S.NO	TITLE	JOURNAL	AUTHOR	CHALLENGES/ FUTURE SCOPE
1	Smart bin: Smart waste management system	2015 IEEE Tenth International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP), 1-2, 2015	Fachmin Folianto, Yong Sheng Low, Wai Leong Yeow	In this paper, we present the Smartbin system that identifies fullness of litter bin. The system is designed to collect data and to deliver the data through wireless mesh network. The system also employs duty cycle technique to reduce power consumption and to maximize operational time. The Smartbin system was tested in an outdoor environment. Through the testbed, we collected data and applied sense-making methods to obtain litter bin utilization and litter bin daily seasonality information. With such information, litter bin providers and cleaning contractors are able to make better decision to increase productivity
2	Internet of Things based garbage monitoring system	2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON), 127-130, 2017	Sagnik Kanta, Srinjoy Jash, Himadri Nath Saha	In today's busy world time is a vital issue which can't be managed by noticing each and every phenomenon with our tight schedule. So now a day's Automatic systems are being preferred over

				manual system to make life simpler and easier in all aspects. To make it a grand success Internet of Things is the latest internet technology developed. The number of users of internet has grown so rapidly that it has become a necessary part of our daily life. Our matter of concern in this project is development of Internet of Things based Garbage Monitoring System. As the population of world is increasing day by day, the environment should be clean and hygienic for our better life leads. In most of the cities the overflowed garbage bins are creating an obnoxious smell and making an unhygienic environment. And this is leading to the rapid growth of bacteria and viruses which are causing different types of diseases. To overcome these situations efficient garbage collection systems are getting developed based on IoT. Various designs have already been proposed

				and have advantages as well as disadvantages. This paper is a review of Garbage Monitoring System based on IoT.
3	Smart waste management using Internet-of-Things (IoT)	2017 2nd international conference on computing and communications technologies (ICCCT), 199-203, 2017	Gopal Kirshna Shyam, Sunilkumar S Manvi,Priyanka Bharti	To make the cities greener, safer, and more efficient, Internet of Things (IoT) can play an important role. Improvement in safety and quality of life can be achieved by connecting devices, vehicles and infrastructure all around in a city. Best technological solutions can be achieved in smart cities by making different stakeholders to work together [5][6][7]. System integrators, network operators and technology providers have a role to play in working with governments to enable smart solutions. But, building such solutions on an open, standards-based communications platform that can be continuously used is a challenge. We present a waste collection management solution based on providing intelligence to wastebins, using an IoT prototype

				with sensors. It can read, collect, and transmit huge volume of data over the Internet. Such data, when put into a spatio temporal context and processed by intelligent and optimized algorithms, can be used to dynamically manage waste collection mechanism. Simulations for several cases are carried out to investigate the benefits of such system over a traditional system. We try to replicate the scenario using Open Data from the city of Pune, India stressing on the opportunities created by this type of initiatives for several parties to innovate and contribute to the development of Smart waste management solutions.
4	Implementation of an smart waste management system using IoT	2017 International Conference on Intelligent Sustainable Systems (ICISS), 1155-1156, 2017	P Haribabu, Sankit R Kassa, J Nagaraju, R Karthik, N Shirisha, M Anila	Waste collection services, today, are exhausted and unable to bear the burden of rising cities. It is one of the biggest ongoing challenges, being faced by developing economies, where a large variety of goods ranging from cars to metal and hardware

				end up in inadequately managed and uncontrolled dumpsites, spreading diseases and increasing pollution. However, most of these plans have been able to manage waste once it has already been created. We, therefore, propose a system through a mobile application associated with a Smart Trash Bin. The main aim of this application is to reduce human resources and efforts along with the enhancements of a smart city vision. At regular intervals dustbin will be squashed. Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes on roadside. Breeding of insects and mosquitoes can create nuisance around promoting unclean environment. This may even cause dreadful diseases.
5	Garbage	2020 IEEE	Ankit Mishra,	The waste produced day

	management with Smart trash using IoT	International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), 1-6, 2020	Dilip Kumar Patel, Tamanna Singh, Abhijeet Singh	to day seems to be unstoppable, from small scale to large scale it is increasing constantly. From different sources we come to know that we don't have proper dumping and disposing mechanism. These are due to lack of technology usages and bad management towards waste disposal. People also do not take it seriously because either they are not aware or not taking responsibility regards it. To reform the current scenario, we have proposed model of Smart Trash. Here, we made system automatic so that human need not to put extra effort, except dumping garbage in the trash. Also, we proposed management system where if trash is full and it is not made empty on time, message will be delivered to concern authorities. In order to involve more participants, there is reward system i.e., if person use the trash properly such people will be benefited with some

				reward points that can be redeemed through the shop. This is not only the beauty of proposed model but it also attracts more people and create an effective waste management system. We have also installed display system where different type of advertisement can be displayed, that will generate revenue and spread message among users to use it frequently and positively.
6	IOT based smart garbage alert system using Arduino UNO	2016 IEEE region 10 conference (TENCON), 1028-1034, 2016	N Sathish Kumar, B Vuayalakshmi, R Jenifer Prarthana, A Shankar	Waste management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the waste management is that the garbage bin at public places gets overflowed well in advance before the commencement of the next cleaning process. It in turn leads to various hazards such as bad odor & ugliness to that place which may be the root cause for spread of various diseases. To avoid all such hazardous scenario and maintain

				public cleanliness and health this work is mounted on a smart garbage system. The main theme of the work is to develop a smart intelligent garbage alert system for a proper garbage management. This paper proposes a smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on level of garbage filling. This process is aided by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the municipal web server once if garbage is filled. After cleaning the dustbin, the driver confirms the task of emptying the garbage with the aid of RFID Tag. RFID is a computing technology that is used for verification process and in addition, it also enhances the smart garbage alert system by

				providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the server affirming that the work is done. The whole process is upheld by an embedded module integrated with RF ID and IOT Facilitation. The real time status of how waste collection is being done could be monitored and followed up by the municipality authority with the aid of this system. In addition to this the necessary remedial / alternate measures could be adapted. An Android application is developed and linked to a web server to intimate the alerts from the microcontroller to the urban office and to perform the remote monitoring of the cleaning process, done by the workers, thereby reducing the manual process of monitoring and verification. The notifications are sent to the Android application using Wi-Fi module
7	Design a smart waste bin for	2017 5th International	Aksan Surya Wijaya, Zahir	In this paper, we presented the smart

	smart waste management	Conference on Instrumentation, Control, and Automation (ICA), 62-66, 2017	Zainuddin, Muhammad Niswar	waste-bin that can managed the waste in a smart city project. The system consist of sensors to measure the weight of waste and the level of waste inside the bin. The system also adapt with network environment, to manage all information from waste management. As the result we proposed a prototype of smart waste-bin that suitable for many kind of conventional waste-bin.
8	Multi-agent based IoT smart waste monitoring and collection architecture	arXiv preprint arXiv:1711.03966, 2017	Eunice David Likotiko, Devotha Nyambo, Joseph Mwangoka	Solid waste management is one of the existing challenges in urban areas and it is becoming a critical issue due to rapid increase in population. Appropriate solid waste management systems are important for improving the environment and the well being of residents. In this paper, an Internet of Things (IoT) architecture for real time waste monitoring and collection has been proposed; able to improve and optimize solid waste collection in a city. Netlogo Multiagent platform has been used to simulate real time

				monitoring and smart decisions on waste management. Waste filling level in bins and truck collection process are abstracted to a multiagent model and citizen are involved by paying the price for waste collection services. Furthermore, waste level data are updated and recorded continuously and are provided to decision algorithms to determine the vehicle optimal route for waste collection to the distributed bins in the city. Several simulation cases executed and results validated. The presented solution gives substantial benefits to all waste stakeholders by enabling the waste collection process to be more efficient.
9	A real-time smart waste management based on cognitive IoT framework	Advances in Electrical and Computer Technologies, 407 -414, 2020	Sujit Bebortta, Nikhil Kumar Rajput, Bibudhendu Pati, Dilip Senapati	The ability of the Internet of things (IoT) to incorporate anything and everything has induced and it is revolutionary applications in spheres of smart healthcare, smart living, smart cities, smart governance, and many

				more. A more general illustration for the IoT-based administration is the smart waste monitoring and management scheme for the smart cities. The smart waste management comprises of certain information and communication technologies (ICT) which support the tracking and management of the garbage bins. In this paper, we present a strategy for the garbage bin detection problem based on the thresholding scheme and also present a real-time waste management algorithm for the dynamic selection of optimal paths by the garbage collection vans. We also provide an optimal cost model subject to the threshold-based constraints which falls under the time complexity , (where and denote the path and the location of the smart dustbins), for our proposed algorithm.
10	Industry 4.0 based	Journal of Cleaner Production 269,	Yun Arifatul Fatimah,	Indonesia is facing a number of independently

	sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia	122263, 2020	Kannan Govindan, Rochiyati Murniningsih, Agus Setiawan	managed challenges related to the collection, transportation, processing (composting, recycling), and landfill dependence on waste management. An intervention is needed to bring stakeholders together to solve these waste challenges. The objectives of this study are to investigate the fundamental issues and opportunities and to develop a sustainable and smart country-wide waste management system using industry 4.0 technologies. The system should provide a multi-dimensional approach, determine the maturity level of the waste management system in a technical method, and pursue the goal of designing a new strategy to minimise waste management problems. A comprehensive systematic literature review, intensive focus group discussions, and direct observation in Indonesian cities were approaches used to develop waste

				management business processes and their system design. Waste business processes consist of mixed-collecting, sorting, transporting, varied-treatment, and chained-disposal. The design of the proposed waste management system presents circular economy processes that can separate municipal waste, identify waste characteristics, and determine sustainable waste treatment technologies through the use of Internet of Thing (IoT) as the integrator. This study contributes to the sustainable development goals (SDG's) such as Good health, and wellbeing (SDG 3); Clean water and sanitation (SDG 6); Decent Work and Economic Growth (SDG 8); Responsible Consumption and Production (SDG 12) and Climate Action (SDG 13). The study proposes a new design of smart and sustainable waste management which could

				achieve satisfactory economic, social, and environmental waste management performances.