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MAINDARGI- SMART CITY

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ABSTRACT

Smart city is a concept adopted by national, state and local governments of India, as an initiative focused on holistic rural development, derived from Mahatma Gandhi's vision of Adarsh Gram (Ideal Village) and Swaraj (Self Reliance). Prime Minister Narendra Modi launched Sansad Adarsh Gram Yojana (SAGY) or SAANJHI) on 2 October 2014, Gandhi's birthday, in addition to Smart Cities and Digital India, as a development programme for India. The Parliamentarian's Model Village Scheme main goal is for each Member of Parliament and Minister to adopt a rural village and develop it into a model by 2019 under the SAGY guidelines. The vision of SAGY is a integrated village development plan, encompassing Personal, Human, Social, and Economic dimensions. A champion of participatory democracy and grassroots development, he believed that making villages self-contained and sustainable was the first step towards empowering India. Contrary to popular belief, he wasn't against industrialization, markets and competition as long as they did not lead to the passive or active exploitation of villagers. Yet, seven decades after independence, we are nowhere close to realizing Gandhi's vision of empowered villages. Rural India remains in a deplorable state.

INTRODUCTIOCan remote villages have the same opportunities as urban centres? Can rural communities have access to careers, clean water, healthcare, education, productive agriculture and communication—without leaving their villages? Smart cityrefers to a concept developed in rural area that provides solutions to problems occurred and improves the quality of life. The main problems faced by rural areas are cover poverty, low level of education, and limited access to technology. Maindargi is a town and a municipal council in Akkalkot taluka of Solapur district in the Indian state of Maharashtra. As of 2011 India census, Maindargi had a population of 47001. Males constitute 51% of the population and females 49%. Maindargi has an average literacy rate of 58%, lower than the national average of 59.5%: male literacy is 70%, and female literacy is 46%. In Maindargi, 15% of the population is under six years of age. The proposed smart city model was categorized into 6 dimensions including 1) Governance, (2) Technology, (3) Resources, (4) Village Service, (5) Living, and (6) Tourism. This research is expected to be applied to cities in other Regencies by adjusting the characteristics of each region

1.1 PROBLEM STATEMENT

In India we have an indirect communication between the government and public. For getting a problem solved within our nearby areas we have to visit the government offices which would require a whole day or else bribe the officers to get the problem solved which can be actually solved in a very short period of time. A common man faces many problems related to governance in his daily life. The main purpose of our Smart City project is to help the public facing such problems and knowing the region where the problem has occurred and getting their problems solved online without going to the officer regularly until the problem is solved

1.2 Problem Motivation

Smart Cities are on the rise. There are many cities worldwide that are planning projects or strategies intended to implement smart solutions. Though there are many success stories, there are no valid reference models yet that can be used to establish a clear path toward a Smart City because, among other reasons, cities are living entities with a vast number of variables and many areas of activity. Cities, like all other organizations, evolve and modernize based on a set of projects

LITERATURE SURVEY

2.1 Smart Cities

2.1.1 Introduction

The urbanization of the world's population has become a key issue that needs to be addressed. In the 1950s, only 30% of the world's population lived in cities; by 2014, the urbanization level had reached 54%, and the United Nations predicts that by 2050, the figure will be 66% . Developing countries in Asia and Africa are urbanizing even more rapidly than other regions of the world. In the past 10 years, China's urbanization has increased from 40.53% to 53.73%. With the irreversible process of urbanization, cities and megacities (cities with a population greater than 10 million) are emerging with increasing frequency. Since cities are not only hubs of human activity, but also the places where economic, environmental and societal demands are magnified, urbanization causes many important and significant economic, social and demographic transformations. The urbanization process has greatly improved people's standard of living, providing water supplies and sewerage systems, residential and office buildings, education and health services and convenient transportation. Cities are commonly regional economic centers that are helpful in improving regional economic prosperity and creating more jobs. The concentration of educated people in cities helps to improve the industrial structure and promote production efficiency. However, urbanization also creates new challenges and problems.

2.1.2 Understanding Smart Cities

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An understanding of the definition of a smart city is vital to be able to understand its scope and content. A concrete definition of a smart city is still emerging, and various definitions have been given by stakeholders from several different standpoints. It is difficult to formalize the definition, because the smartness of a city can be as simple as a single function provided to a certain group of citizens, or as complicated as an entire administration process representing the restructuring efforts of a government procedure.

2.1.3 Smart City: What is it and why is it needed?

What is smart city and why are many people taking about it? In the last several years there has been explosive growth of information and communication technologies (ICTs) due to advancement of hardware and software designs. The use of ICT in cities in various forms for different city activities has led to the increased effectiveness of city operations and these cities have been labeled using many terms such as "cyberville", "digital city", "electronic city", "flexi city", "information city", "telicity", "wired city", and "smart city". Smart city is the largest abstraction among the labels used as it encompasses other labels used for cities. The smart city is a concept and there is still not a clear and consistent definition of the concept among academia and practitioners. In a simplistic explanation, a smart city is a place where traditional networks and services are made more flexible, efficient, and sustainable with the use of information, digital and telecommunication

technologies, to improve its operations for the benefit of its inhabitants. In other words, in a smart city, the digital technologies translate into better public services for inhabitants, and for better use of resources while impacting the environment less. One of the formal definitions of the smart city is the following: A city "connecting the physical infrastructure, the information-technology infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city". Another formal and comprehensive definition is the following: "A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operations and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects".

A broad overview of various components needed in a smart city is depicted. Any combination of various smart components can make cities smart. A city need not have all the components to be labeled as smart.

The number of smart components depends on the cost and available technology. World population has increased significantly in the last decades and so has the expectation of living standards. It is predicted that around 70% of the world population will live in urban areas by the year 2050. At present cities consume 75% of the world's resources and energy which leads to the generation of 80% of greenhouse gases. Thus, in the next few decades there can be severe negative impact on the environment. This makes the concept of smart cities a necessity. The creation of smart cities is a natural strategy to mitigate the problems emerging by rapid urbanization and urban population growth. Smart cities, in spite of the costs associated, once implemented can reduce energy consumption, water consumption, carbon emissions, transportation requirements, and city waste.

2.1.4 Application domains of smart cities

The objective of a smart city is to improve the city's sustainability from the aspects of governance, citizens, businesses and the environment. Smart applications are developed to fulfill the information and decision-making requirements of government, citizens, companies and the environment. A great number of different applications for smart city emerge every day, and researchers try to include the application domains in the literature.

Smart Cities: Components and Characteristics

Components and characteristics of the smart city are summarized. There are many components of a smart city and 8 different components have been presented in the figure. The components of smart cities include the following: smart infrastructure, smart buildings, smart transportation, smart energy, smart healthcare, smart technology, smart governance, smart education, and smart citizens. A brief discussion of these components will be presented in the subsequent sections. Different smart cities have different levels of these smart components, depending on their focus. The various attributes of smart cities include sustainability, quality of life (QoL), urbanization, and smartness. The sustainability of a smart city is related to city infrastructure and governance, energy and climate change, pollution and waste, and social issues, economics and health. The quality of life (QoL) can be measured in terms of the emotional and financial well-being of the citizens. The urbanization aspects of the smart city include multiple aspects and indicators, such as technology, infrastructure, governance, and economics. The smartness of a smart city is conceptualized as the ambition to improve economic, social and environmental standards of the city and its inhabitants. Various commonly quoted aspects of city smartness include smart economy, smart people, smart governance, smart mobility, and smart living. There are four core

themes for a smart city, namely society, economy, environment, and governance. The society theme of a smart city signifies that the city is for its inhabitants or the citizens. The economy theme of a smarty city signifies that the city is able to thrive with continuous job growth and economic growth. The environment theme of a smart city indicates that the city will be able to sustain its 4 function and remain in operation for current and future generations. The governance theme of a smart city suggests that the city is robust in its ability to administer policies and combining together the other elements.

3.1 Smart Infrastructure and Building

In a classic sense, the infrastructure of a city is any physical component of the city such as roads, buildings, and bridges that make the city and its inhabitants operate. However, in the context of smart cities, anything physical, electrical, and digital that is the backbone of the smart city can be considered as its infrastructure. There are many examples and a few are: rapid transit system, waste management system, road network, railway network, communication system, traffic light system, street light system, office space, water supply system, gas supply system, power supply system, firefighting system, hospital system, bridges, apartment homes, hotels, digital library, law enforcement, economy system, etc. The smart infrastructure concept is presented. The backend of the smart infrastructure is the ICT infrastructure which makes the physical infrastructure "smart". The ICT infrastructure is fundamental to the construction of smart cities and depends on factors related to its availability and performance. The ICT infrastructure includes communication infrastructure such as fiber optics, Wi-Fi networks, wireless hotspots as well as serviceoriented information systems. Smart infrastructure is more efficient, safe, secure, and fault-tolerant as compared to classic infrastructure. The smart infrastructure may have physical infrastructure, sensors, firmware, software, and middleware as its overall components. The "middleware" which is a specific type of software typically plays a crucial role in automation and the quick response of smart infrastructure. Middleware accumulates data and combines them into a common platform for analytics and reporting. The middleware in the process can perform web-based dashboard displays for a visual snapshot of the infrastructure. When experiencing high energy usage, abnormal maintenance costs, and many normal and abnormal situations, the prompt attention of the operation staff is requested.

The middleware provides the executives in charge or operation staff numerous information including carbon footprint management and sustainability as well as the big picture of the smart city infrastructure, no matter how many infrastructures, buildings or geographic locations are involved as a whole.

The information of the smart infrastructure through the middleware and ICT is available quickly and can be accessed anywhere by the operation staff and management for better decisions that have an immediate impact on the smart city operations. A specific example of smart infrastructure is a smart power grid or, as it simplistically called, a smart grid. A smart grid consists of various energy sources (renewable or conventional), smart meters, operational control mechanisms, load balancing mechanisms, and fault-tolerant mechanisms for efficient and reliable power delivery to the end user from the various energy sources. Smart buildings can be considered as part of the smart infrastructure or they can be considered as independent components of smart cities. A smart building can have different hardware, software, sensors, and smart appliances, for different automated operations including data network, voice-over-IP (VoIP), video distribution, video surveillance, access control, power management, and lighting control. Smart buildings are different from green buildings. Green buildings are sustainable structures with high energy efficiency, water efficiency, and indoor

environmental control with an objective of reducing their carbon footprint and provide optimal energy performance. Smart buildings are a much larger concept than green buildings. Smart buildings can easily connect to other buildings, people and technology, the global environment, and smart power grids. Smart buildings effectively use the knowledge that is available outside their walls and windows. For example, the smart grid can be used by smart buildings. In this scenario, the smart building can easily adapt to its energy demand as well as that of the grid to have effective and low-cost power utilization. Smart buildings can use dynamic electric rates in which a building is charged closer to the actual cost of producing electricity at the instant it is used instead of the average cost over long time periods. The use of the Internet of Things (IoT) provides integrated solutions that can process and analyze large amounts of data that will maximize the operational and energy efficiency of smart buildings. The advantages of the smart building include the following: data driven decision-making for high efficiency and low-cost operations, higher resource utilization, reduced capital and operational cost structure, risk identification and management, and sustainability.

3.2. Smart Transportation

Traditional transportation systems or facilities such as the railway network, road transport, airline transport, and water transport have existed for a long time. In traditional transport each of these operates independently even in a specific type of transport system, making global usage difficult. Smart transportation also known as the Intelligent Transport Systems (ITS) includes various types of 6 communication and navigation systems in vehicles, between vehicles (e.g. car-to-car), and between vehicles and fixed locations (e.g. car-to-infrastructure). ITS also covers the rail, water, and air transport systems, and even their interactions. A broad illustration of the smart transportation is presented in Fig. 4. The smart transportation system has made it possible to construct global airway hubs, intercity railway networks, intelligent road networks, protected cycle routes, protected pedestrian paths, and integrated public transport for safe, rapid, cost effective, and reliable transportation. The use of ICT and real-time data processing has made the smart transportation system possible. The smart transportation system maximizes the utilization of the vehicles used in the system, for example, the number of aircraft that an airline has or the number of trains a railway network has. The smart transportation system allows passengers to easily select different transportation options for low-cost, shortest distance, or fastest routes. Specific examples of smart transportation technology including sensors in vehicles for collision avoidance and anti-skidding to increase the safety of the system. Radio frequency identification (RFID) based toll collection is an example of smart transport technology. In the RFID toll collection drivers need not stop at a physical toll booth which typically takes time, blocks the traffic flow, as well as requires manpower for toll collection. Automatic passport control at airports is an emerging technology deployed in smart transportation. In automatic passport control, the passengers can use RFID based passports or electronic passports for fast and reliable entry without the need for manual passport check. Another example of smart transportation is the use of smart apps in mobile phones to hire taxis and even tracking the exact location of the taxi and driver information in the same smart app.

3.3 Smart Energy

Energy is the property of an object or system which defines its ability to produce work. Energy can be in various forms such as potential energy, kinetic energy, chemical energy, and thermal energy. Energy sources are also

quite diverse including solar, fossil fuels, gas, electricity, and battery. Energy can be neither created nor destroyed but can be transformed from one form to another. In the last several years, in addition to traditional energy forms, many other terms are associated with it including clean energy, green energy, sustainable energy, renewable energy, and smart energy. The fear that energy sources available for human consumption will be depleted has been driving these new energy related terms. Clean energy or green energy suggests that the energy consumption has very minimal negative impact on the environment. Example, solar energy or wind energy are forms of green energy sources. Sustainable energy and renewable energy are energy sources which cannot be consumed within a few generations and can be regenerated faster than they can be consumed.

However, there can be some differences between sustainable energy and renewable energy: sustainable energy sources are ones not created by human beings, whereas renewable sources are created by human beings. One example of renewable energy is bio-gas which requires the growth, consumption and disposal of organic materials to generate it. Another related term is zero energy system or zero-energy buildings in which the energy consumed and energy generated are the same quantity and hence the net consumption in these structures can be considered as zero. What is smart energy? Smart energy is a much broader concept that any of the above such as traditional energy or clean energy, etc. Smart is a concept which can be viewed as an "Internet of Energy" model. This model is based on one or more principles of smart power generation, smart power grids, smart storage, and smart consumption. In essence any traditional energy, clean energy, green energy, sustainable energy, and renewable energy along with the information and communication technology (ICT) makes smart energy. The smart energy system consists of the intelligent integration of decentralized sustainable energy sources, efficient distribution, and optimized power consumption. Smart energy thus consists of three independent building blocks that must be stitched together and effectively communicate with each other to form a unified smart energy system. Low-carbon generation, also known as a green energy, photo-voltaic, solar thermal, bio-gas, and wind energy can be an important part of a smart energy system. Efficient distribution in the smart energy system is made possible by the use of smart infrastructure, smart grid, smart meters as well as an appropriate level of utilization of the information and communication technology (ICT). The core of a smart energy system is the information infrastructure which is responsible for collecting the energy consumption information as well as sharing the provider rate information. The ICT can be used to control the operations with appropriate level of energy consumption for smart appliances like dishwashers and water heaters. ICT is also useful for transactions for plug-in electric vehicles (PEVs) and heating, ventilation, and air conditioning (HVAC). ICT can be effectively used to purchase energy from various diverse sources such as solar panels systems, wind turbine systems, and other possible energy sources. Optimized consumption of the system is the 3rd key component of the smart energy system. The effective use of efficient energy storage, smart metering, and effective energy management can be keys for optimizing energy consumption in a smart energy system. The backbone of a smart energy system is the smart energy grid or smart grid. In a formal definition, the smart grid efficiently integrates the actions and behaviors of all connected users such as: (1) consumers, (2) generators, and (3) users who are both consumers and generators. Smart grids ensure efficient, economical, and sustainable energy systems with low levels of loss, higher quality supply, safety of system and users, security of the supply, and faculty-tolerance of the system. Smart grid makes it possible to integrate diverse sources of energy available, from fossil fuel based thermal energy to green photo-voltaic energy, and wind energy. The future smart grids will be much more complex than the current generation. For example, a day may come when every

user also generates solar energy, bio-fuel energy, and even wind energy. A smart grid will effectively synchronize this energy from diverse sources and provides electricity at specified voltage and frequency without any fluctuations.

The use of ICT plays a key role in a smart grid for the following: (1) to support demand-response management of energy usage, (2) to dispatch power generation for solar panels and wind turbines, (3) to facilitate location-independent, point-of-sale transactional services for PEVs, and (4) enhancing consumer relationships. Smart energy metering is an important component of the smart grid. The smart meter records consumption of electric energy in certain time intervals and communicates that information to the utility for monitoring and billing. This facilitates accurate and reliable reading of utilization without human reading or recording involvement. A smart battery or intelligent battery which can be made from lithium ion or fuel cells can be effective for energy storage and efficient delivery while having longer life.

3.4. Smart Healthcare

Due to the rapid growth of population, traditional healthcare is overwhelmed. There are not enough medical practitioners to meet the need of the citizens. Many times hospitals make mistakes in handling infectious diseases. In many occasions patients receive the wrong medication. In many remote places in the planet receiving adequate healthcare is still a distant dream. Thus, with limited resources and ever increasing demand, traditional healthcare needs to be intelligent, efficient, and sustainable; that is where smart healthcare comes in. Smart healthcare can be conceptualized as a combination of various entities including 9 traditional healthcare, smart biosensors, wearable devices, information and communication technology (ICTs), and smart ambulance systems. The various components of smart healthcare include emerging on-body sensors, smart hospitals, and smart emergency response. In smart hospitals, various mechanisms including ICTs, cloud computing, smart phone apps, and advanced data analysis techniques, are used for their operation. The patient data can be made available in real-time at various offices in a smart hospital or even various smart hospitals in different cities or the same city. Medical technicians, nurses, and doctors can have access to the test data without loss of any time in transferring the same information physically from one office to another. Similarly, different doctors can see the information to make judgments on a patient's condition. Thus real-time decisions on patient health conditions and corresponding medication can be made possible.

3.5. Smart Technology

Smart technology is key for the design, implementation, and operation of smart cities. A diverse variety of components including infrastructure, buildings, physical structures, electrical infrastructure, electronics, communication infrastructure, information technology infrastructure, and software, make the smart cities happen. A design and operation challenge is how to have a good mix of the smart technologies so that the smart cities are not over smart, rather sufficiently smart to be sustainable for years and years. Thus, it is important that the cost of deployment of such smart technology is not a serious overhead for tax revenue of the citizens of the smart cities. However, as science and technology make progress, smart technology can become cheaper and smart cities may become an economically viable option. Green or renewable energy resources such as solar power and wind power as discussed in a previous Section are an example of smart technology which is key for

smart cities. Green buildings and green neighborhood development communities are also important for smart cities.

Green buildings and hence the corresponding communities using them are categorized by rigorous standards programs like Leadership in Energy & Environmental Design (LEED) in the US and Building Research Establishment Environmental Assessment Methodology (BREEAM) in the UK. The LEED program in the USA is a green building certification program that identifies the best-in-class building strategies and practices. In order to achieve the LEED certification, the building projects must satisfy prerequisites and earn scores to obtain different levels of certification. For example, LEED v4 which is the newest version certification includes important aspects like materials of the building, indoor environmental quality, smart grid, and water efficiency. Similarly, BREEAM includes several categories for the assessment, including management, energy, pollution, materials, waste, water usage, and healthcare. A sustainable transport system is a key technology for smart cities. Sustainable and smart transport systems, for example mass rapid transit systems (MRTS), can transport large numbers of people from one destination to another. This can reduce traffic congestion and is helpful in reducing greenhouse emissions which have a negative impact on global warming. Smart communication technology and ICT are important technologies which include fiber optics to home, citywide Wi-Fi, near field communication (NFC), and Bluetooth. Citywide Wi-Fi can make use of basic services such as calling a taxi easier. NFC can 11 revolutionize the way credit cards are used; may be the day will come where we will have a cash less society. Cyber physical systems (CPS) which are integrations of computation, networking, and physical entities just like the internet of things (IoT) are a key to make physical entities smart. Social networks and short-message services (SMS) have created communications mechanisms to efficiently avail utilities in smart cities. A variety of state-of-the-art technologies can be used to make the cities smart. The above discussed technologies like Wi-Fi, and NFC can be considered as part of this; however, there are many other forms of smart technology. A specific example of state-of-the-art technology are smart meters that can measure and record consumption of various utilities such as electricity, gas or water and communicate that information for monitoring and billing to central facilities. Another state-of-the-art technology is electronic cards or smart cards which contain a unique encrypted identifier that allows the owner to log in to a range of services without setting up multiple accounts. A network of secure digital cameras can be an effective solution for secure and copyrighted image or video communication in the IoT for use in smart health care and smart transport.

CONCLUSION

As a nation we have identified that the actual economic growth lies in urbanization. We need to treat urbanization as an opportunity and not as a problem. This naturally gives a thrust to the development of smart cities across the nation which is well planned peripheral urban city centres. We need to ensure that smart cities evolve from the existing urban conglomeration as well as proposed newly-planned smart cities. This needs to be done by going along the route of urban renewal, adopting environment-friendly measures which will also ensure that they become economically strong, financially viable and from an environment perspective, 'sustainable' – not just for today but also for the future.

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