This document was for the 2010-11 Biennium

Texas Air Quality Research Program

Research Project Priorities

The goal of the State of Texas Air Quality Research Program (AQRP) is to support scientific research related to Texas air quality, in the areas of emissions inventory development, atmospheric chemistry, meteorology and air quality modeling. Research topics are identified and prioritized by an Independent Technical Advisory Committee (ITAC). Projects to be funded by the AQRP are selected from the list of ITAC recommended projects by the Texas Commission on Environmental Quality (TCEQ) and an Advisory Council. Members of the ITAC and Council are attached to this document.

The research topics recommended by the ITAC in their initial meetings during 2010 are summarized below. These topics will evolve as scientific understanding of air quality in Texas evolves, and as the priorities for the State of Texas in meeting National Ambient Air Quality Standards evolve. At the time of the ITAC meetings in 2010, the highest priorities for improving scientific understanding of air quality were related to proposed new primary and secondary National Ambient Air Quality Standards for ozone. When effective, these new standards would significantly increase the number of counties in Texas in non-attainment of the ozone standards, and would shift the problem of attaining the ozone standard from a local problem (multiple contiguous counties) to a regional problem impacting the entire eastern half of the state, neighboring states, and regions at even greater distances.

ITAC recommendations for research initiatives, related to ozone formation, accumulation and transport, are summarized below.

Emissions: Quantifying the emissions that lead to ozone formation (ozone precursors) is a critical step in developing effective plans for reducing ozone formation. Because of the number, variety and continual changes to ozone precursor emissions, maintaining current, accurate emission inventories is a continual challenge. Strategic research in emission inventory development should be focused on those emission categories that have the greatest uncertainties and that are likely to have the greatest impacts on ozone formation. In Texas, in 2010, those emission categories include industrial emissions from industrial flares and storage tanks, emissions associated with oil and gas production, and emissions from vegetation (biogenic emissions).

Chemistry: Although portions of the chemistry that lead to the formation of ozone have been understood for decades, new discoveries have revealed the need to improve scientific understanding of ozone formation chemistry in three key areas: heterogeneous chemistry, halogen chemistry and condensed chemical mechanisms. Chemical reactions between gases and particles in the atmosphere (heterogeneous chemistry) can lead to the formation of highly reactive species, including halogen species, which can accelerate and promote ozone formation. In some cases there is direct experimental evidence that these pathways are important in controlling ozone formation in Texas. Understanding these chemistries will be important in determining the extent and types of emission reductions that will be most effective in reducing ozone. Once the scientific understanding of heterogeneous chemistry, halogen chemistry and other chemical pathways are improved, those improvements must be incorporated into the air quality modeling tools (condensed chemical mechanisms) used to describe ozone formation.

Modeling: Meteorological and air quality models, like any scientific models, are designed for a purpose. For decades a primary purpose of regional air quality modeling systems has been to characterize ozone formation at the scale of individual urban areas. Increasingly, however, it will be important to use models to characterize inter-city, inter-state and international movement (transport) of ozone and its precursors. This will require refining scientific understanding of the ozone that is transported into the region being modeled from outside the region being modeled (model boundary conditions), and refining the scientific understanding of the effectiveness with which the models describe long-range transport of ozone and its precursors under variable meteorological conditions. While improvements will be necessary to enlarge the spatial scale at which the air quality modeling systems can be successfully applied, it will also be necessary for the models to improve performance at the smallest spatial scales. The ozone formation associated with very large (typically industrial) sources of emissions in Texas is often determined by mixing that occurs over distances of a kilometer or less. Modeling at these small spatial scales will require scientific improvements to the models, including representation of spatially-resolved effects of variable land surfaces and clouds. Better use of data assimilation is needed for more accurate modeling of individual ozone episodes and may help improve the physical representation of processes within the models.

System integration: In order to provide valuable information to policy-makers, and in order to identify future priorities for air quality research, improvements in the scientific understanding of emissions, atmospheric chemistry, and meteorology, and improvements to air quality modeling tools must be integrated into air quality management systems. Therefore, the AQRP should, as a high priority, develop air quality modeling systems that can assess the significance of its on-going research programs. Two initial case studies air quality modeling system performance that could be examined are (i) whether the knowledge base required to meet the new primary ozone NAAQS will also be sufficient to address the new secondary ozone NAAQS and (ii) the identification of source regions for long range transport of ozone and ozone precursors impacting Texas.

Applicants may also wish to consult documents that provide research recommendations that have been developed by other organizations and that the ITAC will use to inform its proposal evaluations.

- TexAQSII Rapid Science Synthesis Team Final Report
- 2009 TERC Science Synthesis Report
- TCEQ Priority Research Areas
- 2004 State of the Science of Air Quality in Texas