Chapter 7
Municipal Solid Waste Management:
Case Study on Smart City Tirunelveli

Raghavi K.
Anna University Chennai – Regional Office Tirunelveli, India

Anie Gincy V. G.
Anna University Chennai – Regional Office Tirunelveli, India

Rajesh Banu J.
Anna University Chennai – Regional Office Tirunelveli, India

Dinesh Kumar M.
Anna University Chennai – Regional Office Tirunelveli, India

ABSTRACT

Smart city technology evolved with the developments in wireless sensor networks (WSN) and the internet of things (IoT). IoT-based waste management is an advanced waste management system offered in smart cities. The practice of monitoring, transporting, and processing of solid waste are included in the waste management. Litter bins play an indispensable role in the waste collection process at the primary level. The process of monitoring litter bins would become difficult for the ones placed at out of reach areas and remotely located sites. Smart litter bin (SLB) is generally embedded with different types of sensors where used for sensing the garbage levels and locating the bins location. Radio frequency identification (RFID), sensors, global positioning systems (GPS), general packet radio service (GPRS) are the components in smart waste management system and are discussed in this chapter. These components were used to monitor the collection, transportation, processing, and dumping. This chapter also focuses on the perception of IoT architecture to upgrade waste management in smart cities.

DOI: 10.4018/978-1-5225-9199-3.ch007

INTRODUCTION

The rapid population growth and economic development of developing countries over the last several decades has led to an unprecedented increase in solid waste production which in turn has led to rapid deterioration of environmental quality (Wang et al., 2018). The quantity and quality of the solid waste generated depends upon the livelihood of people, urbanization, commercial activities and socio-economic status. The generated solid waste consists of wet waste as well as dry waste. The wet waste is biodegradable and can be employed in the production of biogas and biofuels whereas the dry waste can be recycled or landfilled. The major problem encompassed by the city municipalities includes the collecting garbage, transporting and disposing it (Bharadwaj et al., 2016). Smart city by definition, has the following characteristic of smartness in administration, living, environment, transportation and economy (Perera et al., 2014). Smart city concept incorporates the information and communication technology (ICT), and various physical strategies connected to the network, called Internet of things (IoT). The Internet of Things is a combination of different hardware & software technology. The Internet of Things provides solutions based on the incorporation of information technology, which refers to hardware and software used to store, retrieve, and process information and communications technology which includes electronic systems used for communication between individuals or groups. This concept could optimize the efficiency of city operations and services. Smart city technology allows city executives to interact directly with public, to monitor the activities in city and to manage assets and resources efficiently. IoT plays a substantial role in reforming the livelihood of people with new technologies. IoT is widely used in various applications such as home automation, health care, environmental monitoring, manufacturing, energy management, agriculture and transportation. IoT reduces the challenges in waste management such as monitoring the garbage bins, transporting waste and processing. Waste management in smart cities mainly aimed on monitoring of waste, effective collection and separation with the benefit of IoT based solutions. This chapter deals with the waste management and the integration of IoT in waste management turns into smart waste management (SW) system in smart cities.

MUNICIPAL SOLID WASTE MANAGEMENT

Municipal solid waste may include wet waste such as (food waste, leaves, vegetables, meat residues), recyclable waste recyclable waste (paper, plastic bottles, metal, cloth), and non-recyclable waste (plastic bags, glass, metal). Prevention, end-of-pipe strategies and restoration practices are the three main existing waste management practices. Generally, the prevention practices involves waste minimization, awareness, and legislations. End-of-pipe focuses the collection of waste at sources, recycling, waste separation, reuse, recycling and energy from waste. Environmental restoration strategies aims to restore the damaged environment. In this practices, prevention practices deal the highest efficiency with the lowest cost, while environmental restoration is the most expensive practice with the lowest efficiency. According to Chen, 2010, municipal waste mainly contains kitchen waste. Normally, solid waste disposal methods include selling, recycling, landfill, burning and dumping in open areas without any treatment. Recycling includes treating biosolids by composting residues of vegetables, anaerobic fermentation (organic substance) to obtain bio-fertilizers, biogas and other resources. But landfill and burning is expensive and disposed to generating secondary pollution such as air and soil pollution. Dumping solid waste in open areas without treatment is common developing countries, may causes pollution and affect the surround-