Current status and future potential of the multi-pollutant approach to air pollution control in Japan, China, and South Korea

Mark Elder, Naoko Matsumoto, Akira Oghara, Mika Shimizu, Andrew Boyd, Xinyan Lin, Sunhee Suk, Hideyuki Mori, Changsub Shim

International Workshop on Strengthening the International Cooperation Framework and Science-Policy Interface to Promote Air Pollution Control in East Asia 2014
March 7-8, 2014 Yokohama, Japan

Concept map of the Multi-pollutant Multi-effect (MPME) approach in the Gothenburg Protocol of LRTAP

Integrated Modeling (RAINS => GAINS) / EMEP Monitoring
- Interactions among pollutants
- Effects of pollutants
- Reduction technologies
- Reduction costs
- Transboundary movement

MPME’s Role in the LRTAP/Gothenburg Protocol
MPME as a system of scientific analysis
MPME Role: Support Negotiations
- Informs target setting
- Cost-benefit optimization
- Target concept, principles
- Scientific justification

GOTHENBURG PROTOCOL
- Legally binding treaty
- Reduction targets informed (recommended) by MPME
- But actual targets are decided politically
- Countries have different targets
- Targets are cost optimized

Negotiations for Revision of Gothenburg Protocol
- How to incorporate new pollutants (e.g. PM2.5)
- How to incorporate climate change?

Variety of Similar Concepts of MPME
- Integrated approach
- Multi-pollutant approach
- Risk based approach

- Sometimes different focuses on different multi-pollutants or different multi-effects (e.g. health, ecosystems)
- Basically it means a modeling system
  - Monitoring, modeling, transport
- Therefore, requires a certain level of scientific capacity
- Can be used in single countries or subnational geographic areas (not just for international cooperation)
Main Arguments

Conventional Thinking
- MPME is an integrated approach.
- MPME is closely linked to a legally binding treaty (LRTAP).
- Therefore, MPME may not be feasible in East Asia

Main Results
- MPME consists of several components.
- MPME is a system of scientific analysis, not a treaty
- MPME assists decision making about targets (sci./policy link)
- MPME improves effectiveness, lowers costs
- Can set targets without MPME, but will be less effective
- Components can be separated and implemented in steps
- China, Japan, Korea, already moving towards MPME steps (can be used domestically, not just for international treaties)
- Less developed countries can also begin steps

International cooperation can be helpful without a treaty
- Focus can be on information sharing & capacity building
- Can use MPME in E. Asia as a scientific system w/o a treaty
- Scientific epistemic community can promote MPME

Northeast Asian Countries Already Moving in MPME Direction (Domestically)

<table>
<thead>
<tr>
<th>Country</th>
<th>Direction</th>
</tr>
</thead>
</table>
| China    | China GAINS (not endorsed by the government)  
Regional management system in 12th FYP => Future domestic LRTAP  
Beijing Olympics control system: Mini-temporary domestic LRTAP  
Government is supporting related research |
| Korea    | Korean GAINS under development  
Related research underway |
| Japan    | Developing systems similar to GAINS  
Related research underway |
| Russia   | Member of LRTAP  
Promoting NEA LRTAP-type framework in NEASPEC |

China: Regional Air Pollution Management

- 12th Five Year Plan On The Prevention And Control Of Air Pollution In Key Regions
- Further elaborated by the Air Pollution Action Plan of Sept. 2013
- China’s domestic pollution is transboundary;
- Provinces & local governments can’t address internal pollution
- Designates key regions and city clusters
- Sets up coordination mechanisms
- Regional management is a key policy
  - Stronger targets & implementation measures
  - (e.g. stronger EIA, tech. requirements, industrial adjustment, key projects, etc.)

Analysis
- Good policies on paper / difficult to implement
- Sets up a coordination structure
- (But coordination may be difficult)
- Originates from Beijing Olympics w/modeling
- Modeling/MPME analysis could be incorporated
- Could become domestic LRTAP
- Beijing Olympics: Was a mini (temporary) domestic LRTAP

Importance of National Models (not just unified regional model)

- Countries can address domestic transboundary movement
- Countries can estimate international transboundary movement
- Analysis of cost effectiveness can be used domestically

- NEA countries already developing them.

European/LRTAP Case
- Development of several national GAINS models (e.g. Italy, Ireland)
- Only some countries have national models
- National GAINS models are more detailed
- Used to negotiate obligations with EU and implementation with local governments
Major Advantages of MPME (& GAINS-type Models)

- Cost Effective Reductions
- Differentiated Targets (in International Agreements)
- Countries can’t achieve reductions on their own (and costs are not minimized)
- LRTAP: country can negotiate with LRTAP & local authorities

Not just about transboundary movement

East Asian countries should be interested in cost effectiveness and differentiated targets.

Necessary Capacity for MPME

Key Foundation: Scientific Capacity
(Many developing countries lack)

Scientific
- Analytical capability (human resources)
- Multidisciplinary cooperation
- Monitoring capability

Administrative
- Officials need some technical understanding
- Ability to coordinate between departments
- Legal framework that allows differentiated targets

International cooperation
- Means for international cooperation among scientists
- Mechanism for information sharing
- Means for scientists to communicate with policymakers

MPME Cooperation Images

LRTAP: TOP DOWN
- Italian GAINS
- LRTAP/GAINS
- Netherlands GAINS

EAST ASIA: BOTTOM UP?
- China GAINS Regional Mgmt
- Japan Integrated Model
- Korea GAINS
- Ireland GAINS
- Voluntary Cooperation
- Russia (from LRTAP)

Only a few countries have national GAINS
National models based on central one

4 NEA countries developing models
Models have significant differences
Maybe benefits from cooperation

MPME Steps and Choices: Overall

Main Ideas
- MPME can be introduced in a stepwise manner
- Range of possible focuses for pollutants & effects
- Focus first on scientific analysis, then incorporate into policy (variable scientific support for an influence on targets)
- Targets: range of possible magnitudes, types, principles

Scientific Analysis
- Start with studies & models
- Focus on interactions & effects
- Less emphasis on transboundary aspects

Policy
- Start with domestic policy framework
- International cooperation can use various models
- International cooperation can be voluntary
- May recommend differentiated targets
Multipollutant-MultiEffect Approach and Regional Cooperation

MPME APPROACH

Scientific System (Monitoring, Modeling) ↔ Treaty: LRTAP (Reduction targets)

Conditions:
- National scientific capacity
- Neutral institute
- Cost effective reductions
- Transboundary movement
- Can calculate cobenefits
- Scientific system recommends targets
- LRTAP is legally binding
- Legally binding not essential
- Could be domestic

Recommendations for East Asia
- MPME can be good focus for cooperation
- Develop the scientific system first, treaty later
- Capacity building may be needed for SEA, other Asia
- (NEA countries already developing MPME elements)

Thank You!

Acknowledgment: this research was supported by the Environment Research and Technology Development Fund (5-7-3) of the Ministry of the Environment, Japan.
Adapted from Paper Prepared for the Society for Environmental Economics and Policy Studies (SEEPS), 18th Annual Meeting, Univ. of Kobe, (Kobe, Japan), Sept. 22-23, 2013