Expert Consultation Meeting on TAP in NE Asia, UNESCAP

Review of the main activities on TAP in Northeast Asia with focus on China

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Chinese Research Academy of Environmental Sciences

St Petersburg, Russia Federation, July 9-10,2012

Chapter 1: Major cooperation programs/mechanisms for regional air pollution in NE Asia

Major programs and projects China involved

- These mechanisms include Northeast Asian Conference on Environmental Cooperation (NEAC),
- Tumen River Watershed Environmental Preservation Project (Tumen NET)
- North-East Asian Subregional Programme for Environmental Cooperation (NEASPEC)
- Acid Deposition Monitoring Network in East Asia (EANET)
- Northwest Pacific Region Action Plan (NORPAP)
- Tripartite Ministers Meeting Among China, Japan and Korea (TEMM)
- Tripartite Presidents Meeting among Chinese Research Academy of Environmental Sciences, National Institute of Environmental Studies of Japan and National Institute for Environmental Research of Korea (TPM)

I. Northeast Asian Conference on Environmental Cooperation (NEAC), 1992~2004

- Policy related. Annual meeting.
- Government officials and researchers to share environmental information on management and pollution control measures, promote understanding and relations of the participating countries.

II. EANET- Acid Deposition Monitoring Network in East Asia

- Thirteen countries : Cambodia, China, Indonesia, Japan, Lao P.D.R, Malaysia, Mongolia, Myanmar, Philippines, Republic of Korea, Russia, Thailand, Vietnam..
- The UNEP Regional Resource Centre for Asia and the Pacific (UNEP RRC.AP) as Secretariat and the Asia Center for Air Pollution Research (ACAP) as the Network Center for EANET.
- Conduct acid deposition monitoring and related study, training and cooperation.
- 52 monitoring sites (19 urban, 11 rural, and 22 remote sites) in East Asia in 2009

III. Northwest Pacific Region Action Plan (NOWPAP)

- The Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP) adopted 1994 as a part of the Regional Seas Programme of the UNEP.
- Democratic People's Republic of Korea; Japan; People's Republic of China; Republic of Korea; Russian Federation.
- Protection of the Marine Environment from Land-based Activities.
- Regional Overview on Atmospheric Deposition of Contaminants to the Marine and Coastal Environment

IV. Tripartite Environment Ministers Meeting among China, Japan and Korea

* 1999~
* At 12th TEMM in 2010, 10 priority areas for the period 2010 – 2014:
  (1) Environmental Education, Awareness and Public Participation;
  (2) Climate Change;
  (3) Biodiversity Conservation;
  (4) Dust and Sandstorms (DSS);
  (5) Pollution Control;
  (6) Environment-Friendly Society/3R/Sound Resource Recycle Society;
  (7) Trans-boundary movement of E-Waste;
  (8) Sound Management of Chemicals;
  (9) Environmental Governance in Northeast Asia; and
  (10) Environmental Industries and Technologies

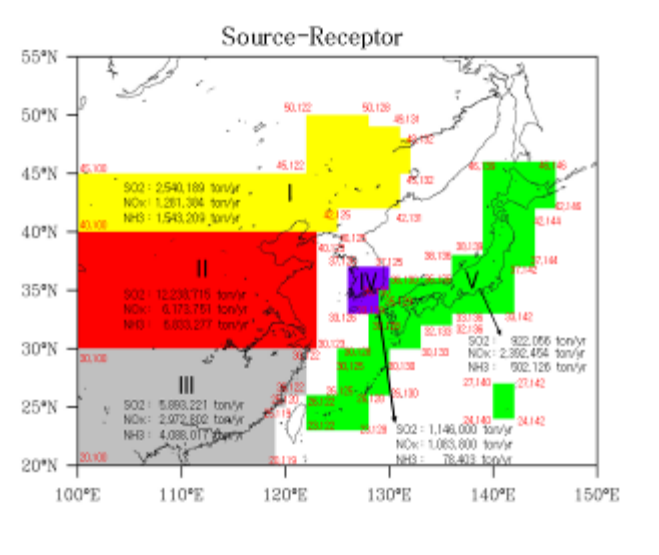
V. Tripartite Presidents Meeting (TPM) among CRAES,NIES,NIER

- Chinese Research Academy of Environmental Sciences (CRAES), National Institute of Environmental Studies, Japan (NIES) and National Institute for Environmental Research, Korea (NIER)
- Annual meeting since 2004
- eight cooperative priority areas : fresh water, air pollution including vehicle pollution and trans-boundary air pollution, dust and sandstorm, hazardous substances pollution, such as EDS and POPs, biodiversity conservation, climate change and solid waste management.

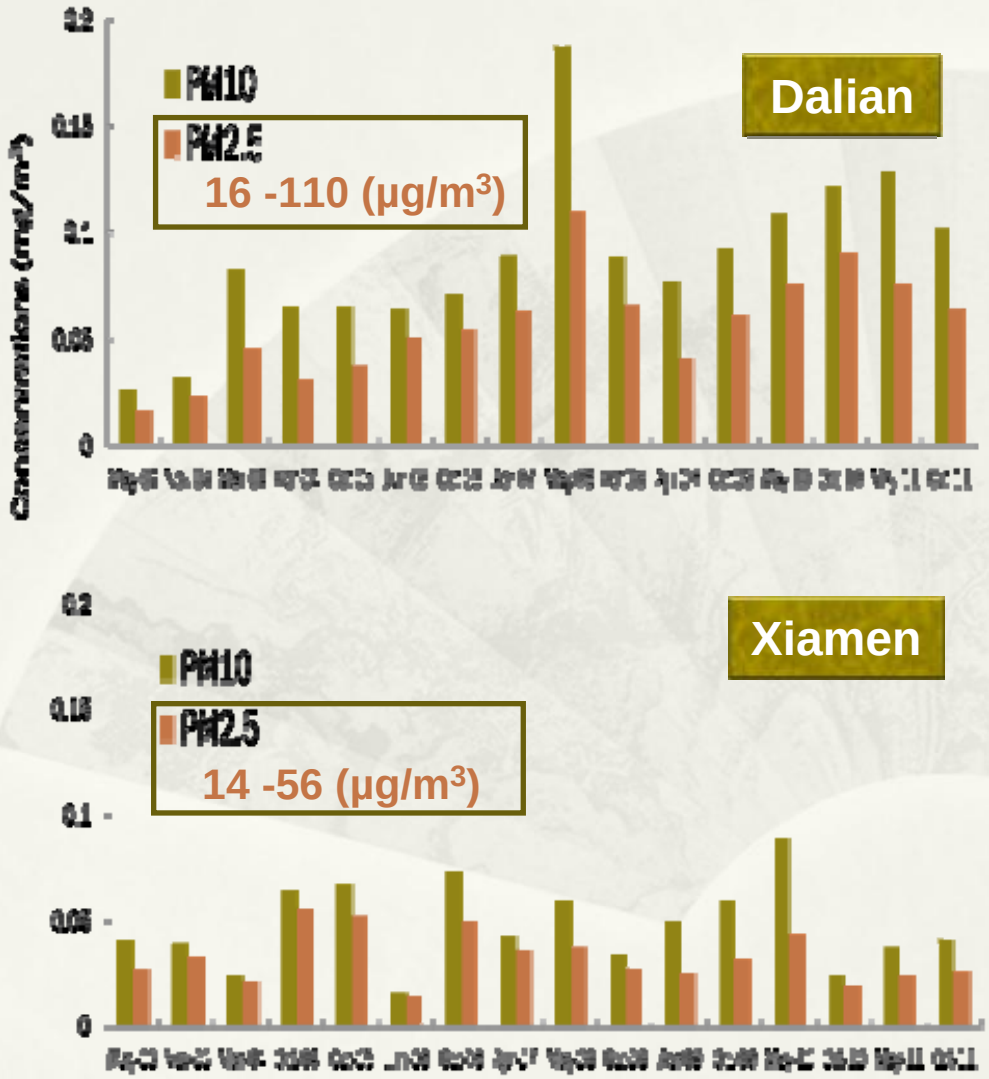
Chapter 2: China's participation regional/sub-regional scientific programs/projects on TAP

1. LTP project in China

- 3 sites in Dalian, 2 sites in Xiamen for long-term monitoring since 2002.
- Twice per year (spring and autumn), 10-day intensive monitoring also performed respectively in Dalian (Fujiazhuang) and Xiamen (Xidong) since 2003.
- The research on S-R for SO2 and NOx related deposition conducted for 2002 and 2006 using CMAQ regional AQ model.



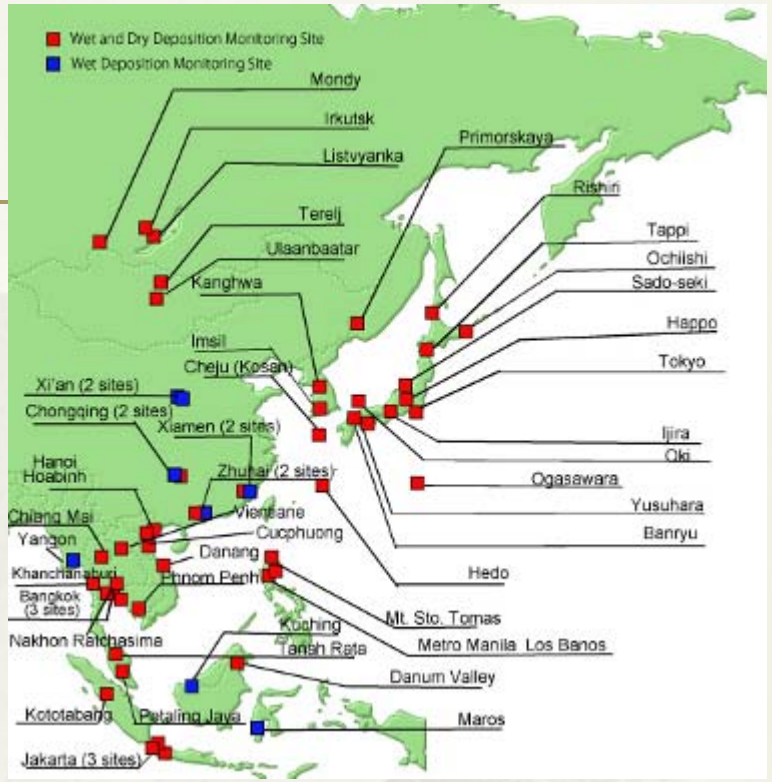
PM in Dalian and Xiamen

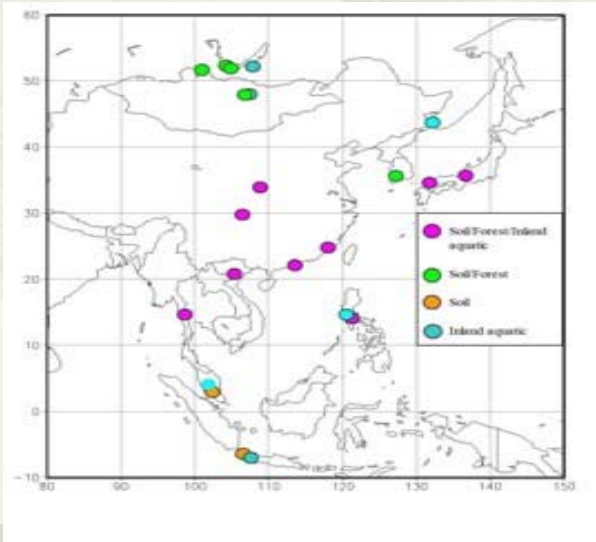


Long-range Transboundary Air Pollutants in Northeast Asia Project (LTP)

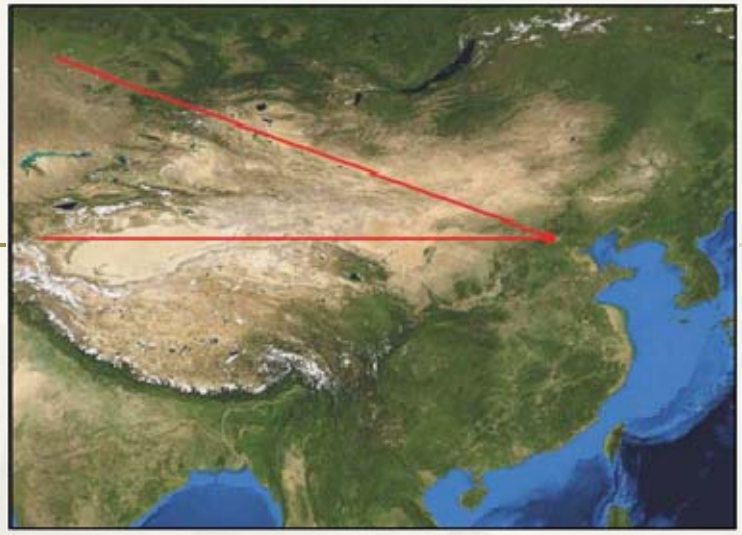
2. EANET project in China

- 2 sites in Dalian, 2 sites in Xiamen 2 sites in Chongqing , 2 sites in Zhuhai for wet and dry deposition.
- 4 Ecological monitoring sites
- Provide open monitoring data before other monitoring data open to public in 2011
- Training and data QA/AC of international standard





3. Sand dust storm

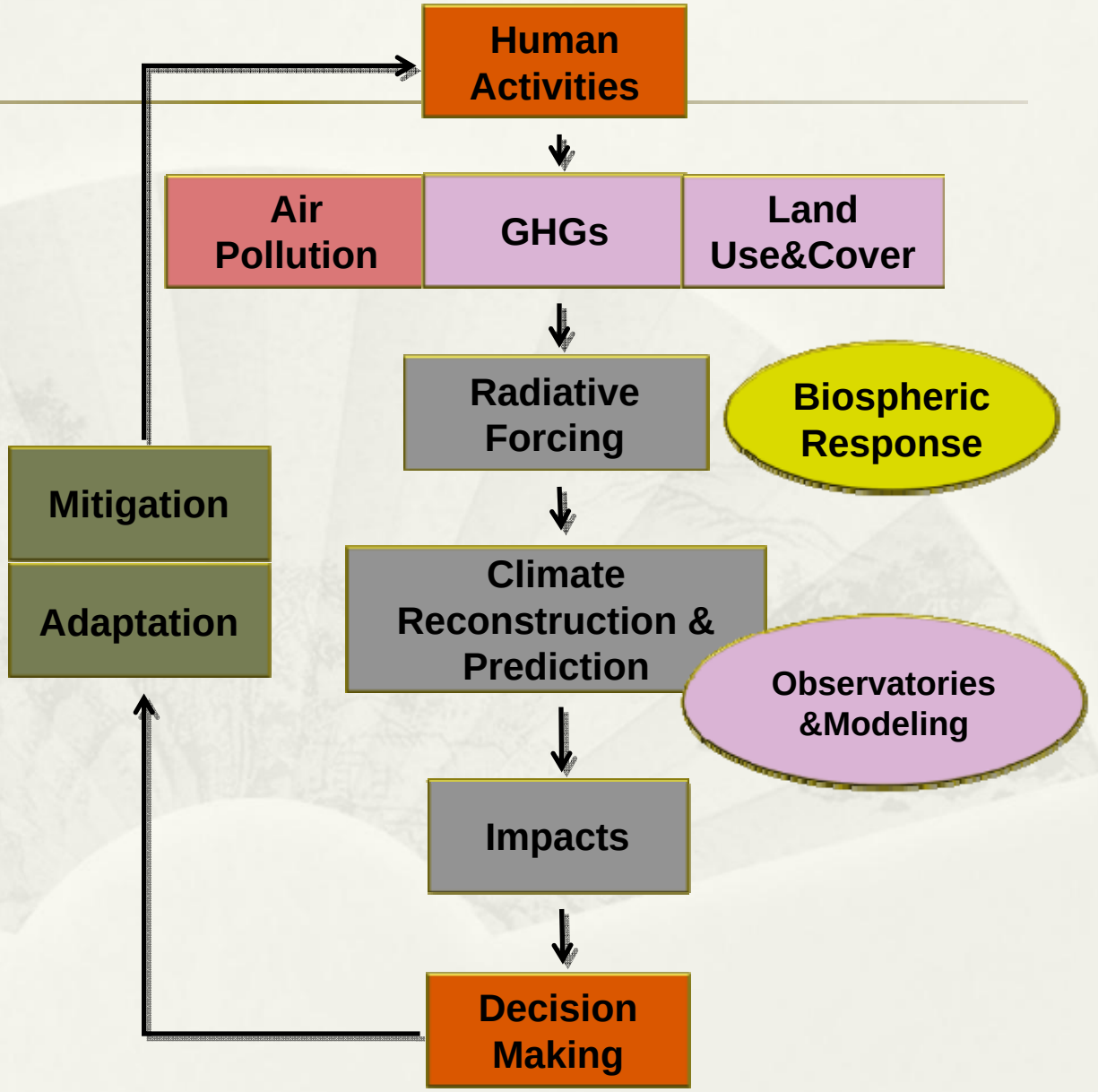


- Two regions have a high frequency of dust storms, one located in the western Taklimakan Desert and the other one in the west Inner Mongolia Plateau.
- 2 paths of sand storm transportation making effects on East Asia. 1) Western path: Cold fronts related to the Siberian High 2) Northern path: Cold fronts from northwest of Lake Baikal merge with strong winds flowing northeast toward an intense low pressure cyclone over eastern Mongolia.
- PM monitoring and ecology monitoring.


4. ABC – Asia Programme
UNEP
ATMOSPHERIC
BROWN CLOUDS

ABC Phase II Framework

- Four year plan
- ABC observatories and data archive
- Climate change
- Impact study reports (Agriculture, Water and Health)
- ABC Emission Inventories
- BC bulletin



Expanded UNPE/ABC Science Team

ABC International

Coordinate the 3 regions and implement activities on cross cutting areas. Facilitate the implementation of adaptation and mitigation programmes

V. Ramanathan (Chair), Chair ABC-Asia, Chair ABC-Africa, Chair ABC-Latin America

ABC-Asis

Coordinate the scientific activities in Asia. Facilitate the Implementation of ABC observatory programme and impact assessment programme

T. Nakajima (Chair); A. Jayaraman, S. C. Yoon, and Z. Yuanhang (Vice Chairs); V. Ramanathan, P. J. Crutzen, G. R. Carmichael, S. Fuzzi, H. Rodhe, K. R. Kim, M. G. Lawrence, G. Y. Shi, J. Srinivasan. Y. Kondo (Members);

Ex-officio members: IPCC (R. K. Pachauri), and WMO (L. Jalkanen)

ABC-Africa

ABC-Latin America

UNEP-ROAP

Health Impact G.
CRI

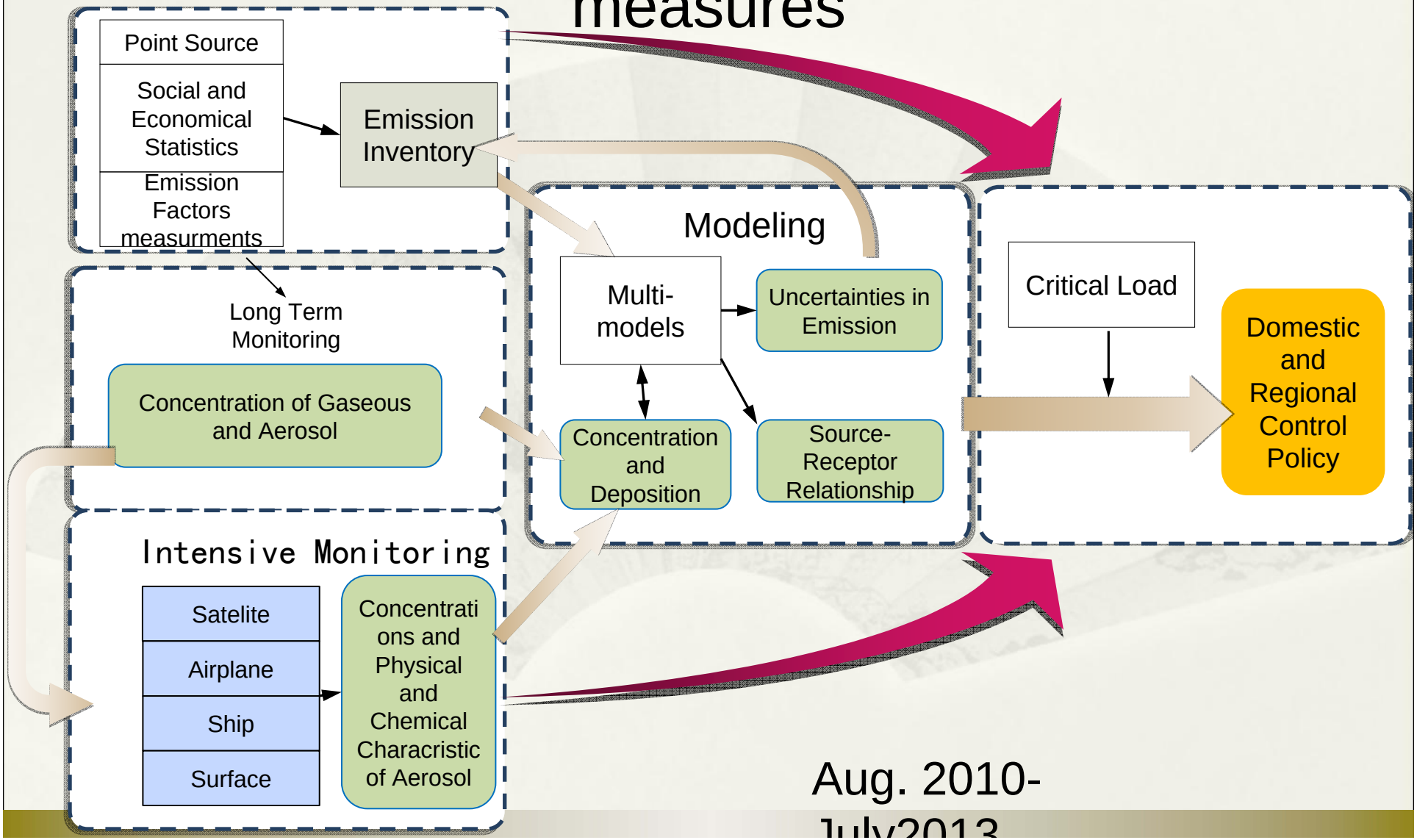
Observatory G.
Site managers

Agriculture impact G.
IARI

Modeling G.
G. CarMichael

Water impact G.
NTU

5. Study on Long-range Transport of Air Pollutants in Northeast Asia and Counter-measures



Aug. 2010-
July2013

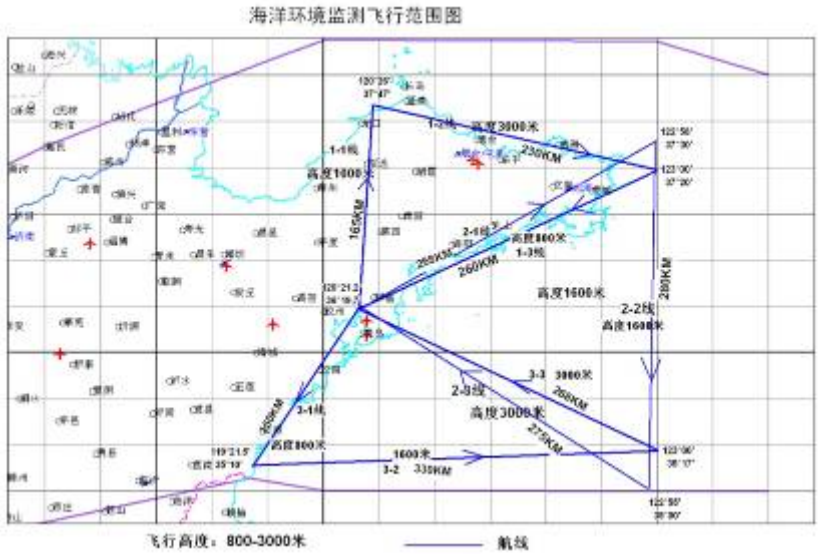
Intensive Surface Monitoring

Duration： Spring, 2011 and 2012, 20days

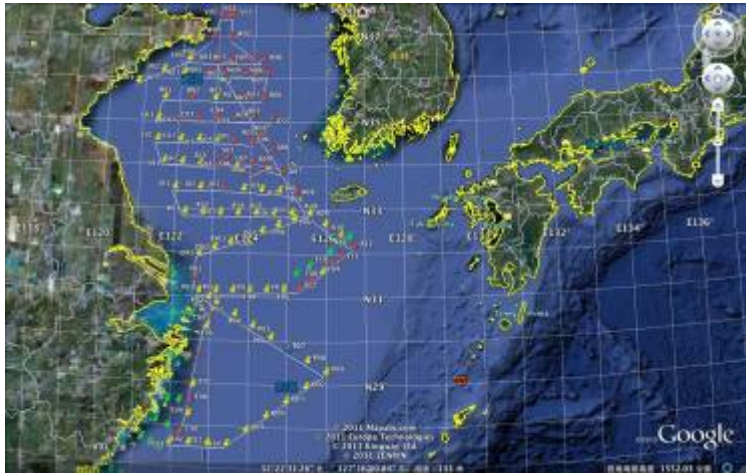
Location： Changdao, Shandong Province, Hongze Lake, Jiangsu Province

Instrument	Specification	Item Measured	Producer
O_3	0-1000 ppb	O_3	**TE**
Nox	0-1000 ppb	Nox	**TE**
SO_2	0-1000 ppb	SO_2	**TE**
CO	0-100ppm	CO	**TE**
VOCs	0-500ppb	VOCs	**Dadi-encon, China**
Size Distribution	0.03～10 μm Frequency：10min	Size Distribution	**TSI**
Nephelometer Aethalometer	aerosol absorption and scattering	aerosol absorption and scattering	**TE**
Lidar		Wind Profile and Height of Mixing Layer	**SIBATA, Japan**

Airplane Measurement



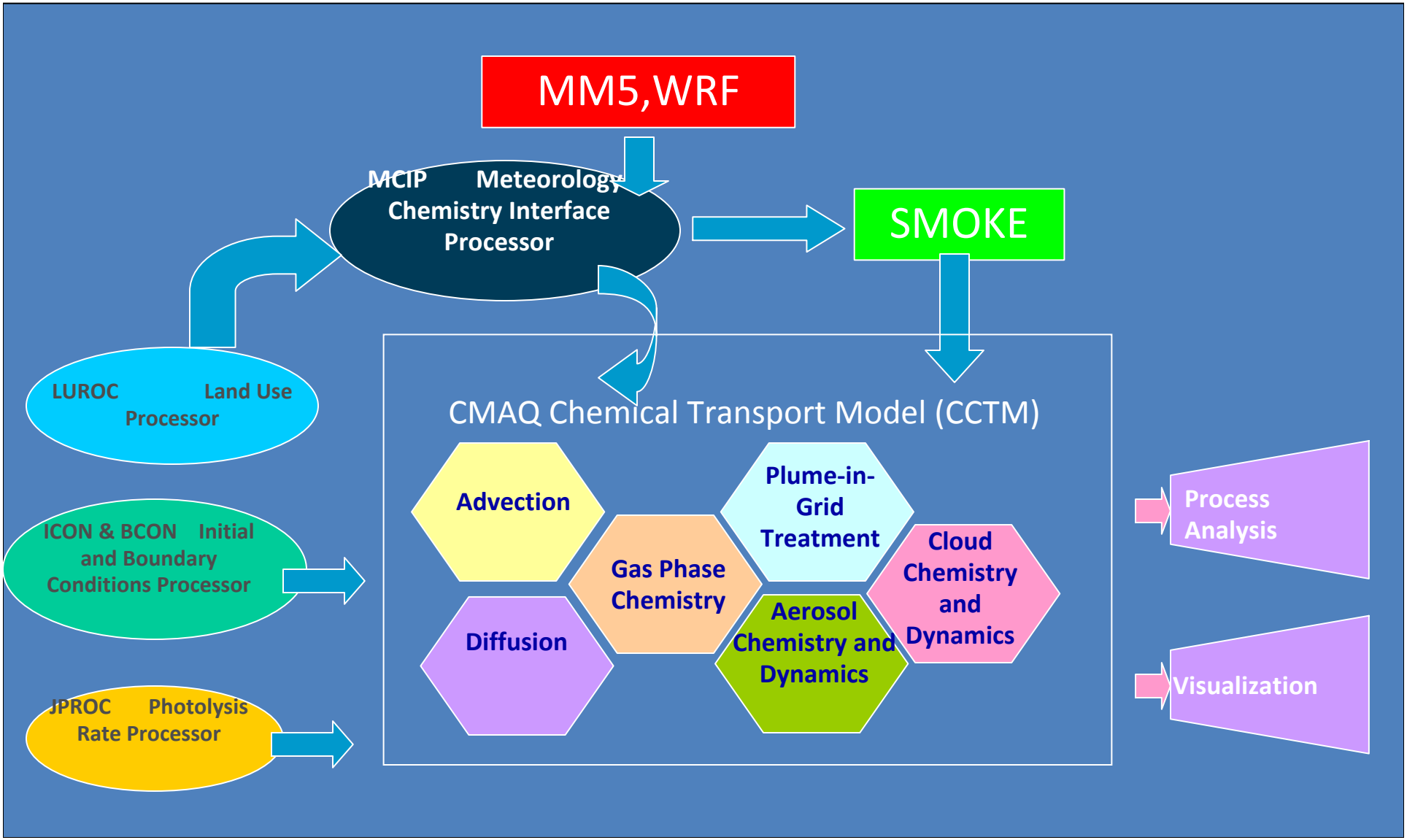
Ship Measurement



March 17—April 7, 2011

Instruments	Specificatioin	Item
TE 49i, O3	0-1000 ppb	**O3**
TE 43i, Nox	0-1000 ppb	**Nox**
TE 42i, SO2	0-1000 ppb	**SO2**
TSI, Size Distribution	0.03～10 μm Frequency：10min	**Size Distribution**
Nephelometer Aethalometer	3wavelength 7wavelength	**aerosol absorption and scattering**
Chemical Composition	**Chemical Composition Of PM2.5**	**Ion ,Element , OC, EC**

CMAQ Modelling System
CMAQ version 4.7



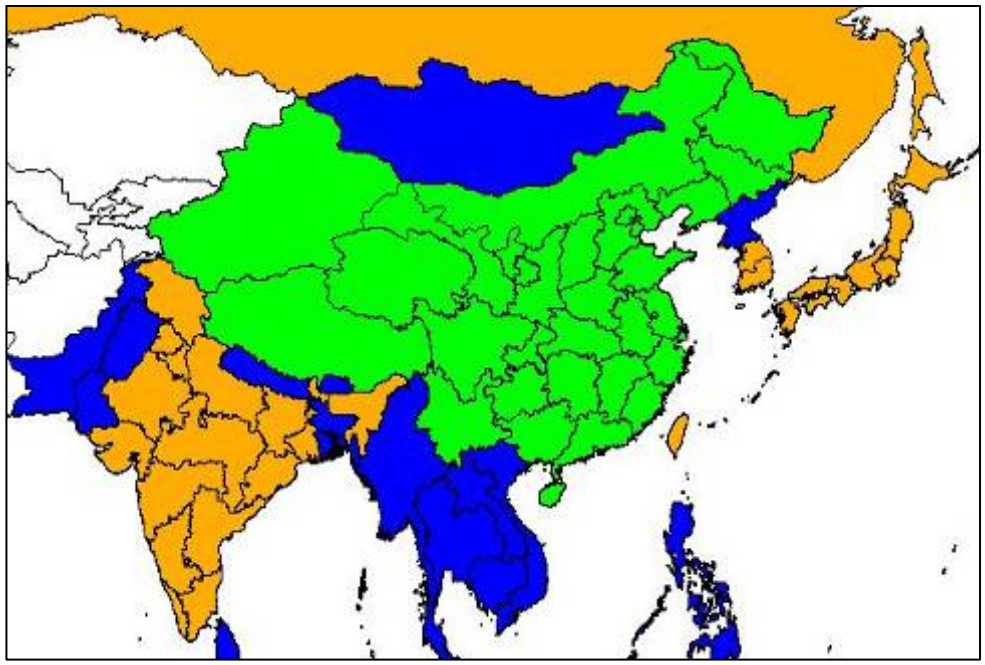
Emission Inventory

Base Year： Updated from 2007

Emission Sources: Stationary and Mobile

Pollutants: SO_2、NO_X、VOCs、NH_3、PM_{10}、CO和Hg

BC: On-going project for on-road mobile source, project for other source categories will start in 2012

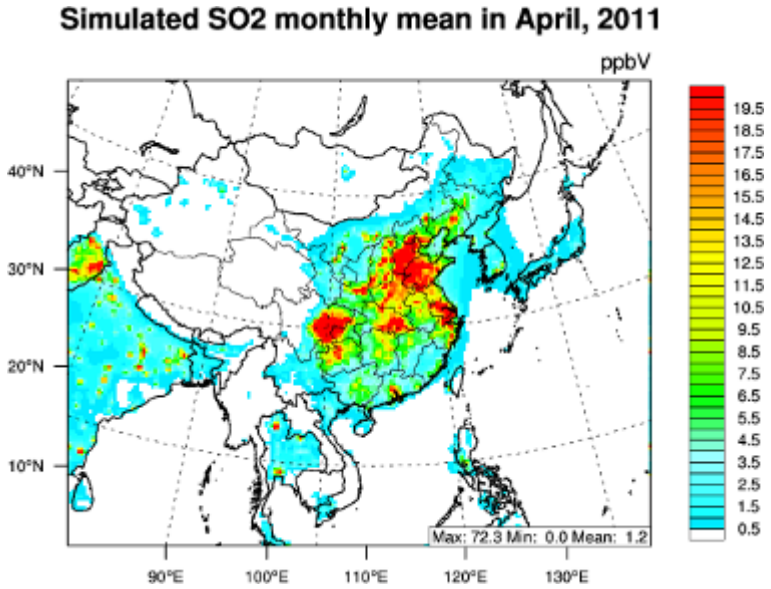


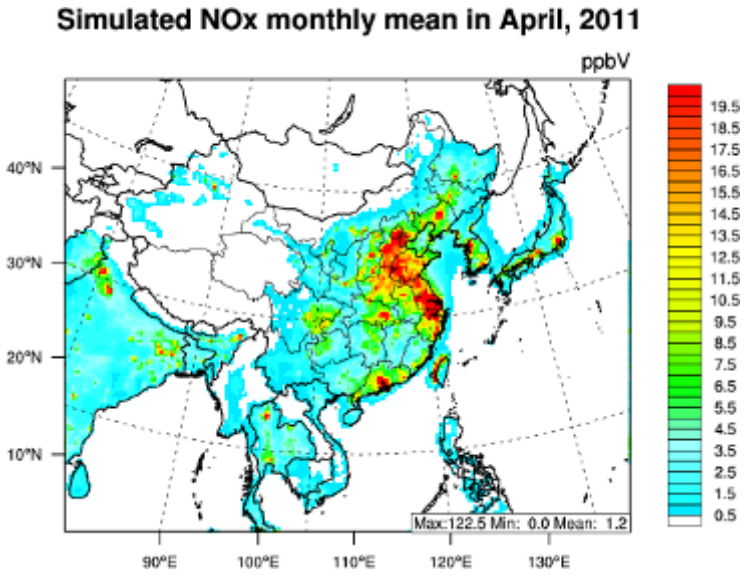
Emission Inventory to be updated in this project

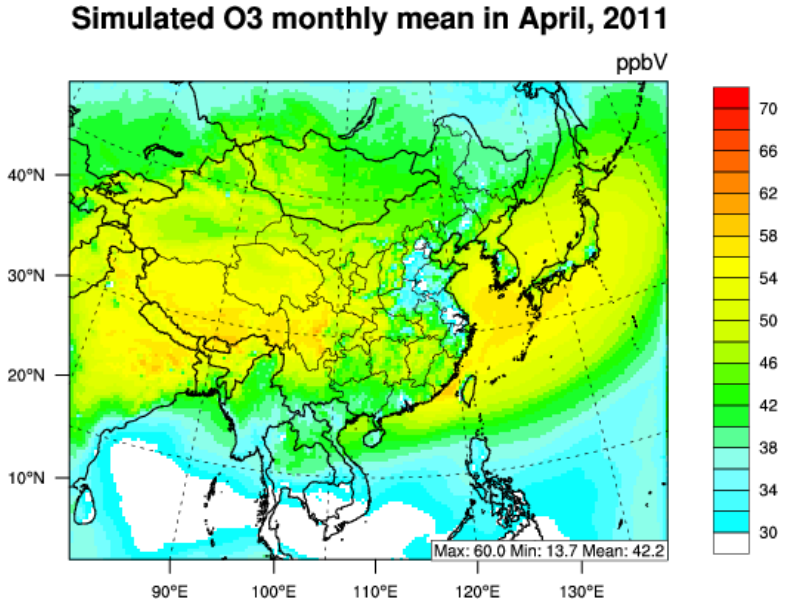
INTEX-B Emission Inventory

Data from other sources

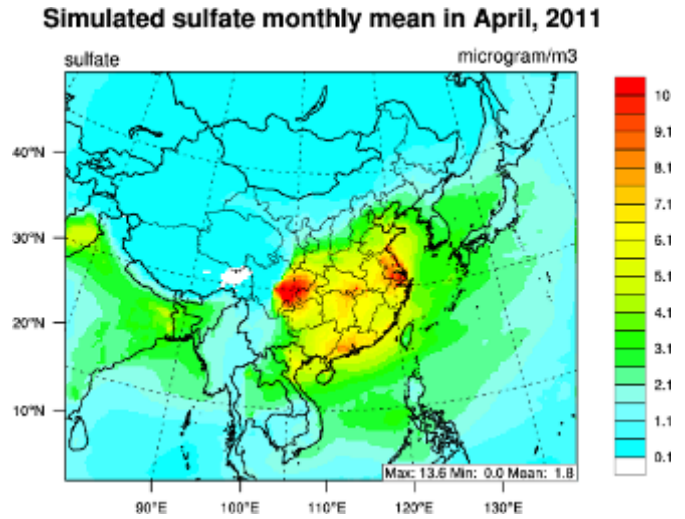
Monthly Averaged Gaseous Concentraion in April, 2011

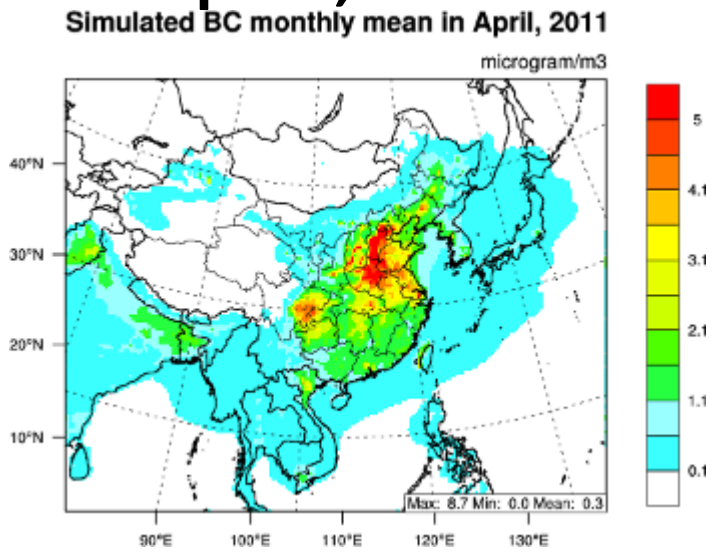


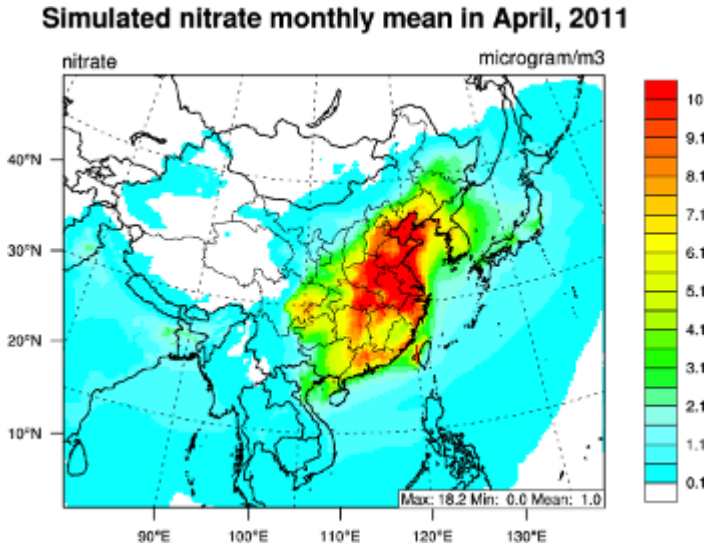


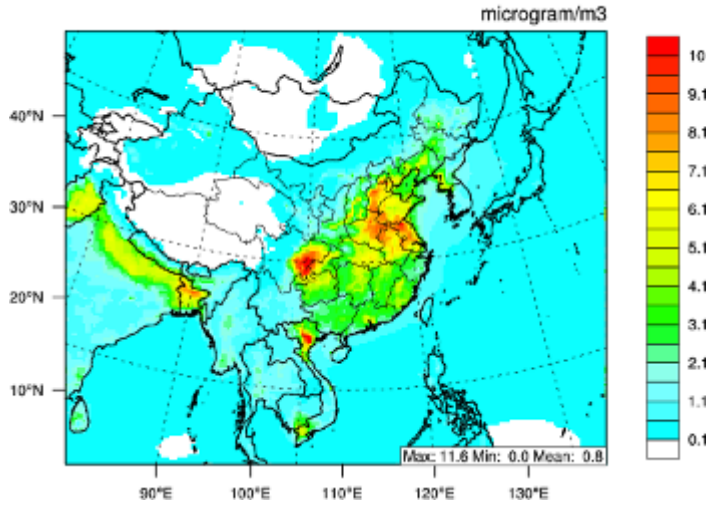


Monthly Averaged Aerosol Concentraion in April, 2011

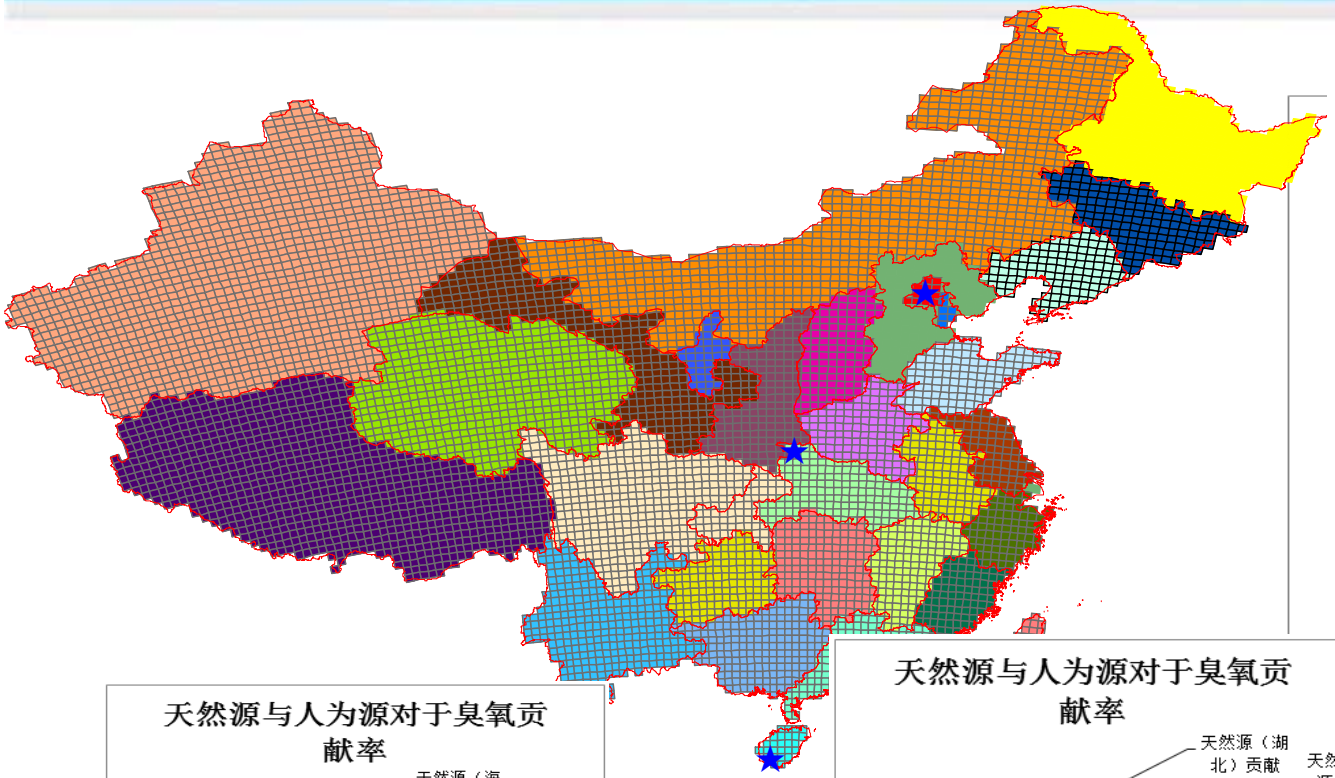




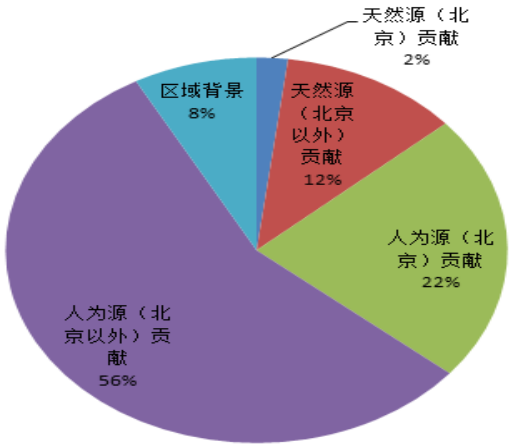


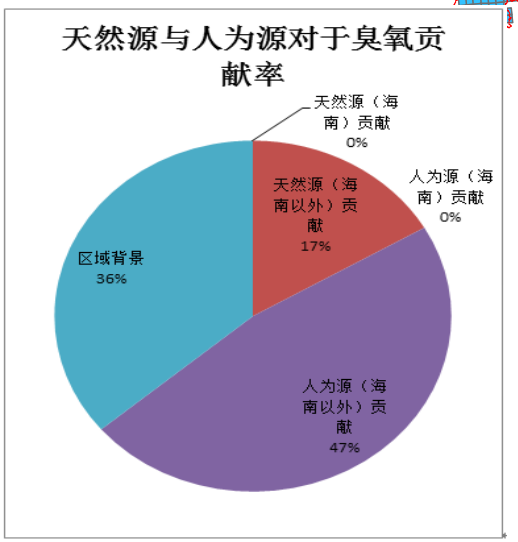


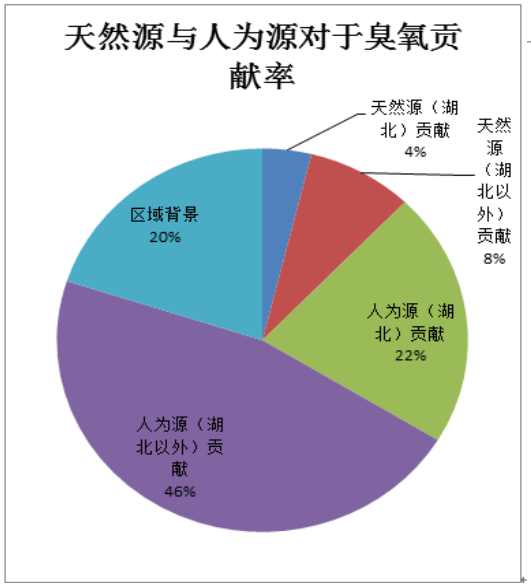
CAMx臭氧生成源解析技术的试算



OSAT：分区域、分行业追踪





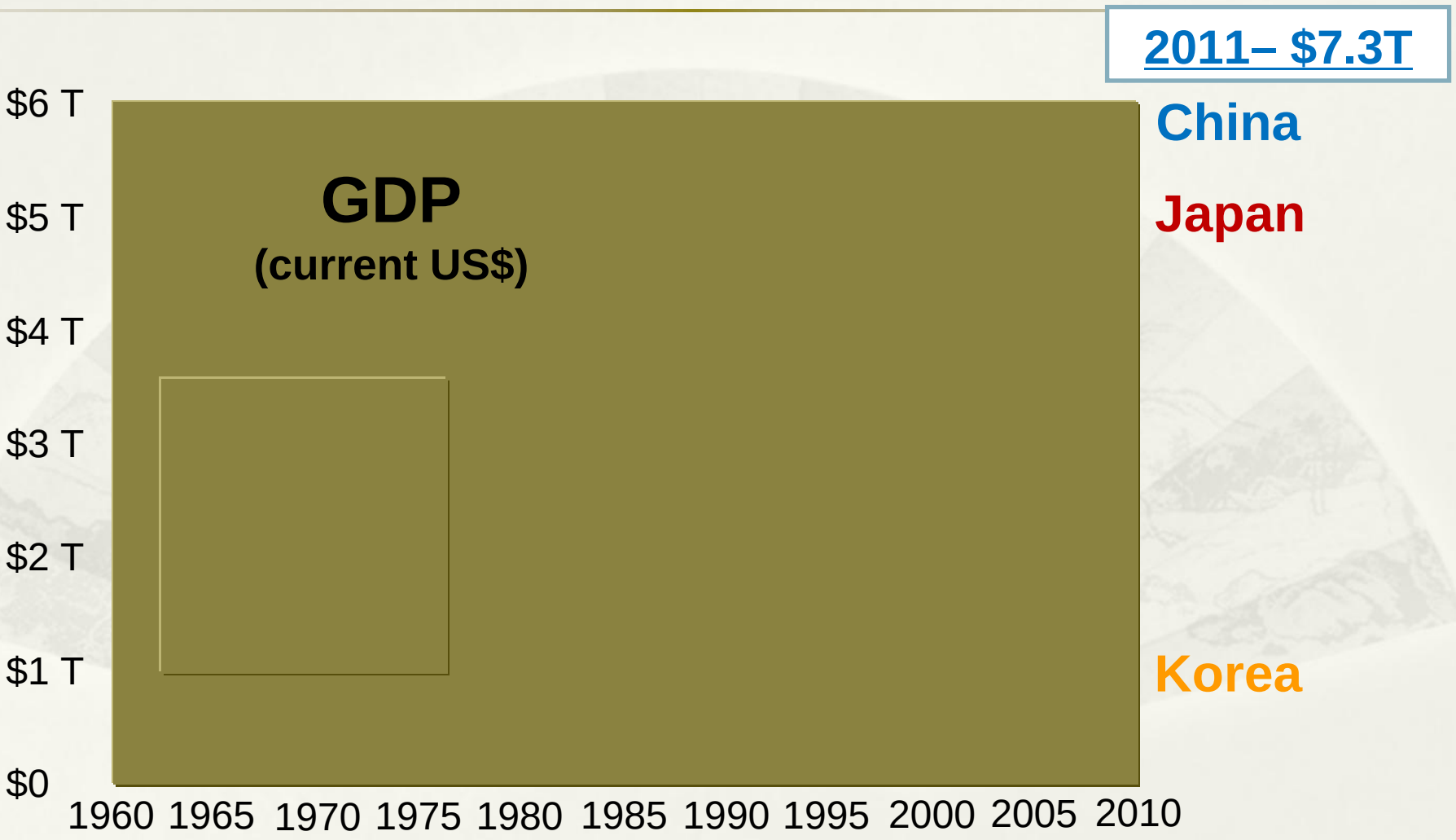


6.Other projects

- TRACE-P (Jacob, 2002)
- INTEX-B (Singh, 2009)
- Model Inter-comparison Study (MICS-Asia)

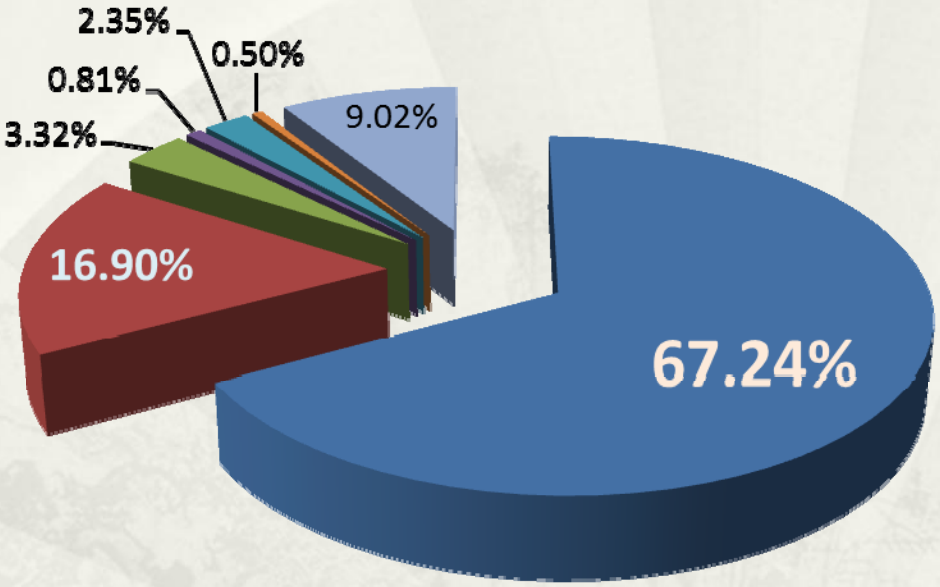
Chapter 3:
Air pollution in China: impacts and national measures to mitigate air pollution with focus on PM2.5

Economic growth



Data from World Bank, 2012 ©2012 Google

Energy structure



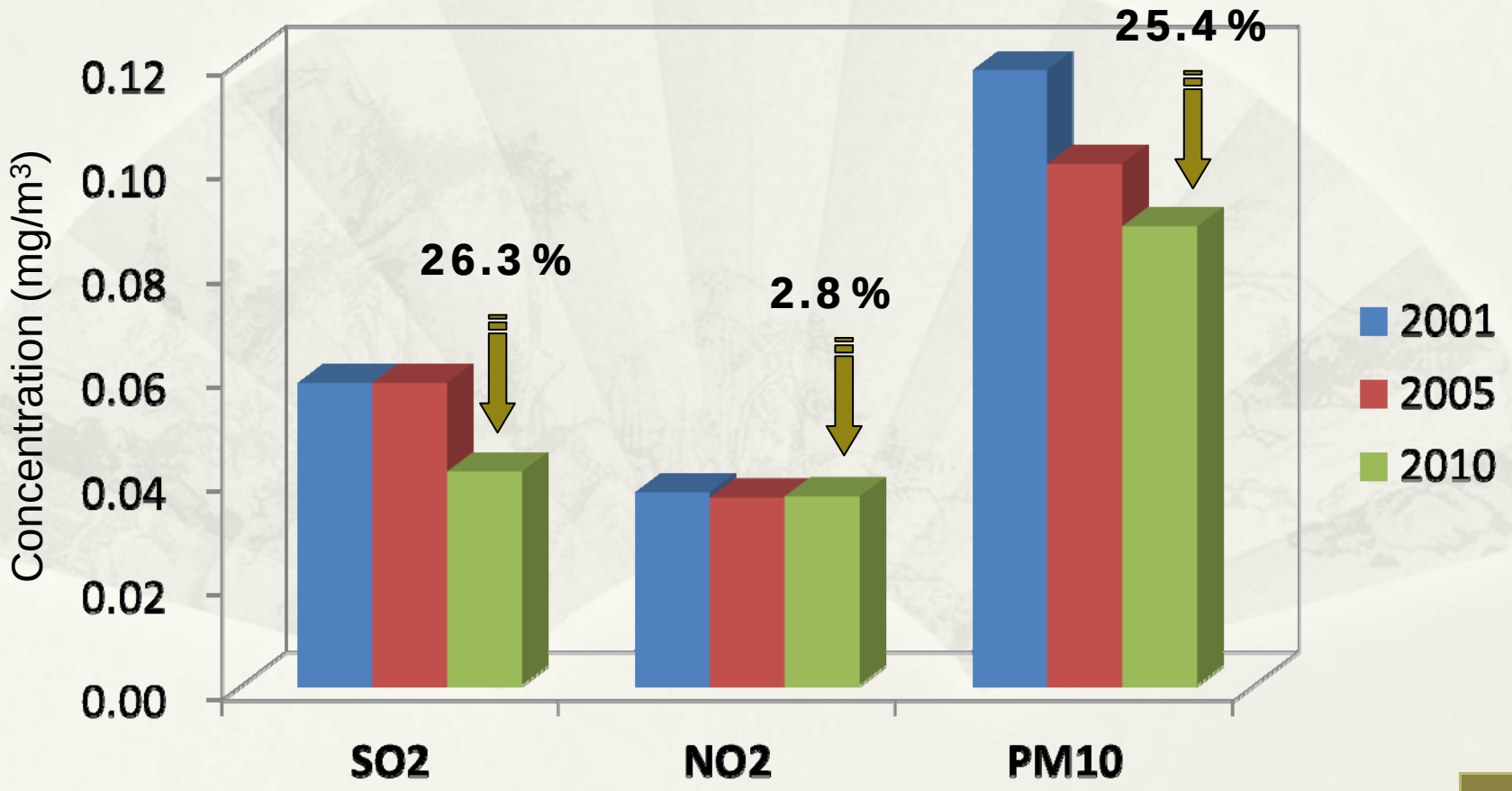
2009 Total primary energy supply (TPES) in China

- Coal and Peat
- Crude Oil
- Natural Gas
- Nuclear
- Hydro
- Geothermal, Solar, etc.
- Biofuels and Waste

"2009 Energy Balance People's Republic of China"
International Energy Agency

Achievements on air pollution control Efforts

Averaged annual concentrations in China



2011, China National Environmental Monitoring Center (CNEMC)

New challenge

Air pollution type changing

coal-burning pollution → combined pollution

↓

Fine particles increasing **(PM2.5)**

↓

Haze pollution

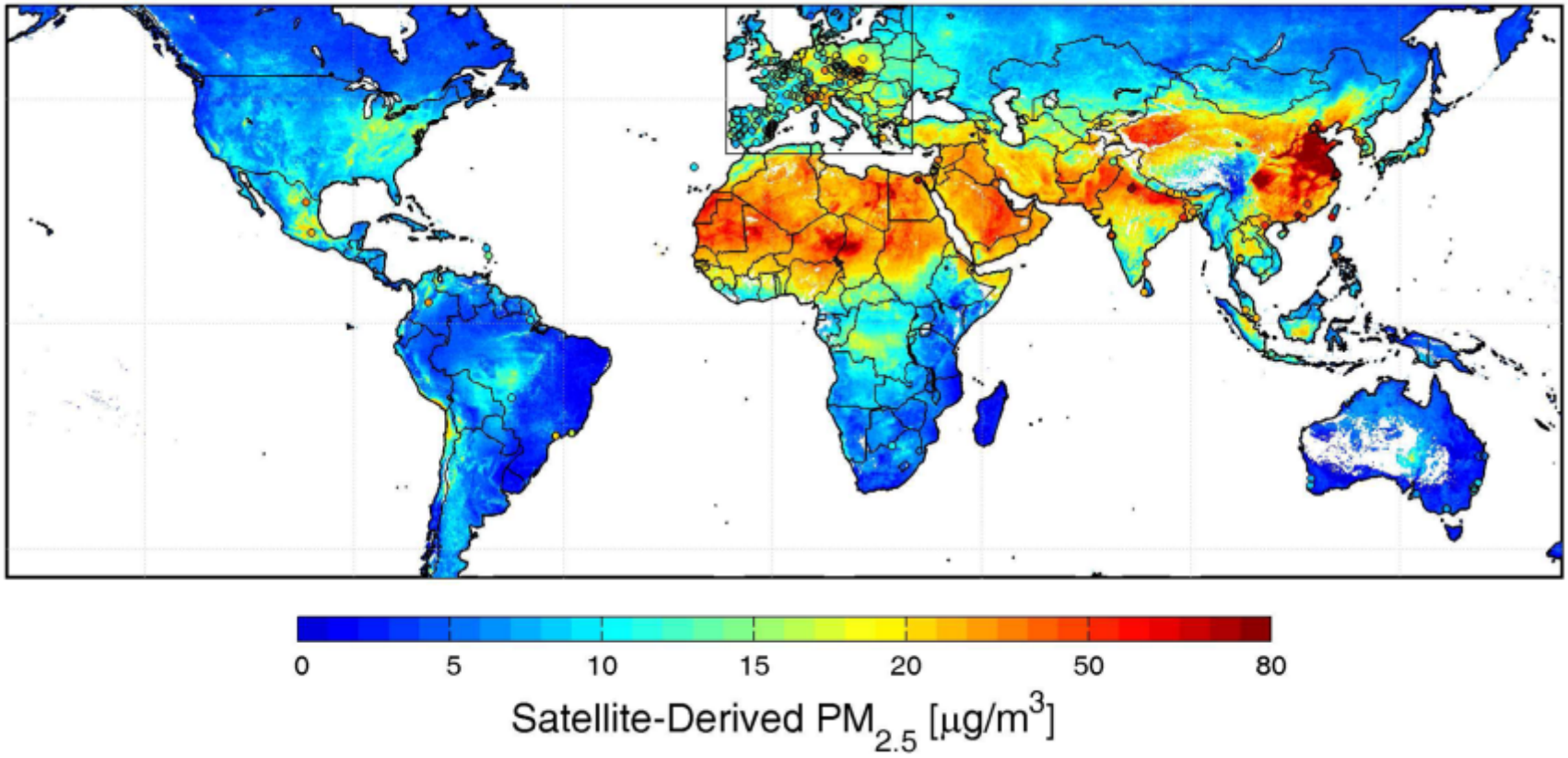
Visibility degrade

Health effect

Haze harms Beijing air on Jan. 10, 2012

[China.org.cn, January 16, 2012.
http://www.china.org.cn/environment/2012-01/16/content_24416460.htm]

Global ambient $PM_{2.5}$



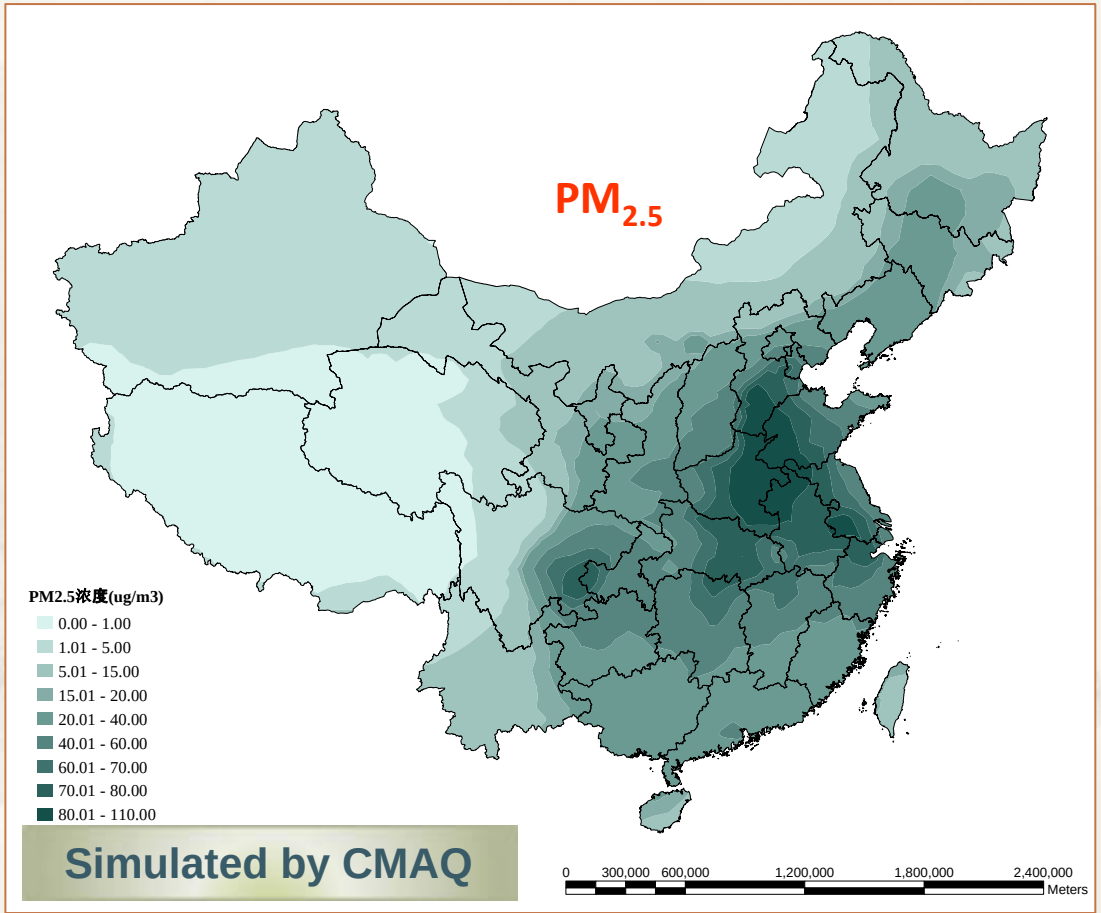
Population-weighted geometric mean concentrations (µg/m^3)

Global 20 North America 10 East Asia 34

Aaron van Donkelaar, et al. 2010. Global Estimates of Ambient Fine Particulate Matter Concentrations from Satellite-based Aerosol Optical Depth: Development and Application. Environ Health Perspect :-. doi:10.1289/ehp.0901623

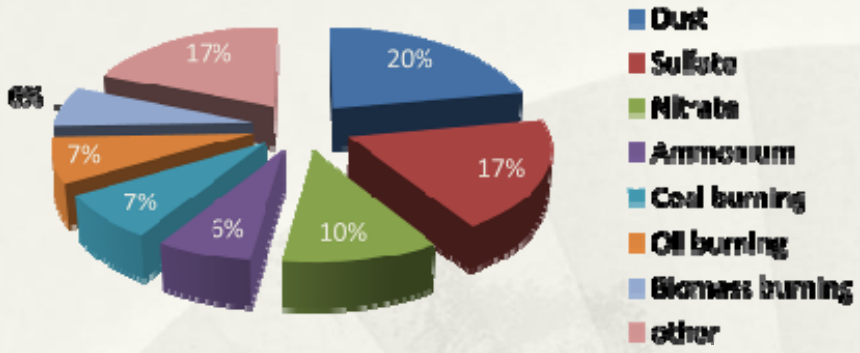
$PM_{2.5}$ pollution in China

- **Extremely high $PM_{2.5}$ concentration in eastern area;**
- **$PM_{2.5}$ in 1/2 of China exceeded the new standard (annual 35 $\mu g/m^3$) ;**
- **Some regions, 4 - 6 times higher than the standard value.**

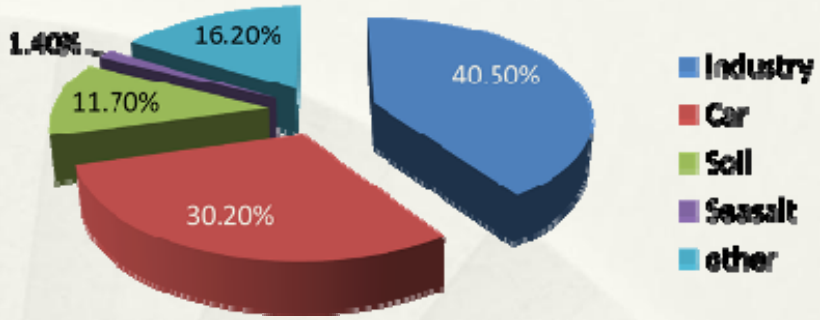


Chinese Academy For Environmental Planning, 2011

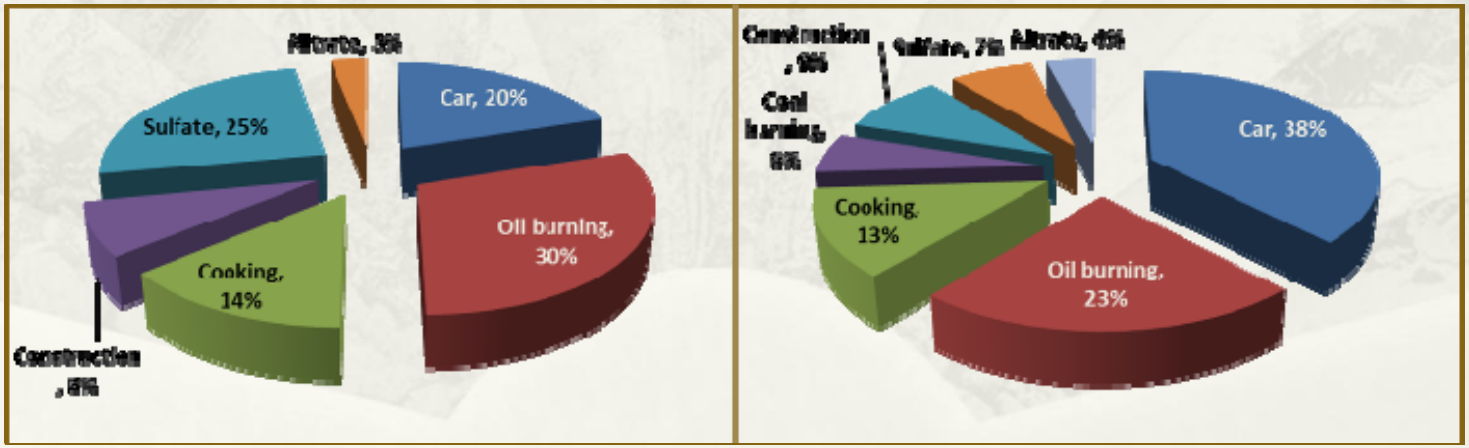
Contributions of $PM_{2.5}$



Beijing



Xiamen



Summer and winter in Shenzhen

Ambient air quality standards

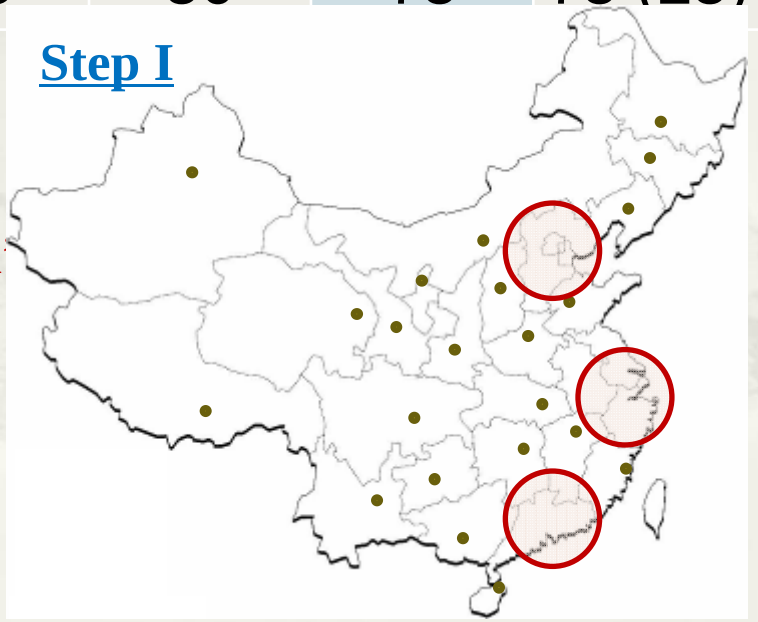
(μg/m³)	EU	US	JAPAN	KOREA	CHINA	WHO
$PM_{2.5}$ (annual)	25	15	15	25	35	35 (10)
$PM_{2.5}$ (daily)		35	35	50	75	75 (25)

4-steps in China:

I.2012 – "Beijing region" (Beijing, Tianjin, Hebei), "Yangtze River Delta Region" (Shanghai etc.), "Zhujiang River Delta region" (Guangzhou etc.) and provincial capitals

II.2013 - 113 key cities next year,
III.2015 - all major cities
IV.2016 - nationwide

Step I



** By the end of 2011, 56 cities in China had been able to monitor PM2.5, with 169 sets of equipments ready for such monitoring.*

Local government control strategy for PM2.5

- Coal-burning emission control, including replacing the residential heating systems and boiler for electricity and natural gas.
- Coal fired power plan.
- Car emission control, e.g. new emission standard in Beijing V and National V.
- Industrial emission controls
- More forest and grassland in cities.

Chapter4: Scientific Problems to be addressed

The major air pollution problems are as following:

- Regional particulate air pollution or haze; PM2.5 control program in China; Air pollution in Megacity area
- Troposphere ozone or photochemical smog
- Air pollutant deposition, acid deposition, air pollutants deposition to ocean, BC deposition to snow/ice
- Toxic air pollutants such as Hg and other heavy metals, POPs such as PCDD/Fs(dioxins),PCBs, PAHs, etc.
- Interaction of air pollution and climate
- Health impact
- Long term regional air pollution trend and future prediction. Regional control program of each country. Regional strategy and the effectiveness assessment of current regional control mechanism and programs.

Uncertainties existing in following issues:

- Emission inventory of China especially VOCs emission of both anthropogenic and biogenic, mobile sources, biomass burning, fugitive source of dust.
- Trans-boundary transport of air pollutants including primary air pollutants and secondary air pollutants. Synoptic and climate processes.
- Regional photo-chemistry mechanism, including transport of ozone and precursors; photo-chemistry mechanism study using smog chamber and modeling; developing tools to assess the source-receptor relationship
- Aerosol mechanism related to long-range transport including aerosol composition change, new particle, heterogeneous reaction
- Impact of aerosol on atmospheric radiation (radiative forcing), including direct forcing of aerosol and aerosol-cloud interaction; black carbon on snow, etc.
- New technology of monitoring, modeling for regional air pollution research

Suggestions for cooperation research in the future

- An intergovernmental scientific body for regional air pollution problem with credibility or authority is needed to coordinate the research activities
- long term plan or strategy for research
- knowledge and data sharing, review and disseminate the findings.
- Cobine the internatinal projects/program with domestic ones
- Comprehensive scientific assessments of current scientific, technical and socio-economic information
- Assessment of potential consequences such as health, climate ,economy, social development and possible options for control the problem.

Thank You !


中国环境科学研究院
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