Case Study 2 Air Quality Monitoring in Multiplex Environments

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Linking SDGs

Urban Challenges

The causes and sources of air pollution in Tainan City are complex. The main pollutant is PM2.5, which refers to atmospheric particulate matter with a diameter of less than 2.5 micrometers. 30% of PM2.5 pollution comes from sources including local factories, gas exhaust from motor vehicles, vehicle dust, construction sites, the food service industry, agricultural operations and bare land. The remaining 70% is contributed by other counties and cities through cross-border pollutant transfer.

To improve Tainan's air quality, the city's PM2.5 and PM10 concentrations should meet national air quality standards. Air pollution and weather must be monitored throughout the country. Changes in air pollutant concentration and long-term weather analysis should be formulated in order to develop control strategies to improve air quality and maintain a friendly environment for urban living.

Suspended Particulate Reduction Plan

The Tainan Environmental Protection Bureau has been cooperating with other municipal bureaus to promote "bright and clear air, suspended particulate reduction plan (亮麗晴空懸浮微粒管制削減計畫)". The city has implemented pollution source control and planning control measures to improve Tainan city's air quality. Specific strategies and progress are as follows:

1. Installed a hierarchical air quality monitoring network of environmental sensors for the intelligent management of air quality deterioration events. Set up 4 national air quality monitoring stations, 2 local auxiliary stations and 12 artificial monitoring stations. Set up an additional 4 monitoring stations in sensitive industrial areas.
2. Develop community protection measures in industrial areas, including increased education about the environment to raise citizens' awareness of how air quality affects their quality of life. Set up 240 sensing points in cities to respond quickly to affected areas during air quality deterioration events (overseas pollution, fire incidents, and regional poor air quality), quickly adopt response measures, and issue warnings to mitigate the impact of air pollution on citizen health.

3. Use scientific instruments to identify, inspect and curb major sources of air pollutants. Conducted inspections of stationary pollution sources, gas stations, and construction sites, using Unmanned Aerial Vehicles (UAVs), Light Detection and Ranging and Infrared Gas Imaging instruments. Identify abnormal emissions and pollution sources that exceed emissions standards and require improvements.
4. Set up real-time air quality monitoring facilities in large factories that are connected to the Environmental Protection Administration. Equip 13 large-scale factory chimneys with real-time air quality monitoring facilities connected to the EPA; facilities monitor items such as opacity, sulfur oxides and nitrogen oxides.
5. Implement a license plate recognition system to control highly polluting vehicles. Announce the Clean Air Zones to control the entry of highly polluting vehicles. A license plate recognition system is used to screen out vehicles that do not comply with the regulations.

Results & Reflections

Over the past seven years (2011-2017), Tainan air quality has improved substantially. The annual and daily average of PM2.5 concentration has decreased by 32% over this period. The PM10 annual and daily average concentrations have been lower than the air quality standard for three consecutive years (2015-2017). Furthermore, in 2015 and 2016, Tainan City earned the Taiwan Environmental Protection Administration's evaluation of "Excellent" performance.

Looking forward to the future, Tainan City's vision for 2026 is that the average concentration of PM2.5 will reach the national air quality standard (15μg/m3). To build on the success of existing initiatives, Tainan City plans to implement the following strategies:

1. Gradually replace the commercial and industrial use of oil-fired boilers with clean fuels
2. Announce the Air Quality Maintenance Areas (Clean Air Zones) to control the entry of diesel vehicles obtains autonomous management entities; Confirm the vehicles will be in line with the air pollution index regulations to improve the Clean Air Zones' air quality
3. Introduce policies regarding the Provision of Air Pollution Prevention in the catering industry
4. Build a miniature air quality sensor for improved environmental management

Clean Air Zones © Tainan City Government

Review Comments

1. Air quality management is one of the common issues in Asia countries. This project demonstrate one of the solutions which can share to other cities.
2. The diesel vehicles control is key to improve the air quality in cities. The cities may need also to initiate plan for e-car policy.