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Exploring the Concept of Smart Cities in Rapidly Urbanizing Pakistan

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ABSTRACT

Smart cities hold the promise of a sustainable future. The concept of smart cities was born out of a need to improve the quality of life for people. The basic principle of a smart city is to integrate information and communication technology (ICT) with efficient and ubiquitous public service delivery. Pakistan's future is inextricably bound up with the fate of its cities. The urban population of Pakistan is rapidly increasing from 32.5 percent in 1998 to 36.4 percent in 2017. By 2050, it is projected that two-third of Pakistan's population will reside in urban areas. Most of the population expansion occurs haphazardly, which results in crafting urban issues. In the absence of effective urban policy and true population data, it is challenging to manage urbanization. It seems that the only way to manage rapid urbanization, real-time information is the need by which government can be able to control novel urban problems. The paper focuses on the smart city concept in Pakistan's context for addressing urbanization-related issues.

Key Words: **Smart Cities, Urbanization, Urban Population, Urban Issues, Information, and Communication Technology (ICT)**

Introduction

"Smart City" is an emerging phenomenon of contemporary urban development that cities are adopting worldwide to enhance their citizens' quality of living. This type of urban development utilizes the "Internet of Things" (IoT) and "Communication technology" (ICT) to collect, organize and sustain valuable data for efficient management. Data from people and technological devices are further evaluated to manage resources in the best possible way (Kumar & Rattan, 2020). This concept of smart transformation of cities is gaining momentum and has already proved to be an effective platform for urban development (Ghosal & Halder, 2018). Hundreds of cities worldwide have implemented smart-city programs and have spent a trillion dollars in the past few years to make their cities sustainable and socially developed.

The term "Smart Development" was coined in the 1990s by urban planners, architects, and social activists as an alternative paradigm to urban sprawl and its associated issues (Rosatia & Contia, 2016). The basic concept of smart development was to offer a compact design for mixed land use with various transportation and housing options. The population actively realizes the sense of community living and participates in making rational and cost-efficient planning

decisions. The concept of smart development of cities has become popular, and more innovative approaches to urban planning and architecture with technology emerged. From discussions on smart development and smart communities, the concept of “smart city” originated. IBM and CISCO were the first to introduce the term "smart cities" in the United States. Later, smart cities incorporated the concept into the Strategic Energy Technology Plan (SET) official documents in 2009, defining the logical approach to achieving the Europe 2020 goals. A smart city, according to SET, is "one that makes a concerted attempt to innovate through the use of information and communication technology (ICT) to foster a more inclusive, diverse, and sustainable urban environment” (Rosatia & Contia, 2016). IBM registered the 'smarter cities' trademark in 2011. Smart city concepts are still emerging, with a vast range of conceptual variations of calling it an intelligent city or digital city (Hollands, 2008). It means there exist many differences in the definitions and concepts with the term smart city.

A "Smart city" was considered as a "digital city" or "intelligent city," but later, this concept has taken the meaning of a sustainable and environmentally friendly city. Moreover, the city must be "social," which means that a smart city must be liveable, socially inclusive, and supportive of its citizens' well-being. In general, smart cities are characterized as "places that make use of information and communication technology (ICT) to improve their citizens' quality of living while also promoting sustainable development." (Almirall, Bakici, and Wareham, 2013). That means a smart city connects the physical, information technology, social, and business infrastructure influence the city's intelligence (Harrison, 2011). It also aims to balance the cities' economic, social, and environmental challenges with technological innovation. A smart city benefits the citizens to improve their social well-being, enhance their quality of life, and positively impact the delivery of municipal services.

What Makes A City Smart?

The growing use of technology to provide quality services to the citizens and solve novel urban problems makes a city smart. Cities become smart when they take care of their citizens using communication technology and the internet of things. Technology is a tool used by municipalities to make them smart. A smart city needs smart people to better intact with the networks and efficiently utilize the city governments' services. Smart cities are well-equipped with sensors, appliances, meters, and personal devices, integrating data into the computing devices and disseminating it among different city services.

Smart city has smart mobility for its citizens. The city has intelligent bus service networks and well-connected bus stops so that any citizen can move quickly to its destination place. They have smart governance and e-government by which citizens can register a complaint or apply for any service from their smartphone. They can pay their utility bills and buy tickets online with their smartphones. Citizens can buy or sell their products and run their businesses with

their smart gadgets making the economy smart. With electric cars, people can control carbon emissions and save the environment. Using LED lights for buildings and streets saves energy which again conserves the environment. All these practices make smart living possible which collectively makes a smart city.

Smart cities provide better economic opportunities, address emerging urban issues, and regulate sustainable environmental activities without disrupting social development. In other words, sustainable development is achieved if social, economic, and ecological stability is maintained by integrating innovative technology and communities as the solution to emerging challenges. The term smart does not refer to a characteristic rather a tool. A smart city provides smart tools to its residents to get benefits from the services offered by the government quickly. The city is smart if it can give a smart economy, smart environmental practices, smart governance, smart living, smart mobility for smart people (*Chi, 2015;* Harrison, 2011; Kumar, & Dahiya 2017; Cohen, 2012*)*.

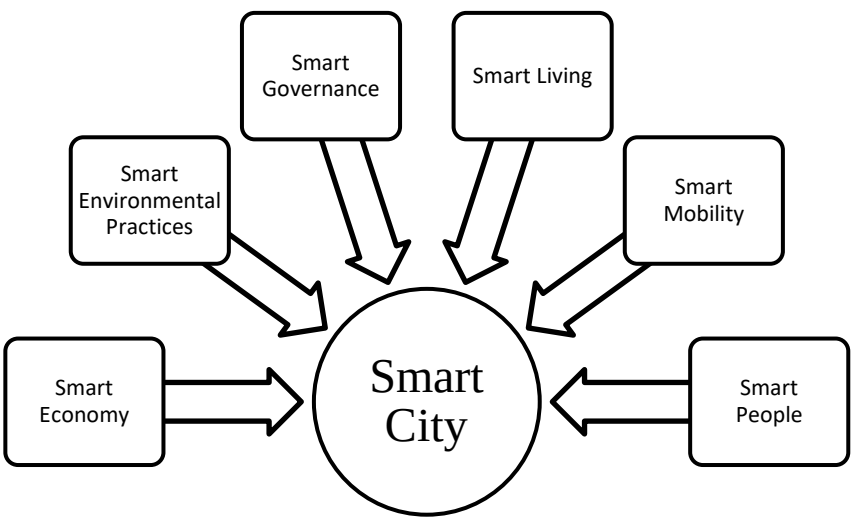

Figure: Characteristics of a Smart City

Smart cities around the world have used sensors extensively to track and control traffic. The cities have implemented intelligent parking technology, smart streetlights, and air quality and noise control sensors. They also have a free Wi-Fi network in public areas. For example, Amsterdam provides IoT solutions to minimize traffic, save resources and strengthen law and order. Barcelona promotes developments in agriculture, emergency management, and transport. Manchester is conducting major programs on transportation and travel, health and social services,

electricity and the economy, community, and the public sphere. Singapore can also detect when people smoke in illegal areas or throw garbage from high-rise buildings. London is planning to deploy IT to reduce congestion. The city started using technologies to combat pollution and simplify parking. Many other cities have adopted London and modeled their intelligent parking policies. There is a decent payment system in San Francisco that allows people to pay their utility and shopping bills using a contactless automated payment system. The United States, India, Singapore, China, and other established technology economies also consider IoT, a smart cloud, and innovative analytical initiatives.

From the examples above, some of the essential infrastructure components in a smart city include efficient urban mobility and public transport, water supply management, and uninterruptable electricity supply. Others have solid waste management, affordable housing, e-Governance, sustainable environment, health, education, and citizens' safety, especially for the women, children, and the elderly. The smart city concept varies from city to city depending upon the resources and citizens' needs. (Kar et al., 2017). Every country has its concept and level of smartness for being a smart city based upon its town planning and urban policy. A smart city uses technology to offer a better quality of services and helps in resolving urban problems. Smart city improves transportation, enhances social service structure, and promotes sustainability to make people's lives easier.

Source	**Concept**
World Bank	A smart city pursues development thoughtfully and sustainably, considering all the factors and the city's potential needs. This strategy enables communities to offer facilities and resources to their inhabitants to meet existing and future population needs.
The World Economic Forum	The essential purpose of this initiative is to develop, exchange, and disseminate actionable frameworks and best practices to bridge the infrastructure gap at the global and regional levels.
European Council	A smart city where existing networks and services are enhanced using data and telecommunications technology to benefit people and businesses.
IDA (Singapore)	Smart Nation is one in which people and businesses are motivated by enhanced data access. Via the contribution of new ideas and solutions, the government becomes more proactive with using technologies to better support peoples' interests.
UK Government	A Smart City should allow every resident to interact with all available resources, both public and private, in a manner ideally tailored to his or her needs.
IBM	Replacing existing city infrastructures is often financially and logistically unfeasible. However, recent technical advancements would allow us to inject new intelligence into our current infrastructures. It involves digitizing and linking our networks for

	them to sense, interpret, and apply data and intelligently respond to the needs of their respective jurisdictions. In short, we can revive them and enhance their intelligence and strength. This mechanism enables cities to develop while maintaining a high standard of living for their inhabitants.
Cisco	Smart cities implement "scalable technologies that use information and communication technology to improve performance, minimize costs, and improve residents' quality of life."

Table: Smart Cities Concepts

Urbanization in Pakistan

Pakistan becomes the fifth most populous country by having almost 207.8 million people in 2017, with an annual growth of 2.4% (1998-2017). During the 1981-1998 intercensal period, the population growth rate was 2.7%. With a population growth rate of 2.4% in 2017, 75 million more people add to Pakistan's population. This alarming growth rate will double Pakistan's population in just 29 years. (Goujon et al., 2020). This population increase is changing the demography of the country with an increasing urbanization rate. Due to continuous higher growth rate of urban population, the percentage of urban population increased from 18% in 1951 to 28% in 1981 and 32.52% in 1998 (Jan et al., 2008). Almost 36.4% of the total country's population is living in cities. Sindh is having 52% of its population in urban areas, while Punjab seconds with 36.7%.

Pakistani cities are expanding rapidly, mostly without planning. In 2017, ten cities of Pakistan had one million population. Metropolitan cities face rapid urbanization as Karachi's population has risen 80 % from 2000-2010, the most significant rise of any municipality in the world (Kotkin & Cox, 2013). Karachi and Lahore become megacities with more than 10 million populations. According to the 1951 census, a single city in Karachi has more than one million. In 1998, due to a population increase, seven cities in Pakistan exceeded one million people. Most of the development has been attributed to expanding existing towns and cities at all levels in Pakistan, except for Islamabad, the country's first planned city. (ICT, 1992).

Cities, the center points of urbanization, are essential for development. They contribute up to 55% of the gross national product (GDP) in the least developed countries, 73% in developing countries, and 85% in developed countries (UN-Habitat, 2006). Almost 60% of the global GDP is produced by one-fifth of the world's population living in 600 cities (World Cities report, 2016). Trends show that large cities are contributing more to the economic growth of the country. Cities that have more than 1 million population generate 95 per cent of revenue. Karachi and Lahore generate 70% of the total revenue. Urban centers are now considered as one of the economies because it provides several opportunities for

these centers. Health, education transportation, and all the facilities are easily approachable.

However, this unplanned urbanization is instigating numerous governance challenges. It causes expansion of urban slums, aggravating poverty, and inequality, accelerating environmental degradation, and hindering the efforts to deliver essential infrastructure to the population (Cohen, 2006). On the other hand, urbanization demands intensive consideration on access to fundamental human development indicators, including employment, social justice, education, healthcare, security, and civic engagement (Haque & Nayab, 2007). Urbanization was considered a burden on infrastructure with inadequate resources, but nowadays, it is regarded as a necessary social and economic development tool.

Challenges that cities faced due to rapid urbanization are growing population, traffic congestions, shortage of public places and homes. Others include lack of resource management (water and energy use), global warming, limited city budgets, poor quality of education and health care services, non-availability of sports ground and parks. Pakistan faces almost all of these problems today. Especially is an infrastructure problem and big cities overcrowded. The basic idea of a smart city is to gather information from a city together with its intelligent handling to achieve smart decision making and control of the city. The Pakistani government has not many resources to tackle the challenges of resources and the need for smart cities for solving all problems.

Concept of Smart Cities in Pakistan

Urbanization is both promising and challenging for Pakistan. Pakistani cities are the primary source of employment opportunities for small and medium enterprises, which provide most of Pakistan's non-agricultural jobs (Kugelman, 2013). They are also center for educational institutions which impart education, training, skills, research and development opportunities in marketable disciplines. Pakistan is struggling to provide housing, transport, education, jobs, healthcare, clean water, and energy to its urban population, meeting these needs in the coming decades. However, at the same time, the population is increasing, and new inhabitants are adding into mainstream demanding better and better opportunities for their future, creating an immense challenge to social development. Pakistan needs to develop systems and technology to analyze the current situation of urbanization that allows municipal governments to manage urban centers better and service the people with time. However, the safety of the citizens and their future is a big challenge for the government. Different private sector residence projects provide high-level services for a living. These schemes are provided the most smart city facilities to their citizens.

The smart cities concept is a novel idea for Pakistan (Irfan, 2018), though there is plenty of work to be done to call it "smart." The term smart city gained much momentum in the recent past, but there is a lack of comprehensive understanding of what smart cities mean in Pakistan. This concept is proposed as a

structural and inclusive approach that will deal with all the urban problems. The advances in ICT-based urban solutions worldwide have made Smart Cities 'imperative' and not 'an option or choice,' especially to rapidly urbanizing countries. This statement also refers to Pakistan, the fifth largest country to deal with fast growth. Pakistan is also a signatory of Sustainable Development Goals (SDGs) (Javed et al., 2020), where Goal 11 is about sustainable human settlements. This goal's central theme is "making cities and human settlements inclusive, safe, resilient and sustainable."

As urbanization progresses, Pakistan's cities need to use modern and recent technology to handle urban centers properly and better serve the people. The transformation of conventional cities into smart cities is trending all over the world. There is no universal design of a smart city as every city have their unique type of challenges. Cities transform according to the needs and demands of the people and with available resources. The city governments encourage technology firms to create a solution for a city to build the necessary infrastructure in the city to increase the quality of facilities and governance for its residents. It provides businesses with all the necessities of various services, such as civil defense, police, water and sanitation, municipalities, transport engineering.

Both government and private sectors are considering the transformation of major urban areas into smart centers. This consideration is associated with integrating mobile phone technology (ICT) and things (IoT). Pakistan's government has considered smart cities as an essential element of "Pakistan Vision 2025". to transform urban areas into innovative and environmentally friendly sustainable cities with improved urban governance, efficient urban planning, efficient local mobility networks, and security as drivers of growth render urbanization. Vision 2025 aims to ensure that Pakistan's cities are technologically linked, fitted with wireless network sensors, and e-connectivity in all areas where the free flow of knowledge is possible, paving the groundwork for smart and innovative cities in Pakistan (Pakistan Vision 2025).

The success of a smart city depends upon the citizens. According to the Pakistan Telecommunications Authority (PTA), there are 180 million cellular customers, 95million 3G/4G subscribers, and 98 million broadband subscribers, according to the Pakistan Telecommunications Authority (PTA). Pakistan has digital infrastructure like cloud virtualization and big data, which are the most critical milestones in ICT development after the internet. Communication infrastructure and interconnection are the real challenges for the country, and the government is working on this. It means that cities in Pakistan must be digitally linked, with wireless network sensors and e-connectivity. There need to design a plan for the three tiers of government, i.e., federal, provincial, and city level, to make Pakistan's cities smart. All the government projects seem isolated, but later they help in making a city smart. For example, Metro Bus Service, Orange Line Metro Train, safe city projects, and waste management are major smart city projects. A safe city project with full automation will help maintain traffic with electronic ticketing (challan) and backs the video record evidence for the police

department. Moreover, when integrated with solid waste management services will helps to make our cities with zero waste.

How Smart is Rapidly Urbanizing Pakistan

The current scenario of Pakistan's urban areas identified the need to develop smart cities to better cope with the challenges caused by urbanization. The government and the private sector are taking initiatives for the transformation of conventional cities into smart ones. Pakistan's smart city model is in its infancy. Ongoing projects in Pakistan and Islamabad's major cities have increased the government's efficiency to provide better services to the citizens. It could be possible only due to the real-time data availability, which ultimately helps in effective decision-making for city planning (Irfan, 2018). In "Pakistan Vision 2025", it is envisioned that soon Pakistan will develop smart cities as the 'Urban Planning Unit' works at the Ministry of Planning and Development.

China Pakistan Economic Corridor (CPEC) is rapidly upgrading Pakistan's existing infrastructure. 820 km fiber-optical cable project helps Pakistan's IT and telecom industry and promotes trade and tourism opportunities, especially in northern areas of Pakistan. It offers a robust IT sector with 100% coverage of 3G/4G broadband, creating intelligent technological solutions. An initiative of installing telecommunication towers at K2 base camp is a step ahead in making smart tourism. Cities like Lahore, Peshawar, and Multan have an immense cultural history and may significantly influence these characteristics. These cities also have a booming IT industry with an increasing number of IT parks, data centers, and creative technology incubators.

The Pakistan Citizen Portal has greatly increased access to government facilities and has been recognized by various stakeholders. Digitizing government departments to harness e-governance and including people in policymaking through the development of e-platforms are just a few of the government's measures to create smart cities. Governments also created online portals to facilitate service delivery, public engagement, and access to government services.

Punjab

Punjab province is the most progressive province in making the cities smart and taking many mass transit initiatives and safe city projects to make their cities smart. It is also leading other provinces in terms of computerization and automation schemes aimed at improving the quality and success of government departments (Irfan, 2018). Punjab Safe City Authority provides a vibrant forum to build and integrate different ICT initiatives at the city level and is a significant step in this direction.

In the education sector, Punjab Government's key initiatives include the smart monitoring of public schools and colleges. Under this project, tracking of administrative staff, attendance of students and teachers via digitally monitoring

forms are ensured. It helps increase the attendance ratio of teachers and students and provides open access to real-time data of over fifty thousand schools to the citizens. To monitor the threat of COVID-19, Dengue Virus, and other epidemic diseases, the Punjab government designed a system that records the real time data of all the activities regarding preventing and eradicating diseases.

Another smart city initiative Punjab that the government took is "The Integrated Command, Control, and Communication System" (IC3) for the security of the city, which aims to improve the police operational efficiency with technology. Initially, almost 90 police stations have been done with complete automation of FIR and complaint lodging system. This system integrates all law and enforcement agencies into one page.

Soon Lahore will become the first smart city in Pakistan. It is currently expanding the networks, including the Metro Bus System and the Orange Train. Additionally, the Punjab Information Technology Board establishes modern state-of-the-art Citizen Facilitation Centers known as e-Khidmat Markaz in all provincial headquarters. Moreover, the Punjab Information Technology Board automated all the province's police forces. Police officers use new techniques and technology used by the PITB for identification, inquiry, and questioning. (Irfan, 2018).

Computerization of the government records and data will help the citizens to avail the facilities better. Lahore, the capital of Punjab, has high courts, IG office, Secretariat, Assembly Hall, and other important government offices. These departments' digitalization helps the masses access these departments online from their home and with their smartphones. It will save time and congestion on roads reduced. It is estimated that around seven hundred thousand cars entered Lahore to visit these public offices, which creates a burden on road infrastructure. With smart governance, we can better cope with the traffic issues and improve the efficiency of the government departments.

Khyber Pakhtunkhwa (KPK)

Khyber-Pakhtunkhwa government also initiated many projects for the transformation of conventional cities into smart cities. The provincial government has a focus on mass transit bus service (BRT) and safe city projects. Additionally, the 'Citizens Portal,' the CM Complaint Cell, online FIR registration, online admissions to public sector colleges, and online application for a driving license are all ICT-related initiatives in KP. In health, the KP health department established the Independent Monitoring Unit (IMU) to conduct systematic reviews of the public sector's health performance (Irfan, 2018).

Sindh

The Sindh government has signed an agreement with three investors from the United States, China, and the United Arab Emirates to turn Karachi into a smart

region by installing solar streetlights, closed-circuit cameras, and free Wi-Fi. Mass transit and environment-friendly electric bus projects are already launched (Dawn, 2015).

Baluchistan

The smart cities project is part of the development initiatives of the province under the Chinese-Pakistan Economic Corridor (CPEC). In November 2015, a memorandum of understanding was signed with the Chinese government to turn Gwadar into a smart city (Irfan, 2015).

Discussion

Pakistan faces many hurdles in its effort to build smart cities. The transition to smart cities is fraught with financial restrictions. Costs associated with city-wide implementations of smart technologies are heavy. Although established facilities such as transit, health, and education have improved, integration of public services remains a challenging task—the absence of a regulatory agency capable of providing a suitable structure for smart city initiatives. Additional impediments to sustainable community-smart growth involve a general lack of awareness and institutional comprehension about smart city initiatives. Consensus on an apt model for smart cities within Pakistan's socio-political framework is also not overlooked. While Pakistan enjoys a unique level of social acceptance when it comes to sustainability, some criteria should be established before working on smart cities in Pakistan for attaining sustainable growth.

Energy crises are one of Pakistan's major problems, and they can obstruct efforts to make Pakistani cities smart. Once Pakistan addresses this problem and has a sufficient supply of electricity on the national grid, things can become more transparent and open for succeeding governments to embark on megaprojects with faith and determination. Indeed, without a reliable power source, it is impossible to enjoy the benefits of information technology and next-generation technology. The government is aware of it and is paying particular attention to this dimension.

Cities are more than physical infrastructure; they also include social infrastructure through their culture, traditions, behaviors, and folklore. The physical and social infrastructures of each city are distinctive. Cities' vitality drives innovation and renewal. Dynamic cities thrive and expand, while stagnant and dying cities perish. Cities have never been recognized as distinct legal bodies in Pakistan. Pakistan needs an organized and systemic approach to issues associated with urbanization. Federal and provincial governments are tackling particular matters on their own, although they are inextricably linked. Government departments deal with traffic problems, sanitation, urban slums, and waste management separately. Apart from the federal and provincial governments, local governments can raise enough funding for new construction programs. Involve the

business sector in the phase of sustainable planning to ensure the smart city's sustainability.

Globally, as technology advances, cities become more intelligent and livable. Smart cities are a combination of computer technology, informatics, and information to improve the quality of life for people. Urban settlements are the engines of growth and change, and therefore can either support or hinder the life of a culture. In Pakistan, sustainability has reached a tipping stage, with several regions afflicted by urban crises. Karachi, Pakistan's largest capital, was listed among 40 cities globally in the United Nations' 2018 e-Government Index for its resilience and prosperity as calculated by e-governance.

The country's urban centers must be transformed into autonomous cities. Pakistan's major cities are precisely on the cusp of conforming to this concept, forcing policymakers to do so. Pakistan Vision 2025 indirectly suggested that the smart city be renovated. By 2025, the vision envisions Pakistan's cities being digitally connected and equipped with wireless network sensors, laying the foundation for Pakistan's smart and creative cities. However, this is a naive and educated vision of the city. It is entirely reliant on technologies and makes no note of the need for capability and skills development to address urban problems.

The goal of smart city strategies is to address public issues, maintain prosperity and productivity – economic growth and social capital – and keep residents comfortable and fulfilled. As a result, intelligent communities must evolve and build (technology-based) resources that leverage citizens' abilities and expertise. In the future, smart cities will produce actionable data, but the secret to unlocking this data will be our citizens' mindset. If we continue to dump trash along highways and city streets, smart bins will not fix the issue. Without the appropriate mindset, neither the government nor any external partner can engage in better future generations. Thus, before we get on the smart cities bandwagon, we can step back and realign our goals and activities to ensure that we are thoroughly prepared for future challenges.

To accomplish the goals of a smart city, an enabling atmosphere, technological innovation, universal internet access, a favorable economic climate, high-tech equipment, and a political will to exchange valuable data with the public good are needed. Pakistan has one of the highest rates of cell phone use globally; this advantage can be leveraged to advance the country's smart city growth. Additionally, certain developed-country towns, such as those in the United States and Canada, may function as examples. Additionally, they partnered with industry titans such as Cisco and Google to create digital innovations that improve community accessibility, increasing resource usage, and lowering pollution. Include, though, a cautionary warning. The use of technology to foster economic growth cautions Pakistan to practice restraint, noting that the wave of technology will also result in employment losses, wage inequality, and social isolation.

Pakistan is confronted with numerous hurdles on its path to sustainable smart city development. It lacks awareness of the operational ramifications of smart city policies and consensus on a standard model for smart cities consistent with its

socio-political context. Pakistan often adopts a western model of smart cities, which does not work in the local sense. Another issue is a lack of cooperation with Other Urban Sector Programs and considerable institutional overlap between various provincial agencies' scope and authority. The roadmap, methodology, and range of the Smart Cities Program were incoherent. There is currently no plan for financing smart cities.

This limited knowledge of intelligent cities severely limits their use in practice. Countries are most likely to be affected by multinational information technology providers or more developed countries that market remedies as though they are ubiquitous in these circumstances. Pakistanis must grasp, accept, and adopt the smart city concept to remain successful since they are better suited to decide their own potential needs and desires. Pakistan cannot afford to lose momentum or face losing its competitive advantage in domestic or foreign markets. Given that China and India are well ahead of Pakistan in smart cities due to their innovative national policies and technological innovation centers, Pakistan must take the chance to become economically and environmentally viable.

Conclusion

Smart cities generate valuable data that aids in improving and providing services to people, effectively improving citizens' quality of life and enabling cities to work at their maximum potential. It comprehensively tackles poor living conditions, unemployment, unsafe drinking water, drainage, sanitation, environmental pollution, road congestion, and illegal constructions. They place a premium on economic growth and account for most jobs in the value-added market. In Pakistan, the concept of smart cities must be refined by the cities' economic and political circumstances. Pakistan needs an organized and sustainable urban strategy aimed at keeping cities smart. A collaborative approach involving the public sector, the private sector, and the public is required. All must share and understand their responsibilities and work cooperatively to ensure that the consequences have a synergistic impact. In this regard, government agencies, the business sector, and residents must be aware of their respective obligations. Governments must practice effective governance at all decision-making stages to plug financial leakages and rein in graft, ensuring the sustainability of the smart city project.

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