



The Regulatory Assistance Project

International Experiences in Regional Air Quality Management: Recommendations for China's Forthcoming RAQM Regulation

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The international participants are pleased for this opportunity to provide input into China's efforts to establish a system of regional air quality management (RAQM). Decades of experience in regional environmental planning in the US and EU have produced lessons that can help China's policy makers and regulators to learn from demonstrated successes, avoid failings, and take advantage of timely opportunities to leapfrog antiquated and costly practices, particularly in light of new challenges posed by global warming emissions.

China has had notable experience using regional approaches to air quality, including the establishment of Regional Environmental Supervisory Centers and the application of regional approaches in implementation the SO₂ acid rain control program. The Ministry of Environmental Protection's (MEP) recent efforts to address water pollution in key river basins through regional mechanisms have also made significant progress. The RAQM regulation can build on these successes and expand the use of regional approaches to support the efforts of local provincial Environmental Protection Bureaus and effectively address the challenges of pollution emissions that do not adhere to provincial or local governmental boundaries.

The RAQM regulation can provide clear and adequate authority for all anticipated functions of regional air quality management agencies and programs. This can include ensuring that:

1. Regional environmental management areas are designated.
2. Air quality management regions are established to address specific air pollution problems.
3. Regional air quality management offices are adequately authorized, staffed, trained and sustained through dedicated sources of funding.
4. Provinces are authorized to request the establishment of air quality management regions.

5. Provinces and local governments are authorized to establish voluntary regional bodies.
6. Provincial and local environmental authorities cooperate fully with MEP regional offices to improve emissions data collection, monitoring networks and inventories.
7. Regional air quality management plans are developed with air quality goals, emission reduction targets and control measures to be approved by State Council.
8. Local air pollutants and greenhouse gases are controlled jointly through integrated multi-pollutant strategies for air quality management.
9. Key air quality management regions are required to adopt more stringent air quality requirements than those at the national level.

These nine recommendations are described in greater detail below.

1. ***Regional environmental management areas are designated.*** MEP should be authorized to establish environmental management regions which divide the country according to scientific and practical criteria that reinforce environmental management goals. These criteria would include air sheds, socio-economic, and other geographic factors determined by MEP. Chief regional offices would be created in each region, built into the MEP's existing regional office structure, to serve as an extension of the central government, and support and coordinate with a regional air quality management framework, described below. Regional Coordination Committees can be set up as a first step to establishing fully functional regional offices.
2. ***Air quality management regions are established to address specific air pollution problems.*** An effective RAQM framework would authorize MEP to designate key air quality management regions.¹ These AQM regions would serve as an overlay to the aforementioned environmental management regions, potentially overlapping with one or more regions and/or provinces. They would be designed for dealing with specific air quality issues that require special administration by the national government. The following are logical zones to be identified from the outset: (1) the Beijing, Tianjin, Tangshan region; (2) the Yangtze River Delta region; (3) the Pearl River Delta region. But there may be additional regions and air sheds that deserve special attention. To imbue the regulatory system with flexibility to address new and unforeseen problems into the future, MEP should be authorized to establish zones as needed based on set criteria. A regional office would be established in each

¹ Regional offices may initially find it effective to organize themselves internally according to environmental media, such as air, water, land. This division of labor can facilitate rapid uptake of analysis and enforcement capabilities for pollution control options, particularly end-of-pipe solutions. International experience, however, demonstrates the limitations of such an approach, which can result in: stove-piped departments, uncoordinated and overly-bureaucratic regulations, prescriptive technology fixes, and problems of transferring pollution from one media to another (as in the case of removing mercury from flue gas emissions to deposit it on land and in water). Sector approaches, which holistically consider input and output flows from whole sources (for instance, electricity/energy input, productive output, and multi-media emissions), can be more successful at reducing pollution and improving overall environmental quality and public health. With this in mind, while it may make sense initially to confront urgent environmental problems like air quality through single media approaches, MEP may want to work toward an internal structure, regional as well as central, that organizes itself on the basis of a multi-media sector approach.

of these zones. The regulatory entity, while supported by regional environmental offices, would be a direct agency of MEP. These RAQM offices would be obligated to develop regional air quality management action plans to meet certain air quality improvement targets. (More on the scope of responsibilities of RAQM offices appears below.)

- In the US, an example of this sort of management region is the Ozone Transport Commission, or OTC, founded in 1992 to facilitate collaboration on pollution transport issues among 12 states in the northeastern and middle Atlantic regions.
- In the EU, what is known as the *subsidiarity principle* seeks to keep decision-making as close to citizens as possible by allowing EC-wide actions only when they would be more effective than actions at the national, regional or local levels. In accordance with this principle, there are no common rules to organizing and funding regional air quality offices. Each member state has its own legislation for this. However, the Europe-wide trans-boundary air pollution problems, namely particulate matter, acidification, eutrophication, and tropospheric ozone, are addressed by the Emission Ceilings Directive, a multi-pollutant, multi-effects regulation (more detail below).

3. ***Regional air quality management offices are adequately authorized, staffed, trained and sustained through dedicated sources of funding.*** A primary responsibility of regional air quality management offices would be to develop regional air quality action plans. They would also be involved in program implementation and overseeing activities at the provincial and local levels to comply with national and regional air quality mandates. Regional air quality management offices would be authorized to work with provincial and local agencies to monitor and verify emissions data and improve emissions inventories. Regional air quality management offices would provide assistance to provincial and local agencies by way of technical and policy support, equipment, supplies, training, information, financial support or other means of support. The regulation should specify as clearly as possible the relationships between RAQM offices, local, provincial, and central authorities, including lines of authority, accountability and divisions of labor. To ensure performance, dedicated and consistent funding must be allocated to RAQM offices. Below are international examples of sustained funding mechanisms:

- Pollution fees in the US are paid by large industrial sources to state agencies, which help pay for staff to issue air permits and to conduct compliance inspections.
- Additionally, under the Regional Greenhouse Gas Initiative (RGGI), a regional cap-and-trade program among ten states in the northeastern US, there are provisions which require the majority of revenue from auctioning GHG allowances to be used to finance additional investments in energy efficiency – which in turn further reduce GHG emissions. In most states, a small portion

of the auction revenue is also used to support administrative costs of the program.

4. ***Provinces are authorized to request the establishment of air quality management regions.*** A strong RAQM system would authorize provinces to petition MEP to establish regional air quality management region to address trans-boundary pollution affecting one or more provinces. Petitions would be based on criteria established by MEP, and MEP would be authorized to approve, deny or amend such request as appropriate.
 - The US Clean Air Act provides this type of authority to states and political subdivisions in US CAA, Section 126 (42 USC Section 7426).
 - The European Commission Directive on Ambient Air Quality and Cleaner Air for Europe (CAFE), adopted in 2008 to address regional approaches in air quality management, includes a provision in Article 25 for member states to cooperate by developing joint or coordinated air quality plans.²
5. ***Provinces and local governments are authorized to establish voluntary regional bodies.*** To enable local authorities and facilitate bottom-up decision making and policy development, effective RAQM should permit and encourage local governments to creation voluntary regional organizations. Provincial-level Environmental Protection Bureaus (EPBs) from across affected provinces should be permitted to form voluntary regional mechanisms to address pollution problems collaboratively. MEP should be authorized to provide appropriate technical, policy, and financial support to any such regional bodies.
 - In the US, air districts routinely collaborate across municipal and state boundaries to identify sources of pollution, technologies to control these emissions, and regulations to ensure that the reductions are achieved. These voluntary efforts, operating without formal federal-level involvement, are closer to both the impacts and sources of pollution than federal authorities, and have long been successful. Regional planning organizations in the eastern US, have collaborated for decades on air quality policy and planning. Specifically, the Northeastern States for Coordinated Air Use Management, or NESCAUM, which is an effort of eight northeastern states, dates back to 1967. Regional organizations in the east have also worked with counterparts in the southeastern and mid-western regions of the US to collaborate on strategies to reduce trans-boundary pollution. In California, the California Air Pollution Control Officers Association, or CAPCOA, has been coordinating 35 local air agencies across the state of California since 1976.
 - In the EU, interstate trans-boundary pollution is addressed by the air quality directive which obliges member states to cooperate when necessary, with

² Directive on Ambient Air Quality and Cleaner Air for Europe (Directive 2008/50/EC), available at <http://eurlex.europa.eu/JOHtml.do?uri=OJ:L:2008:152:SOM:EN:HTML>.

assistance from the European Commission. If problems exceed the capacity of cooperation between member states, the European Commission can intervene and substitute itself for national management. Inter-provincial pollutions across borders of member states are addressed by “Interreg” programs, funded by the European Community.

6. ***Provincial and local environmental authorities cooperate fully with MEP regional offices to improve emissions data collection, monitoring networks and inventories.*** Developing inventories of reliable emissions information is the key to evaluating program accountability, understanding pollutant interactions and population and environmental exposure, and designing results-driven planning processes. The need for reliable emission information will become increasingly urgent, and regional air quality management offices have an important role to play in building the country’s emissions inventories. Local and provincial agencies, including air quality monitoring stations, should be required to cooperate fully with MEP regional offices on emissions monitoring and verification, to develop systems to improve data collection, accuracy, sharing, and transparency, and to expand the range and resolution of pollutants and sources covered.
 - EPA requires all states to develop, implement and maintain emissions inventories. States must submit periodic reports every three years to EPA to demonstrate progress towards meeting emissions reduction goals.
 - According to the EU Integrated Pollution Prevention and Control Directive, Member States have to produce a triennial report on the emissions of facilities into air and waters. The report covers 50 pollutants. Also according to this directive, emission data of each facility must be made public.
7. ***Regional air quality management plans are developed with air quality goals, emission reduction targets and control measures to be approved by State Council.*** The implementation of regional air quality management plans should be monitored and evaluated periodically by MEP. Effective regulation would employ carrots and sticks to create incentives for the implementation of the plans. Such incentives could include, for example, creating relevant government officials performance evaluation indicators, using positive performance incentives to reward performance beyond what is required, or generating public pressure by publicizing the progress of the implementation of the plans. Policy measures that jointly reduce greenhouse gas emissions and local air pollutants require a fully integrated approach to regulating the energy and environmental sectors. All agencies and authorities at the provincial and local levels, and across related sectors of the economy, should be incorporated into regional planning mechanisms.
8. ***Local air pollutants and greenhouse gases are controlled jointly through integrated multi-pollutant strategies for air quality management.*** Recent studies from around the world are drawing the same conclusion: that significant cost-effective benefits can result from implementing measures that jointly reduce

local air pollution and greenhouse gases.³ Emission control policies have traditionally focused on one pollutant at a time – setting limits for a single pollutant and leading power plants and other industrial facilities to develop separate control strategies for each pollutant. These types of single-pollutant approaches can be very effective for the pollutant of concern, but can have adverse impacts on other emissions. Many environmental problems are caused by more than one pollutant, or by interactions among pollutants,⁴ so single-pollutant approaches fail to achieve overarching environmental or public health goals effectively. Controlling one pollutant can fail to address the problem and may even make the problem worse, as in the case of reducing NO_x, which can in some conditions increase ozone (O₃), a major air pollutant and powerful global warming agent.

The same principle of holistic planning applies to greenhouse gas emissions and local air pollution; if considered separately, control strategies are substantially less cost-effective and can adversely impact emissions of the other category. Take for example, end-of-pipe technology solutions for PM, which require additional energy to operate (known as a “heat rate penalty”), reduce plant efficiency and increase CO₂ emissions. Indeed, many air pollutants, such as methane, ozone and black carbon act both as conventional air pollutants and global warming agents.⁵ On the other hand, many climate change policies can drive structural changes in energy and industrial production, delivering significant co-benefits for local air pollution. RAQM programs and planning should be required to take a comprehensive and holistic approach to the dual challenges of improving regional air quality and reducing climate change emissions, by considering the full range of emissions and control measures.

- Massachusetts is a leading US example. Legislation in 2001, Multi-pollutant Regulation 310 CMR 7.29, required power plants to meet output-based multi-pollutant standards to address a range of issues concurrently, including acid deposition, climate change, mercury levels, nitrification, eutrophication, ozone, fine particles, regional haze and impaired visibility. Later, state air quality and energy planners worked together to develop regulations to meet carbon reductions required by the RGGI cap-and-trade

³ A sample of recent analyses includes: J. Bollen, et. al., “Local Air Pollution and Global Climate Change: A Combined Cost-Benefit Analysis,” *Resource and Energy Economics*, v. 31, 2009, pp. 161-181. Minjares R. et. al., “Challenges of Developing and Applying Integrated Strategies at Various Scales,” *Pollution Atmospherique*, Avril 2009, Numero Special, pp. 19-22. G.F. Nemet, et.al., “Implications of incorporating air-quality co-benefits into climate change policymaking,” *Environmental Research Letters*, January 2010, available at http://www.iop.org/EJ/article/1748-9326/5/1/014007/erl10_1_014007.html. For resources related to the US EPA’s multi-pollutant analyses and technical supporting documents, see <http://www.epa.gov/airmarkets/progsregs/cair/multi.html>. Sam Napolitano, et. al., “A Multi-pollutant Strategy,” *Public Utilities Fortnightly*, January 2009, available at <http://www.epa.gov/airmarket/resource/docs/multipstrategy.pdf>.

⁴ Examples of combined pollutants causing environmental problems include: VOCs and NO_x which contribute to O₃; SO₂ and NO_x which contribute to acid rain; and SO₂, NO_x, black carbon, etc., which contribute to PM_{2.5}.

⁵ These pollutants are among a category of GHGs known as “short-lived climate forcers,” due to their short atmospheric lifetime relative to CO₂ (CO₂ may persist for 40 years, whereas black carbon and ozone for a matter of days; methane may persist for an estimated decade). These pollutants are considered an important target for fast-action climate mitigation.

program, and to qualify energy efficiency as a energy resource in the region's electricity capacity market . More recently, new legislation will result in tripling the quantity of energy efficiency statewide. The emissions benefits from these energy efficiency investments will help the state meet GHG reduction requirements and will be an important measure in the state's air quality plan to meet new EPA ozone and fine particulate standards.

- In the case of the EU, extensive modeling found that using a multi-pollutant framework would permit the optimization of technology choices, both in terms of cost and energy efficiency, to address the cross-boundary pollution transport issues and meet various environmental objectives simultaneously.⁶ The European Commission's National Emissions Ceiling, established through Directive 2001/81/EC , required national total caps for SO₂, NO_x, VOCs and ammonia (NH₃).⁷ The EC set upper limits for each member state for the total emissions that could be discharged in 2010 against a 1990 baseline. The directive mandated the use of multi-pollutant and multi-media approaches, but it left control strategies up to member states to design. These ceilings were revised downward in 2005 and new targets were established for 2020. A more recent directive, 2008/1/EC on Integrated Pollution Prevention and Control, additionally addresses NO₂, PM₁₀ and PM_{2.5}, lead, benzene, CO and ozone (O₃). Supporting the EC multi-pollutant approach are annual reports that update and revise modeling projections, relate progress to date, and incorporate new and evolving factors, such as changes in member States' laws, new information on technologies and costs, and other relevant data and information.

9. ***Key air quality management regions are required to adopt more stringent air quality requirements than those at the national level.*** Key air quality management regions can be designated model regions for piloting advanced environmental standards and regulations to lead the country. These more robust policies could include:

- More stringent total emissions targets for SO₂ (and NO_x);
- Air quality standards for PM_{2.5} and ozone, set to clear timelines, to reflect the acute air pollution problems of regional haze and smog;
- More ambitious air pollution emission standards for key industries, and adoption of output-based multi-pollutant standards that link emissions and

⁶The EC used the RAINS (Regional Air Pollution Information and Simulation) and GAINS (Greenhouse Gas Air Pollution Interactions and Synergies) models. Each model allows for a dynamic assessment of strategies that can be modeled with many variables (including energy use, population, and climate changes) and for various effects (such as costs, air pollution benefits, etc.), adjusted to each member state's unique characteristics and circumstances for various scenarios.

⁷ Directive 2001/80/EC of the European Parliament of the European Council, "On the limitation of emissions of certain pollutants into the air from large combustion plants," 23 October 2001, available online at http://eur-lex.europa.eu/LexUriServ/site/en/oj/2001/l_309/l_30920011127en00010021.pdf.

energy-use to productive output to encourage more efficient production;

- Requirements that energy planning be integrated into air quality planning, and vice versa. An integrated approach to energy and environmental regulation could lead to the consideration of clean energy and energy efficiency resources as options for air quality control. For example, new coal-fired power plants and expansions to existing plants could be prohibited in favor of investing in renewable energy, energy efficiency, and combined heat and power (CHP) to meet electricity demand. Programs could be put in place to prohibit direct coal-burning in certain areas and to retrofit or phase out small coal boilers.