Technologies in Urban Policies and Smart cities in India

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Abstract

As urban areas become more and more overpopulated and increased migration from rural to city areas for better opportunities to the cities. The potential of urban place proving to be failed to accommodate the people, the development of new sustainable smart cities turns out to be one solution to these problems for policymakers. Technology is at the heart of these new sustainable cities that are enabling real-time monitoring and management of cities through a network of sensors, cameras, GIS, and data centres control rooms which are overall called smart cities, these new sustainable smart cities are helping in thriving urban environment that creates sustainable economic development and a high standard of living in areas such as economy, environment, energy efficiency, mobility, management, and living conditions.

Smart cities, on the one hand, offer great potential for growth in the years to come and on the other hand offer a variety of challenges. Smart City's most complex projects have residential and commercial facilities supported by the backbone of energy, infrastructure, roads, water, drainage system, a living and breathing of any city. A critical success factor is a need for a standard technology platform to enable the integration and collaboration of various city stakeholders. The GIS (Geographical Information System)-based information system provides an IT framework that includes all stakeholders and all aspects of the city's smart - from planning for the policies and implementation of it.

This article aims to use different technologies like the Geographical Information System in the Urban policies of India for making cities smart and to improve the Urban problems prevailing on the ground. An in-depth analysis has been done to understand the role of these innovative technologies in making smart cities and overcome challenges through it by using these technologies in India's urbanisation policies. The research concludes by an observation that inculcation of Technology like GIS can be used for better efficiency, monitoring, coordination.

Key Words: Smart Cities, Urbanisation Policies, Technologies, Real-Time Monitoring, Geographical Information System.

Introduction:

Evidence suggests that the demography of urban areas will continue to change positively, to the point where more than 90% of the world's population will be shifting to urban areas by the end of this century (Batty 2018). Bigger cities are complex and economically powerful but face many challenges related with their efficiency in working for overload vehicles causing traffic congestion, crime, rising taxes, pollution of all type, and city heat, to name just a few. Despite all these issues, however, large cities are benefiting from a larger scale economy, although services are costly than rural areas and town.

Today, the ned of the hour is for effective operation and management of the cities. The data is becoming significant nowadays than ever before which has sometime called as "fuel of the future" due to the broader acceptance of internet, mobile phones, communication network devices. The power of computation is also becoming greater now than before, as it has the capacity to store unlimited big digital data, it has possible to gather and take out every information from the data by processing it. because of all this the policy makers, administrators and officials turned to make the city 'smarter'. In short, the 'smart city' described as a city that exploits every possible digital technology with the intension to improve its performance, working efficiency, and management, as well as addressing the problem of modern city.

What role can the Geographical Information system play in the effort of the making of the smart city efficient? Big Cities are very complex combinations of buildings, unlimited roads, not specific dumping areas, undeveloped parks, neighbourhood's, shops, and industries. Cities take advantage when the distances are shorter to their various parts which saves time, or in situations like New Delhi which has endless issues like this, the largest conurbation of India. What is happening in one place affects the other place in the city and other parts of the area. Location, land use patterns, distances, and interactions are key concepts of geographical design and Geospatial approach which tells that GIS technology is important for management of cities and for smart city projects.

By analysing the challenges faced by policymakers in formulating policies for urban areas and smart cities projects, I have felt the need of including technologies in the urban policies and also provide well-structured plan using GIS in the urban areas for smart city projects, operating in real-time basis, which is essential for making any city smart.

The question of making urban areas smarter and accommodative with having the most essential needs for the people has been the subject of research and this research is trying to encourage Policymakers to use tools like GIS. This research is focusing on the uses of technology in the urban policies in India and the challenges faced by the technologies.

II.   Review of Literature:

Hernández-Muñoz (2011), Pereira (2017) promoted and advocated the widespread use of Information Communication Technology in the paper which enables cities to enable the development of the significant services of public security, health care system, smart governance and services for delivery of the product to people.

Lee et al. (2013) have proposed six major dimensions of a smart city concept, in terms of economy, mobility, environment, people, residents, and governance. As of 2012, there were many projects in Europe seeking to use smart technology in managing urban issues. These include - traffic congestion, energy needs, high resources, etc.

Chourabi et al. (2012) has advocated of the central theme of governance as one of the keys to growing a network of smart cities that are effective. Therefore, the advocacy for the better effective governance for handling problems.

Dwivedi et al. (2015) and Hughes et al. (2016) argued that citizens are one of the most important stakeholders in such development. Therefore, in order to avoid stakeholder resistance and the failure of these programs, the views of citizens and government employees regarding smart cities should be taken into consideration and assessed using established ideas and approaches.

Faisal (2012) Internet of things has **enabled users in smart cities efficiency** and it made possible by the unique marking technology such as NFC, RFID and 2D barcode that allows the material to be seen and transmitted over the Internet. Due to low complexity and lower cost of these technologies, they have become an effective way to build an IoT system in smart cities. Thus, proposes the use of digital signatures (ECDSA) to address the issue of IoT spam in smart cities for the safety.

By analysing all the above-mentioned research by scholars, it was found out that no such studies had been carried out which is carried out in this paper, although all these works have given a path to put all this information together in the Urbanisation sector policies the efforts have put in this paper to use technologies like GIS in the Urbanisation sector policies for making smart cities is a rare practice but it is the need of the hour.

Central Question:

How can these technologies like Geographic Information System (GIS) be used to improve the urban policies for smart cities on the ground?

Related Question:

How should we use technology like GIS and its application in urban areas?

What connections can be made between GIS and smart cities?

What challenges faced because increasing urbanisation of the bigger cities?

What steps can be taken by the government bodies in tackling the problems?

Hypothesis:

By using these technologies like GIS through the policies to improve the situation in urban area, which are increasingly getting packed because of the migration and to make administration and its work more efficient and also it can help in using the limited resources efficiently and equitably.

Objective of the study:

1. To analyse the role of technology in urban policies.
2. To understand the technology like GIS in the field of urbanisation policy process.
3. To suggest reforms by including a wider technological approach into urban sector policies.

Research Methodology:

This paper is factual, analytical, and descriptive in nature. By this, paper is trying to build the relationship between Technology like GIS and urbanisation policies for smart cities. The data used in this paper is from secondary sources as per the requirements of the study.

V.I. Technological intervention in Urbanisation:

At the above level, the smart city is digitally empowered. Smart city is defined as an urban community that uses data for information and communication networks technologies for gathering it to improve the lives of its citizens and to deal professionally with the many today's problem of the city. Admittedly, each city has a long history of problems that its people have been struggling with for decades.

So, in a nutshell, what problems do smart cities solve? Let's see some of the key elements of a smart city to see what aspects of life in the urban areas can be improved with smart city projects through policies.

Smart Manufacturing:

In the era of digital manufacturing operations, smart and digital use for manufacturing will harness IoT and also increase efficiency, increase employee safety, and reduce pollution levels.

Smart Mobility:

Smart travel means using digital programs and tools to improve and enhance the urban transportation experience, solve traffic problems such as traffic congestion, and reduce the number of accidents.

Smart energy systems:

Some of the most attractive interests include digital systems for sustainable and renewable energy. For example, smart energy plants that use solar or wind energy can be an important part of smart city projects.

Smart healthcare system:

Smart Health Care system is a combination of modern technology which is aiming to enhance longevity and trying to improve the quality of life of its people. Smart healthcare systems use mobile, IoT telesurgery, telemedicine, and computer technology to get accurate diagnoses and improve health care services.

The smart construction of the building:

Smart Buildings use a sophisticated combination of modern technologies and services provided by these technologies that ensure energy efficiency, improve security, and deliver better public services. From wireless technology to IoT devices, intelligent building systems help control and control lighting, ventilation, air installation, primarily modern architecture infrastructure.

Implementing good construction technologies leads to improvements in safety and health standards, as well as the convenience of its residents.

Digital citizenship:

Smart city technology is interactive and aimed primarily at citizens who are active users of digital devices and services. Digital citizenship means using digital technology to participate in domestic, social, political, and governmental activities.

E-governance:

The digital government aims to facilitate access to public services by bringing them directly to a citizen's laptop or smartphone screen. Digital government promotes communication and engagement between citizens and state, reduces the cost of public services, and delivers them more quickly and securely.

Smart farming:

Smart farming is a set of different digital technologies used in the agriculture sector to increase the alliterativeness and unattractiveness of agricultural products. Smart technologies such as soil scanning for healthiness for the soil and identification of the correct crop according to the region, GPS for forecasting also help to reduce the negative impact of farming on the environment.

Public transportation: Smart city traffic control systems can continue to add positives to public transportation. All types of public transport is to be connected to a single database that enables them to communicate and connect with each other for better decision making and alert users to arrival times so that they can select the appropriate routes to travel in the cities. In part, such schemes for the beautiful city have begun to take root in Madrid (Spain), although much remains to be done to unleash its full potential.

Parking: Parking problems is the most common prevailing problems the city nowadays, but this does not make them more intimidating. Modern technology enables drivers who uses it to automatically find available parking positions which reduces the time and stress levels of the people living in the city which is difficult in crowded cities like New Delhi. Companies such as T-Mobile and VW are already working to introduce these solutions in cities around the world.

Data Transparency (open data):

To fully embrace infrastructure construction, smart cities need a vibrant culture that will provide open access to information related to almost every aspect of smart city infrastructure from information on new children's playgrounds to government tender details.

The concept of open data also means that all data should be available in readable formats and open to processing and analysis. With open data access, businesses can introduce new services and solutions for the benefit of the city.

V.II. GIS and smart cities:

A real-time paradigm of GIS-enabled smart city:

The smart city which using real-time GIS which is an emerging technological platform designed for the detection, storage, analysis, and detection of geospatial data in real-time. Unlike traditional GIS technology platforms, the new real-time GIS considers the provision of heavy and high input and fast processing of data used in fast decision making. These streams are location sensitive, temporarily granular, and are continuously developed from sensory devices that include the IoT.

Information and Communication Technology (ICT):

ICT technology is the spinal cord of the all these emerging technologies which is allowing data to be collected and processing through devices, such as smart-house and mobile devices, to be properly retrieved from a data centre and easily shared and exchanged between connected devices. For example, RFID which is radio-frequency identification system, this is used for the location identification of any moving object through electromagnetic field. An RFID tag like FasTag which is used nowadays in the car for toll tax can be applied to almost anything, from industrial objects to animals to humans, real-time tracking purposes. RFID can be used for many positives in the smart city projects (Chowdhury and Chowdhury, 2007), like real-time waste management system for sustainable development, intelligent parking, and the detection of travel and avoidance collisions.

Real-time data on cities:

Every City produce many types of real-time data, the major one is traffic data which is among the first which can be automatically collected by devices using these technologies (Batty 2012). In contemporary time, traffic jams, congestion and pollution through these have become a major problem not only causing severe economic losses but also affecting the health of the people. Therefore, building a control system which is technological smart is very important to enhance the efficiency and safety of people. Wireless Sensor Network has emerged a great tool in managing the traffic in the real-time basis. (Kafi et al. 2012) has describe the use of sensors which can be mounted on streetlights for looking at working of it, underpasses for safety, and in vehicles to collect location, speed, and traffic directions, and weather and other traffic conditions. This information is then integrated into robotic controls at intersections of traffic jams and reduced intermediate waiting times and also manages traffic congestion of the populated city and provide a timely vehicle route.

Real-time urban simulation:

When the information is gathered by the devices, it is important to make it clear and analyse and interpret it to advance human knowledge and make cities smarter. The real-time data requires that traditional old urban policies and models to be updated with the most affordable and accurately design. Big cities are very complex and busy system which connects spatial changes, social changes of cities, economic dynamics, and physical changes, and their working is constantly changing due to human actions and the widespread use of information technology (Batty 2007).

Real-time view of city data:

Visualization is significant means for city-building to organizers, stakeholders, and policymakers (Goodchild 2010, Batty 2014). It is used nowadays in the smart city projects to create real-time monitoring systems for city infrastructure (e.g., energy and water systems), and also for government agencies to interact with people and for public information which is to promote participation, and increase transparency. Moreover, curiosity is significant for innovations, when provides an effective and accurate way to visualize large things it resolves the complex problems. Here we focus on our overall data viewing strategies for data collected in real-time from IoT sensors within the city and process it through technologies.

Dashboard system has popular nowadays in smart-city projects and technology for providing powerful visualisation and image-based visualisation to show real-time data in a city on one dashboard (Rivard and Cogswell 2004). For example, London dashboard or Boston dashboard.

Real-time GIS performance:

Urban data becomes big data, and its large volume makes it difficult to do analysis on a single system due to limited memory present in one system and limited computing power of one system. A popular solution is to connect different systems through a fast speed communication network technology to build an effective cloud-based system platform (Botta et al. 2016). Thereafter, by gathering all data it can be distributed to different systems as per the requirements. Data analytical tasks can be subdivided into small tasks performed on these nodes alike, speeding up global performance.

However, to achieve real-time system and big city data analysis, GIS should go beyond the big traditional statistics where data is the most worrying and batch processing is key. Instead, real-time GIS requires high input and low travelling time in receiving, storing, and managing real-time streaming data. The better devices installation addresses the challenges of 'velocity' and 'volume' data. A system can handle large data of high speed if high output system available.

VI. Challenges with urban policies:

1. **Finance:** The Smart cities project does not have a prioritised privilege, unfortunately, when it comes to finances. Money is said to be one of the biggest challenges when it comes to the challenge of a smart city. With the acquisition of state-sponsored companies, the project also seems to have a poor start. The banks that support these activities are currently one of the important reasons for the huge increase in the number of non-performing assets. The government has recently taken steps to fund these activities by making changes to the budget. For example, Indore and Bhopal smart cities project.

2. **Lack of Institutional Intergovernmental Integration:** Successful implementation of a project can only be achieved if there is a cooperation between the different department and agencies and ministries of government. We need stricter regulation and both horizontal and vertical coordination and collaboration when it comes to planning for the development of smart cities.

3. **Acquisition of Master Plan:** Most Indian cities do not have their development plans. This is a sad situation when it comes to raising the big smart cities. The availability of both demands is key to the implementation and integration of the smart city project as this is where the changes would be considered and there is no other way to make it easier, better, and more efficient. Unfortunately, many cities in India do not have their presence.

4. **There is no time limit involved with this program:** The entire smart city system is one large system that should get all the approval if not ahead of time and on time. Everything will be on the online platforms. The most important step to take in this context would be to establish a single regulatory body that oversees all necessary project approvals. Doing so will address two major issues, the cooperation and conflicts.

5. **Availability of services:** We are well aware of the fact that India is henceforth well equipped in terms of skilled workers and the need for advanced technology to develop 100 cities. That is a huge number and requires a lot of skillful effort. When it comes to building a skilled workforce and building capacity, there is not much funding for institutional and state funding for such programs. Such projects include training, research and development, and better performance high speed database. This is a major problem in our country as this area is still to be focused upon.

6. **Corruption:** This point should probably have come from the first as this is the cause of all the above challenges. But if we talk about it only this is also a big challenge. Both at higher level and lower-level corruption are responsible for all inconsistencies. The decline in finances is somehow due to this issue. Corruption in India is a challenge that has always been the reason for the incomplete or inefficient implementation of many major projects in the country.

VII. Limitations of technology:

A. **Digital Infrastructure:** While the advent of new technologies has reshaped our daily lives on a large scale, the infrastructure of many cities has remained unchanged. Understandably, smart city projects require solid space to thrive. Specifically, to fully realize their value, IoT sensors that capture a wide range of data from air pollution to traffic congestion require high-quality infrastructure backed by new hardware (Batty 2012). Most cities in the developed world are already struggling with other infrastructure problems such as plumbing, broadband internet, electricity, etc. Therefore, optimal resource allocation, open funding, and full government support are essential for successful infrastructure transformation.

B. **Private concern:** Most people would like to benefit from smart city projects and enjoy higher levels of security, lower crime rates, and generally, a better life. The price they are asked to pay, however, may feel unbearable and perhaps threatening. Surveillance cameras installed in every corner of the city can prevent speeding and other offenses, but knowing that "Someone is watching" creates a variety of emotions - from being uncomfortable, to feeling unsecured (Doran, 2016). Another thing is people are not comfortable with sharing personal information collected by these devices. Complete clarity on how the data will be used, and education programs aimed at informing citizens about how cities work, should reduce this concern, at least in part.

C. **Privacy issues:** The security of the people privacy and their personal information and private data like health, age, work, ideology are issues in smart cities technologies and big data gathering of personal information are one of the main reason why people are doubtful about the projects for making cities smart. The growing number of online platforms and sensors and the expanded interconnectivity of the city's infrastructure raises serious concerns. If security standards remain unchanged, cybercriminals will one day shut down the entire city. Fortunately, technology companies are developing security solutions based on big data analytics, blockchain, and encryption technology designed to manage the growing cyber-attacks (Allam, 2019). Smart city developers are investing in these new generation security programs to eliminate threats.

D. **Public inclusion:** When it comes to ensuring inclusion while building smart cities, examples of unused systems can be very helpful. Failure to confirm the installation may contradict the best intentions. For example, a city may fail to introduce a health care system for older citizens because most of them do not know how to use the technology. Therefore, smart city plans should consider the inclusion of every stakeholder and not just those who are well-off and professional.

E. **Smart traffic management:** Modern cities are experiencing heavy traffic congestion due to higher number of vehicles on the road, as the number of vehicles continues to grow the traffic management will continuous to become problem, such as those used in Irvine, California, address traffic problems and help alleviate traffic congestion (Chourabi, 2012). The system monitors traffic and estimates the arrival time for the next group of vehicles to ensure that the robot is green at that time. Smart road management solutions, such as robots repairing real-world traffic situations, can solve problems of the modern big cities of India.

Overall, smart city technology can demonstrate its potential in a wide range of fields, from transportation to education and health.

V.III. Critical Perspective and Discussion

The attempted research puts a new perspective into place, i.e., understanding how the problems like congestion, limited resources in urban areas can be solved using technologies like GIS and others. The mainstream discussions mainly have been revolving around the role of technologies and their inclusion in the policy-making process and strive to find out different ways to adopt best technologies for betterment of the society.

Thus, it is significant that the different role of these technologies is also acknowledged as a resource-intensive activity and urbanisation policies should be made by keeping in mind the advantages and disadvantages of these technologies.

Simultaneously, the governments must take the responsibility to indulge these best practices in the policy-making process and also with the attentive regulators on the ground with good engineers working for the concerns from the technologies.

IX. Findings of the study:

1. Technology is significant in understanding the situation on the ground for formulating and implementing the best policies, evaluate the effects by these policies on the ground and outcomes from these policies.

2. These technologies like GIS will help policymakers in to find out the solution for the problems and help in making effective decision.

3. Systematic and structural change is the important to transforming urban areas in India.

4. The role of big data is significant and when the big data is gathered for the solutions of the problems, it helps policymakers because more data more information and better information than better outcomes.

X. Suggestions:

The development of smart city, of course, will not happen overnight. For building any smart cities require careful planning, and a well-planned strategy supported at all levels of governance, not to mention public approval and acceptance. Below is a step-by-step guide for making Urban policies workable in the current situation.

1. Collect data: Every smart city project starts with details. Initially, you do not need complex systems for data gathering and processing (although you will do so later). Focus on retrieving and separating the data you already have. The big problem here is that this data is usually stored in different databases, so you will have to work on merging it into integrated data pools. Also, make sure the data is presented in readable and understandable formats. You will need this if you want to make data available to the public as part of an open-minded city concept.

2. Find the points of advantages: Every urban community has its share of disadvantages. From traffic congestion to high crime rates, issues can vary in degree and type. Smart cities, in the end, are not limited to the hype: those hi-end technologies should focus on eliminating existing problems, even if their application may not seem so amazing. In the trading industry, income is often the main motivating factor. City projects are focused on specific social goals. Find out what goals you want to achieve and state them positively: healthy citizens, low crime rates, a seamless public transport system, etc.

3. Work on financial planning and budgeting: Granted, smart city projects are expensive and will require city officials and policymakers to use a revenue-generating approach. Apart from the city budget, businesses, individual aid, funds such as the Regional Development Fund and government subsidies can be seen as effective sources of funding. If your projects are getting enough support from the local community, then perhaps a large-scale refund is the way to go.

4. Launch a pilot project: Smart city projects have one thing in common - they are sustainable. Their proportions are often very high, and if something goes wrong, it can be very difficult to get back to the way things used to be. The evaluation of our project, collection, and process feedback, is significant when it comes to building smart cities policies. Choosing experienced and trustworthy contractors with a proven track record of successful use of smart city programs is key to success.

XI. Conclusion:

By summing up, real-time GIS technology for urban areas making smarter has become a topic of discussion, and after studying the hypothesis found to be true and correct based on the secondary study, technological approaches are significant in the urbanisation policy-making process. Although these approaches have some challenges and limitations, but we can indulge positives of these technologies with making regulators stricter and more effective the benefits from these technologies can be taken positively in the urban areas that may enhance the working efficiency and make the situation controllable by the administration and it will also help in solving the problems of resource allocation.

The future modern cities may certainly be different from the traditional city of today. Due to the use of many emerging technologies, the multilateral economic markets have also transformed with the emergence of the

fintech, and e-platforms, the prevailing resource mismanagement affecting the food availability, energy efficiency, and water shortage which is already approaching critical levels. Global demographic changes, ultra-migration, distance health care creates the future opportunities for the use of GIS technologies in the cities with the help of positive policies in the sector.

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