Progress of GAINS application to China, Korea and other parts of Asia

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Toward an Integrated Approach to Co-benefit in Asia, 6-7 March 2014, Yokohama, Japan
GAINS and its concepts continue to be used in research and policy relevant discussion in Asia

- GAINS – China
- GAINS – City
- GAINS – Korea
- Use of GAINS in several international activities in Asia
  - HTAP (UNECE Task Force on Hemispheric Transport of Air Pollution)
  - MICS – III (Mode Intercomparison Study for Asia)
  - TCAP (Toyota Clean Air Project)
- Other developments
GAINS-China

- Continuing cooperation with Tsinghua University
  - Maintenance and further development of GAINS-China
  - Incorporation of air quality legislation of 11\textsuperscript{th} and 12\textsuperscript{th} Five-Years Plans into GAINS
- Two Papers:
  - Wang S.X. et al. (2014) \textit{Emission trends and mitigation options for air pollutants in East Asia}. ACPD 14:2601-2674
- Assessment of CO\textsubscript{2} mitigation potentials for IEA baseline 450 ppm scenarios (with Energy Research Institute, Beijing, funded by Climate Works Foundation)
Future trends of NO\textsubscript{X} and SO\textsubscript{2} emissions

Source: Zhao et al. (2013), Wang et al. (2014)
GAINS-City for China

- Key question:
  Urban air quality management with co-benefits for GHGs

- GAINS application tailored for cities:
  - Simplified tool for (non-scientists) urban planners in China,
  - Finer scale resolution for urban PM2.5, linkage with CMAQ
  - Sharpened focus on energy efficiency, transport management, etc.

- Funded by Energy Foundation, China Energy Sustainable Energy Program (www.efchina.org)

- Implemented for Beijing and Jinan

- Development in 2010-2011, will be continued in summer 2014 (in collaboration between Tsinghua, Peking University, Princeton, IIASA)

- Publication:
GAINS – City: Example of results for Beijing:
Impact of air quality (left) and low carbon (right) scenario on emissions
GAINS – City: Example of results for Beijing:
Spatial distribution of NO$_x$ emissions from road transport in Beijing in 2005 and in the ‘Air Quality’ control scenario in 2030 (shown in the same scale)
GAINS-Korea

• The Korean government is considering different control strategies for individual provinces, especially for metropolitan areas and the other provinces – with maximum focus on co-benefits and green growth.

Starting perspective on air quality

• Partners:
  – National Institute of Environmental Research (NIER), Korea
  – Konkuk University, Prof. Jung-Hun Woo
  – IIASA

• Project duration: July 2013 – June 2016

• Improved spatial resolution:
  – Emission scenarios for 17 provinces
  – Dispersion and impacts at various spatial resolutions
Development of GAINS-Korea

Modeling Framework

GAINS-Asia (CREATE) • 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: 58x46, 54km; 36x66, 18km grid - MM5/SMOKE-Asia (Woo et al., 2012) - CAMx version 6.0 with OSAT (Ozone Source Apportionment Technology)

GAINS-Korea


Courtesy of Prof. Jung-un Woo
Development of GAINS-Korea

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

Stage 1 : Prototype
Stage 2 : Scenario Mode
Stage 3 : Optimization Mode
Other developments

• MICS-III/HTAP:
  Harmonization of GAINS-Asia emission inventories

• Toyota Clean Air Project:
  Systematic improvement of GAINS emission inventories in collaboration with national institutions, for
  – India (TERI) – new NMVOC inventory
  – Thailand (King Mongkut’s University of Technology Thoburi, Bangkok)
  – Indonesia (University of Indonesia, Research Centre for Climate Change)
  – China (Tsinghua University)
  – Entry point: co-benefits, initial focus on $O_3$, now shift towards PM2.5

• GAINS model updates:
  – Diesel generator sets, kerosene lamps, shale gas
  – Mercury, specific estimate of OM (and OC), temporal distribution
The Clean Air Policy Package

Adopted 18 December 2013

- Press release
- Questions and answers
- Press conference
- Follow-up questions to the press conference
- Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - "A Clean Air Programme for Europe"
  - Proposal and its annexes
  - Implementation plan accompanying the proposal
- Proposal for a Directive of the European Parliament and of the Council on the limitation of emissions of certain pollutants into the air from medium combustion plants
  - Proposal and its annexes
  - Implementation plan accompanying the proposal
- Proposal for a Council Decision on the acceptance of the Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone
  - Proposal and its annex
- Impact assessment accompanying the above proposals. See also the review page for the final policy scenarios of the adopted package
- Summary of the impact assessment
The new EU Clean Air Policy Package 2013

• Based on GAINS analyses
• CH₄ is recognized as an air pollutant – because of precursor of ozone
• Proposal for national emission ceilings for CH₄ (in addition to SO₂, NOₓ, PM2.5, NH₃, VOC)
• Push for implementation of no regret/‘negative cost’ measures for CH₄ (i.e., anaerobic digestion for large farms and food industry waste, reduced leakage of gas distribution;
• Cost savings from CH₄ measures (2.4-4.0 billion €/yr) compensate air pollution control costs (2.1-3.3 billion €/yr)
• To maximize co-benefits of air and climate policies