

5 May 2011

The Honorable Chai Fahe
Vice President
Chinese Research Academy of Environmental Sciences
8 Dayangfang BeiYuan Road
Chaoyang District, Beijing 100012, China

Dear Professor Chai,

We have been monitoring CRAES work on potential revisions to China's air quality standards and the current air quality index (AQI) with great interest. This letter is to provide specific comments on both proposals, which we strongly support. Our personal experiences in US air quality management have taught us the vital importance of setting appropriate targets for air quality improvement. We have also learned that it is necessary to give the public clear and accurate information as to the status of ambient air pollution concentrations at any given time.

There are three fundamental reasons to revise China's air quality standards and AQI process at this time. Those reasons are:

1. To more fully protect public health, ecosystems and crops, thereby assuring food security;
2. To resolve the discrepancy between official statements and public perceptions of air quality, increasing public trust in government; and
3. To establish a solid baseline for the 12th Five Year Plan to track progress and to define the next target for areas that have met China's existing standards.

Comments on Proposed Air Quality Standards

China's air quality standards have dramatically improved since 1982 when China the initial standards for total suspended particulate (TSP), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), lead (Pb) and benzo(a)pyrene (BAP) were established. The 1996 revision further strengthened and expanded the standards. The proposed changes in "*National Ambient Air Quality Standards Revision Draft*" released by MEP in November 2010 represent another good step forward. However, we believe that even more strengthening is warranted based on the severe, often deadly, health impacts of fine particle pollution. Fine particles are also the chief culprit in reduced visibility which is one of China's greatest air quality problems. For other pollutants, we encourage MEP to choose the most stringent option when more than one alternative is identified. Our specific comments are as follows.

Keep nitrogen dioxide (NO₂) standard revision in current draft. We recognize that China has struggled, historically, to meet its ambitious targets for NO₂. In particular, the 1996 standard for NO₂ was very challenging and had to be modified in 2000. But in light of the today's conditions, 100% of China's cities are meeting the 2000 NO₂ standard, which is reducing incentive for cities to do more. We strongly support revising NO₂ standard to return to the 1996 standard level,



which is consistent with WHO guideline. The 12th Five Year Plan requires a nationwide 10% reduction in nitrogen oxide emissions by 2015. This requirement alone is justification for retaining the stringent NO₂ standard as it appears in the current draft. But even if that were not enough, there is strong empirical evidence that NO₂ is a substantial contributor to regional haze at certain times of the year. China needs the NO₂ standard to continue making progress in visibility improvements.

Add national mandatory standards for fine particles (PM_{2.5}). Fine particles are *the* pollutant of this century, responsible for the vast majority of adverse health impacts from air pollution throughout the world, including increased morbidity and premature death. PM_{2.5} can enter the upper and lower respiratory tract and is deposited deep in the lungs, where it enters the body through the alveolus. Fine particles can also cross the brain/blood barrier and are linked to brain cancer. Fine particles often contain heavy metals, acid oxides, and organic pollutants (such as polycyclic aromatic hydrocarbons, pesticides, etc.). Fine particles can also carry bacteria, viruses and fungi. In short, PM_{2.5} is one of the most damaging pollutants to the human body. For all these reasons, the US and Europe have made fine particle control the single highest priority for air quality management. The US and Europe have also adopted very stringent ambient air quality standards for PM_{2.5}. California's PM_{2.5} standards are even more health protective. The sooner China takes the same step, the better off its people will be.

If nationwide mandatory PM_{2.5} standards are not possible, we suggest that such standards be applied to the most polluted areas as a pilot project. Specifically, **we recommend that PM_{2.5} standards be made mandatory in the key regions and city clusters identified by the State Council "Regional Air Quality Management Guidance."** The same areas have already been instructed to use the reference standards for ozone and PM_{2.5} as "indicators" of progress. Stepping that requirement up to a full mandate will give China valuable experience in tracking and controlling fine particulate concentrations before it launches a nationwide effort. It will also bring relief to the citizens who need it the most, namely those exposed to the highest pollution levels on a daily basis. To make this fully effective, PM_{2.5} monitors need to be installed at the same time (at least two per area) if they do not currently exist. We also suggest that PM_{2.5} be included in the Air Quality Index for the key region and city clusters (see below), to provide an accurate record of daily conditions.

Tighten China's PM₁₀ standards consistent with international norms. China's air quality limits for Grade I are much closer to internationally-recognized standards than the Grade II limits, yet the former apply only to natural conservation areas and not to the places where people live. To provide greater health protection, China's PM₁₀ standards for urban and residential areas need to be significantly strengthened. This would also have the added benefit of reducing PM_{2.5} as a fraction of PM₁₀. For reference, we note that the WHO recommended daily limit for PM₁₀ exposure is 50 micrograms/cubic meter, whereas China's daily ambient air quality standard for PM₁₀ is 150 micrograms/cubic meter – a threefold difference.

Authorize and mandate provincial governments to establish more stringent standards. There are good reasons to be prudent in establishing national standards since the economic, industrial and social conditions across China vary so widely, but heavily polluted provinces need prompt attention. Giving such provinces the flexibility to set their own air quality standards ahead of the

national government would ease this conflict and accelerate public health protection. If the provincial governments are not willing to do so, then Ministry of Environmental Protection should have the authority to judge which provinces should have their own standards and require them to do so. The US and Europe both follow this regulatory model. In the US, the states can be more stringent than the federal government but not less. Likewise, the European Commission sets the floor for environmental protection but individual member states may adopt additional requirements.

Establish schedule for regular standard revisions in the future. China takes a very pragmatic approach to air quality standard setting, choosing targets that can be readily achieved in the foreseeable future. The US and Europe take a different approach, defining the best possible outcomes for public health and then taking as much time as necessary to reach those goals. Both approaches have their advantages and disadvantages but one thing is constant: the need to continually assess air quality, its impact on human health and the environment, and the appropriate next steps to address those effects. If China retains the incremental standard setting approach, we strongly recommend that China also establish a review cycle of no longer than every five years. We also suggest that China set a long term goal of reaching the WHO health-based standards (or their equivalent). It is not necessary to set a deadline for the latter. Establishing the general principle of health protection is sufficient at this time.

Comments on Proposed Air Quality Index

China's recent decision to require hourly, real-time reporting of air quality data was a tremendous improvement over the previous system. Now the entire population has prompt access to information about local air pollution concentrations that directly affect them. Bringing the Air Quality Index (AQI) in line with those hourly reports, as proposed, is another great step forward. We also support changing the reporting cycle to a natural day basis, and the new one hour averaging time for ozone. Unfortunately, the AQI will still not be fully aligned with the public perception of air quality because it does not account for all the contributors to regional haze. This is a serious problem that needs to be addressed in the current revisions. Also, there is room for improvement regarding public health alerts and the tracking of peak concentrations (in addition to regional averages). Our recommendations for further improvements are as follows:

Include ozone, carbon monoxide and PM_{2.5} in the AQI. The AQI will not reflect reality until it includes all of the pollutants that are affecting people's health and regional haze. Until that happens, the discrepancy between public perceptions of air pollution and official statements will remain. That gap is very problematic because it breeds distrust and cynicism. The best way to close the gap is to add ozone (O₃), carbon monoxide (CO) and PM_{2.5} to the index. Of the five options identified in the proposed revision, we like Option 5 the best. However, if that is not possible for any reason, we recommend that the nationwide implementation of Option 1 (natural day) and Option 2 (add O₃ and CO), plus the use of Option 5 in the key regions and city clusters subject to the State Council's RAQM requirements.

Provide health alerts when air pollution reaches dangerous levels. The US, Canada and Hong Kong take their AQIs one step further and provide public health alerts when air pollution poses

an immediate threat to human welfare. Such warnings may include the advice to stay indoors, the cancellation of outdoor sporting events, and a request to postpone any non-essential polluting activities (such as painting one's house or burning agricultural debris). We recommend that China consider establishing a similar system since it experiences very high pollutant concentrations.

Report highest daily pollutant readings, not just the average concentration of all monitors. It is important to know the severity of each region's air quality problem and the location of geographical hot spots in order to craft the most effective air quality management strategies. Reporting average concentrations only obscures those facts and makes the clean-up job more difficult. It has also been our experience – looking back at the last three decades – that peak concentrations come down the fastest. By contrast, relatively low (but still unhealthy) pollutant concentrations can linger for a very long time. Unless China starts consistently tracking peak levels at individual monitors, it will not have an accurate picture of national progress in reducing air pollution.

SUMMARY OF RECOMMENDATIONS

Regarding Proposed Air Quality Standards

- Retain NO₂ standard in the revision
- Adopt national, mandatory standards for PM_{2.5}
- Alternatively, apply mandatory PM_{2.5} standards to key regions and city clusters identified in RAQM guidelines, install two PM_{2.5} monitors per area, and include PM_{2.5} in Air Quality Index for those areas
- Tighten PM₁₀ standards for urban and residential areas
- Establish 5 year standard review cycle and health protection principle

Regarding the Air Quality Index

- Issue hourly AQI reports
- Add 8-hour average in addition to 1-hour average for ozone, and include both in AQI
- Use natural day instead of noon to noon
- Adopt Option 5 nationwide
- Alternatively, adopt Option 1 and 2 nationwide but apply Option 5 to RAQM areas
- Provide public health alerts when air pollution reaches dangerous levels
- Report highest daily concentration at each monitor

Conclusion

We hope these comments will be helpful to you and your colleagues as you finalize CRAES recommendations to the State Council and Ministry of Environmental Protection. If we can answer any questions or provide more information, please do not hesitate to call on any one of us.

Sincerely,



Mr. Christopher James
Senior Associate at the Regulatory Assistance Project,
Former Director of Air Quality Planning for the
Connecticut Department of Environmental Protection



Ms. Catherine Witherspoon
International Air Quality Consultant,
Former Executive Officer of the California Air Resources Board



Ms. Rebecca Schultz
Associate in China at the Regulatory Assistance Project