

Smart Cities in India: Impact of Data-Driven Technologies Among Citizens

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Abstract

Artificial intelligence is currently being used for most purposes including managing climate change, improving health, cleaning homes and cities, creativity and innovation. In cities urban infrastructure has improved and smart technology is used to make them more livable without any problems. Efforts are made to upgrade systems so that lesser citizens live in poor socio-economic conditions of life. The problem of sustainability still remains. The aim of this paper is to analyze some important cities and view them in the light of sustainability and artificial intelligence- how smart are they, how has the infrastructure been designed around their geography, how are the citizens benefitting out of the smart-city programme of governments. Survey was conducted among 69 citizens living in different cities across the world. SPSS software was used to analyse some of the research themes around artificial intelligence and sustainability.

Keywords: artificial intelligence, internet of things, sustainability, smart cities

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I. Introduction

Artificial intelligence is currently being used for most purposes including managing climate change, improving health, cleaning homes and cities, creativity and innovation. In cities urban infrastructure has improved and smart technology is used to make them more livable without any problems. Efforts are made to upgrade systems so that lesser citizens live in poor socio-economic conditions of life. The problem of sustainability still remains.

While the paper studies the uses and extent of the use of artificial intelligence in making our cities smart, findings indicate the future paradigms of smart-city sustainability and efforts to improve artificial intelligence applications.

The Smart Cities Readiness Guide of the Smart Cities Council, an advocacy group of industry houses, defines a Smart City as one that uses 'information and communications technology (ICT), to enhance its livability, workability and sustainability' (Smart Cities Council: 2013). It identifies seven drivers of smart city urbanization: increasing urbanization, growing stress due to inadequate housing, demand and supply gap in infrastructure, economic competition among cities to secure investments, rising expectation of citizens from responsive governments for worldclass facilities, growing environmental challenges due to global warming, expanding technology options in the areas of ICT, electronics and communication, energy, water and waste management (Roy, 2016).

The key themes around smart cities have been identified and uses and applications of artificial intelligence have been analysed.

II. Literature Review

Internet of Things (IoT)

Based on evidence from the literature (Amin et al., 2000; Brenner and Theodore, 2002; Florida, 2005; Graham and Marvin, 2001; Harvey, 1989; Komminos, 2002), Hollands (2008) identifies five prime characteristics of smart city- embedding of ICT into the city fabric, emphasis on business-led development and domination of neo-liberal urban spaces, shift in urban governance from managerial to entrepreneurial forms, significance of social learning and education, social capital for innovation, the nurturing of a creative class, and focus on social and environmental sustainability. In India, people welcomed the idea of a smart living in cities although there were concerns that due to intensive urbanization the economically-weaker sections might be pushed to the peripheries of cities thereby resulting in inequality, polarization and social justice.

The Indian version of smart cities came about with the announcement of the building of seven such cities in six states, along the proposed Delhi-Mumbai Industrial Corridor (DMIC), by the erstwhile United Progressive Alliance (UPA) government in 2007. The city clusters include Dadri-Noida-Ghaziabad in Uttar Pradesh, Khuskehra-Bhiwadi-Neemrana in Rajasthan, Maneswar-Bawal in Haryana, Ahmedabad-Dholera in

Gujarat, Pithampur-Dhar-Mhow in Madhya Pradesh, and Dighi in Maharashtra (D'Monte, 2014). Similar to the concept of developed world, high-end infrastructure, sensors, smart grids, big data and analytics have been considered as the elementary instruments for urban governance. The former chief minister of Gujarat and current prime minister of India, Narendra Modi, had declared two smart cities- Dholera Special Investment Region (SIR) and Gujarat International Finance Tech (GIFT) City, as the building blocks of a global Gujarat (Datta, 2014). The smart city concept has also been conceived as an instrument to invite global funding agencies, technology firms and private investments in real estate (domestic and international), to help realise the dream of 'Make in India'.

According to Roy (2016), smart cities must have a few essential attributes: ICT enablement and technological intervention, service-level benchmarking (comparable to European countries and the developed world), private-sector led development, consultant-driven planned development, greater institutional coordination, transit-oriented mixed use development, governance by incentives rather than government by enforcement, conditions being set for the selection of smart cities, and an enhanced financial architecture.

According to Goldman Sachs (Butler & Lachow, 2016), there are five key technologies driving IoT proliferation which in turn supports smart city efforts:

- Cheap bandwidth
- Cheap processing (enabling more devices to be not just connected but smart enough to know what to do with all the new data they are generating or receiving)
- Smartphones (smartphones are now becoming the personal gateway to the IoT, serving as a remote control or hub for the connected home, connected car, or the health and fitness devices consumers are easily starting to wear)
- Ubiquitous wireless coverage
- Big data (the availability of cloud/software as a service and big data analytics is a key enabler)

Data-driven technologies

The merging of environmental and human sensing can optimize the observation capacity of smart and environmentally sustainable cities and react to urban events (Fang et al, 2021). Citizens in smart cities can take advantage of a data-driven living environment, unrestricted connectivity, smooth access to services, digital urban governance, enhanced resource management, and a sustainable urban setting (Haque et al, 2021). Local government configure smart and environmentally sustainable cities as intrinsic cutting-edge upsides that can optimize their interconnected sensor networks and performance in resource distribution, consequently decreasing environmental pollution through machine-learning based analytics (Chu et al, 2021).

Lazaroiu and Harrison (2021) focus in their study on sustainable smart ecosystem by use of IoT-sensing infrastructures, machine-learning based analytics, and data-driven planned technologies throughout computationally networked urbanism.

Cities are gradually data-driven and smart city advancement entails a mix of fashionable infrastructure, cutting-edge technologies and the harnessing of soft assets to bring about more adequate assimilation of the alterations within each urban community (Nitoslawski et al, 2019; Wataya and Shaw, 2019). Climate change and extreme events tend to become more severe, shaping urban sustainability (Amorim et al, 2019).

Developments in information technology enable superior data gathering (Ionescu et al, 2020; Durana et al, 2019; Dusmanescu et al, 2016; Lazaroiu et al, 2017; Popescu et al, 2017 a,b, c; Valaskova et al, 2019) in addition to the production of applications designed to harness such input (Curzon et al, 2019).

This brings us to some of the important research questions this paper finds out.

Research Methodology

The paper addresses key research questions around smart cities and sustainability:

RQ1: What are the smart ways in which Indian cities have developed?

RQ2: What do citizens feel about steps taken to make their city smart?

RQ3: Have the Indian cities become sustainable and more livable?

RQ4: What can be improved to make cities more smart?

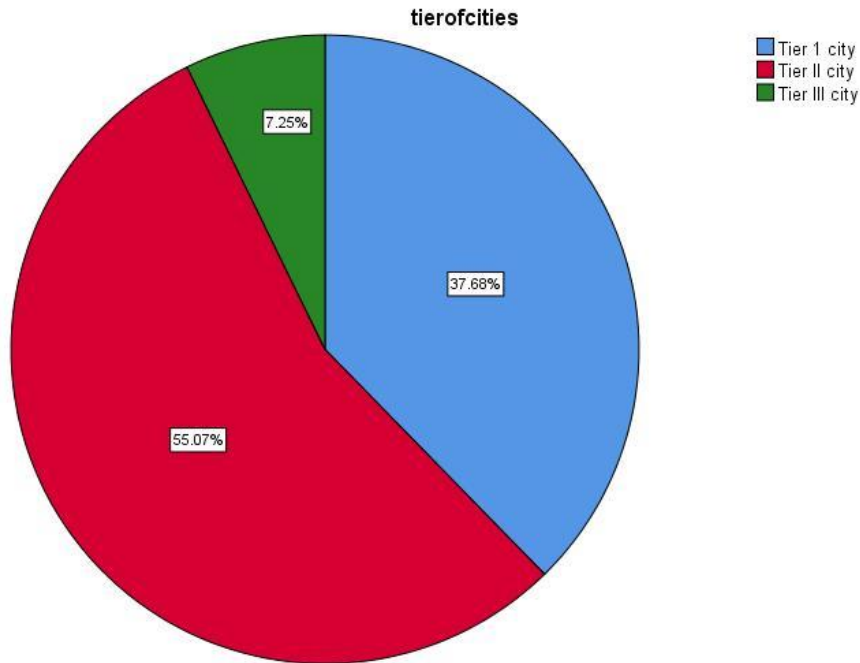
Research method

A questionnaire was sent out to a sample of 69 participants across all cities in India. The survey addressed key issues around sustainability, urban infrastructures, climate change, technology-adaptability among others (Appendix 1) on a Likert Scale. SPSS software was used to analyse the data and bring out results and findings.

III. Results and Findings

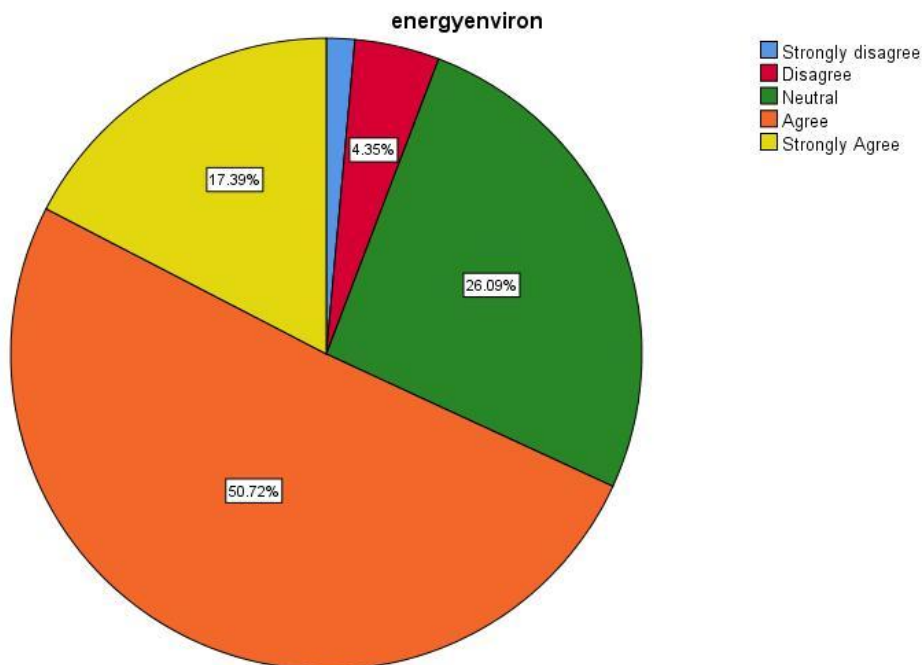
As the survey was analysed the following results appeared:

1. Tier-two cities dominated



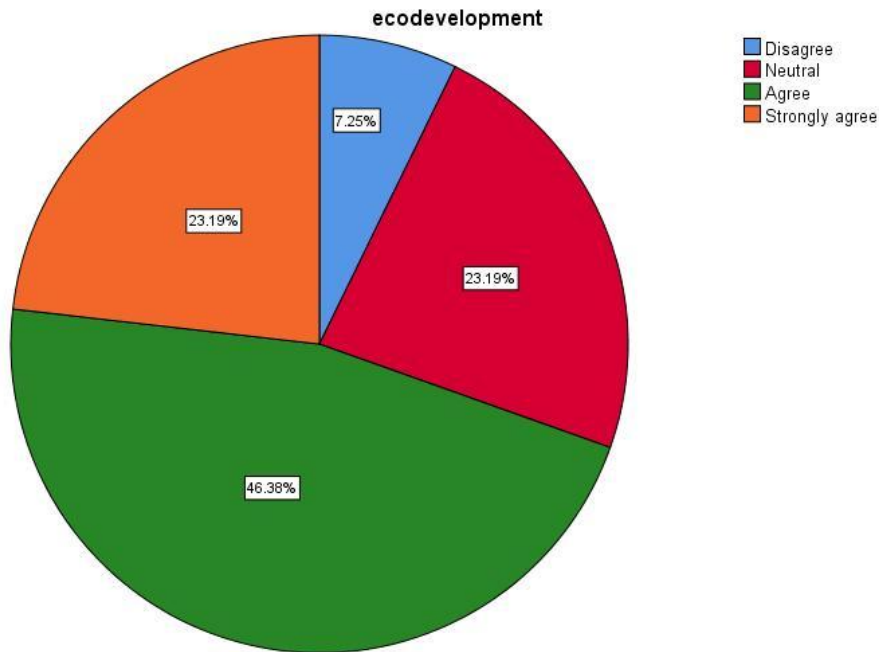
It was found in the survey that 37.68% of respondents were of tier I city while 55.07% of respondents belonged to and were living in tier II cities. Majority of responses are from tier II cities.

2. Cities took environmental-friendly steps to help citizens



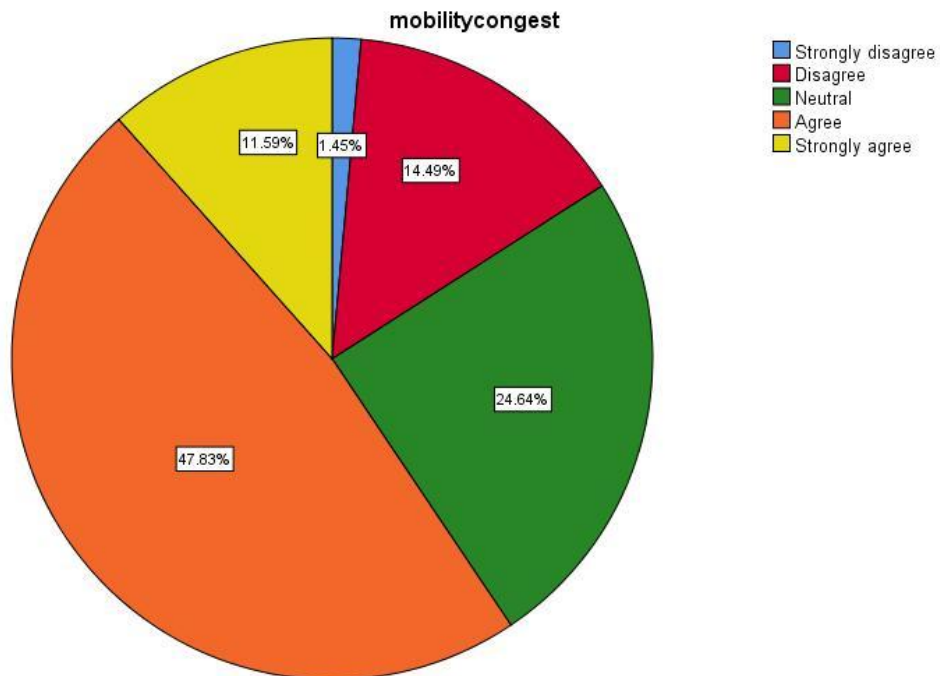
In the survey citizens were aware about the city being clean, green and environmental-friendly. Out of the respondents living in these cities, 26.09% were neutral about whether the authorities took energy steps to make the city green while 50.72% of the respondents agreed that government took steps to make a clean and green city.

3. Authorities worked towards economic development of the city



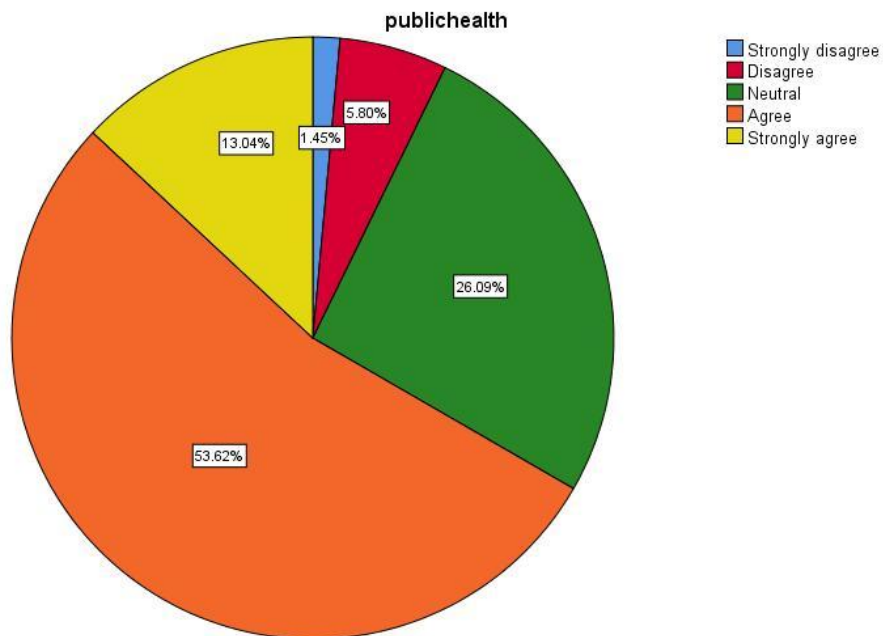
Among the city respondents, 23.19% felt that they were neutral in addressing the city’s needs for economic development; another 23.19% strongly agreed that economic development of the city was worked on while 46.38% agreed that authorities took steps to economically develop their city.

4. Congestion and mobility issues of citizens were addressed



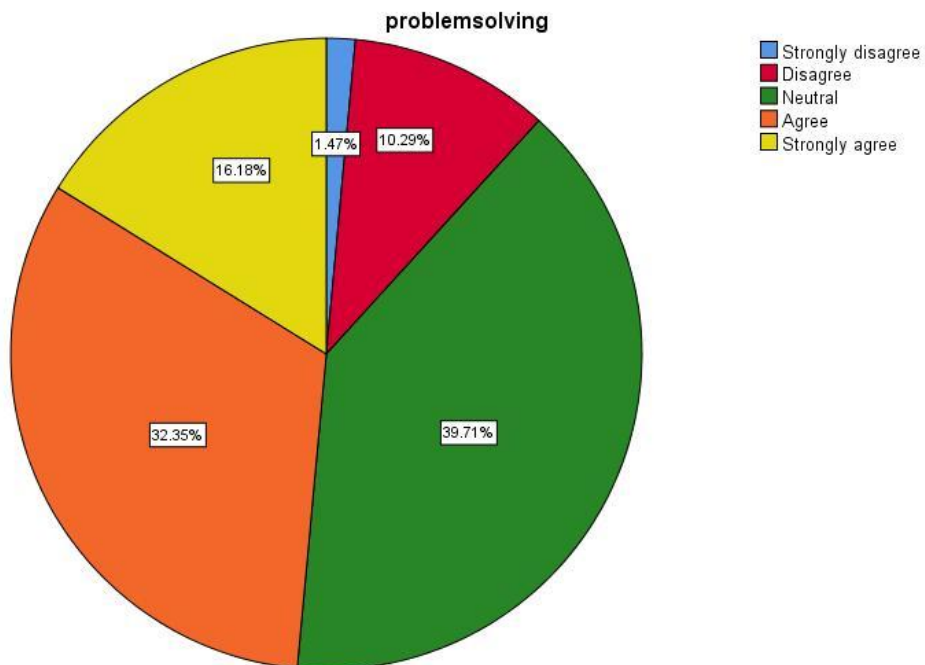
Among total number of 69 respondents, 24.64% felt that they were neutral when government had to control mobility and congestion in the cities while 47.83% students agreed that such issues were addressed.

5. Public health was a focus by authorities



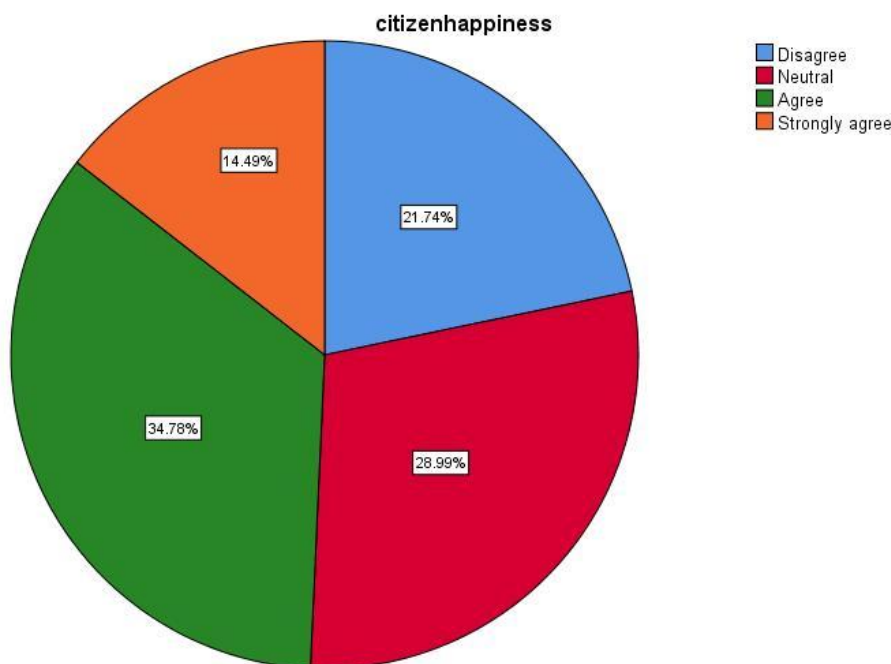
Here, 26.09% of the respondents were neutral that public health was addressed as a major concern by authorities while 53.62% agreed that public health was being addressed well by the authorities.

6. Problem-solving skills of citizens enhanced by government effort



Among the respondents, 32.35% agreed that problem-solving skills of citizens were enhanced by making the cities smart. However, 39.71% of respondents remained neutral.

7. Citizen happiness was given a priority in governance



Here 28.99% of respondents remained neutral that citizens were happy, tech savvy and smart workers in smart cities while 34.78% agreed that citizen happiness was a priority for governments and a parameter for making the city smart.

IV. Discussion

Hence it maybe concluded that smart cities in India are a remote dream. Even tier I and tier II cities have facilities in few areas. Although green cities, tech-savvy cities are a priority by governments and authorities, citizens feel that a lot of it needs to be addressed well so that citizens can feel happy living in data-driven and smart environment.

V. Conclusion

It maybe concluded that smart cities in Indiastill have a long way to go as far as citizen happiness, clean and green energy, sustainability, public health facilities, tech skills, problem-solving skills and digital skills of inhabitants are concerned. While systems of governance have become data-driven and driven by artificial-intelligencecitizens need to be made more aware and their skills need to be enhanced for such initiatives to be made effective.

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