Chapter 19
Air Quality Monitoring Using Internet of Things (IoT) in Smart Cities

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ABSTRACT

Air pollution is a major environmental health problem affecting everyone. An air quality index (AQI) helps disseminate air quality information (almost in real time) about pollutants like PM10, PM2.5, NO2, SO2, CO, O3, etc. In the 2018 environmental performance index (EPI), India ranks 177 out of 180 countries, which indicates a need for awareness about air pollution and air quality monitoring. Out of the 100 smart cities in the Indian Smart City Mission, which is an urban renewal program, many cities have considered the inclusion of smart environment sensors or smart poles with environment sensors as part of their proposals. Internet of things (IoT) environmental monitoring applications can monitor (in near real time) the quality of the air in crowded areas, parks, or any location in the city, and its data can be made publicly available to citizens. The chapter describes some IoT environmental monitoring applications being implemented in some of the smart cities like Surat, Kakinada.

SMART CITIES

Smart Cities can be defined in many ways. The meaning of smart cities has evolved over the years with different meanings to people who come from different areas. Although, there are different meanings of Smart Cities, whenever one uses the word 'smart' it means that there will be usage of Information and Communications Technology (ICT) or Internet in order to be able to address the various urban challenges (Mitchell S., Villa, Stewarts-Weeks, & Lange, 2013). A Smart City can be identified along six main areas, Economy, People, Mobility, Living, Governance and Environment (Giffinger, et al., 2007).

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Smart Cities would be a driver for economic growth, improving people's quality of life by developing the local area with the use of technologies that can provide smart outcomes.

A variety of challenges are faced in today's cities. These include creation of jobs, sustaining the environment and economic growth. Understanding of Internet's contribution and application is important to planning processes of future cities. (Mitchell S., Villa, Stewart-Weeks, & Lange, 2013).

The Government of India under the leadership of its Prime Minister Shri Narendra Modi initiated in June 2015 a Smart City Mission in India with an aim to develop 100 smart cities. This Mission is an urban renewal and retrofitting program. The Ministry of Housing and Urban Affairs(MoHUA), then known as Ministry of Urban Development (MoUD), shortlisted a 100 Cities from potential smart cities identified by the State Governments. Each of the potential Smart Cities, were required to prepare a 'Smart City Proposal' (SCP) with the help of consultants and participate in a 'City Challenge'. The Smart City Proposals would contain the strategies for 'Area Based Development' (ABD) and a 'Pan-City initiative'. The Area Based Proposals could be retrofitting (in an existing built-up area of more than 500 acres), redevelopment (replacement of existing built up area of more than 50 acres) or Greenfield (vacant areas). The Pan-City Initiative would envisage application of selected smart solutions to the existing city-wide infrastructure. Citizen participation was an important aspect of formulating these proposals.

The Ministry of Urban Development (MoUD) shortlisted 20 cities in the 1st round that were declared in January, 2016. Other cities were asked to improve on their proposals for selection in the next round. It was observed that these 20 cities were mostly in eight states. Thus a special round called the 'Fast Track' was conducted for the 23 States and Union Territories to shortlist the smart cities from amongst them. 13 Cities were selected from this Fast Track round and were declared on 24th May, 2016. The 2nd round was declared on 20th September 2016 and 27 cities were shortlisted in it. 30 cities were declared in the 3rd round in June 2017, followed by 9 cities in the 4th round on 20th Jan, 2018. The last city was selected on 20th June 2018, thus totaling to 100 smart cities being shortlisted in different rounds.

A smart city comprises of core infrastructure elements like supply of sufficient water, electricity that is assured, sanitation facilities, solid waste management, public transport to ensure efficient urban mobility, housing which is affordable, especially for the poor, security and safety of citizens, namely, women, children and elderly. It would also comprise of IT digitalization and connectivity which is robust, governance that is good and uses e-Governance and participation from citizens. It must also have health, education initiatives and environments which are sustainable.

An investment of Rs.2,01,981 crore is proposed under the smart city plans by the 99 cities. Projects which are focused on restructuring a specific identified area are known as Area Based Projects and they are estimated to cost about Rs. 1,63,138 crore. Initiatives in the Smart City which pan across the city are known as Pan City Initiatives and are estimated to cost about Rs. 38,841 crores.

In order to implement the different Smart Cities Plans, a Special Purpose Vehicle (SPV) was to be setup at the city level. The SPV would be a under the Companies Act, 2013, be a 50:50 equity shareholding jointly between the Urban Local Body (ULB) and the State/Union Territory and a limited company. Each selected Smart Cities is required to setup an SPVs and implement its Smart City Proposal. The making of Detailed Project Reports (DPRs), various tenders etc has to be done by the SPV. Project Management Consultants (PMCs) will assist the SPV in creation and implementation of the projects from the Smart City Proposal (Ministry of Housing and Urban Affairs, Government of India, 2017).

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