

PROBLEM AND CHALLENGES IN INFRASTRUCTURE DEVELOPMENT IN SMART CITY WITH SPECIAL REFERENCE TO RAJASTHAN



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Introduction: The smart city mission launched on 25 June 2015 is a joint effort of the ministry of housing and urban affairs and all the state and union territory governments. It initially aimed to be completed by 2019-20, but has since been extended. 100 cities and towns in different states and union territory of India have been selected under the smart city mission. The mission aims "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 cities are cities that work for the people". With the ever growing population, India has been witnessing continuous expansion in several cities. Has there is no employment available in rural parts of the country people prefer to move to the cities for earning bread and butter. This migration is leading to additional burden on the existing infrastructure of the cities in India. This is one of the reasons that gave birth to the concept of smart city.

Figure:1.1 Smart Cities Mission



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Source: <https://www.civildaily.com/story/urban-transformation/>

Figure:1.2 Area based development; City Level Criteria



Source: <https://blog.mygov.in/editorial/the-idea-and-practice-of-smart-cities-in-india/>

Overview of smart city concept

In the smart city mission, the government of India has selected at the outset to develop 100 cities. The concept of smart city demands that they would be provided better infrastructure, clean and sustainable environment and also provide smart solutions. Continuous and proper water supply to the citizens, smart system, better quality roads and above all uninterrupted power are some of the key issues to be considered on priority for making the cities „Smart“ in true sense. The concept of smart cities increases the rate of employment for men and women. The idea of a smart city has increased energy efficiency at a higher rate of usage. Promotes social inclusion by reducing poverty and eliminating the risk of poverty. Smart city interconnect the world's systems and makes the world more intelligent. Smart city enables advanced services, helping to bridge the digital divide and provide a better quality of life. Their high speed and well – planned infrastructure define smart cities.

Difference b/w a smart city & a normal city

Smart city	Normal city
Developed facilities with new medical technologies in hospitals and dispensaries.	Poor facility of hospitals and dispensaries with low grade technologies and medical systems.
Upgrade municipal schools with new ideas of teaching and learning processes.	Old processes of teaching and learning with bad quality facilities.
Segregation of garbage at proper source and sewage treatment plants well – maintained.	No proper disposal places of sewage and treatment plants ill – maintained.
Rehabilitation of hawkers and needy people with full government help and concern.	No proper habilitation facilities for hawkers & needy people
Roads & other construction sites well developed & made of cement & properly maintained.	Roads & construction sites not properly developed or maintained.

Concept of smart city in India

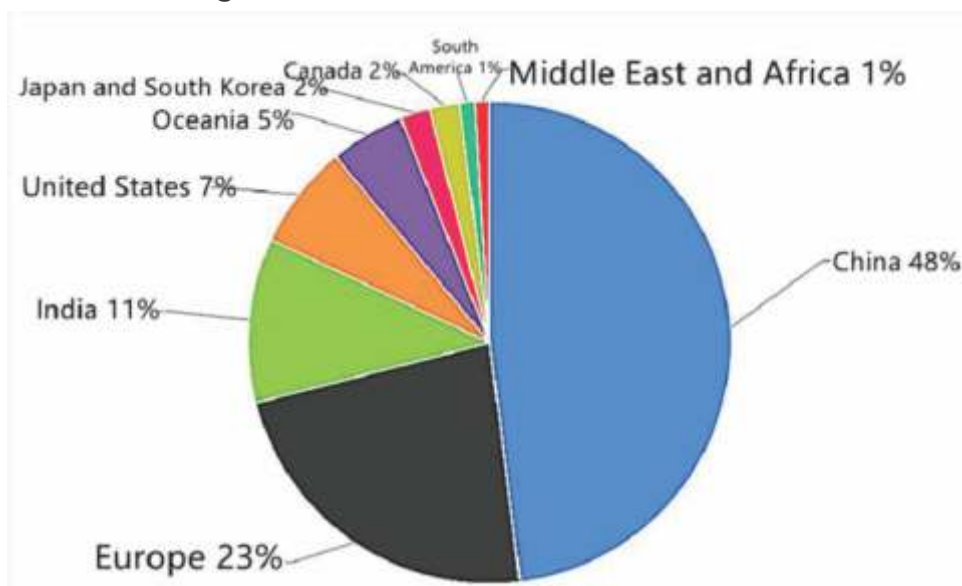
Smart Cities focus on their most pressing needs and on the greatest opportunities to improve lives. They tap a range of approaches – digital and information technologies, urban planning best practices, public-private partnerships, and policy change – to make a difference. They always put people first.

In the approach to the Smart Cities Mission, the objective is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a light house to other aspiring cities. The Smart Cities Mission is meant to set examples that can be replicated both within and outside the Smart City, catalysing the creation of similar Smart Cities in various regions and parts of the country.

The govt. of India launched the smart city mission in 2015 by PM Shri Narendra Modi. According to smart city mission government of India is cleaning to convert 100 Indian cities into smart cities.

The objective of smart city is to promote cities that provide core infrastructure and give decent quality of life to citizens and also given clean environment through the 'smart' solutions for their lives. The concept of smart city of India is not only focus on developing green – fields but also improvement in economic growth.

Figure: 1.3 Statistics of the Proportion of Smart Cities under Construction in Major Countries and Regions in the World



Source: https://www.researchgate.net/figure/Statistics-of-the-Proportion-of-Smart-Cities-under-Construction-in-Major-Countries-and_fig1_351385591

Smart city mission Rajasthan

On June 25, 2015 PM Shri Narendra Modi launched the "100 smart city Mission" to develop 100 cities all over the country making them citizen friendly & sustainable.

A total 4 cities in Rajasthan to developed as smart cities. Jaipur, Udaipur got selected in round 1, Kota & Ajmer made it to the list in round 3. There is no city selected in round 2.

Rajasthan has come first in the ranking of smart cities. The state-wise ranking has been released after reviewing the ongoing smart city work in 100 cities across the country. Rajasthan has got a total of 90.40 Marks in this.

Rajasthan ranked first in the ranking released by the union ministry of urban development. This inspection was performed on many points before releasing the ranking results. Ranking was based on points such as how many projects started in the cities, out of which work was completed on many projects. In these ranking two cities of Rajasthan have come in the top 10 with Udaipur at number 9, while Jaipur at number 10. Apart from Udaipur and Jaipur, Kota is ranked 14th and Ajmer is 22nd. These ranking were issued by the ministry every month on the basis of 9-point analysis including tenders held in smart cities, status of projects on the spot, fund utilization etc.

Rajasthan has the best performance top 5 and bottom 5 states in terms of completion rates (%)

Rajasthan	85.8%
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Source: Smart Cities Mission Dashboard, Lok Sabha, ET Analysis

Completion rate is calculated by dividing the number of completed projects over number of total projects. Data as of **January 27, 2023**.

Figure:1.4 Health Infrastructure at an Ajmer level

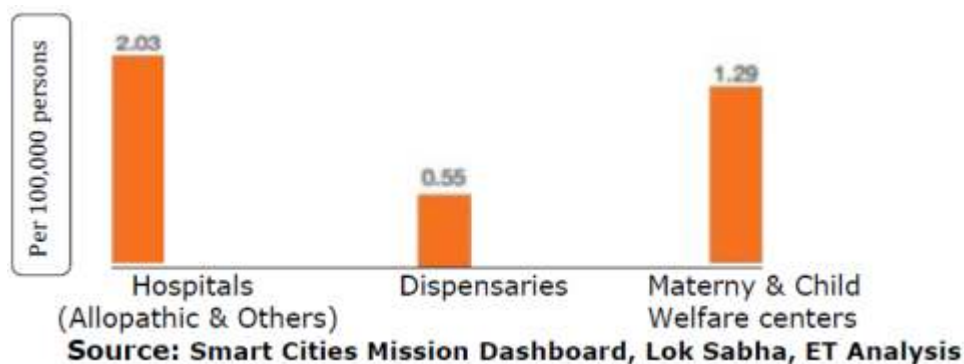
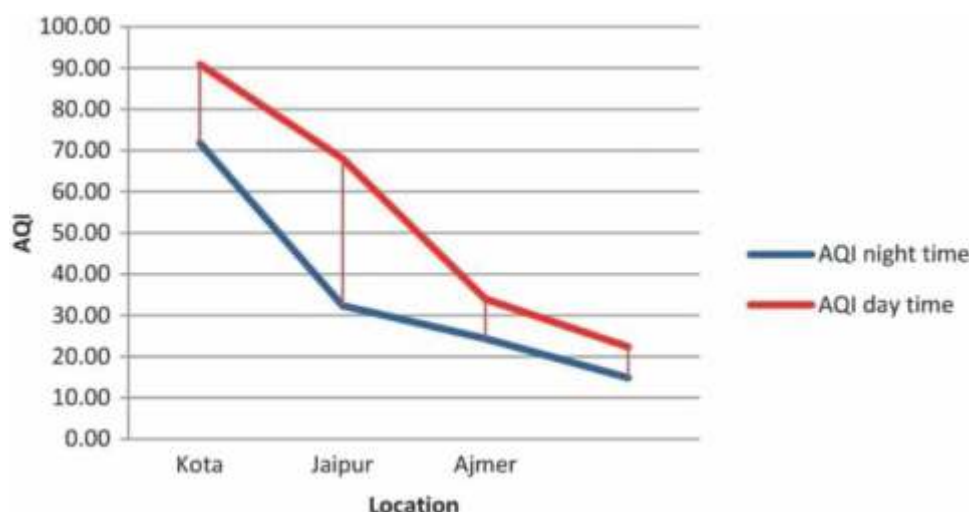


Figure:1.5 Air Quality Statuses



Source: https://link.springer.com/chapter/10.1007/978-981-15-1059-5_19

Smart city definitions: Caragliu & Nijkamp 2009 "A city can be defined as 'smart' when investments in human & social capital & traditional (transport) & modern (ICT) communication infrastructure fuel sustainable economic development & a high quality of life with management of natural resources, through participatory action & engagement". Several major characteristics are used to determine a city's smartness

- › A technology based infrastructure
- › Environmental initiatives
- › A high functioning public transportation system
- › Humans to live & work within the city & utilize its resources

Smart city components:

- › Smart manufacturing
- › Smart govt.
- › Mobility/wifi
- › Smart/digital citizens
- › Open data
- › Smart health

- › Smart farming/agriculture
- › Smart buildings
- › Smart grid/energy utilities
- › Smart transportation

Infrastructure

In India nation of infrastructure was first discussed by **Rangarajan Commission** while examining the statistical system of India. The commission in this report stated that infrastructure is an important input for overall economic and social development of a country.

Infrastructure is the set of facility and system that serve a country, city of other area, and the services and facilities necessary for its economy, households and firms to function infrastructure helps the market to work better. The infrastructure facilities like transport and communications facilitate better supply chain management which ultimately lowers operational costs and helps business to fulfill market demands.

Characteristics of smart cities

› Artificial intelligence

- › Introduction to ICTs
- › IT connectivity
- › Digitalization

› E-governance

- › e-Panchayat
- › e-chaupal

› Good infrastructure

- › Good water supply
- › Electricity for all
- › Proper sanitation

- › Solid waste management system
- › Urban mobility
- › Adequate public transportation
- › Affordable living conditions like housing
- › Sustainable environment

Review of literature

1. **Kaginalkar, Akshara (2022)** this study shows urban computing for air quality management in Indian smart cities with reference to Pune city.
2. **Sing Mahendra (2021)** has concluded in his study development of Tourism Industry in U.P. with special reference to Allahabad as smart city
3. **Chouhan, Ashish (2021)** has observed in his study a path goal approach to smart city through waste management in Udaipur. The awareness about the adverse impact of poor waste management can only help in making the city a more aesthetic place.
4. **Singhal, Shaleen (2021)** has revealed in his study multidimensional assessment of inclusiveness attributes and barriers to inclusion in smart cities.
5. **Hobbar, Sunith (2022)** in his study shows comprehensive adoption model of Mgovt. A citizen's perspective from the smart cities of Karnataka.
6. **Mitra, Somnath (2020)** has observed that insight from India smart city mission a select study.
7. **American heritage dictionary editors (2000)** has revealed the term '**infrastructure**' as the basic facilities, services and installations needed for the functioning of the community or society, such as transportation and communications systems, water and power lines and public institutions including schools, post office and prisons.
8. **Kalu (2001)** has argues that major considerations for property value hinge on the property's ability to produce income, be in demand and have a good location relative to its use. He identifies other determinants of value to include

scarcity prospect of income growth, state of the economy, cost in use, government and political factors, physical attributes and taxation, to determine the property valuation.

9. Nubi (2003) has revealed infrastructure as the aggregates of all facilities that allows a city to function effectively. It is also seen as a wide range of economic and social facilities crucial to creating an enabling environment for economic growth and enhances quality of life.

10. P. Sekhar, (2015) has revealed that a city has systems working for the benefit of both residents and the environment. The improvements and integration of critical city systems – done in a step-by-step manner – becomes the cornerstones to turning a typical city into a Smart City.

Research Methodology

1. Study area

Problem & challenges in infrastructure development in smart city (with special reference to Rajasthan) is real re-emerging issue in India. Under the study area a brief introduction to given of India & Rajasthan but main focus on special reference to Rajasthan.

2. Objective for the study

- a) To highlight the concept of smart city Rajasthan.
- b) To study the factors affecting the growth of infrastructure development in Rajasthan.
- c) To analyze the status of infrastructure at India and Rajasthan.

Data collection

This study is based on secondary data are as follow:

1. Economic survey
2. Statistical abstract
3. Dainik bhaskar & Rajasthan patrika

4. Websites

Smart cities challenges

Smart cities are all about ensuring the efficiency of operations like government, transportation, commerce, energy, law enforcement and healthcare using smart technologies, data analysis and information and communication technologies (ICT). Considering the scale of such operations, it's only inevitable that smart cities will run into challenges.

Here are a few challenges every smart city faces

The lack of capacity to implement smart city initiatives can pose significant challenges to the development and execution of smart city projects.

› Infrastructure limitations:

Implementing smart city initiatives often requires robust infrastructure, including high-speed internet connectivity, sensors, data centers, and communication networks. If the existing infrastructure is inadequate or outdated, it can hinder the implementation of smart city technologies.

› Financial constraints:

Developing and deploying smart city solutions can be expensive. It requires substantial investments in technology, infrastructure, and skilled personnel. If the necessary funds are not allocated or if there is a lack of financial resources, it can impede the implementation of smart city initiatives.

› Technical expertise:

Smart city projects require specialized technical knowledge and skills in areas such as data analytics, Internet of Things (IoT), cybersecurity, and urban planning. If there is a shortage of professionals with expertise in these fields, it can be challenging to implement and manage smart city initiatives effectively.

› Governance and coordination:

Smart city initiatives often involve multiple stakeholders, including government agencies, private sector organizations, community groups, and

citizens. Coordinating and aligning the efforts of these stakeholders can be complex, especially in cases where there is a lack of effective governance structures or collaboration mechanisms.

› **Data management and privacy concerns:**

Smart city initiatives generate vast amounts of data, and ensuring proper data management, privacy protection, and security can be challenging. If there is a lack of policies, regulations, or frameworks to address these concerns, it can hinder the implementation of smart city projects due to public skepticism and privacy-related obstacles.

Addressing the lack of capacity to implement smart city initiatives requires a comprehensive approach involving investment in infrastructure, training and education programs, public-private partnerships, and effective governance models. Collaboration among different stakeholders and learning from successful case studies can also help overcome these challenges.

Political differences and a lack of political will can indeed hinder the implementation of smart city initiatives. Here's how these factors can impact the progress of smart city projects:

› **Conflicting priorities:**

Political differences can arise from varying ideologies, agendas, and priorities among different political parties or government officials. If smart city initiatives do not align with the political priorities of the ruling party or if there is a lack of consensus among stakeholders, it can result in delays or the abandonment of smart city projects.

› **Short-term focus:**

Politicians often face pressure to deliver immediate results to satisfy their constituents or to gain political advantages. Smart city initiatives, however, require long-term planning and investments. If politicians prioritize short-term gains over

long-term benefits, they may be reluctant to allocate resources or commit to the implementation of smart city projects.

› Budget constraints:

Smart city initiatives can require significant financial investments, which may face competition from other pressing priorities. Political leaders may be hesitant to allocate funds to smart city projects if they perceive more urgent needs in areas such as healthcare, education, or public safety. Budget constraints driven by political considerations can limit the capacity to implement smart city initiatives.

› Regulatory and policy challenges:

Implementing smart city initiatives often requires regulatory and policy frameworks to address issues such as data privacy, cybersecurity, and infrastructure standards. Political differences and lack of consensus on these matters can lead to delays in establishing necessary regulations or the development of conflicting policies, making it difficult to move forward with smart city projects.

› Public skepticism and resistance:

Smart city initiatives involve deploying technologies and collecting data that can raise concerns among citizens regarding privacy, surveillance, and potential misuse of information. Politicians may be influenced by public sentiment and hesitant to support smart city projects if they perceive widespread skepticism or resistance from their constituents.

Short-term mindsets of smart city residents refer to the attitudes and behaviors that prioritize immediate benefits and convenience over long-term sustainability and collective well-being within a smart city context. While smart cities aim to improve quality of life, efficiency, and sustainability through technology and data-driven solutions, short-term mindsets can hinder the realization of these goals. Here are a few examples of such mindsets:

Instant gratification: Smart cities provide residents with quick and convenient services, such as on-demand transportation, food delivery, and digital access to information. Some residents may become accustomed to instant

gratification, expecting immediate results and convenience in all aspects of their lives. This mindset can discourage long-term investments in sustainable practices or patience for slower changes.

Lack of active participation: Smart cities rely on the active participation of residents to contribute data, feedback, and engage in civic activities. However, short-term mindsets may discourage residents from actively participating in the decision-making processes or engaging in community initiatives. This can lead to missed opportunities for collective problem-solving and sustainable development.

Reliance on technology: While smart city technologies offer numerous benefits, relying solely on technology for everyday tasks can create a short-term mindset. For instance, relying heavily on personal vehicles or ride-hailing services may prioritize individual convenience over shared transportation options, leading to increased traffic congestion and environmental degradation.

Disregard for data privacy: Smart cities collect vast amounts of data to optimize services and enhance urban life. However, a short-term mindset might lead residents to overlook or undervalue concerns related to data privacy and security. Ignoring the long-term consequences of data breaches or misuse can have detrimental effects on individuals and the overall smart city ecosystem.

Resistance to change: The implementation of smart city initiatives often requires changes in infrastructure, policies, and behaviors. Some residents may resist these changes due to concerns about disruption or inconvenience in the short term. This resistance can hinder progress and prevent the realization of long-term benefits associated with smart city development.

It is important for smart city residents to balance short-term gains with long-term sustainability and community well-being. Promoting education, public engagement, and fostering a sense of shared responsibility can help address short-term mindsets and encourage residents to actively contribute to the long-term success of their smart city.

Here are a few reasons why there might be a lack of information on smart city initiatives:

Limited communication channels: Information dissemination about smart city projects may be hindered by inadequate communication channels. If there are no effective means to communicate project updates or share progress reports, it can result in a lack of information.

Incomplete transparency: Lack of transparency from project authorities or stakeholders can contribute to the scarcity of information. If there are no clear mechanisms in place to provide regular updates, citizens and interested parties may be unaware of the initiatives' details.

Varying stakeholder involvement: Smart city projects involve multiple stakeholders, including government agencies, private organizations, and community members. If coordination among these stakeholders is weak or if some parties are not actively engaged in sharing information, it can lead to a lack of comprehensive data.

Complex and evolving nature of projects: Smart city initiatives are often complex and involve multiple interconnected systems, such as transportation, energy, and infrastructure. Keeping track of the progress and understanding the intricacies of these projects can be challenging, resulting in a lack of readily available information.

Privacy and security concerns: Smart city initiatives involve the collection and utilization of vast amounts of data, which can raise concerns about privacy and security. In some cases, limitations on sharing sensitive information can contribute to the lack of available data.

Resource constraints: Insufficient resources allocated to public outreach and information dissemination can result in a lack of information. If there are budgetary constraints or limited staff dedicated to communication efforts, it can hamper the availability of project-related information.

Addressing the lack of information on smart city initiatives requires improved

transparency, enhanced communication channels, and active engagement with stakeholders. Governments, project authorities, and relevant organizations should strive to provide regular updates, establish public platforms for sharing information, and ensure that citizens are adequately informed about the progress and benefits of smart city projects.

Smart city residents' lack of tech skills refers to the limited or inadequate proficiency and knowledge of technology among the residents of a smart city. A smart city is characterized by the integration of technology and digital infrastructure to improve the quality of life for its residents. However, not all individuals may possess the necessary skills and familiarity with technology to fully utilize and benefit from these smart city initiatives.

Some common factors contributing to the lack of tech skills among smart city residents include:

Age and generational gaps: Older generations, who may not have grown up with digital technologies, can face challenges in adopting and using smart city technologies. They may have less exposure to digital devices, software applications, and online services.

Socioeconomic disparities: Residents from lower-income backgrounds may have limited access to technology due to the cost of devices and internet connectivity. This lack of access can lead to a lack of familiarity and proficiency with tech tools.

Education and literacy levels: Insufficient educational opportunities or low literacy rates can contribute to a lack of tech skills. Without basic digital literacy training, individuals may struggle to use and navigate smart city technologies effectively.

Language barriers: For residents who are not fluent in the predominant language used in smart city applications and services, understanding and using technology can be challenging.

Technological complexity: Some smart city technologies may have complex

user interfaces or require a certain level of technical knowledge. This complexity can discourage residents from engaging with or exploring these technologies.

Here are some key aspects of social inclusivity in smart city initiatives:

Accessibility:

Smart city technologies and services should be designed to be accessible to people with disabilities or special needs. This includes providing inclusive features such as wheelchair ramps, tactile pavements, accessible digital interfaces, and assistive technologies. **Digital Divide:** Bridging the digital divide is crucial for social inclusivity. Smart city initiatives should address disparities in internet access and digital literacy by providing affordable or free internet connectivity and offering training programs to help residents develop the necessary digital skills.

Citizen Engagement: Social inclusivity involves actively engaging citizens from diverse backgrounds in the decision-making processes related to smart city initiatives. This can be done through public consultations, community forums, and participatory design approaches, ensuring that all voices are heard and considered.

Equity in Service Delivery: Smart city services should be distributed equitably across different neighborhoods and communities, with a focus on addressing the needs of marginalized or underserved populations. This includes providing essential services such as healthcare, education, transportation, and affordable housing to all residents.

Data Privacy and Security: Social inclusivity also encompasses protecting the privacy and security of citizens' data. Smart city initiatives should ensure that personal information is collected, stored, and used in a transparent and secure manner, with appropriate safeguards in place to prevent misuse or discrimination.

Multilingual and Multicultural Considerations: Smart city initiatives should consider the diverse linguistic and cultural backgrounds of the community. This involves providing information, services, and interfaces in multiple languages and respecting cultural sensitivities to ensure that no one is excluded or disadvantaged.

due to language or cultural barriers.

Problems of Infrastructure in smart city

Infrastructure in a smart city can face several challenges. Here are some common problems associated with smart city infrastructure:

1. Cost:

Developing and maintaining the infrastructure required for a smart city can be costly. Implementing advanced technologies, such as sensors, connectivity, and data management systems, requires significant investments. Financing these projects and ensuring long-term sustainability can be a challenge.

2. Connectivity:

A robust and reliable network infrastructure is crucial for a smart city. However, ensuring seamless connectivity throughout the city can be difficult, especially in areas with limited internet access or outdated infrastructure. Addressing connectivity gaps and providing high-speed internet to all residents can be a challenge.

3. Data Privacy and Security:

Smart cities generate vast amounts of data from various sensors, devices, and systems. Ensuring the privacy and security of this data is a significant concern. Protecting sensitive information, preventing cyber-attacks, and establishing strong data governance practices are essential for building trust among residents and businesses.

4. Citizen Engagement and Inclusion:

Smart cities aim to improve the quality of life for all residents. However, ensuring citizen engagement and inclusion in the planning and implementation of smart city initiatives can be challenging. Some citizens may lack access to technology or face barriers to participation, leading to the creation of a digital divide.

5. Scalability and Flexibility:

Smart city infrastructure should be designed with scalability and flexibility in mind to accommodate future growth and technological advancements. However, retrofitting existing infrastructure or integrating new technologies can be difficult, especially in cities with complex infrastructural systems.

Smart city suggestion

One smart city suggestion is to implement an advanced waste management system that incorporates automation, data analytics, and sustainable practices. Here's how it could work:

1. Smart Waste Collection:

Install smart bins equipped with sensors that can detect the fill level. When a bin reaches a certain threshold, it automatically sends a signal to waste collection services, optimizing the collection route and reducing unnecessary trips.

2. IoT-Enabled Monitoring:

Deploy Internet of Things (IoT) devices to monitor waste management infrastructure, such as landfill sites, recycling facilities, and composting plants. These devices can track parameters like temperature, humidity, and gas emissions, providing real-time data to ensure efficient operations and environmental compliance.

3. Data Analytics:

Utilize data analytics to analyze waste generation patterns, identify trends, and optimize waste management strategies. By studying the data, city authorities can make informed decisions, implement targeted recycling campaigns, and reduce overall waste production.

4. Recycling Incentives:

Implement a rewards program for citizens who actively participate in recycling initiatives. By using smart bins with built-in identification mechanisms, individuals can earn points or discounts based on the amount of recyclable

material they contribute. This encourages active engagement and increases recycling rates.

5. Smart Composting:

Encourage composting at the household and community levels. Provide smart composting units equipped with sensors that monitor temperature, moisture, and nutrient levels. These devices can alert users when it's time to turn or harvest compost, resulting in high-quality soil amendment for urban agriculture and landscaping.

6. Renewable Energy Generation:

Utilize waste-to-energy technologies to convert organic waste into biogas or biofuel. This energy can power city facilities, reducing reliance on traditional fossil fuels and decreasing the carbon footprint.

7. Public Awareness and Education:

Launch comprehensive awareness campaigns to educate citizens about waste management practices, recycling guidelines, and the importance of sustainable living. Use digital platforms, mobile apps, and interactive displays to engage and inform the public.

8. Intelligent Traffic Management:

Implement a smart traffic management system that utilizes real-time data to optimize traffic flow, reduce congestion, and minimize fuel consumption. This system can include smart traffic lights, dynamic route guidance, and parking management solutions.

9. Energy-Efficient Infrastructure:

Construct and retrofit buildings with energy-efficient materials, smart lighting systems, and automated climate control. Use sensors and smart meters to monitor energy consumption and implement energy-saving measures.

10. Open Data Platforms:

Develop open data platforms that provide real-time information on various

aspects of the city, including waste management, energy usage, traffic conditions, and air quality. This data can be used by citizens, businesses, and researchers to develop innovative solutions and drive continuous improvement.

Conclusion

The govt. of India has taken a better step leading to improve the quality of life of its citizens. With the ever growing population India has been witnessing continuous expansion in several cities. As there is no employment available in rural parts of country people prefer to move to the cities for earning day to day livelihood. This migration is leading to additional burden on the existing infrastructure of the cities.

It is certain that while implementing the project of smart cities, energy demand will increase. The concept of smart city implies the vertical growth of building structures where maximum households can be accommodated a comparatively less area of land. The major objective of smart city is to provide better life with facilities to its citizens.

There are various areas where demand for electricity is vital even if government wants to increase infrastructure to meet with the requirements. Smart cities will have airports covering vast area where power is essential element. Similarly there are places like gardens, spread roads & bridges, road signals and such infrastructure where electricity plays a key role.

There is always a scope for producing renewable energy by using solar / biogas produced at the places of consumption itself. In short smart cities can bring lots of opportunities for those who wish to tap them by sensing the future.

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