



Aerial view of Shenzhen, China.

Asian Cities and Clean Air Action Plans

Faced with a pressing need to reduce emissions and improve air quality, Asian cities are increasingly adopting holistic Clean Air Action Plans to address pollutant emissions from a range of sources. This article highlights aspects of air quality management in four Asian cities: Can Tho, Iloilo, Shenzhen, and Seoul.

A number of Asian cities are prioritizing sustainable development in their local and national development agendas, ensuring that economic growth does not come at the expense of air quality, public health, or the environment. In order to achieve this, they are adopting Clean Air Action Plans (CAAPs)—comprehensive, cross-sectoral air quality management plans—as a means to address emissions from a range of sources.

Can Tho's Monitoring Network

Can Tho is the fourth largest city in Vietnam and the largest city in the Mekong Delta. The city has focused on expanding its industrial and agricultural sectors and improving its economic and social infrastructure. Though air pollution levels are not yet severe, the adoption of a CAAP earlier this year will enable national and local authorities to ensure that economic development does not compromise air quality.

The CAAP (<http://cleanairasia.org/caap-cantho/>)—developed under Clean Air Asia's cooperation agreement with the Ministry of Natural Resources and Environment through the Viet Nam Environment Administration, and implemented by the Integrated Programme for Better Air Quality (IBAQ)—facilitates the implementation of targeted actions and activities to improve air quality. The measures outlined in the CAAP will be implemented over a five-year period, and are focused on addressing the main contributors to air pollution: motor vehicles, rice straw open burning, and production of textiles, metal, steel, and paper.

Critical to any air quality management program is monitoring. In Can Tho, this will include air quality monitoring in localized high concentration locations (hotspot monitoring), building the capacity of staff at the Department of Natural Resources and Environment to use semi-automatic monitoring devices, and installation of an automatic air quality monitoring system in the city's industrial zone.

To supplement its existing monitoring network and to address its limited capacity to monitor particulate matter, hotspot monitoring in the city is intended to better characterize emission levels within its jurisdiction. This information is important to determining measures that will ensure that the adverse impacts of particulate matter on health and environment, and consequently on the city's economic growth, are anticipated and effectively abated.

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Iloilo's Jeepneys and Buses

Iloilo, the capital of the Western Visayas region of the Philippines, is the region's commercial and governance hub. As one of the Philippines' rapidly developing cities, Iloilo is seeking to balance growth with environmental sustainability.

A growing population and the accompanying demand for transportation have prompted the development of a comprehensive strategy to combat the projected rise in emissions.

Cognizant of the importance of air quality management, the Iloilo City Government, with support from Germany's Gesellschaft für Internationale Zusammenarbeit's (GIZ) Clean Air for Smaller Cities in the ASEAN Region project, embarked on a multi-year, multi-stakeholder clean air development process that culminated in "The Clean Air Ordinance of the City of Iloilo" (<http://en.aseantoday.info/philippines-a-clean-air-plan-for-iloilo-city/>).

One of the first steps in that process was the conducting of a citywide emission inventory (EI) in 2011, which confirmed known pollution sources and shed light on sources that previously were not considered to be major air quality problems. It was determined that mobile sources emitted 30 percent of particulate matter (PM), 56 percent of oxides of nitrogen (NO_x), and 50 percent of volatile organic compounds (VOCs), primarily from jeepneys, motorcycles, and passenger vehicles.

The data generated through the EI became the foundation for Iloilo's first Clean Air Plan, which took effect in 2014 with a focus on measures to reduce pollutant emissions and measures to improve air quality management at both the local and national levels. To address high levels of ambient ozone, several transportation-related measures were included, such as the use of buses for selected routes, the enforcement of a vehicle registration system, and the introduction of "green zone areas" as a way to regulate exposure to transport emissions and provide drivers with incentives to use vehicles that comply with higher emission standards (such as Euro IV).

Additional measures for ozone pollution reduction included transition to Euro IV engines for jeepneys, and improving the efficiency of jeepney routes within the city (i.e., routes with the highest transport activity will be traversed by higher capacity vehicles such as buses, and vice versa, given due consideration to road size and origin-destination information).

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Shenzhen's High Polluting Fuel Exclusion Zone

Shenzhen, a southern Chinese city of 12 million people and the world's 13th largest city, has established an unusual, but successful approach to controlling air pollution. It is China's first megacity (i.e., with population greater than 10 million) to attain China's annual fine particulate matter (PM_{2.5}) air quality standard. Furthermore, Shenzhen made a significant commitment in 2016 to achieve the World Health Organization's Stage II PM_{2.5} annual concentration guideline of 25 µg/m³ by 2020.

About the Contributors



Clean Air Asia

In keeping with its regional mission of realizing better air quality in Asian cities, Clean Air Asia works at the local level with different stakeholders—both state and non-state—civil society, and the private sector, building capacity and providing technical support to develop and/or improve existing air quality management systems. This work enhances the skills and knowledge of relevant stakeholders in cities/municipalities to identify key issues and develop and implement strategies, manifested in clean air action plans, to address and evaluate the impact of these measures.

ICLEI—Local Governments for Sustainability

ICLEI is the leading global network of over 1,500 cities, towns, and regions committed to building a sustainable future. In response to the urgent need for actions on air quality voiced by citizens and local governments in the East Asia region, the East Asia Clean Air Cities (EACAC) program was launched by nine local governments with the ICLEI East Asia Secretariat and includes four capital cities. As a long-term multi-lateral cooperation platform, the program aims to foster regional cooperation between local governments, partners, and solution providers for committed cities to tackle air pollution. The EACAC acts on five main areas: joint studies focusing on city projects; capacity building through training for officials or

city peer learning exchanges; an East Asia Air Quality Forum linking cities and partners in an annual regional event to share best practices; assisting cities to monitor policy performance on air quality improvement; and publications to disseminate city achievements and latest EACAC developments.

Clean Air Alliance of China

CAAC is an integrated think tank platform which is dedicated to restoring China's blue skies via strengthening clean air policy-making and implementation at both national and local levels. CAAC has developed a series of tools, including an air quality management indicator system, a clean air measures database, and an air quality attainment planning manual. These tools support local authority efforts to diagnose and spot air quality management problems, design policies, and prepare action plans and measures. In addition, CAAC launched the Bluetech Award Program to find the best available clean air technologies from all over the world to combat pollution in China. Winning technologies are given opportunities to demonstrate and link with China's cities to facilitate the enforcement and implementation of local policies. CAAC is now piloting those management tools and clean air technologies in ten selected cities and provinces in Beijing–Tianjin–Hebei, in the Yangtze River Delta and in the Pearl River Delta regions.

Over the past decade, the city had faced serious haze problems with annual average PM_{2.5} concentrations above 60 µg/m³. In response, the local government collaborated with the Clean Air Alliance of China (CAAC) and employed an economic strategy to improve air quality, including reforming the industrial and energy structure, and implementing and enforcing stricter environmental policies. In both 2015 and 2016,

Shenzhen's Gross Domestic Product growth rate was around 9 percent, which is higher than most Chinese cities.

By 2014, most of Shenzhen's highly polluting industries were relocated or closed down, leaving only coal-fired power plants. This resulted in a decrease in coal consumption from 38 percent in 2000, to 6.3 percent of primary energy. Natural

gas consumption has risen to 8 percent, almost twice the national average. Clean energy power supply for the city (including nuclear, natural gas and co-generated electricity) has increased to 88 percent of the total power supply, which significantly contributed to the reduction of both air pollutants and greenhouse gases emissions. By 2016, Shenzhen's annual average PM_{2.5} concentration had dropped to 27 µg/m³, well below China's PM_{2.5} annual air quality standard level of 35 µg/m³.

New measures have been adopted to control pollutant sources. Power plants are in the process of upgrading their desulfurization and denitrification controls and are changing their fuel feedstock from oil to natural gas. For industrial sources, a citywide high polluting fuel (e.g., coal, bunk oil, straw, etc.) exclusion zone is now implemented for ozone pollution control, focused on control of volatile organic compounds from industrial and commercial boilers.

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Seoul's Targeted LEZ for Wholesale Markets

Seoul, the capital and largest metropolis of South Korea, is the world's 16th largest city, and with a population of approximately 10 million, is home to about one half the country's residents. The Air Quality Management Division of the Seoul Metropolitan Government recently unveiled a low-emission zone (LEZ) to target public wholesale market areas. These areas have the highest concentration in the city of trucks that are noncompliant with Euro III emission standards. Seoul's strategy combines expansion and enforcement of LEZ standards with a diesel particulate filter (DPF) grant program, which is already showing tangible success.

Three components of the new LEZ policies are designed to expand the program area and improve its efficiency.

First, the implementation of a second type of LEZ, expanding on the 2012–2016 conventional LEZs in the city center and heavily trafficked roads of Seoul by targeting public wholesale markets. These are outside the city center and are also hubs for heavily polluting trucks. By targeting these areas, Seoul can regulate trucks originating from outside its jurisdiction, binding them to stricter standards.

Second, the introduction of financial grant programs for DPFs, providing truckers with a viable method to adhere to lower emission limits for the LEZs. In 2016, Seoul committed US\$3.8 million and affixed 1,700 DPFs. The Ministry of the Environment is now introducing similar grant programs for local governments nationwide.

Third, the establishment of a Seoul-Incheon-Gyeonggi (SIG) regional LEZ monitoring network, for improved regional coordination. The successes of Seoul, together with recent episodes of high-density pollution throughout Korea, are leading more local governments to adopt similar LEZ and DPF grant policies nationwide.

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Summary

The rapid pace of urbanization is presenting Asian city administrators and urban planners with a range of social, economic, health, and environmental challenges. This is particularly apparent in deteriorating air quality and its impacts on public health. Growing demands for energy, transportation, and industries is triggering a greater reliance on fossil fuels that, in turn, increases air pollution and greenhouse gas emissions. As demonstrated in these four cities, local monitoring and emission source identification are important building blocks for targeted actions that result in more efficient and effective priority control of the most important mobile and stationary sources.

Asian city initiatives demonstrate flexibility in addressing degraded air quality, tailoring innovative approaches to local conditions. In Can Tho, hot spot monitoring is a complement to the existing network, allowing for rapid identification of significant sources. In Iloilo, an emissions inventory identified mobile sources as significant pollution contributors, and was instrumental in singling out jeepneys for emission reductions. In Shenzhen, reform of the energy and industrial sectors allowed for advanced pollution controls at coal-fired power plants and for a citywide high polluting fuel exclusion zone. And in Seoul, a zoning approach was used to address truck emissions in public wholesale market districts. **em**

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