

Construction of Air Pollution Monitoring and Pre-Warning Platform—Taking Daming County, Handan City, Hebei Province as an Example

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Abstract. Based on GIS technology, computer hardware and software and network communication technology, an air pollution monitoring and pre-warning platform is constructed. It helps to monitoring air pollution situation in Daming county and analysis the data from monitoring sites about AQI, $PM_{2.5}$ and other five kinds of air quality index. By using this platform, people can intuitively find where is the main air pollution source and the air quality forecast around all county.

1. Introduction

With the continuous improvement of people's awareness of environmental protection, air pollution has become the focus of public attention. China's atmospheric environmental pollution problems are intensifying. Doing a good job in monitoring the atmospheric environment, timely grasping the changes in the quality of the atmospheric environment, and early detection of changes in the types of atmospheric pollutants and fluctuations in the amount of pollutants can help relevant department management personnel shall carry out prevention and control and governance work, prepare for responding to air pollution, and better protect our atmospheric environment. The pollution information publishing service based on the data network sharing mechanism and the research and development using Web information technology is gradually emerging [1-4].

Typical domestic systems include air quality release platforms, blue maps, and genuine gas networks.

However, the above system only provides real-time pollution information and simple reminder service. The pollution and environmental governance cannot be combined. The function of analyzing the pollution source traceability and atmospheric environmental treatment assessment for the management organization is not comprehensively considered.

From the complete air quality analysis chain of "Monitoring-Tracking-Governance", the development of the air pollution monitoring and pre-warning platform in Daming County, Handan City can provide dynamic simulation of governance assessment and target setting and simulation index changes to promote air pollution.



2. Overview of Platform

The platform is based on GIS technology, computer hardware and software and network communication technology. And it combines functions such as atmospheric environment monitoring, fine pollution mapping, air-time statistical analysis of air pollution, and air pollution source tracing and analysis. In platform, the air pollution monitoring data is the center.

3. Design of Platform Function

In order to fulfill the requirements of air environment management, combined with the characteristics of atmospheric environmental management, the platform has been designed including site monitoring, global mapping and query, spatial traceability and analysis, evaluation for governance effect and visual forecasting. These five subsystems of platform can achieve integrally logic for air pollution monitoring and governance.

3.1. Home Page

Based on the statistical analysis of the database-related site monitoring data, the overall situation of the atmospheric environment in Daming County is shown on home page.

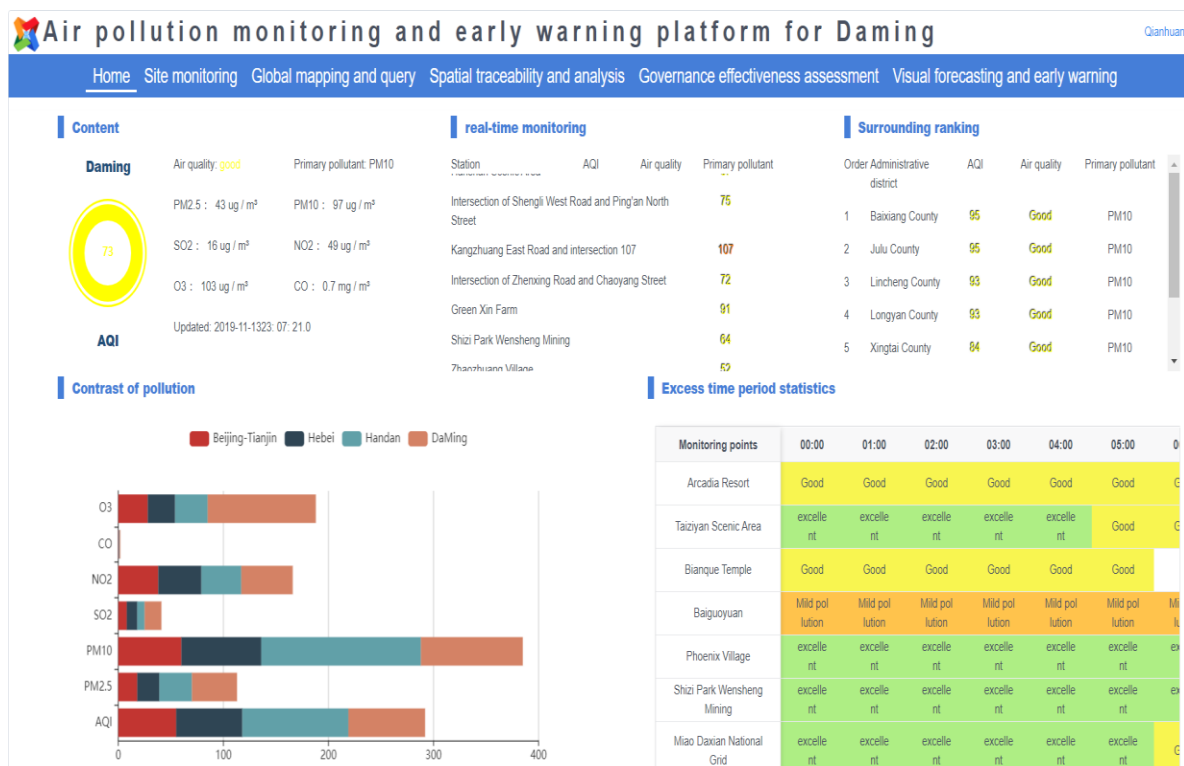


Figure 1. The home page of platform

3.2. Site Monitoring

Based on the sites monitoring data, the air environment of sites can be shown and analyzed on platform.

On platform, monitoring data of sites can be visualized and compared with around others by using AQI in time. And the air quality of each site is sorted according AQI and other six air pollutant concentration values. While the monitoring index is beyond warning line, platform can show it for people by using different color. In addition, platform links to all monitoring devices. People can open the monitoring video at any time.

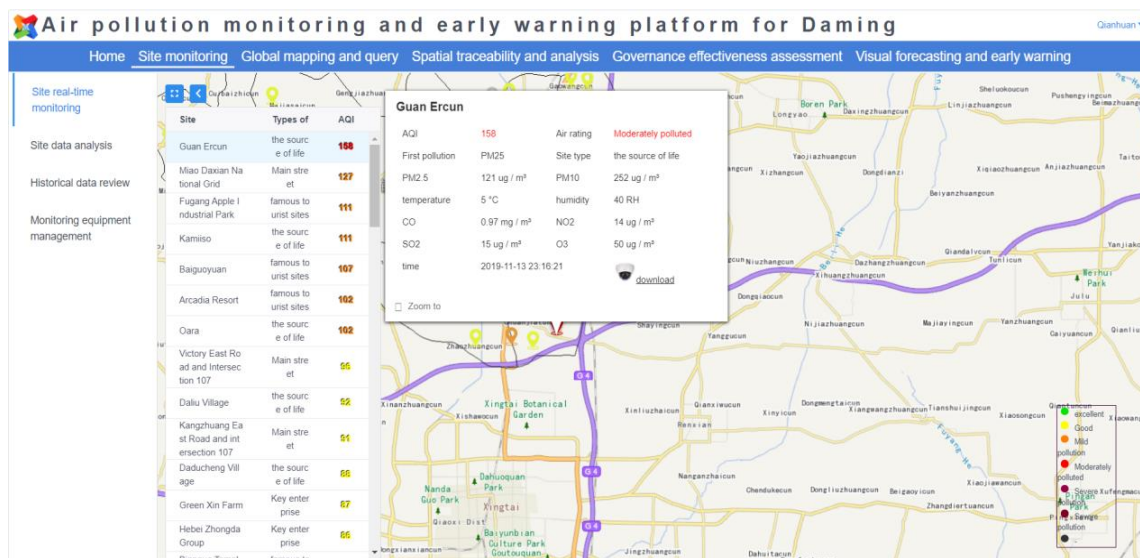


Figure 2. Query for monitoring sites

3.3. Global Mapping and Query

By applying regression model of land using and monitoring data, platform can simulate AQI and other index for whole county with thermal map displaying. Here we use the Kriging interpolation method. Kriging is a regression algorithm for spatial modeling and prediction (interpolation) of stochastic processes/destinations based on covariance functions. the Kriging method can give the Best Linear Unbiased Prediction (BLUP). And it can also calculate proportion of air quality and each main air pollutant in whole county. Platform can display these results by visual chart. The statistical results can be using for global mapping with different color for these air quality index.

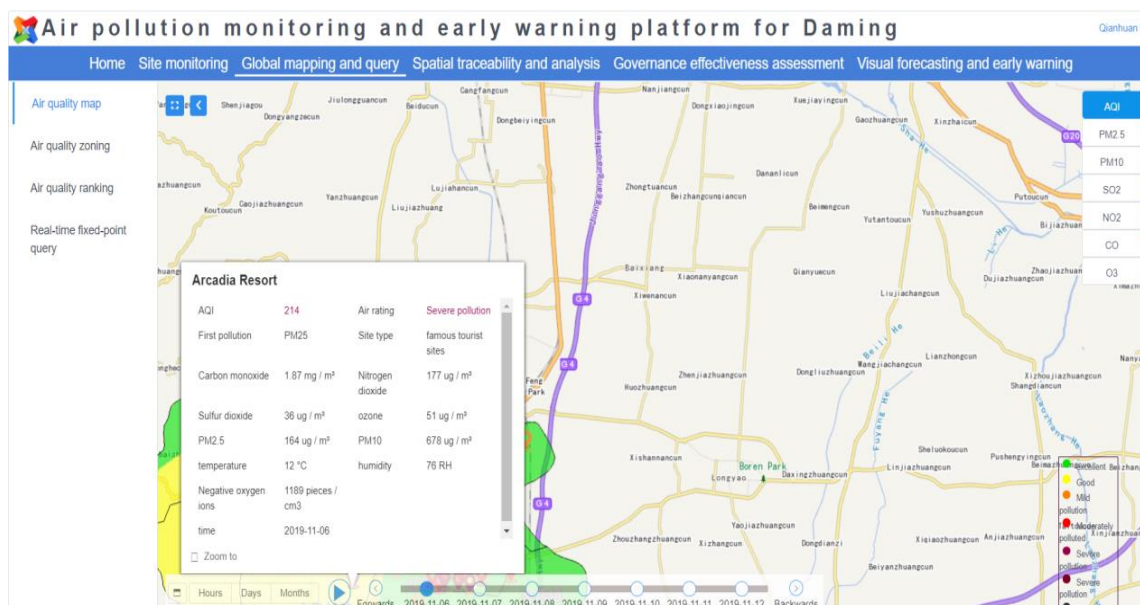


Figure 3. Air quality map of Daming County

3.4. Spatial Traceability and Analysis

Based on global mapping results, people can trace main air pollution resource such as enterprises, construction sites and others. Platform can statistic air pollution situation of these area and provide pre-warning. Platform displays results by charts and sorts. Besides, platform can also monitor live area and main streets for people. In this way, governance of air pollution can be more targeted.

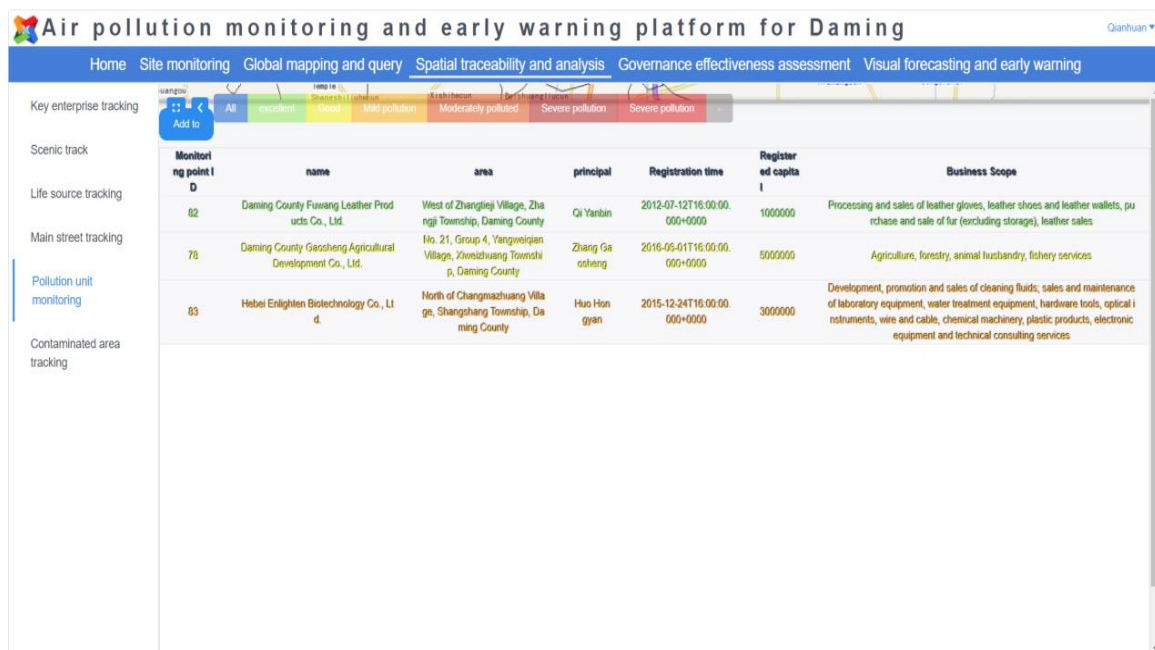


Figure 4. Statistical results for all index

3.5. Evaluation for Governance Effect

In this module, platform can display the governance effect by comparing change between air pollution sources before governance and after. The index change of air pollution sources is displayed by line chart and sorted with other sources.

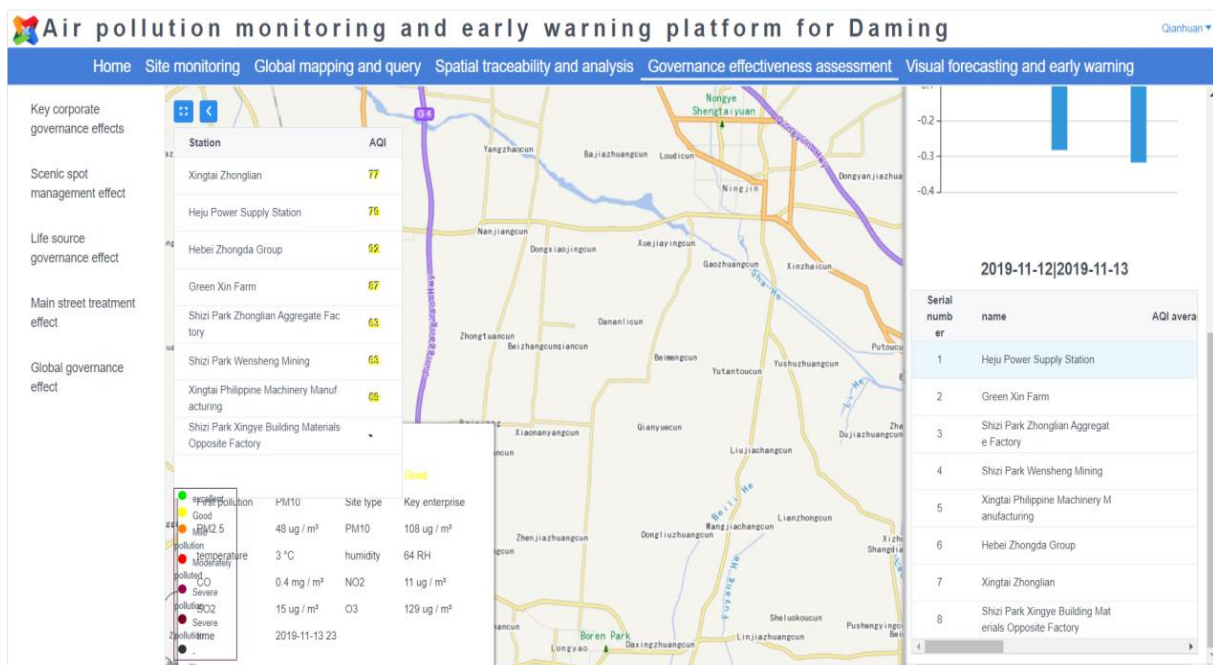


Figure 5. Evaluation for governance effect

3.6. Visual Forecasting

Using the predictive model, a 24-hour fine forecast and a 5-day forecast for Daming County are conducted. And platform can alert the heavily polluted areas.

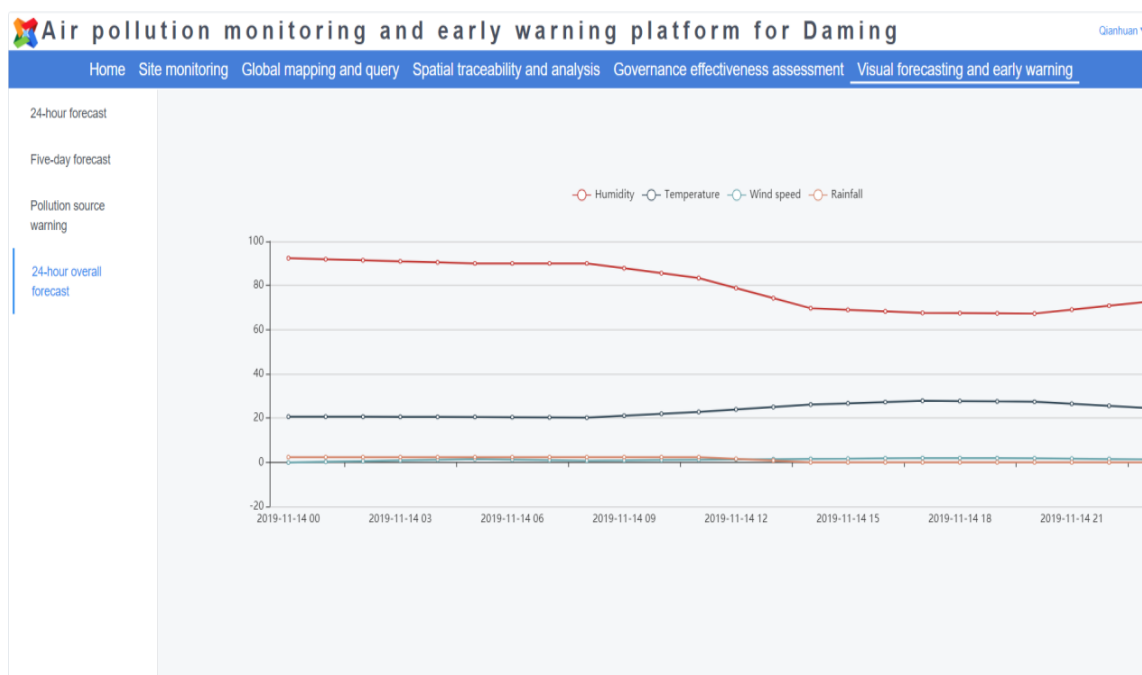


Figure 6. Air quality forecast for Daming country

4. Summary

By construct the platform, air pollution can be effectively monitoring and immediately pre-warning. The monitoring data collected by ground monitoring devices can be used to statistics and analysis. In visualization methods, people can intuitive find where the air pollution beyond standard or the pollution source from. The platform provides to government a new chain which is “monitoring-analysis-governance” by using GIS technical and computer combined.

5. Acknowledgement

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6. References

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