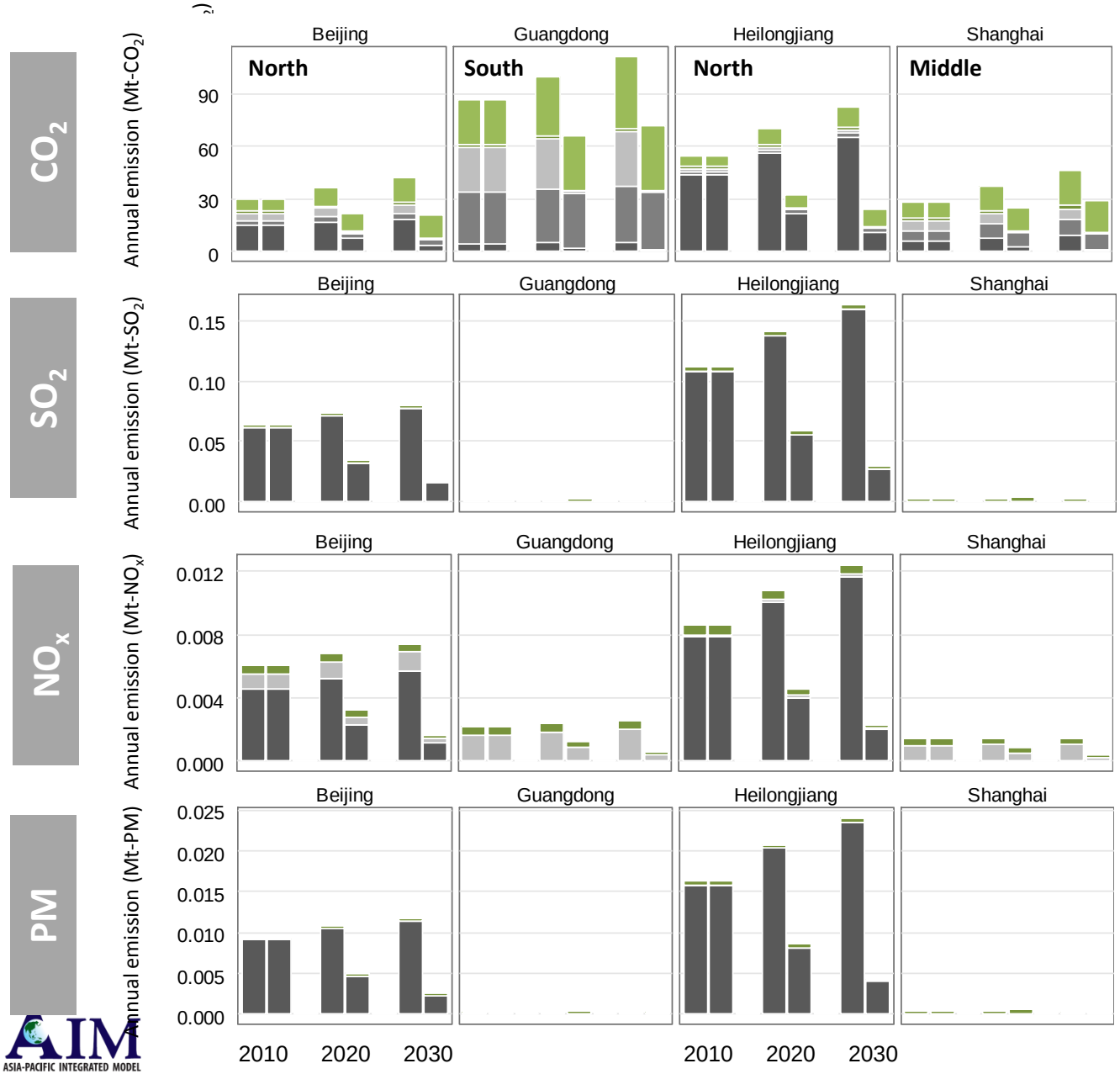
CO2 emission of 31 Chinese provinces by Multi-region Enduse Model for China

- Baseline scenario: technology frozen; Tax80 scenario = 80US$/ton emission tax applied



China Enduse model
by Dr. Xing

Air pollutant emissions from residential sector



- CO_2 emission are mainly caused by use of heating (coal) and electronics (electricity)
- SO_2, NO_X and PM emissions are mainly caused by massive use of central heating (coal) in northern areas

Heating
Cooling
Hot water
Cooking
Electronics

(Results of 31 regions are available)

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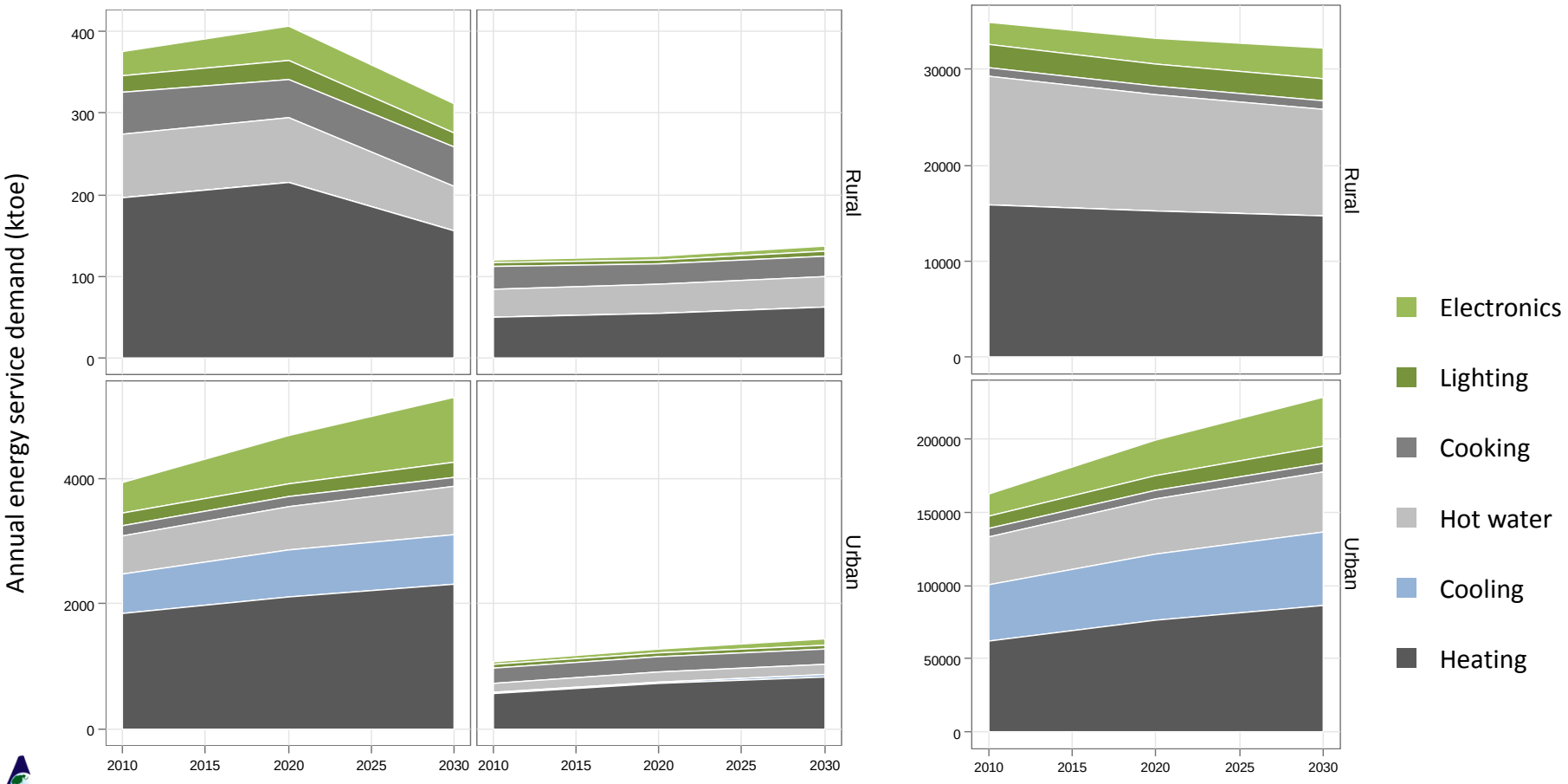
Future trend comparison: urban vs. rural

- Residential energy service demands: China, developed region, less developed region

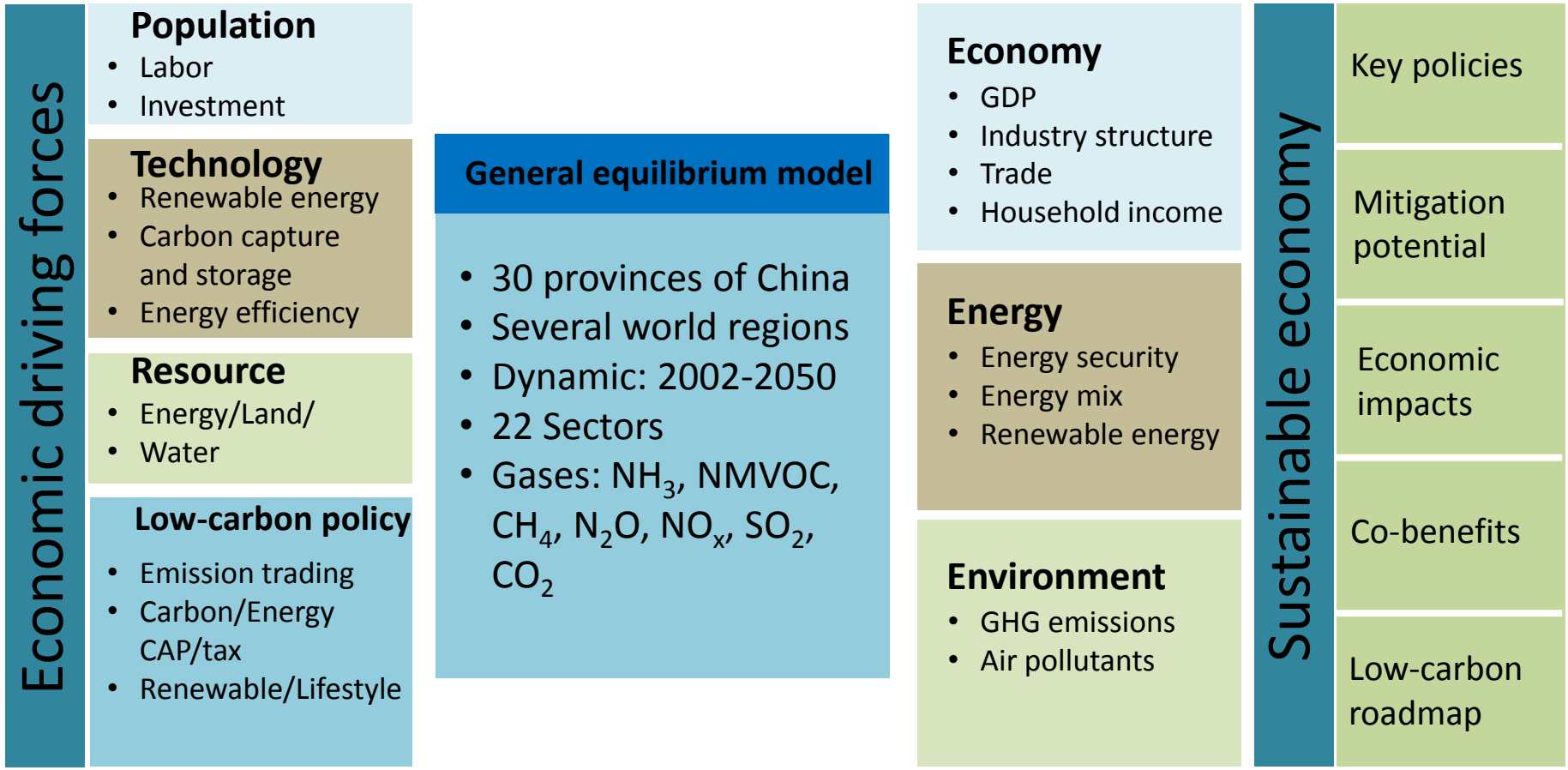
Beijing:
98% urban population by 2030

Tibet:
51% urban population by 2030

China:
81% urban population by 2030



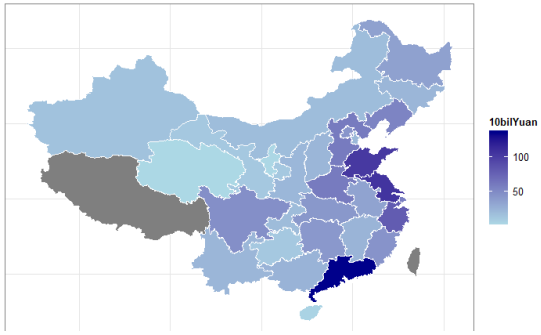
Method: A multi-region CGE model for China



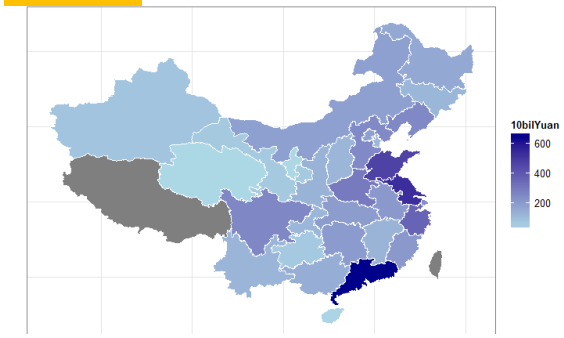
Results: GDP & per capita GDP

- **Catch-up by western provinces, narrowed regional economic gaps**
- **But eastern & southern China are still the richest**

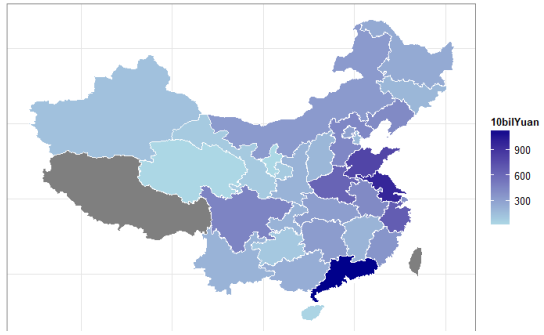
GDP 2002



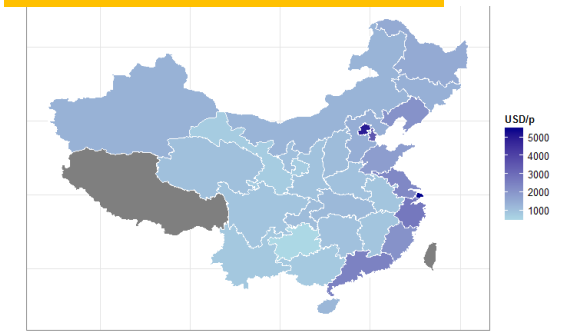
2020



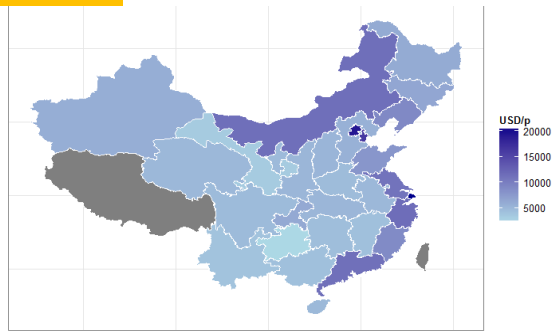
2030



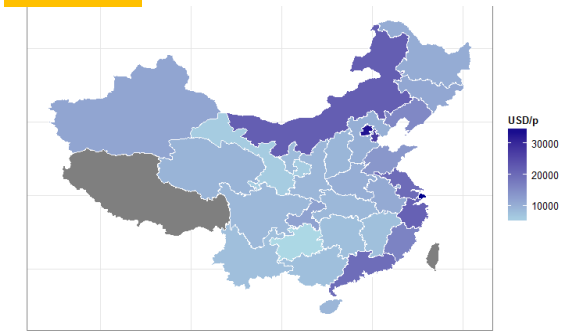
Per capita GDP 2002



2020



2030



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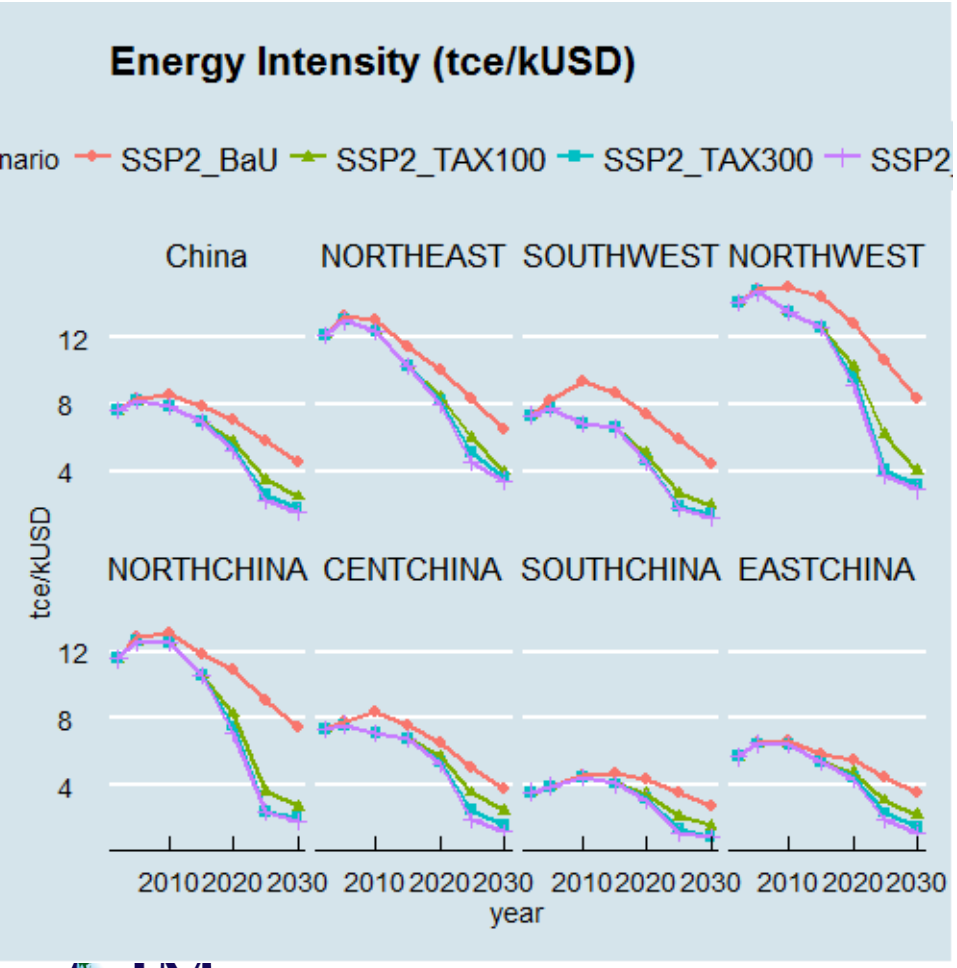
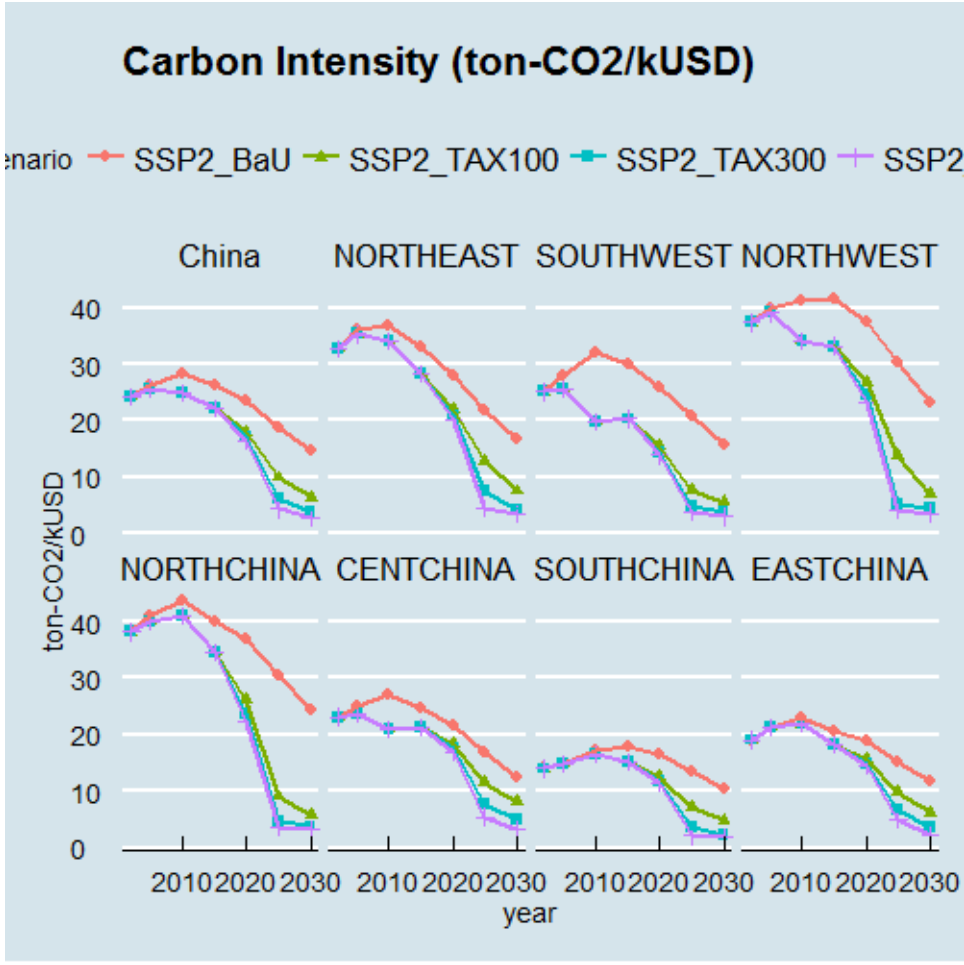
Results: energy intensity & carbon intensity

- **Energy intensity of China from 2002 to 30 improves by 41% in BaU; South (22%) and East (37%) China is slower than Central (48%), Northeast (46%) and Northwest (42%) China.**
- **Carbon intensity improves by 40% over 2002-30; Higher improvement in Northeast (49%) and Central (46%) China; While less in South (27%) and North (35%) China**





Conclusion

- AIM is one of the integrated assessment model to assess climate mitigation and adaptation, and AIM team has training workshops for capacity building with the aim of model development and application.
- AIM team is now extending Enduse model and CGE model in order to assess GHG emission reductions and SLCP emission reductions in local scale in Asian countries.

- Asia will have a common target to achieve the 2 degree target. We will be able to use co-benefit of GHG mitigation.
  On the other hand, not only each country but also each local area has a different condition such as economy, technology, resource, climate, culture and so on. We will have to propose the effective countermeasures taking into account these differences.

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