Chapter 8
Exploring Potentials and Challenges in Making Smart Cities in India: A Case Study of Allahabad City, Uttar Pradesh

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Abstract Globally, cities are grappling with rapid urbanization and problems related to resource management, sustainable development, and climate change mitigation. To overcome these challenges, policy makers and academicians are focusing on the idea of smart city. Both developed and developing nations are cooperating and signing memorandum of understanding each other to transform their old and traditional cities into smart cities. India, as a developing country, has also taken a completely new and bold initiative to transform its existing cities structure and make it more modern and sustainable while conserving its core values. India's smart city mission to create 100 smart cities is a step in this direction. According to Indian Ministry of Urban Development, Allahabad will be one of the future smart cities. The paper is an attempt to assess the current situation of Allahabad city by analyzing various social, economic and urban components and its readiness for smart city transformation. Qualitative and quantitative data is collected from both primary and secondary sources. Multi-criteria decision analysis is used as a method to produce consolidated score against each parameter. Consolidated score enables to understand current status of social, economic, and urban sector in Allahabad city and their contribution toward making smart city. Allahabad has a lot of potential to transform into smart city, but road ahead will not be easy. In many areas complete overhauling is required. To make smart city transformation possible, city officials, academicians, and citizens should cooperate with each other wholeheartedly.

Keywords Smart city · Urban transformation · Multi-criteria decision analysis · Current status · Technology intervention

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P. Sharma and S. Rajput (eds.), *Sustainable Smart Cities in India*,
The Urban Book Series, DOI 10.1007/978-3-319-47145-7_8

Acronyms

UN	United Nations
GDP	Gross domestic product
ICT	Information and communication technology
IT	Information technology
FY	Financial year
SC	Smart city
SCM	Smart city mission
AMRUT	Atal mission for rejuvenation and urban transformation
CSTEP	Center for Study of Science, Technology and Policy

8.1 Introduction

The future of mankind lies in cities. It is evident that remarkable shift from primarily rural to primarily urban population has taken place in the past two centuries. Earlier in the eighteenth century, not more than 5% of the global population inhabited the cities (Population Reference Bureau 2015). Today, more people live in the cities. As per UN World Urbanization prospect, in 2014, global urban population was 54% and projected to rise to 70% by 2050. Also, in the past, new cities have come into existence and building of hundreds more are expected to continue in coming years. These upward trends are likely to be more significant particularly in developing countries, where it is projected that 90 percent of additional 2.5 billion urban dwellers will be accommodated by much of the growth of secondary and tertiary cities by 2050.

Most of this urbanization is characterized as self-motivated because reduction in the demand for manual labor in farming activities due to mechanization has led workers to move to cities for better life (Owen, 2009). This one-sided migratory process has caused rapid and haphazard urbanization. Due to this severe physical, technical, and socioeconomic problems have emerged such as, scarcity of resources, growth of slums, sprawl, housing shortages, traffic congestions, air, water, and sound pollution, inefficient waste management, human health concerns, inadequate, deteriorating and aging infrastructures, social segregation, and exclusion. Cities have also become the place of acute inequalities where one-third of urban inhabitants in the developing nations live in slums. These are also the places where threats to culture and heritage are increasing, and where the enormous and complex congregation of people and assets pose greater level of challenges and disaster risks (UN Habitat 2015).

Such type of complex urban problems poses the need for smarter ways of urban planning design, management, and governance. Across the globe, Governments have created strategic and innovative approaches for smart city transformation to improve operational efficiencies, maximize environmental sustainability efforts, and

create new citizen services. There is an urge to create smart cities all over the world to surpass challenges posed by traditional and conventional cities. Overcoming these critical challenges in a systematic manner is crucial for cities inspired to shift toward more sustainable measures among all stakeholders: citizens, businesses, and governments (PricewaterhouseCoopers 2015).

The current situation and trends of urbanization are more miserable and challenging in a developing country like India. With rapid and unplanned urbanization, Indian cities are characterized by dense population, traffic jams, high level of pollution, unaffordable housing resulting in urban sprawl and slums, high cost of livings, corruption, irresponsible governance, low level of health care, and educational facilities and strained infrastructure in terms of frequent power cuts and water shortages. Most of the cities have already stretched beyond its carrying capacity limit and have become unsustainable. Continued increase in flow of migrants to urban areas is only worsening the problem. Despite all the problem Indian cities are facing nowadays, these are like powerful engine for the fast developing economy like India. Currently, 31% of India's population live in urban areas and contribute 63% of India's Gross Domestic Product (Census of India 2011a, b). With increasing urbanization, 40% of India's population is projected to dwell urban areas and contribute 75% of India's GDP by 2030 (Smart City Guidelines 2015). In the current scenario, development of physical, institutional, social and economic infrastructure of cities is the need of the hour. These are significant in terms of improving quality of life and to draw attention of people and investment toward the city. India's smart city mission for transforming urban areas is a step in that direction.

The Indian government took a major policy initiative to create 100 smart cities across the country. The purpose behind the mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to smart outcomes (Smart City Guidelines 2015). This ambitious plan will transform the structure of existing cities and take it to the global level. To make this mission successful, Indian government has collaborated with many developed countries including United States of America, France, Germany, United Kingdom, Japan, and Singapore. These countries will provide necessary know-how and technologies so that quick implementation and time bound delivery of the project could become possible.

In August 2015, Government of India unveiled the list of 98 smart cities. Allahabad emerged as a winner city in the nationwide competition between states organized by Ministry of Urban Development. It is a chosen one out of 12 future smart cities from Uttar Pradesh (Press Information Bureau 2015). Earlier, United States Trade and Development Agency signed a Memorandum of Understanding with Government of Uttar Pradesh to develop Allahabad into a smart city (The Hindu 2015). In Allahabad, Katra and Mumfordganj areas are selected for retrofitting under the smart city project (Draft Smart City Proposal Allahabad 2015). The present study explores potentials and challenges in making smart cities of India while taking Allahabad as an example. The main objective is to assess the current

situation of Allahabad city by analyzing various social, economic, and urban components and metrics and its readiness for smart city transformation.

8.2 Conceptualizing Smart City

The idea of smart city has become more prevalent nowadays and its growing interest among policy makers and academicians is visible across the globe. More people and governments are embracing this idea. Not only developed countries of Europe and North America but developing nations like China and India are planning their cities for smart city transformation. Although the term "smart city" is frequently being used now, still there is not clear and common understanding of the concept among the practitioners and academia. Only limited number of research work has done and there is need to systematically consider questions related to this new urban phenomenon of smart cities. The idea of smart city is still in the nascent phase and the process of defining and conceptualizing is in progress (Boulton et al. 2011; Hollands 2008). The concept and definition of smart city varies from people to people, city to city, nation to nation, depending upon the level of development, resource availability, zeal for transformation, and aspirations of city residents (Smart City Guidelines 2015). Through the help of literature review, several working definitions of smart city are listed out which are of great practical and academic use.

"A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens" (Giffinger et al. 2007).

"A city striving to make itself "smarter" (more efficient, sustainable, equitable, and livable)" (Natural Resources Defense Council 2014).

"An instrumented, interconnected, and intelligent city": Instrumentation enables the capture and integration of live real world data through the use of sensors, kiosks, meters, personal devices, appliances, cameras, smart phones, implanted medical devices, the web, and other data acquisition systems, including social networks as networks of human sensors. Interconnected means the integration of those data into an enterprise computing platform and the communication of such information among various city services. Intelligent refers to the inclusion of complex analytics, modeling, optimization, and visualization in the operational business processes to make better operational decisions (Harrison et al. 2010).

"The use of Smart Computing technologies to make the critical infrastructure components and services of a city—which include city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient" (Washburn et al. 2010).

A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to dematerialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability" (Toppeta 2010).

"A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens" (Hall 2000).

"A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives" (Rios 2008).

"A city where The ICT strengthen the freedom of speech and the accessibility to public information and services" (Partridge 2004).

8.3 Study Area

Allahabad is one of the largest cities of Uttar Pradesh in terms of area and population. Allahabad is located at 25° 28′N latitude and 81° 54′E longitude. Its mean elevation at sea level is 98 m. The name of the modern Allahabad is derived from "Illahabas" that was founded by Moghul Emperor Akbar in 1575 AD. It can be classified as typical third tier cities of North India. The city is known worldwide for its magical confluence of history, culture, and religion. The city may be divided into three physical parts—(i) Trans-Ganga or the Gangapar Plain, (ii) the Ganga–Yamuna doab (confluence), and (iii) Trans-Yamuna or the Yamunapar tract, all three of which are formed by Ganga and its tributary Yamuna, the latter joining the former at Allahabad, the confluence being known as Sangam. General topography of the city is plain with moderate undulations.

The climate of city is characterized by typical humid subtropical as experienced by the whole north-central India. It has three seasons such as hot dry summer, warm humid monsoon, and cool dry winter. Climate varies from extreme cold dry to extreme hot to pleasant monsoon. The summer season is long and hot with the maximum temperatures ranging from 40 °C (104 °F) to 45 °C (113 °F) accompanied by hot local winds called as "loo." The winter season usually extends from mid-November to February and is followed by the summer which continues till about the middle of June. The southwest monsoon then ushers in the rainy season which lasts till the end of September. October and the first half of November constitutes the post-monsoon season.

As per Census of India, 2011, total area of the city is approximately 70 km^2 and population is 1,168,385. Whole city area is divided into 97 wards for administrative convenience (Table 8.1).

Table 8.1 Allahabad city at a glance

Geographic area	70.05 km^2
Administrative wards	97
Total population	1,168,385
Proportion of female population	46%
Population density	16679 persons per km^2
Sex ratio	853/1000
Literacy rate	84.67%
Workforce participation rate	37.57%

Source Census of India (2011)

8.4 Database and Methodology

Qualitative and quantitative data is collected from both primary and secondary sources. Primary data is obtained from questionnaire survey and interview of city residents and officials. Secondary data is taken from various Indian government information portals, city-specific government websites, city-specific department websites, research papers available publically, public reports and statistics and surveys done by various analyst organizations. There are various central and state government reports such as Allahabad District Census Handbook 2011, Allahabad Town Directory 2011, Census of India 2011, 2011, Jawaharlal Nehru National Urban Renewal Mission reports of Allahabad city, etc. City components that are significant in understanding the current situation of the city and the smart city transformation are identified. The data for the components is collected from different city-specific departments such as Allahabad Nagar Nigam, Purvanchal Vidyut Vitaran Nigam Limited, Jal Kal Vibhag Allahabad, Disaster Management Department Uttar Pradesh, Uttar Pradesh Fire Service, Revenue Department Allahabad, Higher Education Department, Uttar Pradesh, Uttar Pradesh Basic Education Board, Department of Medical Health and Family Welfare Uttar Pradesh, Uttar Pradesh Transport Department, Allahabad Development Authority, Uttar Pradesh Police, etc.

To fulfill the objective, methodology, and indicators developed by PricewaterhouseCoopers, India on Smart city has been adopted with some modification according to the study area. To understand the current situation of Allahabad city by analyzing various social, economic, and urban components and metrics and its readiness for smart city transformation, a structured approach has been adopted that involves detailed assessment of fundamental and critical parameters for smart city transformation and to take cognizance of city readiness to achieve the smart city vision. In order to develop a comprehensive picture, Allahabad city has been assessed on the basis of social, economic, and urban characteristics and several parameters as discussed in the following sections (Table 8.2).

Multi-criteria decision analysis is used as a method to analyze each sector in detail. Across each identified sector, metrics were developed of smart city based on

Table 8.2 Major components of smart city identified for analysis of Allahabad as smart city

Social	Urban	Economic
Health Education Public Safety Disaster management	Power Water Transport	Municipal corporation Sustainability

Source Based on PricewaterhouseCoopers (2015)

Table 8.3 Framework for rating the criteria

Criteria/rating	Rating 3	Rating 2	Rating 1
Current status	High service delivery	Medium service delivery	Low service delivery
Technology Intervention	High technology involvement (for city monitoring and control points)	Medium technology involvement (limited to city monitoring only)	Low technology involvement
Contribution to smart city	Essential to a smart city, fundamental requirement	Significant to a smart city	Least significant for a smart city

Source Based on PricewaterhouseCoopers (2015)

benchmarks and target values. Score is given in accordance with and deviation from these benchmarks and target values. Considering the difficulties in data collection and limited resources, 41 components have been identified. PricewaterhouseCoopers report on smart city and Draft Concept Note on Smart City Scheme developed by Ministry of Urban Development have been of great importance in the selection and assessment of components. These components have been assessed and rated across three criteria such as Current status, Technology intervention, and Contribution to smart cities (Table 8.3). Current status refers to the current level of city performance and service delivery across each of the component is assessed. Technology intervention defines the use and state of technology solutions for city operations and the delivery of various city services and Contribution to smart city implies the vitality index and the contribution made by individual components in city operations. Out of these 41 components, 39% depicts an urban overview, 32% a social overview, and the remaining provides an economic overview of the city. During the assessment, care has been taken to use the most recent data available. These criteria are assessed on a scale of three to one, three being the highest rating and one the lowest. Weights have been assigned to these criteria on the basis of their significance and contribution to help assess the preparedness of the city in reference.

The final score has been derived as per the following formula:

$$\text{Final score} = (\text{Current status} \times 4) + (\text{technology intervention} \times 4) + (\text{contribution to smart city} \times 5)$$

Weighting factors are used to define the level of importance of criteria. Weights have been assigned from zero to five scales. Zero refers to not important, one is for very low importance, two is for low importance, three is for medium importance, four is for high importance, and five is for very high importance. Current status and technology intervention have been assigned equal weightage of 4 that is of high importance. Very high weightage of 5 is assigned to "contribution to smart city" to emphasize the critical components that need urgent attention and efforts. Assessment findings have been rationalized by carrying out a ground level analysis and initiative taken by cities in that particular sector by individual departments across all identified components. City development plan of Allahabad under Jawaharlal Nehru National Urban Renewal Mission has been of great importance in these respects. To know the valCurrent, ground level initiatives and mechanisms have been examined in detail to substantiate the findings and ratings. Through the standardization process, consolidated score on a scale of one to 10 for each component has been developed. This has helped to gain clear insights of the entire city-wise operations till the last level.

8.5 Results and Discussion

8.5.1 Assessment of Current Situation of the Allahabad City and Its Readiness for Smart City Transformation

The component scoring of nine components including power, water, public safety, disaster management, transport, health, education, municipal corporation, and sustainability has been derived in the study (Tables 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11 and 8.12). Each component has been rated against the current state, technology intervention, and contribution toward smart city. Consolidated score is produced from multiplying ratings with weights.

8.5.1.1 Power

Power is a significant component in terms of livability and sustainability from the citizen and industrial perspective. With respect to power sector that includes 24 × 7

Table 8.4 Component scoring for power

Power				
Subcomponents	Current State	Technology intervention	Contribution toward smart city	Score (considering weights)
247 electric supply	2	2	3	31
Energy consumption details	3	3	3	39
Online payment facility	3	3	3	39
Metering	1	1	3	23
Grievance redressal for citizens	2	1	3	27

Source Author

Table 8.5 Component scoring for water

Water				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
24 × 7 water supply	2	2	3	31
Metering of water connections	1	1	2	18
Online payment facility	1	1	3	23
Water losses minimization	1	1	3	23

Source Author

Table 8.6 Component scoring for public safety

Public safety				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
City surveillance	1	1	3	23
Online FIR, complaints registration	1	1	2	18
Complaint response time	2	1	2	22

Source Author

power supply, energy consumption details, online payment facility, Metering and Grievance redressal for citizens, Allahabad city has a consolidated score of 8.15 out of ten for power. Overall Allahabad has performed well in power sector, still some areas require greater attention. Electricity metering and citizen grievances redressal

Table 8.7 Component scoring for disaster management

Disaster management				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
Disaster prediction system, early warning system	1	1	3	23
Disaster alarm and response system	1	1	3	23
Fire stations basis population density	1	1	3	23

Source Author

Table 8.8 Component scoring for transport

Transport				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
Transport surveillance: Traffic violation detection, speed violation detection, traffic signal violation detection	1	1	2	18
Challan management	1	1	2	18
Traffic management system	1	1	3	23
Parking management	1	1	2	18
Availability and frequency of mass transport	2	1	2	22
Availability of bicycle tracks	1	1	2	18
Unobstructed footpaths of minimum 2 m width on either side of all streets	1	1	2	18

Source Author

Table 8.9 Component scoring for health

Health				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
No of hospitals against population density	1	1	3	23
Healthcare facilities	1	2	3	27
Emergency response facilities (ambulances, emergency wards, etc.)	1	2	3	27

Source Author

Table 8.10 Component scoring for education

Education				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
Total number of schools	3	1	3	31
School for the specially abled	1	1	2	18
Colleges against population density	3	2	2	30
Professional colleges against population density	3	2	2	30

Source Author

Table 8.11 Component scoring for municipal corporation

Municipal corporation				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
Property tax payment	3	3	2	34
Complaint registration	2	2	2	26
Birth and death registration	3	3	2	34
Online building plan sanction	1	1	2	18

Source Author

Table 8.12 Component scoring for sustainability

Sustainability				
Subcomponents	Current state	Technology intervention	Contribution toward smart city	Score (considering weights)
Noise pollution control	1	1	2	18
Air pollution control	1	1	2	18
Adherence to the green building norms	1	1	3	23
Water pollution control	1	1	2	18
Households connected to the waste water, sewerage network	1	1	3	23
Waste water treatment	1	1	2	18
Population with regular solid waste collection (residential)	1	1	2	18
Recycling of solid waste	1	1	2	18

Source Author

system need greater technological input and government support. The city is yet to achieve 24 × 7 power supply for domestic and commercial use. To make Allahabad a smart city, administrators and residents need behavioral changes. They should make efforts to stop all activities related to theft and wastage of electricity (Table 8.4).

8.5.1.2 Water

In terms of water that comprises 24 × 7 water supply, metering of water connections, online payment facility and water losses minimization, Allahabad has a consolidated score of 6.09. It shows that more improvement is required in level of infrastructure related to water in the city. 24 × 7 water supply is still a dream. Increasing population has created more pressure on city infrastructure carrying capacity. The city requires more technological input and financial support in metering of water connections, online payment facility, and water loses minimization.

Issues related to water distribution, water pricing, water population, water cycling, and rainwater harvesting need greater level of financial resources and should be dealt with proper care for smart city transformation (Table 8.5).

8.5.1.3 Public Safety

Increasing security-related issues is a major challenge of not only Allahabad city but of whole urban India. Public safety is another critical component to assess smart city readiness. With regard to public safety that includes city surveillance, online FIR, complaints registration, and complaint response time, Allahabad has a consolidated score of 5.38 out of ten. The city needs more emphasis in utilization of technology and components for city surveillance. More mobile vehicles with advanced technology and CCTV cameras should be provided to police department. Various securities-related projects are in pipeline and the city administration needs to align its current project objectives with smart city vision to further enhance public safety (Table 8.6).

8.5.1.4 Disaster Management

Expanding population and urbanization has made city more vulnerable in terms of earthquake, flood, fire, epidemics, etc., with respect to disaster management that includes disaster prediction system, early warning system, disaster alarm and response system and fire stations basis population density, Allahabad has a consolidated score of 5.90. The medium score is attributable to the absence of infrastructure related to disaster prediction management. Figures 8.1 and 8.2 shows the vulnerable places in Katra area of Allahabad city. To make Allahabad a smart

Fig. 8.1 Vulnerable residential buildings in Katra. *Source* Author

Fig. 8.2 Overhead web of power cables in Katra. *Source* Author

city, more emphasis should be given on capital investment, policy support, and public awareness program related to disaster management. The city needs more fire stations and advance equipment for fire fighting to meet any unforeseen events (Table 8.7).

8.5.1.5 Transport

Smart transportation is one of the major characteristic of smart city. To make any city smart, transport facilities should be of global level. The city should have efficient modes of transport including road, rail, water, and air. Allahabad city has the potential to develop all the modes smartly. In terms of transportation which includes transport surveillance for instance traffic violation detection, speed, violation detection, traffic signal violation detection, challan management, traffic

Fig. 8.3 Encroachments on road in Mumfordganj. *Source* Author

Fig. 8.4 Parking along the road divider in Katra. *Source* Author

management system, parking management, availability and frequency of mass transport, availability of bicycle tracks, unobstructed footpaths of minimum two meter width on either side of all streets, the city has consolidated score of 4.95. Low score is the result of poor current status and lack of technological intervention in transport-related infrastructures. The city lacks in modern intra-city transport facility due to poor quality private auto rickshaws running on road. Figures 8.3, 8.4, 8.5 and Fig. 8.6 describe the current situation of transportation in the city. The city needs research and development, capital investment, and public support to make transport smoother and smart (Table 8.8).

8.5.1.6 Health

Health is an important component to measure the smartness of people and living style. A smart city should have smart healthcare facilities combined with state-of-the-art technology and 24 h unobstructed emergency service. With respect

Fig. 8.5 Newly constructed road with wider footpath in Mumfordgang. *Source* Author

Fig. 8.6 Signboard for cycle path in Mumfordganj. *Source* Author

to health sector that includes, number of hospitals against population density, healthcare facilities, and emergency response facilities (ambulances, emergency wards, etc.), the city has consolidated score of 6.58. The city shows poor performance in terms of current status in healthcare facilities. More hospitals against population density are needed in the city and emergency facilities require urgent attention (Table 8.9).

8.5.1.7 Education

Education plays significant role in creating smart people who are interested in more use of information and communication technology. Education makes them creative, flexible, cosmopolitanism, open-mindedness, and to enjoy social and ethnic plurality. In terms of education that includes total number of schools, school for the

specially-abled, colleges against population density, professional colleges against population density, the city has consolidated score of 6.99. High score is attributed to the availability of large number of schools and colleges. Allahabad city acts like an educational hub of Purvanchal. Large numbers of students come from surrounding areas to prepare for competitive examinations (Table 8.10).

8.5.1.8 Municipal Corporation

Municipal corporation plays a great role in making a city smart. Whole things depend on the perception of corporation officials toward the city. Awareness program should be run to sensitize officials to make people-oriented programs and assimilate communities. Municipal corporation can help in cleaning roads and sewerage as well as managing solid waste. With regard to municipal corporation which comprises property tax payment, complaint registration, birth and death registration, and online building plan sanction, the city has consolidated score of 7.18. High score refers to efforts taken by corporation in areas related to online birth and death registration and online complaint registration, still city needs to take more steps in municipal governance such as online building plan sanction and online complaint redressal (Table 8.11). Municipal corporation of Allahabad city is also taking part in spreading awareness related to Smart City Mission, Swachh Bharat Abhiyan and Namami Gange etc. (Fig. 8.7).

Fig. 8.7 Spreading awareness through advertisements in civil lines. *Source* Author

8.5.1.9 Sustainability

Environmental sustainability is the core feature of smart city. A smart city should be sustainable in every respect such as economy, transport, livelihood, and environment. A smart city should not only care about its present generation but future generation too. To make a city sustainable and smart, carrying capacity of the city should be taken into consideration. In terms of sustainability that includes noise pollution control, air pollution control, adherence to the green building norms, water pollution control, households connected to the wastewater, sewerage network, waste water treatment, population with regular solid waste collection (residential), and recycling of solid waste, the city has consolidated score of 4.94. The city has not performed well, because of poor mechanism and strategies related to pollution control, water recycling, and solid waste management (Figs. 8.8 and 8.9).

Fig. 8.8 Katra Nala and its roofing. *Source* Author

Fig. 8.9 Garbage dumping in between two houses in Mumfordganj. *Source* Author

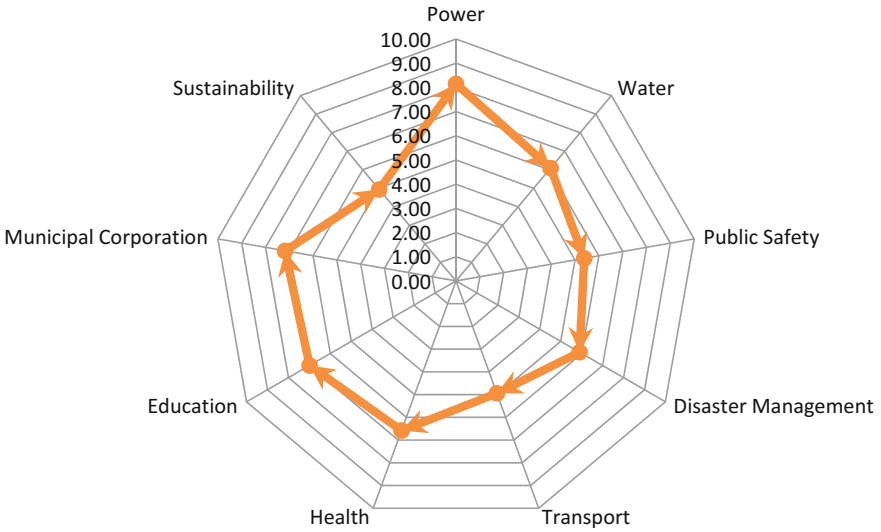

Fig. 8.10 Current status of smart city components in Allahabad city

City administration should address these issues without delay. To make Allahabad city sustainable, more focus should be given to use of information and communication technology in generating environmental awareness (Table 8.12).

Figure 8.10 shows the current status of smart city components in Allahabad city as a whole in terms of power, water, public safety, disaster management, education, health, transport, municipal corporation, and environmental sustainability. Out of the nine components, the performance of power sector is best. The performance of environmental sustainability is lowest among all components. All the other components have performed averagely. Current status of all these components can be improved by greater technology intervention and focus on root problems by city officials. More attention should be given to citizen participation because of its paramount importance in making a city smart. The higher educational status of Allahabad city inhabitants can help in making successful the process of citizen participation and awareness to make the city smart.

8.6 Conclusion

With ever-growing population and urbanization all over the world, and cities progress toward knowledge and information economy, the concept of smart cities is attracting interest from city officials, the private sector, local community and academics. The paper has assessed the current situation of Allahabad city and its readiness for smart city transformation. Thorough assessment will identify the challenges that city officials are facing today. It will support city administrators to

lay strong foundation to design the strategy for smart cities and analyze current state and performance through various lenses, while also taking into consideration the readiness of the city for the transformation.

The study shows that making smart city in India is not an easy task. Cities like Allahabad needs complete overhauling of social, economic, and urban infrastructure. Overall, Allahabad has not performed well on many components such as water, transport, public safety, disaster management, and environmental sustainability. In terms of technology intervention, Allahabad has to go long way. Some components like power, education, health and municipal corporation are showing positive signs, still there are substantial gaps in proper functioning and management, that need urgent attention of city officials. Government of India has launched several schemes to fulfill the gap such as Digital India for electronic empowerment, Swachh Bharat Abhiyan for cleanliness, Integrated Power Development Scheme for power sector, Make in India for boosting investment and manufacturing, and Pradhan Mantri Kaushal Vikas Yojana for skill development of youth. Finally, transformation of Allahabad into smart city requires great cooperation among city administrators, private sector, academicians, and citizens.

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