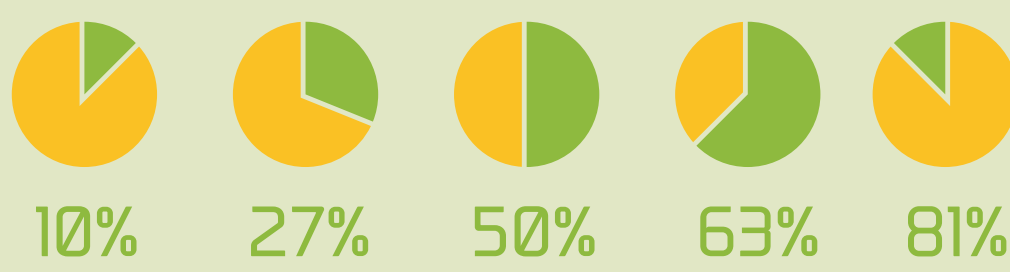




Executive Summary



The *Real-Time Air Pollution Detection and Dissemination through ICT Platform* is a pioneering initiative in Lao PDR aimed at addressing the growing challenges of air pollution, protecting public health, and promoting sustainable development. Over the past decades, Laos has experienced rapid economic growth, but this progress has also brought environmental challenges, particularly air pollution in urban centers like Vientiane. Contributing factors include vehicular emissions, industrial activities, agricultural burning, and transboundary haze from neighboring countries. Exposure to pollutants such as PM2.5, PM10, CO, and CO₂ poses significant health risks, including respiratory and cardiovascular diseases.

Project Objectives and Partners

The project, supported by the Asia-Pacific Telecommunity (APT) with funding from the Government of China (EBC-C Project), aims to:

1. Automatically collect pollution data.
2. Visualize the air pollution level in real-time using the Geographic Information System (GIS).
3. AI based air quality analysis and early warning.
4. Promote open data for public awareness and informed decision-making.
5. Provide technical support for environmental management.
6. Strengthening collaboration among environmental authorities, telecom operators, academia, and development partners.

Key partners include the Applied Research Institute of Smart Technology (MTC), Department of Methodology (MoNRE), Chongqing Electronic Engineering College (China), ETL, National University of Laos, and provincial authorities.

System Overview

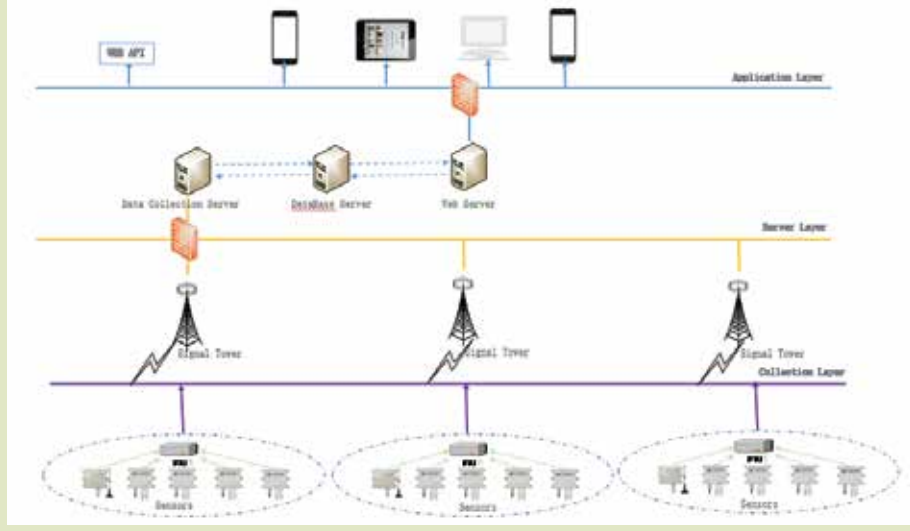


Figure 1 System network Architecture

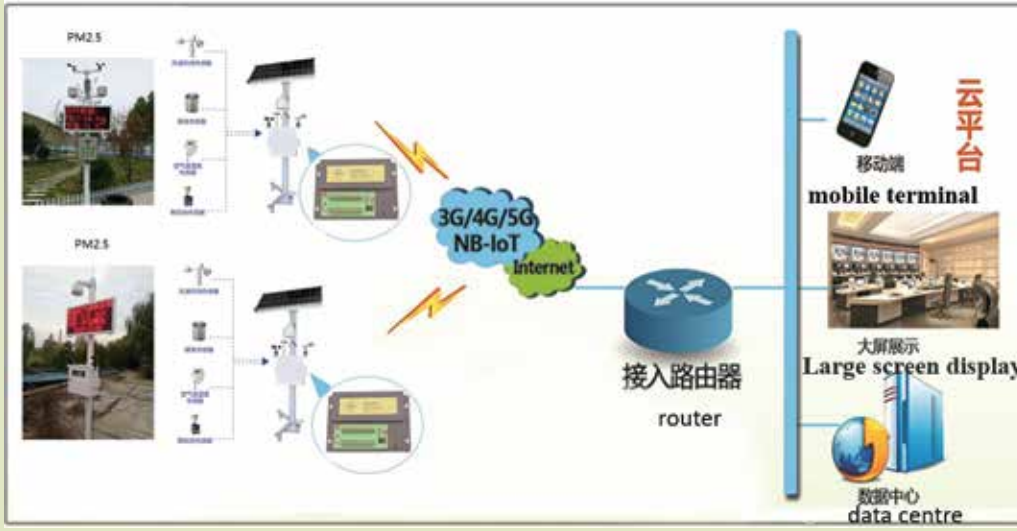


Figure 2 System Architecture



Figure 3 hourly AQI data



Figure 4 Daily AQI data

The project employs an IoT-based monitoring network with sensors and towers deployed across Vientiane and selected provinces. Data on PM2.5, PM10, CO, CO₂, temperature, and humidity are automatically transmitted to a cloud server at hourly intervals, visualized via web portals, mobile applications, and LED displays. AI algorithms analyze pollution trends and generate real-time alerts for citizens and decision-makers. Data classification follows WHO/WMO standards, supporting evidence-based interventions.

Key Achievements and Activities

- Consultation and Planning: Three rounds of stakeholder meetings established monitoring requirements, public dissemination strategies, and a national collaboration framework.
- Equipment Procurement and Installation: Customized sensors and platforms were procured and deployed at strategic sites, with robust connectivity and data redundancy systems.
- Training and Capacity Building: National staff received training in system maintenance, AI analysis, and data dissemination.
- Workshops and Seminars: Engaged policymakers, technical staff, and local communities to promote understanding and use of the system.
- Project Outputs: The system provides real-time monitoring, AI-based pollution trends analysis, a user-friendly dissemination platform, guidelines for national implementation, and training materials for sustainability.

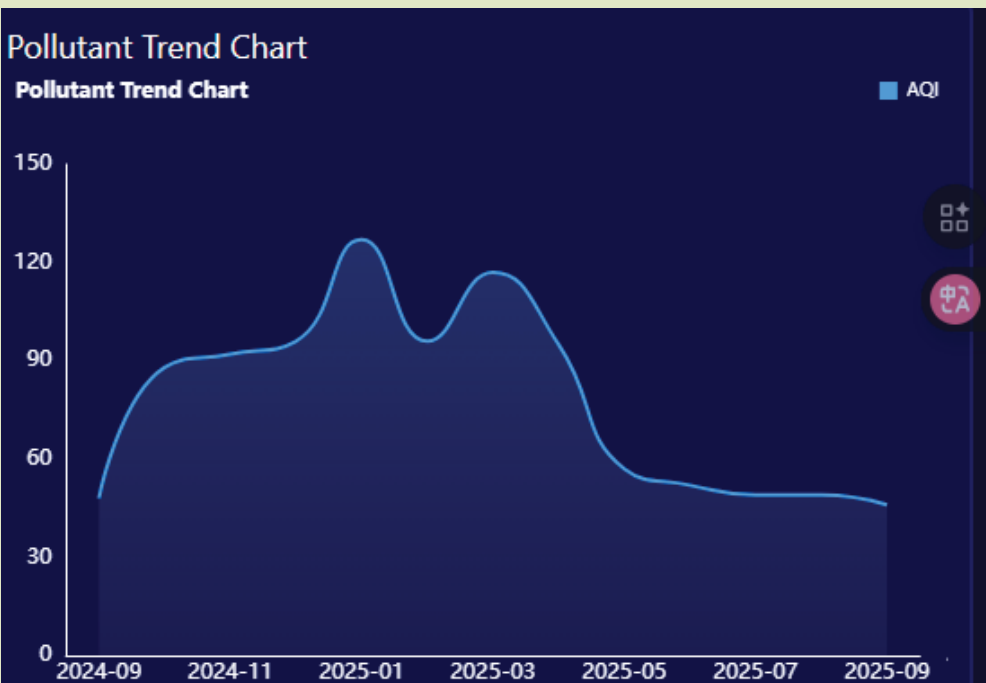


Figure 5 AI-based pollution trends

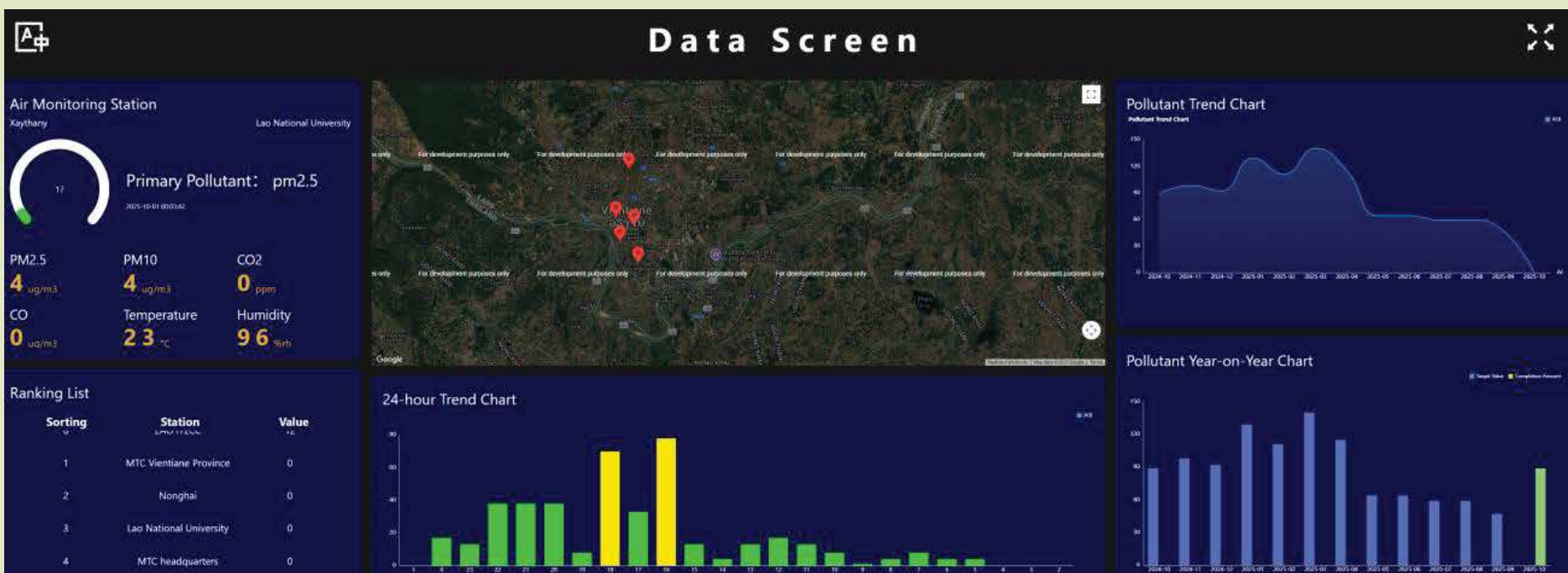


Figure 6 Air Quality Monitoring Screen

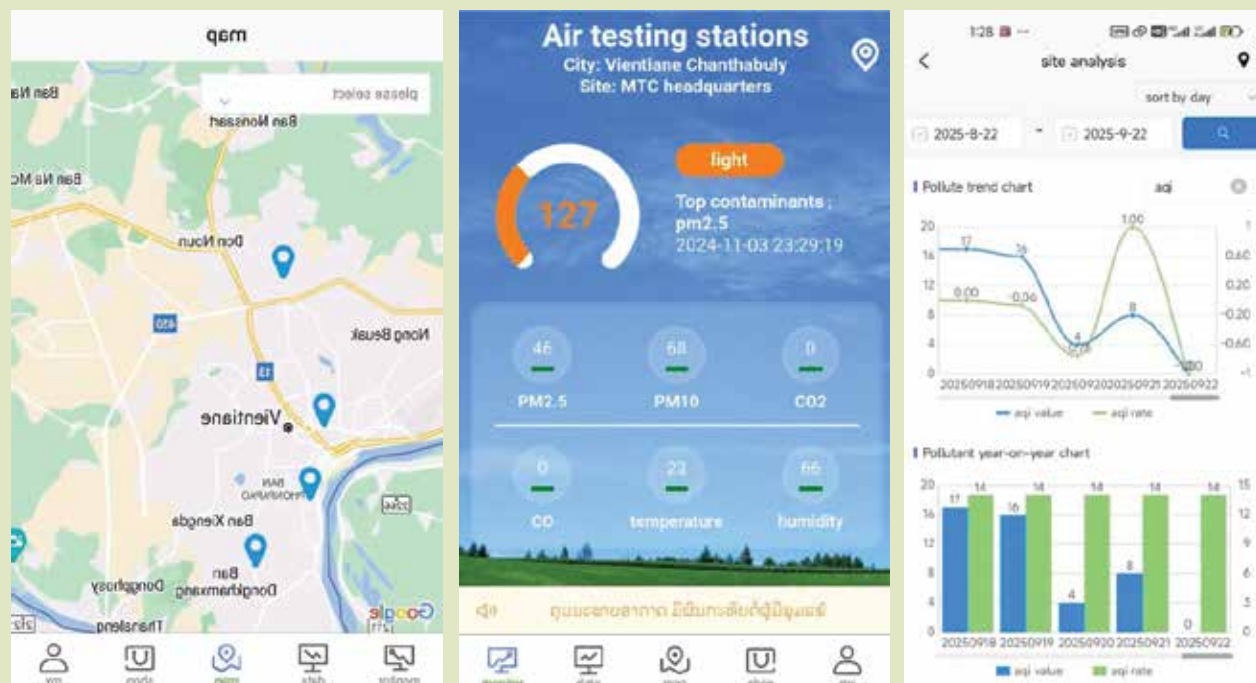


Figure 7 Mobile Application platform

Project Contributions and Impact

1. Public Health Protection: Real-time alerts reduce exposure risks, particularly for vulnerable groups.
2. Policy and Decision Support: Centralized, standardized data strengthens governance, urban planning, and regulatory enforcement.
3. Regional and International Cooperation: Facilitates transboundary air quality collaboration with ASEAN and global networks.
4. Digital Transformation and Innovation: Enhances capacity in ICT, AI, GIS, and data-driven governance.
5. Public Awareness and Engagement: Empowers citizens through transparent, accessible information.
6. Economic and Development Benefits: Reduces health-related costs, improves productivity, and attracts sustainable investments.

Challenges and Barriers

The project faced financial constraints, technical limitations, limited human capacity, and partial coverage of pollutants. Ensuring interoperability between ministries and scaling the system nationwide also presented challenges.

Conclusion

The project demonstrates a successful integration of technology, innovation, and multi-stakeholder collaboration in environmental governance. By providing real-time, evidence-based monitoring, it strengthens Laos' ability to protect public health, inform policy, and contribute to regional air quality initiatives. The future plan ensures the system evolves into a nationally integrated and internationally recognized platform, supporting sustainable development, digital transformation, and long-term environmental resilience in Laos.

Air Quality Station at ARIST office, Vientiane.



Air Quality Station at Primary School, Vientiane.



Air Quality Station at Luangprabang province

