TPM11 - Session 4

PRA8. Climate Change
- Research Collaboration for Low Carbon Development in Three Countries

Reports on PRA 8 – Climate Change

Research Collaboration for Low Carbon Development in Three Countries

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11th Tripartite Presidents Meeting among CRAES, NIES and NIER

Kawasaki Nikko Hotel, Kawasaki City, Japan

November 12, 2014

Activities in PRA 8: Climate Change

- CRAES
  - Evaluation system toward Low carbon & Sustainable development
    - Low carbon, Environmental protection and Development
- NIER
  - New Asia Future Emission Scenarios
- NIES
  - New research project, S-12 of the Environment Research and Technology Development Fund by MOEJ, focusing on LLGHG and SLCP emission pathways.
    - On 21 and 22 July 2014, the 2nd International Symposium for ABC (Atmospheric Brown Cloud) and SLCP (Short-Lived Climate Pollutant) was held in Tokyo.
  - NIES had a workshop on AIM (Asia-Pacific Integrated Model) Enduse model and CGE (computable general equilibrium) model in Tsukuba.
  - The above two events are treated as a research collaboration among 3 institutes, and NIES invited CRAES and NIER.

AIM ASIA-PACIFIC INTEGRATED MODEL

Activities in CRAES (1)

The evaluation system: Index

indicators

低碳指数
- 低碳生产指数（12）
- 低碳消费指数（6）
- 低碳资源指数（7）
- 低碳管理指数（3）

环保指数
- 环境污染指数（14）
- 环境质量指数（15）
- 环境管理指数（9）

发展指数
- 经济指数（12）
- 人口指数（5）
- 健康指数（5）
- 生活指数（3）
- 差异指数（4）
- 智力指数（4）

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The evaluation system: Index

Low Carbon Index

低碳指数

$$I_{\mathrm{LC}} = \frac{1}{n}[\delta_1 x^*_{lc_1} + \delta_2 x^*_{lc_2} + \cdots + \delta_n x^*_{lc_n}] = \frac{1}{n}\sum \delta_n x^*_{lc_n}$$

Environmental Protection Index

环保指数

$$I_{\mathrm{EP}} = \frac{1}{n}[\delta_1 x^*_{lc_1} + \delta_2 x^*_{lc_2} + \cdots + \delta_n x^*_{lc_n}] = \frac{1}{n}\sum \delta_n x^*_{lc_n}$$

Development Index

发展指数

$$I_{\mathrm{SD}} = \frac{1}{p}[\omega_1 x^*_{d_1} + \omega_2 x^*_{d_2} + \cdots + \omega_p x^*_{d_p}] = \frac{1}{p}\sum \omega_p x^*_{d_p}$$

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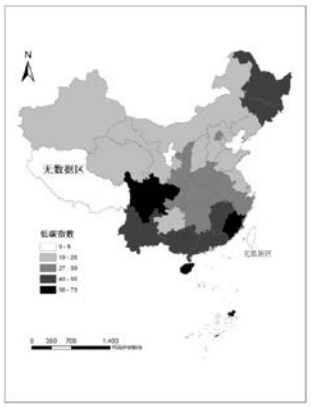
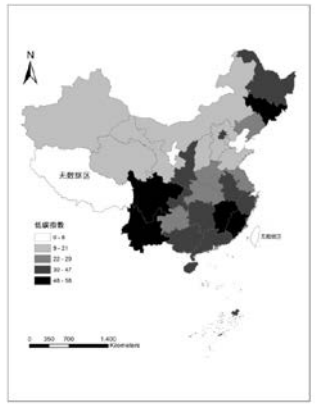
Activities in CRAES (2)

Evaluating results



LC Index

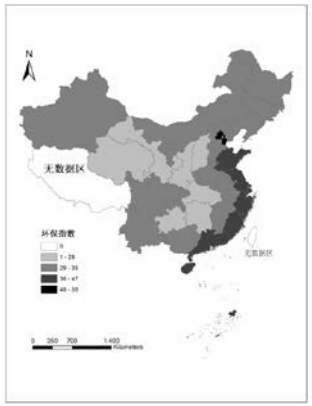
North-south differences obviously



2005 2011

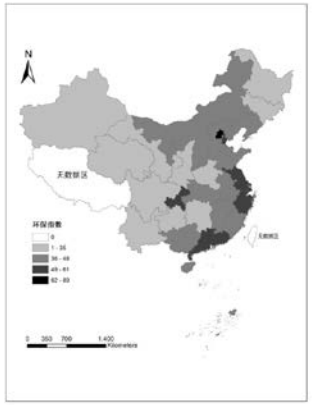
Evaluating results

中国环境科学研究院 Chinese Research Academy of Environmental Sciences



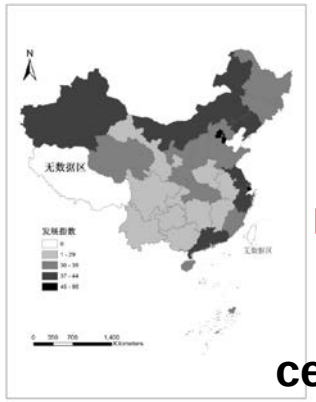
EP Index

East high - west low, optimized constantly



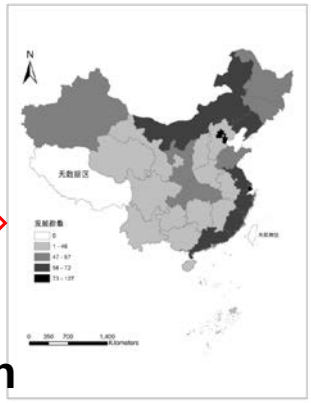
2005 2011

Activities in CRAES (3)



SD Index

East and north region high, the central and western region low

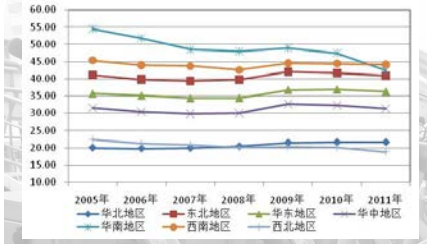


2005 2011

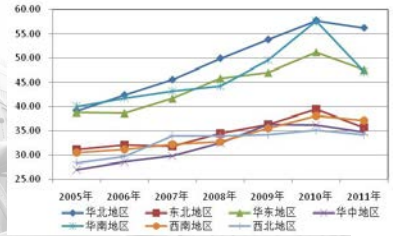
Evaluating results

中国环境科学研究院 Chinese Research Academy Of Environmental Sciences

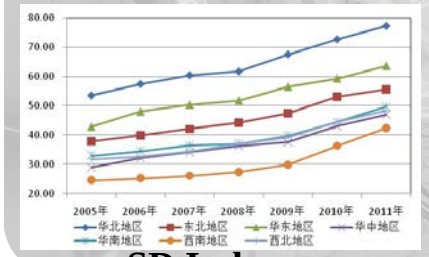
➢Regional Assessment for 7 Regions in China



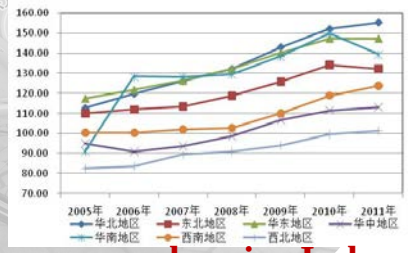
LC Index



EP Index



SD Index



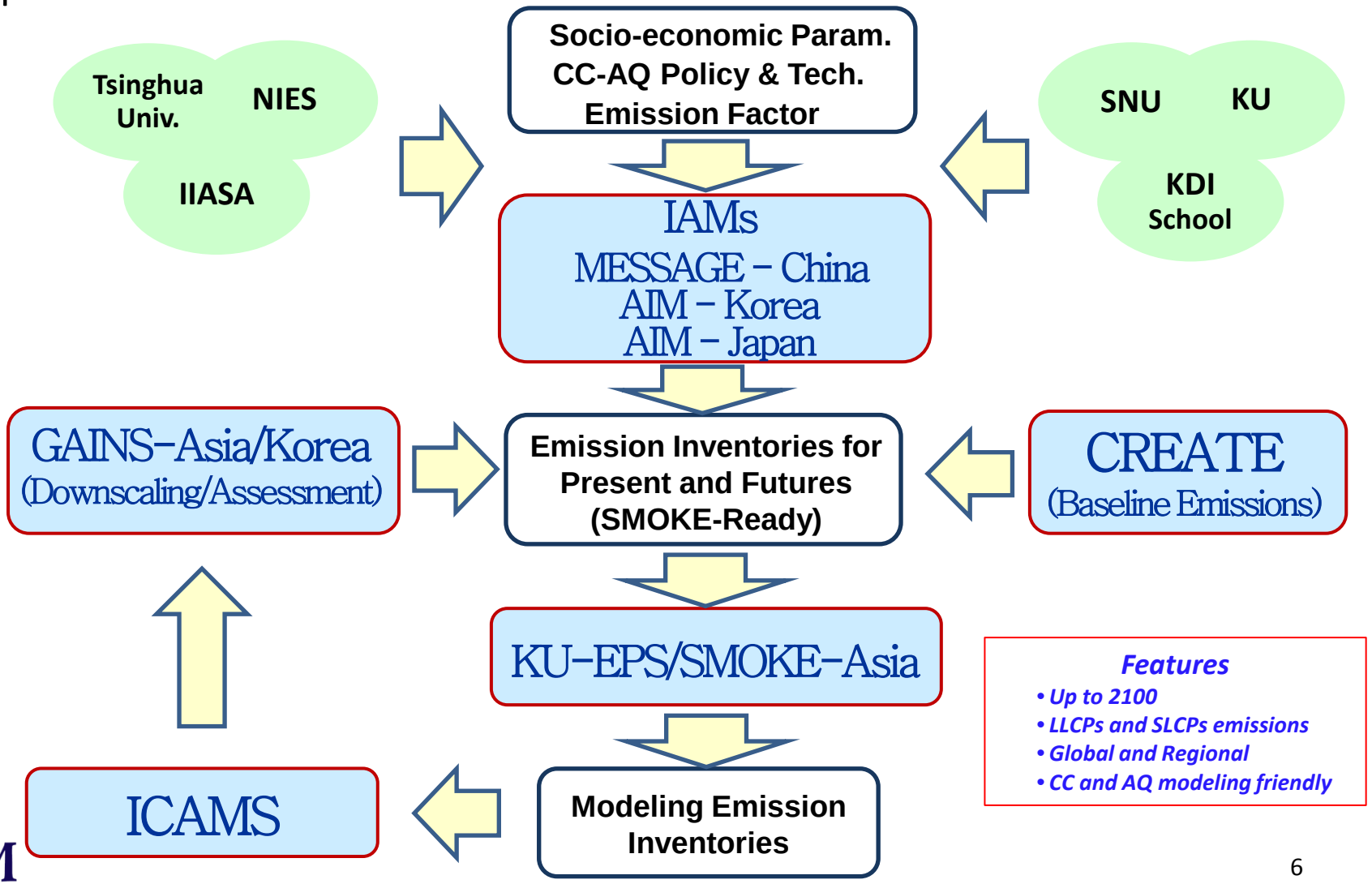
comprehensive Index

Comprehensive index: Based on Development Index under Low carbon constraint (I_{SD}^{ILC}), Environment constraint (I_{SD}^{IEP}), and both constraints ($I_{SD}^{(ILC+IEP)/2}$), Comprehensive index is calculated (($I_{SD}^{ILC}+I_{SD}^{IEP}+I_{SD}^{(ILC+IEP)/2}$)/3).

Activities in NIER (1)

Development of New Asia Future Emission Scenarios in NIER project

- Development Plan and Structure



Features

- *Up to 2100*
- *LLCPs and SLCPs emissions*
- *Global and Regional*
- *CC and AQ modeling friendly*

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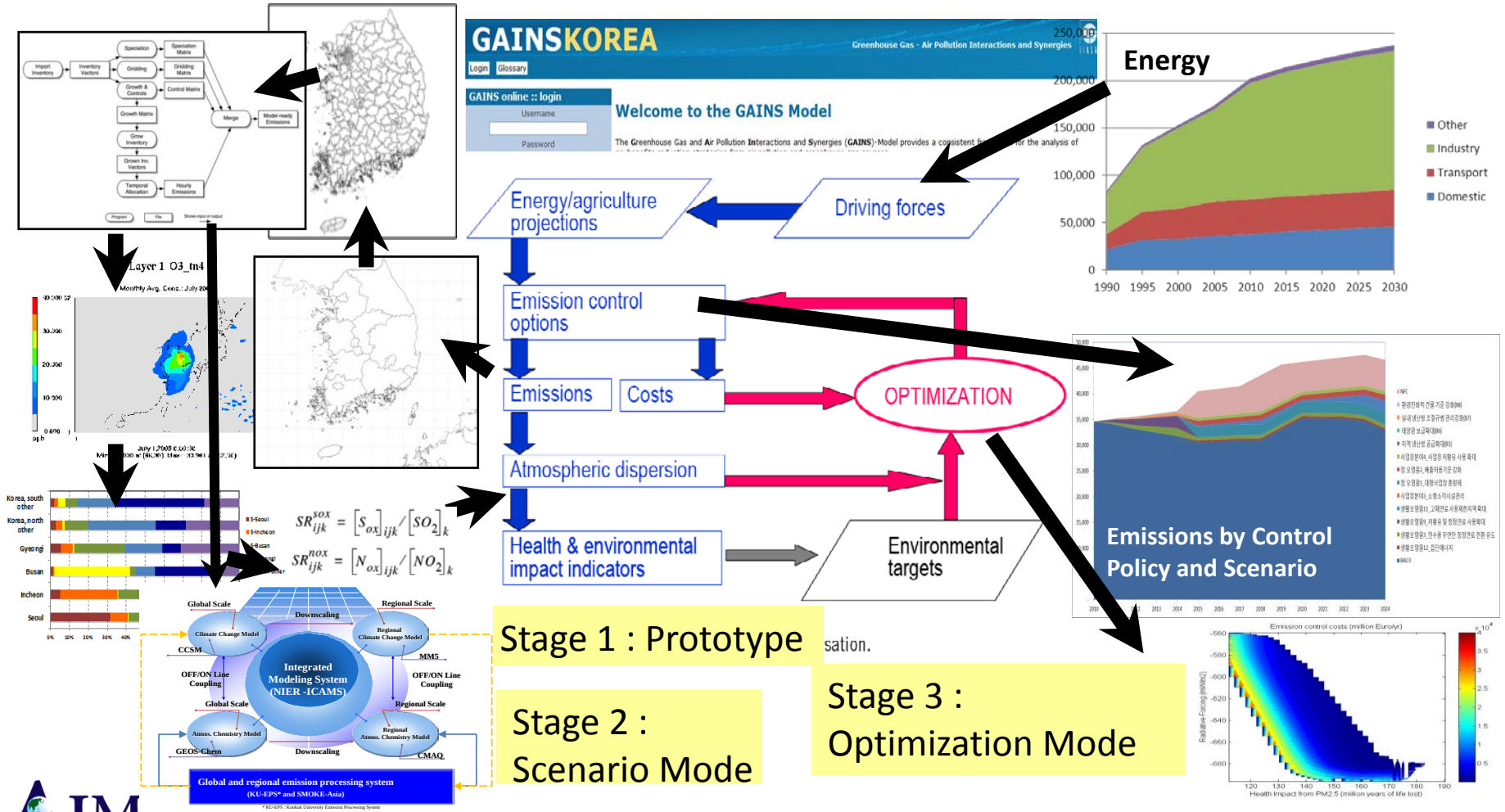
Activities in NIER (2)

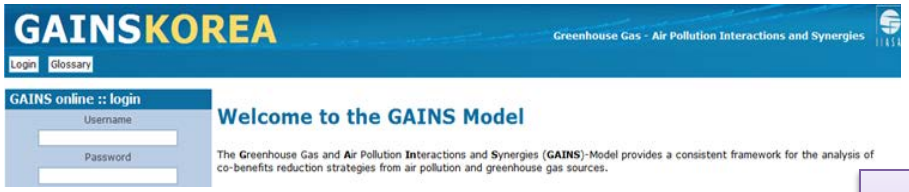
NIER is developing Future Emission Scenarios

- GAINS-Korea : The Scenario Engine for Climate-Air Quality Management



Activities in NIER (3)

GAINS-Korea



- **Regions : 17, Year: 2010(base) ~ 2050(Future)**
- **Emissions : CAPSS +GHG CAPSS + GAINS**
- **Pollutants: CO2, CH4, NOx, N2O, PM10, PM2.5, SO2, VOC, NH3, CO, BC, OC, Mercury**
- **Sectors: Energy, Mobile, Industrial Process, VOCs, Agriculture (detail sectors : 250)**
- **S-R modeling**

- Domain 1 & 2: 58×46, 54km; 36×66, 18km grid

- MM5/SMOKE-Asia (Woo et al., 2012)

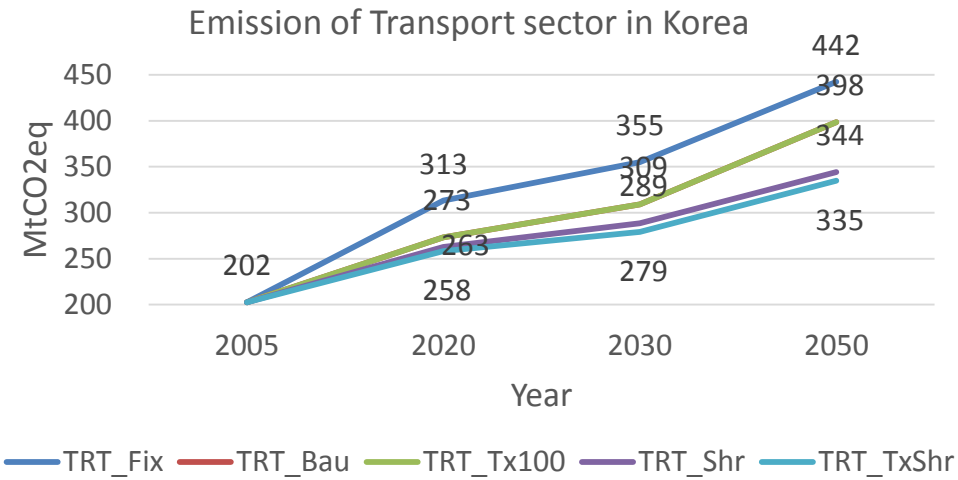
- CAMx version 6.0 with OSAT (Ozone Source Apportionment Technology)

AIM – Korea (TWS2014)

AIM/Enduse Training workshop Results

- Future transport scenarios for services demands

	2005	2010	2020	2030	2050
Population (million)	47,044	48,184	49,378	49,661	46,183
GDP ($/person)	577,264	695,267	1,009,588	1,338,333	1,801,145



Results of carbon tax by Korea government at 2015
(Target : Transport sector)
- No effect of tax because of high price of car
- To reduce emission in TRT sector, introduces not only emission tax, but also high-efficiency device

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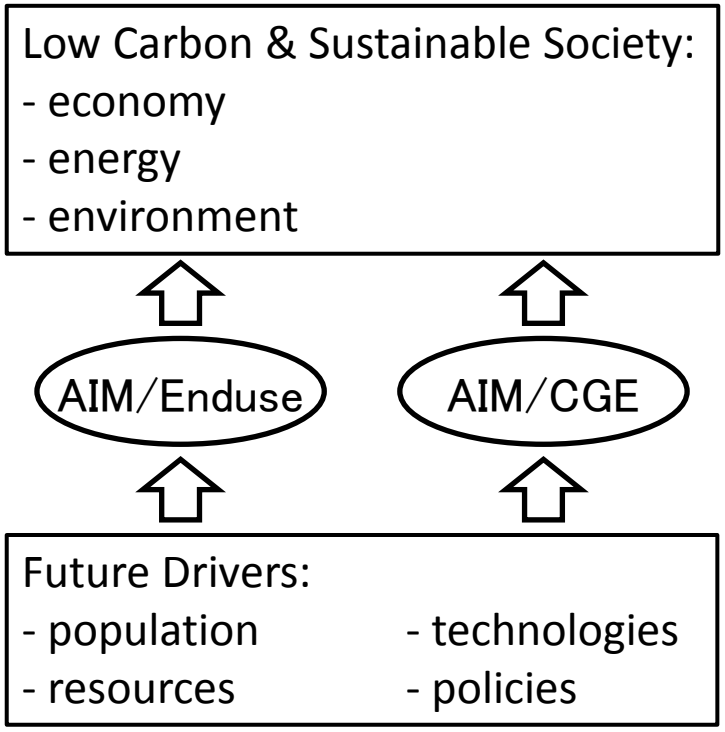
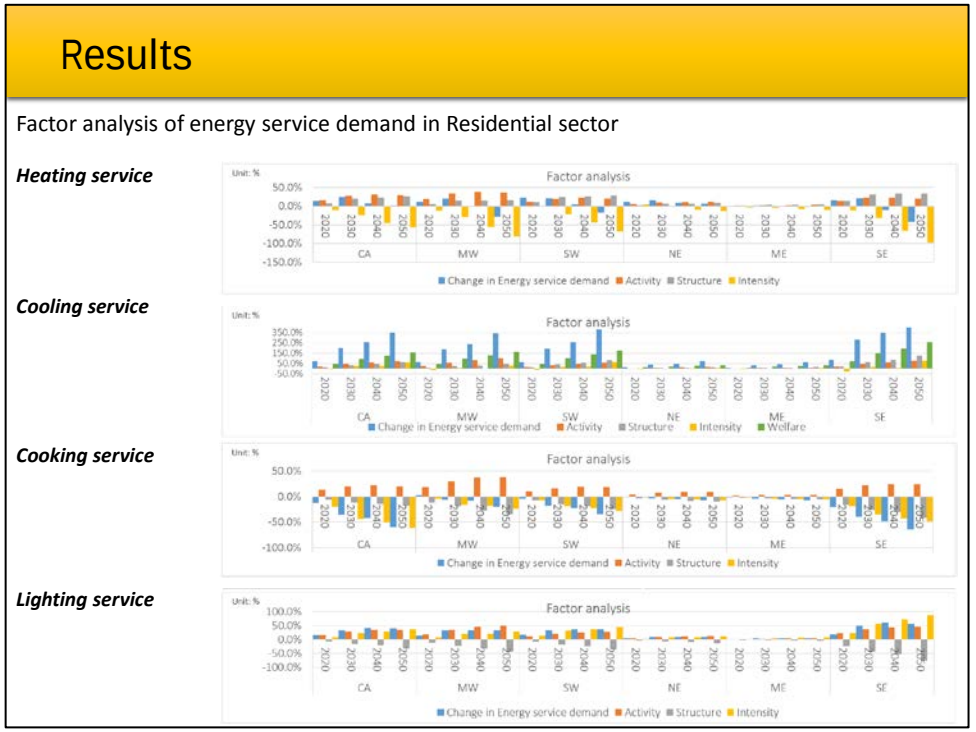
Activities in NIES (1)

- S-12 project: In order to estimate GHG and SLCP emissions in local scale, NIES is developing regional AIM model.
  - China: 31 provinces
  - Korea: 6 regions

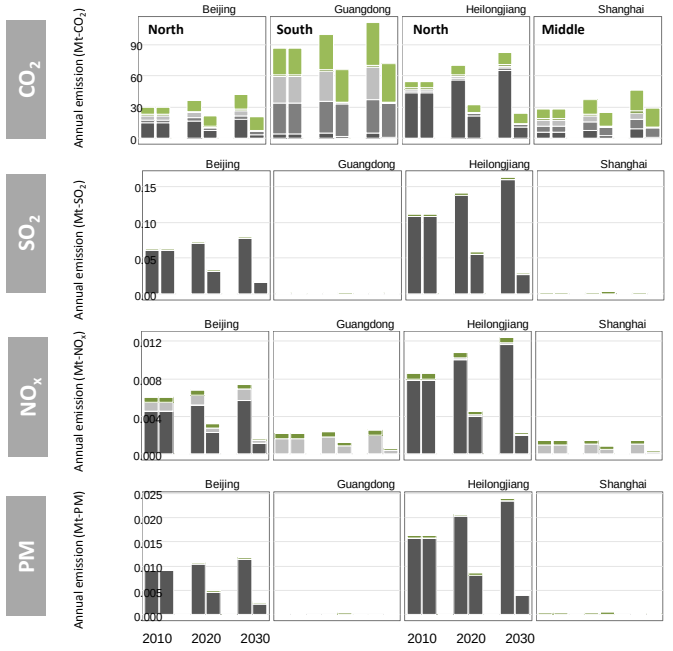




by Dr. Park Chan

Activities in NIES (2)

Air pollutant emissions from residential sector



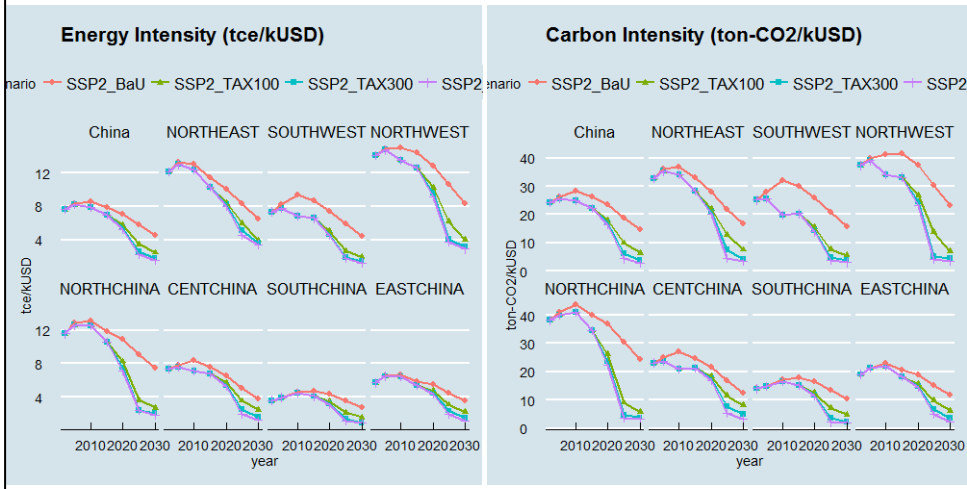
- CO_2 emission are mainly caused by use of heating (coal) and electronics (electricity)
- SO_2, NO_x and PM emissions are mainly caused by massive use of central heating (coal) in northern areas

(Results of 31 regions are available)

by Dr. Xing Rui

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**



by Dr. Dai Hancheng

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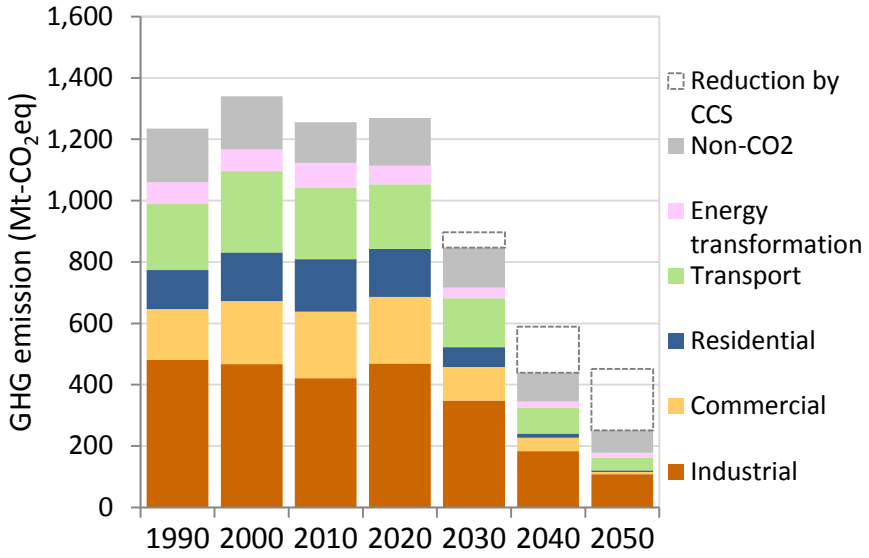
Activities in NIES (3)

- How to realize the drastic GHG emission reduction in Japan (80% reduction in 2050 compared to 1990 level)
- DDPP (Deep Decarbonization Pathways Project)
  http://www.unsdsn.org/what-we-do/deep-decarbonization-pathways/



GHG emissions in Japan

DDPP seminar introducing Japan's results was held on October 7 in Tokyo.

In 2014, technology feasibility was assessed.
In 2015, economic aspects will be reported.

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Research collaboration among CRAES, NIER & NIES

- The 2nd International Symposium for ABC and SLCP, Tokyo, 21-22 July 2014
  - Oral session
    - T. Masui, T. Hanaoka, G. Hibino, G. Kurata: Local socio-economic scenario development based on SSPs (Shared Socio-economic Pathways)
    - T. Hanaoka, K. Fujiwara, Y. Motoki, G. Hibino, T. Masui: Cobenefits of reducing air-pollutants emissions in Asia by achieving a 50% global GHG emissions reduction target by 2050
    - J.-H. Woo, D.-K. Lee, J.-B. Lee, R. Park, C.-K. Song, J.-S. Han: Effects of climate change on regional air quality -Use of IPCC emission scenarios and plan for a new creation
  - Poster session

Workshop at Tsukuba, Oct 27 - Nov 7

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Next steps toward low carbon society

- By March 2015, INDC (intended nationally determined contribution) would be submitted toward post-2020 international framework. We will also contribute to each government.
- We want to develop common scenarios including LLGHG and SLCP emissions toward low carbon society.
- Not only Mitigation but also Adaptation becomes more important.
- We are necessary for data sharing and intercomparison of research.

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