

UNIVERSITY OF HERTFORDSHIRE

Exploring the design of people-centred inclusive smart cities using integrated inclusion approaches and citizen engagement strategies through case studies of London, Bengaluru, and Kampala

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Abstract

The twenty-first century is the age of cities. A country's sustainable growth and development depend on its cities' success and failure. The smart city approach, the new and emerging model of urban development, is expected to offer plausible solutions to tackle urban challenges. However, the different smart city models that evolved around the globe are still at a nascent stage and are subject to substantial debates and questions. Critical questions still need to be answered: Does this new urban development paradigm contribute to all its citizens' well-being, leaving no one behind? Is urban inclusion a priority in current smart city planning? If so, does smart city planning address the challenges of the inclusion of vulnerable and disadvantaged populations living in cities? How ICT and digital innovations can contribute to change in our contemporary cities? Do they have the potential to improve quality of life, access, participation and opportunity and eliminate exclusion and existing inequalities?

Urban inclusion, the crucial aspect of sustainable development, is a critical challenge. It affects different people, often identified by gender, age, race, religion, class, and disabilities, including migrants and refugees. However, the current discussions of urban inclusion within the extant smart city literature are abstract and limited in their scope and considerations. This research focuses on this gap and contributes to the research literature and the advancement of practice-based knowledge to better understand inclusive development models in smart city theory, principles and projects.

The key question guiding this research is: Can smart city be equitable; does it address the current challenges of urban inclusion and contribute to the well-being of all citizens, leaving no one behind? This research investigates the critical challenges of urban inclusion in contemporary cities and explores the interplay between the smart city and the inclusion of vulnerable and disadvantaged populations. The study involves a literature review of the existing research and policy landscape, exploring evidence from multiple data sources, including rigorous document analysis, followed by a qualitative study of three case studies (London, Bengaluru and Kampala), providing an enriching spatial comparison with additional inputs from global thematic experts. To increase the credibility and validity of qualitative research, semi-structured interviews are conducted with relevant stakeholders from the case study locations and other global regions.

This study offers conceptual, theoretical, and empirical contributions to knowledge about the dimensions, challenges and relationships of the inclusion of vulnerable and disadvantaged populations in smart city planning and development. It aims to identify new tools and methods and offer policy recommendations for enhanced inclusion and equity. The integrated inclusion approach and renewed citizen engagement strategies are expected to contribute to people-centric and inclusive smart city planning. The recommendations include an integrated inclusion vision, an inclusive smart city framework and certain key elements of a citizen engagement strategy. This study focuses on vulnerable and disadvantaged populations like- the elderly, people with disabilities, women, children, youth, poor, migrants, refugees and other minority and ethnic and religious groups, including the LGBTI community, who are often neglected and excluded from mainstream development.

This study is relevant to understanding the need and urgency of an inclusive smart city development approach and suggesting the basic and essential guidelines and integrated framework to address the specific challenges identified in this study and for creating a basis for an inclusive approach and for designing future cities that are more inclusive and equitable, thus leaving no one behind.

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List of Acronyms

3D	3 Dimensional
ADB	Asian Development Bank
APEC	Asia Pacific Economic Cooperation
ASEAN	The Association of Southeast Asian Nations
CCTV	Closed-Circuit Television
CEO	Chief Executive Officer
DFID	Department for International Development
EU	European Union
ICLEI	Local Governments for Sustainability
ICT	Information and Communication Technologies
IDRC	International Development Research Center
ILO	International Labour Organisation
IMF	International Monetary Fund
IoT	Internet of Things
ISO	International Standards Organisation
ISOCARP	The International Society of City and Regional Planners
ITU	International Telecommunication Union
LGBTI	Lesbian, Gay, Bisexual, Transgender and Intersex
NGO	Non-Governmental Organisation
NHS	National Health Services
OECD	Organisation for Economic Co-operation and Development
TfL	Transport for London
UCL	University College London
UCLG	United Cities and Local Governments
UK	United Kingdom
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
UN SDG	United Nations-Sustainable Development Goals
UN-Habitat	United Nations Human Settlements Programme
UNHCR	United Nations High Commissioner for Refugees
WHO	World Health Organisation
Wi-Fi	Wireless Fidelity

Chapter I

1 Introduction

This introductory chapter discusses the research motivation and background in terms of the urban challenges in contemporary cities, varied urban development models from across the globe, the lead model of the smart city paradigm, and its contribution and gaps highlighting the significance of this research. Finally, a section on the thesis structure describes the chapters in this thesis and discusses their essential contributions.

1.1 Motivation for the work

Equality and inclusion are the fundamental elements of sustainable development. However, human societies worldwide exhibit multiple forms of inequality and exclusion. It affects different categories of people who are discriminated against based on gender, age, race, religion, class, and persons with disabilities, including migrants and refugees. In addition, there is inequality and exclusion based on ethnic group, tribe or linguistic group or caste group (social stratification in India), different economic classes, and sometimes by nationalities. The problem is not being similar or distinct from others, as all human beings are born equal; the problem is thinking superior and inferior to others. Such inequality, discrimination, and exclusion affect millions worldwide and exist in almost all human societies, with variations in nature, form, characteristics, and scale. I am often disappointed and perturbed by this situation. Therefore, I am interested in assessing this situation in contemporary human societies and see what contribution in this field will help achieve inclusion and global sustainable development goals.

I started my career as a public official, where as a member of civil services in India, I got an opportunity to work in development administration across multiple domains, managing complex public systems, understanding people's diverse needs, the challenges in the distribution of scant resources, power and pressure politics, the winners, the losers and left outs. The plight and unfair treatment of vulnerable populations like the elderly, people with disabilities, women, people experiencing poverty, minorities, and migrants particularly drew my attention. As a strong advocate of UN-Sustainable Development Goals (UN-SDGs), I developed a passion for mainstreaming these vulnerable and disadvantaged communities in the overall development agenda. Even though I have always strived to work for the benefit of these populations and contribute towards equality and inclusion, I learnt that the problem is vast and

complex. Therefore, combining my passion with empirical knowledge, I decided to embark on this PhD study, where I want to use my long years of experience in the urban domain and smart cities and contribute to applied research in developing practical and achievable inclusive, sustainable urban development model and tools to meet the requirements and challenges of contemporary cities at a global level.

More than half of the world's population resides in cities, and rapid urbanisation is a huge problem for human societies. The growing urban regions are facing tremendous challenges like low-quality infrastructure, inadequate services, increasing poverty with a widening gap between rich and poor, mushrooming slum areas, environmental degradation, growing disasters, shortage of financial resources, technology deficit, capacity constraints and many more; ultimately making cities poor habitats and unsustainable environments for quality living.

The challenge is to reinvent our city systems to improve the quality of life and explore innovative approaches to solve the 21st Century's urban challenges. Governments across the globe are exploring new and innovative solutions and adopting renewed strategies and methods for making cities more inclusive, sustainable, and liveable. There are attempts to improve public service delivery, build basic amenities for people in need, develop environment-friendly natural-based solutions, improve community resilience, develop social infrastructure, and increase energy efficiency, among many others. However, there is no single best approach, and each city chooses priorities based on local conditions and needs and is continuously experimenting with new planning tools and management methods. The smart city model is one of the most advocated and adapted tools in contemporary cities and is aimed at making cities engines of growth, creativity and innovation using digital innovations. While cities are at the threshold of this new beginning, my attention is drawn to the existing inequality, exclusion, and plight of millions of vulnerable populations who are marginalised from mainstream development in smart cities. These populations are often deprived of basic facilities and lack a decent living and face all kinds of inequalities and exclusion in daily lives. As the smart city is becoming more popular in this digital age, the potential and extensive use of digital technologies is expected to solve complex urban challenges, including inequality and exclusion in cities.

Against this backdrop, I am keen to investigate the relationship and interplay between smart cities, the current emerging and increasingly adopted urban development paradigm with urban inclusion. My key question is: Can the smart city be equitable; does it address the everyday

challenges of urban inclusion and contribute to the well-being of all citizens, leaving no one behind? This is to understand how the smart city proposed as a plausible solution for many urban challenges addresses the needs of the vulnerable, disadvantaged, and marginalised populations and how it contributes to their inclusion. I hope this work will supplement the knowledge and sustainable urban planning resources and helps transform the lives of millions of vulnerable and disadvantaged populations who are voiceless and silently struggle and lead a life of second-class citizenship in their cities and towns. My findings will further identify the affected population groups and shed more light on the day-to-day challenges of these vulnerable populations. It finally presents more verbal arguments on the need and urgency for inclusion and equality of all human beings, thus reducing widespread discrimination and inequality in our societies.

1.2 Research context and its significance

The world is transitioning through the most challenging phase of human life as rapid urbanisation and rising inequality poses a challenge to sustainable global development (UN SDG 2015). More than 55 per cent of the global population resides in cities, which is expected to increase to 68 per cent by 2050; by then, almost two-thirds of the world's population will be urban (UN DESA 2018). In some countries, rapid urbanisation has resulted in more slums, inadequate and overburdened urban infrastructure and services, and increased air and environmental pollution (UN SDG 2015). Furthermore, it is claimed that most of the urban population faces severe hardships and challenges, including a lack of access to basic needs like food, healthcare, education, shelter, employment, human rights, and dignity (Freire et al., 2016).

According to a few social thinkers, the existing development models are claimed to be non-inclusive and elitist, leading to rising inequality and exclusion of specific populations instead, affecting their social, economic, political, psychological, and cultural well-being (Prodius 2019; Sudakova and Astafyeva 2019, Munandar 2018). It is claimed that such a scenario has influenced the global development agenda with increased emphasis on a rights-based approach and the principles of equality, inclusion and non-discrimination (Fredmen and Goldblatt 2015). The 17 Sustainable Development Goals (UN SDG 2015), promoted by the UN and officially adopted by 193 countries, aim to realise human rights and the critical principle of leaving no one behind. The goals also aimed to achieve gender equality and the empowerment of all women and girls with a key emphasis on inclusion, mainly through SDGs- 8, 10, 11, and 16,

where the rights-based approach or Human Rights-Based Approach to Programming (HRBAP) of the UN advocates an analysis and redressal of existing inequalities and discriminatory practices, including unjust distributions of power in its current development model.

Due to increasing urbanisation, this new focus of global sustainable development is now shifting to cities (UN-Habitat 2015). Therefore, among UN SDGs, one exclusive and standalone goal is prescribed to address the multiple challenges of urbanisation and, more so, the issues of exclusion and inequality. Goal 11 of the UN-SDG aims to make cities more safe, inclusive, resilient and sustainable. Similarly, the UN-sponsored New Urban Agenda (Habitat III 2016) has set goals to ensure that the basic urban infrastructures and future cities will be more user-friendly, environmentally friendly, accessible and inclusive of all people's needs. The World Bank (2021), an international financial institution working across 189 member countries and leading global partnerships to fight worldwide poverty through sustainable solutions, advocates urban inclusion as the critical aspect of sustainable development in cities. According to World Bank, non-inclusive development affects multiple dimensions of human development, such as physical inclusion (access to land, housing, and infrastructure), economic inclusion (opportunities for all) and social inclusion (rights and participation). And it affects different categories of people by gender, age, race, religion, class, and persons with disabilities, including migrants and refugees.

In terms of the current update, the situation is grim and discouraging. According to the UN SDG knowledge platform 2020 website, the progress and achievements of UN-SDGs, among others, concerning the objectives of Goal 11 are claimed to be achieved only partially and still, much more needs to be done. For example, nearly one billion people still living in urban slums are hard hit and severely affected due to the COVID-19 pandemic. Slum dwellers increased from 23 to 24 per cent between 2014-2018. The 2019 data reveals that only half of the urban population has access to public transport, and most cities do not have convenient access to open public spaces. Globally, almost two billion people do not have access to waste collection services, and nine in ten people living in urban areas still breathe polluted air (UN SDG Knowledge Platform 2020).

Conversely, the Internet age and the digitally interconnected world are redefining human lives and community living, creating immense possibilities and opportunities for change. The application of Information and Communication Technologies (ICT) or digital technologies is

claimed to be emerging as the best bet for improving urban services and addressing issues of resource efficiency, citizenship and participation, security and surveillance, behavioural change, evidence-based policymaking, social cohesion (Alberti et al., 2019; Yigitcanlar et al., 2019; Karvonen et al., 2018; Smørðal, O et al., 2016; Meijer and Rodriguez Bolivar 2015; Mostashari et al., 2011). Several international development organisations like United Nations, OECD, World Bank, UN-Habitat, and ADB, among others, strongly advocate using digital technologies to support the sustainable development of cities. It is argued that smart urbanisation is the most common way to innovate and prosper, and this trend is further leading to the emergence of smart cities across the globe (Karvonen et al., 2018).

However, the discussions on smart cities and their contribution to sustainable development are subject to conflicting views and criticism. While several studies claim their positive contribution to urban sustainability, the critical question remains whether these smart technologies ultimately improve the quality of life and well-being of all citizens, including vulnerable populations (OECD 2019; Yigitcanlara et al. 2019; Ghasemi 2015). Added to this, it is claimed that the multiple definitions of a smart city with various objectives and scope, different agendas and models based on context and conditions offer numerous viewpoints, further adding confusion and more questions on its role and contribution rather than giving the correct answers (Tariq et al., 2020; Tang et al., 2019; Cosgrave et al., 2013; Meijer A 2013).

It is often argued that the current smart city ideas, approaches, and products are pretty polarised and fragmented (Kitchin R et al., 2018), creating issues of interoperability and integration of services, including access and inclusion of all citizens (Alberti et al., 2019). Therefore, according to some analysts, the claim of its contribution to increasing collaborations is doubtful (Susa Eräranta and Aija Staffans 2015). The other criticism is that smart cities and digital technologies pose new threats and vulnerabilities, making city infrastructure and services more brittle, insecure and easy prey to criminal activities (Kitchin, R. and Dodge M 2019). There is another viewpoint that digital urbanism and urban management are claimed to be practised in isolation, adding to their drift from reality (Aurigi, A 2013). It is argued that the contribution of smart cities to the social and political systems of city governments is also unknown and less researched (Ghasemi 2015). How digital technologies can provide a new approach to enable citizens to co-construct ideas and visions for future sustainable cities is a question that remains unanswered (Smørðal et al., 2016). It is therefore argued that the relationship between smart cities and sustainable urban development is still unclear (OECD 2019; Yigitcanlara et al.,

2019; Ghasemi 2015), and there is a need for more theories to highlight the complex interactions between the social system and technology (Ghasemi 2015; Meijer A 2013).

This study aims to answer some of the above questions and address the knowledge and practice gaps, particularly relating to smart cities' contribution to urban inclusion. It is pertinent and timely due to the urgency for achieving global sustainability by 2030 and fast-emerging smart city models that are proposed and considered plausible solutions for many urban challenges. This research mainly focuses on the inclusion of vulnerable populations, which is the most critical component of sustainable development (UN SDG 2015). This study argues that millions of people are excluded from mainstream development and often identified based on gender, age, race, religion, class, and persons with disabilities, including migrants and refugees, among others, who, as entitled stakeholders, should equally share the fruits of development and prosperity (World Bank 2020; UN SDG 2015; UN-Habitat 2009). Further, the inclusion of these excluded groups is considered the key to sustainable development and the principle of 'leaving no one behind' (UN SDG 2015), which is the slogan of the global sustainable development agenda that aims at giving an equal chance and opportunity to everyone to participate in and benefit from development. This research study pertains to the emerging urban development paradigm of 'the smart city', where extensive digital technologies are mooted to solve urban challenges. The idea is to understand the interplay between the smart city and urban inclusion and develop an argument for the need and urgency of an inclusive city development approach across the globe; in a context, the exclusion issues are the same with slight variations in nature, form, characteristics, and scale.

1.3 Research aim and objectives

At present, there is a race for smart urbanisation with renewed interest and excitement worldwide to use the ICT and smart cities approach as a panacea for solving urban problems and challenges, including urban sustainability (OECD 2019; Yigitcanlara et al., 2019; Ghasemi 2015; Meijer and Bolivar 2013). This study focuses on the smart city and the current emerging urban development paradigm (Schuurman et al., 2012; Meijer and Bolivar, 2013; Vanolo 2014; Yigitcanlar et al., 2017) and explores its interplay with urban inclusion. Specifically, it explores the potential contribution (if any) of smart cities and digital technologies in achieving enhanced inclusion of vulnerable populations who are often neglected and kept away from mainstream development. This research is very relevant because many cities suffer from the exclusion

problem affecting millions. This is the most critical global challenge hampering sustainable development (UN SDG 2015).

The research aim is – ‘*Exploring the design of people-centred inclusive smart cities using integrated inclusion approaches and citizen engagement strategies through case studies of London, Bengaluru, and Kampala*’.

To achieve this aim, the following four research objectives have been developed:

1.To identify the challenges of inequality and exclusion in contemporary societies with a focus on smart cities.

2.To identify the different categories of vulnerable and disadvantaged populations often excluded from urban planning and smart city development projects and highlight their specific challenges in city life.

3.To assess the priority of inclusion of vulnerable populations in smart city planning and to assess the impact of digital technologies in enhancing their inclusion and equity.

4.To identify the key pointers to design a people-centred inclusive smart city.

The above research aim and objectives are dealt with by addressing the following three research questions (grouped out of seven interrelated questions):

1.Who are the individuals and groups of the population excluded and marginalised from smart city development projects? What are their experiences of different forms of exclusion?

2.Is urban inclusion a priority in current smart city planning? What is the impact of digital technologies that are extensively used in smart cities? Do they have the potential to contribute towards enhancing the inclusion and equity of vulnerable populations? If so, how?

3.What are the key features of a people-centric and inclusive smart city, and how to design the same?

This study focuses on smart urban governance and smart city development planning. It, therefore, aims to understand and analyse the inclusive and sustainable development approach vis-à-vis smart city planning. It mainly focuses on the inclusion of marginalised, vulnerable and disadvantaged population groups often differentiated by gender, age, race, religion, class and persons with disabilities, including migrants and refugees.

1.4 Structure of the thesis

This thesis has nine chapters. The first chapter explains the motivation for this research, followed by a brief explanation of the significance and then an introduction to the research aim, objectives, and questions. Finally, this section explains the structure of the thesis in terms of a brief introduction to all the chapters.

The second chapter is the literature review chapter which includes a literature survey of relevant academic research and relevant resources from the policy landscape on related topics of dimensions of exclusions in contemporary cities, smart urbanisation and smart cities, the essential requirements for inclusive cities and the role of citizens. The third chapter discusses the research methods, research design, and secondary and primary data collection methods, including ethics, research reliability, and validity. The subsequent three chapters are case studies from different global locations. The fourth chapter discusses the first case study of Smart London, the plan and the city government's vision with a brief introduction to the smart urbanisation policy of the UK national government. The fifth chapter covers the second case study of Bengaluru Smart City, India's most famous IT destination, among 100 smart cities identified by the Government of India's national smart urbanisation mission. The sixth chapter is the third case study from Africa, and the city is Smart Kampala from Uganda.

The seventh chapter discusses a global perspective on smart city and urban inclusions, where 26 global thematic experts from multiple organisations and geographies have shared their experiences on global smart cities, the strategies and policies of international organisations, and national and city government plans, among others. The eighth chapter discusses the analysis and comparison between the cases, including the national and city governments' similarities, differences, challenges and policy trends, and the evolution of digital solutions, including the study findings and recommendations. The ninth chapter concludes with the main conclusions, limitations, and future scope for further research.

1.5 Chapter Summary

This chapter lays out the background and relevance of the study. It highlights the importance and need for equality and inclusion to achieve urban sustainability, briefly introducing existing research gaps. The motivation for this research is dealt with, along with a brief discussion on the context and significance of the study for contemporary cities that are increasingly adopting smart urbanisation for development. The study focuses on the new and emerging urban development paradigm of the ‘smart city’, where digital technologies are widely used to solve urban challenges. The research aim and objectives are briefly discussed and followed by a section on the thesis structure, highlighting the nine chapters' summary details.

Chapter II

2 Literature review

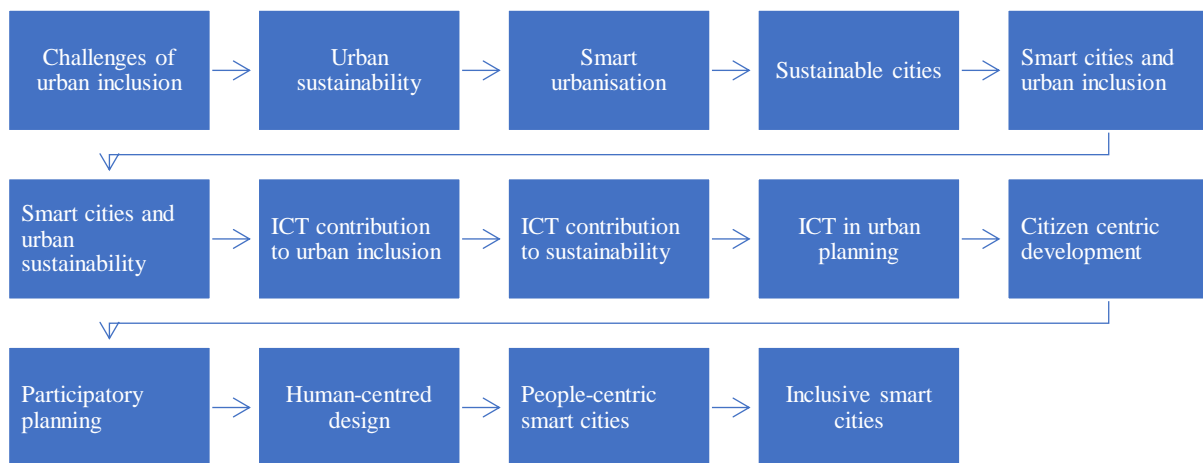
As discussed in the previous chapter, the critical question guiding this research is: Can the smart city be equitable; does it address the current challenges of urban inclusion and contribute to the well-being of all citizens, leaving no one behind? With this overarching aim, the present chapter deals with relevant literature as a background theory to understand inequality and exclusion in contemporary cities. It identifies the research gaps and open questions from other studies, particularly in the context of smart cities and their purported contribution to urban inclusion.

As the current international development agenda is increasingly focusing on sustainable development and the use of ICT as a strategic tool by public authorities, this research focus is narrowed down to exploring the impact of smart city models, which are increasingly adapted as new urban development paradigms worldwide. Further, to assess the ground reality, the current gaps and inconsistencies and the critical challenges to achieving urban inclusion are discussed, along with the scope and contribution of digital technologies and smart cities to enhance urban inclusion. The smart city versus sustainability is reviewed, and the need for inclusive smart cities and the role of citizens in designing people-centred inclusive smart cities are explored.

Starting with evidence of the problem of inequality and exclusion, this chapter analyses the significant dimensions of this critical issue in contemporary urban life. It identifies the most affected and vulnerable individuals and populations. The key challenges are highlighted, followed by the gaps essential to address and develop an inclusion strategy and related policy recommendations. The following section explores the current emerging urban development paradigm of smart urbanisation as part of the solution. The smart city, globally acknowledged as the leading smart urbanisation model, is reviewed in different action areas and best practices for inclusive development. Further, the role and contribution of digital technologies towards inclusive city development are analysed. Finally, to enhance the meaningful participation of citizens, multiple engagement strategies are explored and reviewed with relevance to the role and contribution of citizens in smart city planning and development.

To understand the complex domain of urban governance and assess the interplay between smart cities and urban inclusion, the literature review includes an analysis of academic research and relevant non-academic resources from the policy landscape. The sources of literature included multiple research databases such as leading journals, peer-reviewed articles, and conference papers available on the web; including the non-academic literature, such as government reports, documents and practice-based smart urbanisation policies and smart city plans, projects and program guidelines, committee reports, working papers, technical reports, theses, and dissertations, among others providing practical learnings from different countries and regions. To remain focused on the research area, to identify and review only relevant literature, the broad search criteria were restricted to the following topics (in the order of priority), as shown in Figure 1 below:

Figure 1 Strategy and topic selection criteria for literature review (Source: Author)



This approach aims to gather a comprehensive understanding of urban planning and development. It helps acquire knowledge from academic and non-academic resources with empirical findings contributing to the overall research process. In addition, this literature survey method is claimed to lead to convergence and corroboration of multiple data sources, further adding to data triangulation with increased evidence and credibility of the research (Bowen G.A 2009).

A theoretical framework is argued to help focus the research and situate the author within a scholarly conversation specific to the problem to be investigated (Anfara V.A. and Mertz NT 2006). In addition, it helps to generalise and limit the multiple aspects of an observed phenomenon. Further, it builds new knowledge by validating and challenging the theoretical

assumptions and facilitating the understanding of concepts and variables as per the given definitions. Therefore, placing the key research question as the central theme, the theoretical framework of the literature review is broadly structured around the following three main themes and relevant sub-themes, as shown in Table 1 below:

Table 1 Theoretical framework of literature review (Source: Author)

Themes	Sub-themes
Degree and dimensions of inequality and exclusion in contemporary cities	<ul style="list-style-type: none"> ▪ Evidence of the problem of inequality and exclusion-Nature, scope and extent ▪ The category of affected individuals and vulnerable population ▪ The challenges of the vulnerable populations living in cities ▪ Inclusion is the key element of sustainable development
Smart city versus urban inclusion	<ul style="list-style-type: none"> ▪ The vision and goal of a smart city ▪ Smart city-driven sustainability ▪ The role and contribution of technology in smart cities to enhance urban inclusion ▪ The smart city-driven inclusion: Rhetoric versus Reality
People-centric planning in smart cities	<ul style="list-style-type: none"> ▪ Current gaps and trends in people-centric planning ▪ Digital eco-system for public consultation ▪ Citizen engagement methods in smart cities

The literature review includes academic study and analysis of practice-based smart urbanisation policies and smart city plans, projects and programs. This approach aims to gather a comprehensive understanding of urban planning and development and helps acquire knowledge from academic and applied research with empirical learnings from different countries and regions. The broad findings and gaps from the literature are further narrowed down to a specific study area and finally for framing research questions.

2.1 Degree and dimensions of inequality and exclusion in contemporary cities

This section first recognises the problem of inequality and exclusion in contemporary cities. It then identifies the individuals and groups excluded and marginalised from the smart city development projects and programs and further describes the related issues and challenges in their daily lives. In this study, these excluded and marginalised individuals and groups are termed vulnerable populations.

2.1.1 Evidence of the problem of inequality and exclusion-Nature, scope and extent

Inequality and exclusion are global phenomena that manifest differently across all human societies and persist within and between countries (Oxfam International 2021; UN 2020; UN SDG 2015). At present more than 70 per cent of the global population is severely affected by

inequality and exclusion and is suffering from economic and social backwardness and well-being (UN 2020). Other than income, they are often determined by age, disability, gender, origin, ethnicity, class, religion, and sexual orientation (UN 2020). The United Nations report on the 'World Social Situation' mentions that despite global social progress and achievements, many people face social exclusion and discrimination (UN DESA 2016). Oxfam, a leading international development organisation working across multiple countries, claims the gap between rich and poor is growing continuously, damaging economies and tearing societies apart (Oxfam International 2021). It is claimed that while half of humanity is leading a life with less than £ 4.75 per day, the world's richest 1 per cent have doubled the wealth of 6.9 billion people.

Millions of people live in poverty without proper access to basic needs such as food, education, and housing, denying their fundamental human rights (UN 2017). Many lack access to clean water and sanitation, including political freedom (Akhavan 2012). Some authors claim that safety, mobility, affordability, and provision of adequate services are a few challenges of the ageing population in cities (Van Hoof and Kazak 2018). According to WHO (2020), 35 per cent of women worldwide have experienced some form of sexual violence. The financial and economic crisis affecting employment is claimed to have a gender dimension (Lombardo and Sangiuliano 2009).

According to a few social scientists, the benefits of development are not distributed equally and uniformly, thus leading to inequality and exclusion of specific individuals and groups of the population (Chand, R., Nel, E. and Pelc, S 2017). Few others argue that exclusion and inequality are interrelated where discriminated groups in unequal societies face exclusion, leading to inequality and vice versa (Khan et al., 2015). Whatever the cause the inequality and exclusion are multi-dimensional challenges encompassing social, political, economic, cultural, physical, financial and digital forms and dimensions (UN-Habitat 2020; UN 2020; Greene et al., 2016; UN SDG 2015; World Bank 2015; Nowosielski 2012). Where vertical inequalities focus on individuals, and horizontal inequalities concern groups.

Even though discussed in academic literature and policy landscape for ages, the growing inequality was prominently identified as a threat to prosperity and global development in 2005 (UN Report on the World Social Situation 2005). The report noted that the world was at a crossroads, and the vision for a shared future could be achieved only if world leaders take bold

decisions to reduce inequality. Since then, inequality has moved to the forefront of the policy debate with the global slogan 'leave no one behind', becoming the strong rallying point behind the 2030 Agenda for Sustainable Development (UN SDG 2015).

On the other front, urbanisation is the most significant driving force of recent global development (World Bank 2020). Today more than half the world's population lives in cities, and this proportion will continue to increase rapidly to 70 per cent by 2050. However, many contemporary cities suffer from the problems of widened income gaps, spatial gaps, inter-city disparities, class and race or ethnicity, among others (Nijman J. and Wei Y.D 2020). The literature search on urban exclusion indicates that it is a global phenomenon severely affecting the progress and development of human societies and constantly posing a challenge to practitioners, policymakers, and societies in general (Prodius 2019; Sudakova and Astafyeva 2019; Schailée et al., 2019). Some scholars argue that the current model of urbanisation is unsustainable (UN SDG 2015; Bansal et al., 2015). It is claimed that many national development plans aimed to achieve prosperity through economic-focused urban development achieved high economic growth but failed to reduce poverty and inequality (Munandar 2018). It is further argued that non-inclusive economic growth and development increase inequality and marginalise certain sections of society (UN 2015).

Contemporary cities face multiple challenges in terms of increasing concentration of slums, widespread poverty and unemployment, pollution, increased crime, gender inequality, and marginalisation of the vulnerable population, among many others, which is the result of exclusion and inequality (Bansal et al., 2015; UN-Habitat 2009). According to the World Bank and WHO (2015), 15 per cent of the world population lives with some form of disability or impairment, and by 2050 nearly one billion city dwellers will be persons with disabilities. According to UNHCR (2016; 2015), 65.3 million people are forcibly displaced worldwide, of which 60 per cent live in urban areas, and more than half of all refugees are school-aged children. Therefore, the problem of urban exclusion is interpreted as a severe issue affecting contemporary cities' social fabric hindering society's equal and sustainable development (World Bank 2020; Freire et al., 2016; UN SDG 2015; Nowosielski M 2012). Therefore, it is argued that urban exclusion is one of the most critical challenges of contemporary cities. It manifests itself as a complex problem with multiple dimensions of social, economic, political, cultural, financial, and digital (World Bank 2015; Nowosielski 2012).

The 2030 Agenda for Sustainable Development (UN 2015) proposed a plan of action for people, the planet and prosperity to strengthen universal peace, more considerable freedom and eradicate poverty in all its forms. The United Nations Sustainable Development Goals (UN SDGs), as agreed upon and signed by the 193 Member States of the UN, provide two fundamental operational principles- those of 'universality' and 'leaving no one behind' (UN 2015). To address this global issue, a specific UN SDG Goal 10 aims to reduce inequality within and among countries to ensure no one is left behind and achieve the Sustainable Development Goals (UN SDG 2015). Despite these global efforts, embodying these principles in practice is unclear and challenging.

The COVID-19 pandemic, also known as the *coronavirus pandemic*, has exposed the existing inequalities and exclusion in human societies and, more particularly, the cities where vulnerable people like the elderly, poor, women, children, and migrants were worst affected, further adding to their deprivation and destitution (WHO 2021). The coronavirus has exposed, fed off and increased existing inequalities of wealth, gender and race (Oxfam International 2021). The pandemic further affected and exacerbated the current societal inequalities across the populations and between different groups by age, ethnicity, gender, geography, and so on (Marmot M. and Allen J. 2020; Blundell R et al., 2020; Public Health England 2020; Zia Qureshi 2020).

The markets and societies are in chaos due to COVID-19 lockdowns affecting the livelihoods of many small-time traders and businesses (UNDP 2020). The pandemic-related lockdowns created more fissures and divided across critical domains of life such as health, education, employment, and domestic responsibilities, among many others, and the vulnerable groups were those most affected (Blundell R et al., 2020). According to United Nations Conference on Trade and Development report (UNCTAD 2022), the world has suffered severe setbacks with the pandemic. It claims that in addition to the human loss, suffering, and difficulties in maintaining decent livelihoods, some of the hard-won gains in gender inequality and access to education have been lost.

The pandemic has caused an unprecedented dent in human progress and development. The UNDP's new estimates for global human development, which combine the measure of the world's education, health and living standards, are reported to be on course to decline during 2020 for the first time since the concept was developed in 1990 (UNDP 2020). The decline is expected across most countries, including the rich and poor, across all regions. The global per

capita income is likely to fall by four per cent. The World Bank has warned that the virus could push between 40 and 60 million into extreme poverty, with sub-Saharan Africa and South Asia being the hardest hit regions (World Bank 2020). The International Labour Organization (ILO 2021) estimates that half of working people could lose their jobs, and the virus could cost the global economy several trillion dollars. According to the World Food Programme, nearly 265 million people will face crisis hunger levels unless direct action is taken.

It is argued that the pandemic has led to an even more sharply unequal world as the development gains for millions in poor countries are reversed (Sachs, J et al., 2021). The UN SDG Knowledge Platform (2020), measuring the global progress and achievements on sustainable development goals, acknowledges that the achievement made so far have been slowed or even reversed due to the impact of the COVID-19 epidemic. It is argued that COVID-19 will widen the existing inequalities in income, education, health, and every other metric of well-being and will severely affect global sustainable development for years ahead (Ian Goldin and Robert Muggah 2020). In such circumstances, it is claimed that only immediate action can prevent a lost decade of development for many countries (Sachs, J et al., 2021). This situation, therefore, warrants us to consider and revisit the fundamental question relevant to this study—whether development is for everyone or only for the elite and select few populations, leaving a big chunk of the people behind. How to address inequality and exclusion, particularly aftermath of the pandemic and its ill effects on vulnerable populations?

2.2 The category of affected individuals and vulnerable population

The multiple dimensions of urban exclusion include social, economic, political, spatial, and cultural exclusion (World Bank 2016). Social exclusion is discrimination based on religion, caste, ethnicity, gender, race, descent, age, sexual orientation, disability, migrant, HIV status, or living place (Khan et al., 2015). Financial exclusion denies full and equal participation in economic life (Greene et al., 2016). It includes economic vulnerability, labour market exclusion, lack of minimum wages, poor-quality jobs and isolation from opportunity. Political exclusion leads to the denial of democratic rights, civil rights, freedom of expression, and dignity, including a lack of political liberty affecting daily life and survival (Tilly 2007; Sen 2000). Spatial or physical exclusion refers to physical access to public spaces and infrastructure (Alimohammadi et al., 2016). Cultural exclusion relates to mutual respect and harmony for diverse values, norms, and ways of living among different cultural groups (Mosse 2007). Many

authors often describe social exclusion as the overarching challenge affecting the full participation of individuals in economic, social, political, and cultural life.

The other two forms of exclusion resulting from contemporary development practices in modern cities include financial and digital exclusion. Financial exclusion is the inability of individuals to access finance from banks and financial institutions (Mosley and Lenton 2012). It is estimated that globally there are 2.5 billion adults who do not have formal bank accounts and experience financial exclusion (Demirguc-Kunt and Klapper 2012). Regarding digital exclusion, the recent estimates of UN-Habitat (2020) show that while more than 50 per cent of the world's population is online, nearly 3.6 billion people do not have Internet access. The global digital divide across countries and within countries and regions is claimed to enhance existing socioeconomic disparities and further increase inequality by reducing access to goods and services available through technology (International Monetary Fund 2020). Whatever the dimensions and factors of exclusion, it remains a fact that a considerable population face inequality and discrimination in city life. In most cities, the most vulnerable and marginalised people identified by research scholars and from various studies of international development organisations are shown in Figure 2 below:

Figure 2 Vulnerable and marginalised population identified in contemporary city life (Source: Author)

Vulnerable and marginalised populations in city life		
<p style="text-align: center;">Senior citizens and elderly people</p> <p style="text-align: center;"><i>(Kurian et al., 2019; Van Hoof and Kazak 2018; OECD 2018; Dugarova, E 2017; UN DESA 2015a; Nicholson 2012)</i></p>	<p style="text-align: center;">Persons with disabilities</p> <p style="text-align: center;"><i>(Pineda et al., 2017; Neto and Kofugi 2016; Quinn et al., 2016; UN 2014; Inclusion International 2012)</i></p>	<p style="text-align: center;">Women</p> <p style="text-align: center;"><i>(Mikkelsen et al. 2019; Abitbol et al., 2017; WHO 2017; IDRC 2017; Brown and McGranahan 2016; UN Women and UN-Habitat 2011; UN-Habitat 2010)</i></p>
<p style="text-align: center;">Children</p> <p style="text-align: center;"><i>(UN SDG 2015; UNICEF 2012; UN-Habitat 2011)</i></p>	<p style="text-align: center;">Youth</p> <p style="text-align: center;"><i>(Dhakal et al., 2018; ILO 2016; UN-Habitat 2009)</i></p>	<p style="text-align: center;">Migrants and refugees</p> <p style="text-align: center;"><i>(Bilecen 2020; Bauder 2020; Sudakova and Astafyeva 2019; Costa and Ewert 2014; Papillon, M 2002)</i></p>
<p style="text-align: center;">Poor</p> <p style="text-align: center;"><i>(Satterthwaite et al., 2018/2007; Nayak and Gupta 2018; Sattelberger 2017; World Bank 2016/2013; Almanac, 2016/ 2015; UN SDG 2015; Shah 2013; Demirguc-Kunt and Klapper 2012; UN-Habitat 2009)</i></p>	<p style="text-align: center;">Ethnic or religious minorities and indigenous population</p> <p style="text-align: center;"><i>(Basu 2011; Hunter 2005/2000)</i></p>	<p style="text-align: center;">LGBTI -Lesbian, Gay, Bisexual, Transgender or Intersex individuals</p> <p style="text-align: center;"><i>(Poku et al. 2017; UN SDG 2015)</i></p>

The specific challenges of ageing populations living in cities include poverty, poor health, malnutrition, lack of access to clean water and sanitation, housing, prejudice, discrimination, right to autonomy and participation, physical, emotional and financial abuse and violence (Dugarova 2017). In addition, the elderly also face challenges such as lack of safety, mobility, affordability, financial resources, isolation, community participation, social relations, and civic participation, including lack of access to adequate services (Kurian et al., 2019; Van Hoof et al., 2018). Similarly, cities continue to be the most significant obstacles for people with disabilities who experience multiple barriers regarding access to public buildings, public spaces, and digital access, including capability challenges (Pineda et al., 2017; Neto and Kofugi 2016).

Women face many disadvantages in city life: restricted mobility, exposure to crime and violence, discrimination, restricted access to capital and skills, and limited access to essential services (Brown and McGranahan 2016). Disabled women face a double burden of deprivation of opportunity for community participation, marriage, childbearing and limited access to education and formal employment (Quinn et al., 2016). According to UNICEF (2012), nearly 25 per cent of the world's children live in poor urban settlements, where they are subject to social exclusion and lack access to basic amenities and opportunities for a better future. By 2030, nearly 60 per cent of urban residents will likely be under 18 (UN-Habitat 2015). The growing youth population has profound implications for any country's economy and growth (ILO 2016). How and where to utilise this population? What is their competency, and where are the jobs?

The other category of the vulnerable population living in urban areas is migrants and refugees, who often flee their home countries to escape poverty, civil war, and other domestic problems (Bilecen 2020). The settlement of immigrants in a city has always been an enormous challenge that requires social, economic, political, and cultural inclusion-related interventions (Papillon, 2002). It is claimed that nearly one billion people live in slums, which is almost one-third of the world's urban population (UN-Habitat 2015). The challenges of these populations include low income, inadequate social security, poor social infrastructure, financial exclusion, lack of land ownership, poor living conditions, high living cost, lack of security and increased crime rates, nil or minimal participation in decision-making, and often lacking the fundamental voting rights, lack of clean water and sanitation with barriers to access essential urban services

including discrimination and a low level of participation in the community (Sattelberger 2017; Shah 2013).

The religious and cultural differences, neglect of indigenous populations, growing intolerance and ignorance, added to racism and xenophobia, are creating a tense situation in many cities across different countries, causing more exclusion and inequality (Basu 2011). Similarly, the LGBTI (Lesbian, gay, bisexual, transgender, or intersex individuals) are among the socially excluded population in many cities where they face challenges of identity, housing, employment, human rights violations, denial of participation in family and community, exclusion from markets and so on (Poku et al., 2017).

2.2.1 The challenges of the vulnerable populations living in cities

The excluded populations who are vulnerable face several challenges in cities. Are these vulnerable populations capable of accessing essential goods and services? One of the critical challenges these vulnerable populations face in urban life includes challenges of accessibility (UN-Habitat 2020; Chaskin et al., 2012). It is stated to have challenges of physical access, financial access, socio-demographic access, cognitive access, design access, digital access, institutional access, political access, and cultural access, among many others. Affordability is another challenge these vulnerable populations experience in city life in terms of being costly and expensive. It refers to the availability of basic human needs and wants like food, livelihoods, and shelter at a reasonable and affordable cost (UN-SDG 2015). Lack of opportunity is another challenge the vulnerable populations face in urban areas and refers to the lack of better living conditions for all with equality of opportunity (World Bank 2020; OECD 2018; Tilly 2007).

Being vulnerable, these populations are marginalised and often constitute a voiceless group. They face the challenge of active participation and experience denial of democratic rights, freedom of expression and civil rights, including political freedom, personal security, and the rule of law (Tilly 2007; Sen 2000). It is argued that participation is a multi-dimensional phenomenon and ensures meaningful engagement of citizens in the development process (World Bank 2020). If neglected, it is stated to affect the survival, daily life, and dignity of human life (UN SDG 2015). The other most critical challenge faced by the vulnerable populations living in cities is the challenge of liveability. In abstract terms, liveability encompasses all the above challenges and aims to provide a sustainable and resilient urban

environment for all members of society (Council of Europe Development Bank 2018; UN SDG 2015). To sum up, Figure 3 below lists the challenges of vulnerable and marginalised populations living in contemporary cities across five main themes of accessibility, affordability, opportunity, participation, and liveability:

Figure 3 Challenges faced by vulnerable and marginalised populations living in cities (Source: Author)

Challenges faced by Vulnerable Population				
Accessibility	Affordability	Opportunity	Participation	Liveability
Includes physical access, financial access, socio-demographic access, cognitive access, design access, digital access, institutional access, political access and cultural access	Refers to accessing the basic human needs and wants like food, livelihoods and shelter	It aims to provide better living conditions for all with equality of opportunity.	It aims at political freedom, personal security, democratic rights, the rule of law, freedom of expression and civil rights affecting the survival, daily life and dignity of a human being.	A sustainable urban environment for all members of society includes multiple dimensions like- mobility, access to and quality of essential services, public spaces and amenities, preservation of cultural heritage, affordable access to housing, resilience to natural disasters (such as flood risk) and climate change.
(UN-Habitat, 2020; Chaskin et al., 2012)	(UN-SDG, 2015)	(World Bank, 2020; OECD, 2018; Tilly, 2007)	(Tilly 2007; Sen 2000)	(Council of Europe Development Bank (CEB), 2018)

Based on the literature survey, the five key challenges are further elaborated by identifying the required action areas to tackle the inclusion challenges, as shown in Table 2 below: (See

Figure 2 and Figure 3 for more information)

Table 2 Action areas to tackle the inclusion challenges in contemporary cities (Source: Author)

Key challenge	Action areas	Literature evidence
I. Accessibility	1. Access to land, housing, built environment and infrastructure	World Bank (2020); OECD (2018); Dugarova (2017); Sattelberger (2017); Neto and Kofugi (2016); UN-SDG (2015); UN-Habitat (2010); European Commission (2010)
	2. Access to public places and social infrastructure	Alderton et al., (2019); Van Hoof and Kazak (2018); Dugarova, E. (2017); Quinn et al., (2016); UN-SDG (2015); UNICEF (2012); Nicholson (2012); UN-Habitat (2010); European Commission (2010)
	3. Access to transport and mobility	Van Hoof and Kazak (2018); UN-SDG (2015); European Commission (2010)
	4. Access to water, sanitation, hygiene and energy	UN-SDG (2015); UN-Habitat (2010)
	5. Access to the Internet and digital infrastructure	Neto and Kofugi (2016); European Commission (2010)
	6. Access to information (language barriers)	UN SDG (2015); European Commission (2010)
	7. Access to services (including emergency services)	Inclusion International (2012); European Commission (2010)
	8. Access to credit and finance	World Bank (2020); Kurian et al., (2019); Brown and McGranahan (2016)
	1. Adequate food and nutrition	Dugarova, E. (2017)

II. Affordability	2. Affordable necessities such as housing, water, energy and sanitation, including land and other essential assets	World Bank (2020); Sattelberger (2017); UN-SDG (2015); UN (2011)
	3. Affordable education and healthcare	Dugarova, E. (2017); Quinn et al., (2016); UN SDG (2015); Nicholson (2012)
	4. Affordable data	Neto and Kofugi (2016)
	5. Affordable mobility	Van Hoof et al., (2018)
	6. Affordable services and public facilities	Van Hoof et al., (2018)
III. Opportunity	1. Fair and equitable opportunity	Mikkelsen et al., (2019); Pineda et al., (2017)
	2. Jobs and employment	Dhakai et al., (2018); ILO (2016); Quinn et al., (2016)
	3. Essential skills and knowledge development	Dhakai et al., (2018)
	4. Business support and market reach	Brown and McGranahan (2016)
IV. Participation	1. Right to autonomy	Kurian et al., (2019)
	2. Representation and participation in community, governance and public offices	Kurian et al., (2019); UN SDG (2015); UN (2011)
	3. Labour rights	Pineda et al., (2017); ILO (2016)
	4. Equality and Non-discrimination	Mikkelsen et al., (2019); Pineda et al., (2017); Brown and McGranahan (2016); UN SDG (2015)
	5. Gender equality	Mikkelsen et al., (2019); WHO (2007); Brown and McGranahan (2016); Quinn et al. (2016); UN Women (2011);
	6. Human rights	Pineda et al., (2017); UN SDG (2015)
	7. Capability and know-how	World Bank (2020)
V. Liveability	A. Physical liveability	
	1. Safety and security (crime and violence prevention)	Van Hoof and Kazak (2018); UN SDG (2015); WHO (2017); UN Women (2011); UN-Habitat (2011)
	2. Resilience from climate and environmental risks and other stressors	Alderton et al., (2019); UN SDG (2015); UN-Habitat (2009)
	3. Job security and minimum wages and social protection	Dugarova (2017); UN (2014); Nicholson (2012)
	4. Local or neighbourhood amenities	Alderton et al., (2019)
	5. Good governance and anti-corruption	Alderton et al., (2019)
	B. Mental liveability	
	6. Work-life balance	Alderton et al., (2019)
	7. Health and wellbeing	Alderton et al., (2019)
	8. Community living & Social connectedness	Alderton et al., (2019)

2.2.2 Inclusion is the key element of sustainable development

A society of equals means a community where no person is valued more than others, and everyone is celebrated for individual differences (Schostak 2019). Inclusion assimilates individuals and groups into mainstream culture and society (Cornell and Jorgensen 2019). It mutually benefits the individual and community and includes societal and communal forms of inclusion (Felder 2018; UN DESA 2009). Inclusive principles have a universal application (UN 2015). The UN Preamble declares the determination of faith in fundamental human rights and equality of men and women and large and small nations as the foundation for an equal world. These principles are enshrined as universal values of UN working, where principle one includes- a ‘human rights-based approach’; principle two is to ‘leave no one behind’; and principle three is ‘gender equality & women’s empowerment.

According to United Nations Development Programme (UNDP)- Human Development Index (HDI) in 2010, inclusivity is derived from three factors: economic status, access to and status of education, and access to and status of health with life expectancy as a metric. Ram Bahadur (2017) argued that people participate in society through services like education, health, labour markets, credit and physical and political spaces. According to Chaskin et al. (2012), the two aspects of inclusion are –(i) access to institutions, resources, social arrangements, spaces and opportunities; (ii) participation in the decision-making process, including policy-making and implementation. Papillon (2002) argues that inclusion is a process, not a fixed state; it is not uniform and often changes with context, situation, and location (Walter 2016; Popay, J., 2010); it is the process of participation of individuals and groups in society (World Bank 2013).

A society with the principle of participation by all considers inclusion as the fundamental foundation (Memoli and Sannella 2017). It is suggested that an inclusive society should support marginalised groups like religious minorities, ethnic minorities, and indigenous groups (World Bank 2013). According to the UN, the elements necessary for creating an inclusive and equal society are -respect for all human rights, freedom and the rule of law, participation in civic, social, economic and political activities, existence of a healthy civil society, universal access to public infrastructure and facilities, equal access to general information, equality in the distribution of wealth and resources, cultural diversity, education, effective leadership and positive narratives of the inclusive society of the future (UN DESA 2009).

The global development agenda 2030, driven by UN SDGs, recognises inclusion as a critical aspect of sustainable development; hence, SDGs 8, 10, 11, and 16 focus on inclusion. Goal 8 aims to promote sustained, inclusive, and sustainable growth with employment creation; Goal 10 aims to promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or another status; Goal 11 is to make cities and human settlements inclusive, safe, resilient and sustainable; and Goal 16 aims to promote peaceful and inclusive societies as well as inclusive institutions.

According to the report of the Development Bank of Latin America (2016), the success or failure of SDGs will be decided in urban areas; therefore, national sustainable development strategies should be aligned with the urban development agenda and guarantee that all citizens, especially the vulnerable, to have equal access to quality basic services and means of production. It is claimed that inclusive societies are characterised by greater social justice,

equality, and collective response (Allman, D., 2013). The cities to be the key agents of social integration and sustainability need a balanced development across social, economic and environmental fronts (World Economic Forum 2016). The standalone urban development SDG 11 aims to make cities more inclusive, safe, resilient and sustainable. The UN-led New Urban Agenda (2017) aims to build future cities and urban infrastructures and services to be more environmentally friendly, accessible, user-friendly and inclusive of all people’s needs. The summary of key elements of inclusion identified through the literature survey is shown in Figure 4 below:

Figure 4 Summary of key elements of inclusion in cities (Source: Author)

human rights-based approach
leave no one behind
gender equality
women’s empowerment
economic status
access to education
access to health (with life expectancy as a metric)
participation of individuals and groups in society
market access (labour, credit)
access to spaces (physical, political)
access to institutions
access to resources, social arrangements, and opportunities
participation in decision-making process including policy making and implementation
freedom and the rule of law
participation in civic, social, economic and political activities
existence of a healthy civil society
universal access to public infrastructure and facilities
equal access to public information
equality in the distribution of wealth and resources
cultural diversity
effective leadership and positive narratives of the inclusive society of the future

All the key elements of inclusion identified above, when mapped to the action areas/gaps to mitigate challenges of inclusion in Table 2, are similar and covered. However, it is argued that social inclusion is a multi-level challenge which manifests differently at different levels. At the global level, it is identified in terms of least developed and developing countries and post-conflict societies; at the national level, it considers the marginalised sectors, neglected places, and communities; and at the local level (or a city level), it would imply accounting for specific individuals and groups (Gupta J. and Vegelin C 2016). This research discusses the local context of cities, the urban sustainability, and the associated challenges of inclusion of specific individuals and groups of the population living in cities.

2.3 Smart city versus urban inclusion

As discussed in previous sections, rapid urbanisation is shifting the focus of sustainable development to cities. Urban governance and sustainability are becoming critical city management issues worldwide (UN 2015; UN Habitat 2010). The complex urban problems and cross-cutting functions require strategic decisions, new tools, and enhanced accountability for the better functioning of cities (UN-Habitat 2010). The current age of the Internet and the digitally interconnected world, which redefines human lives and community living, is considered a critical driving force for achieving a better quality of life for everyone (UN SDG 2015).

There is broad consensus and strong advocacy for the use of ICT as a smart governance tool and to achieve the goal of urban sustainability (Yigitcanlar et al., 2019; Meijer and Rodriguez Bolivar 2015; UN SDG 2015; Karadag 2013; Demirkan et al., 2011; Ali Mostashari et al., 2011; UN Habitat 2010). Therefore, ICT is being tested and used in every aspect of the urban ecosystem to achieve sustainability goals for efficient delivery of services and improved quality of life (Bifulco et al., 2016; Anthopoulos and Tougountzoglou 2012). However, it is stated that the current discussions of urban inclusion within the extant smart city literature are abstract, still at a preliminary stage, and limited in their scope and consideration (Meijer 2013; Alberti et al., 2019). Few authors argue that smart cities' social and political potential remains to be fully tested and realised (Ghasemi 2015). According to some scholars, it is hypothesised that people-centric design and participatory planning are the essential elements for successful outcomes of any smart city project (Motasim et al., 2010; Yigitcanlar and Kamruzzaman 2015). The question is whether investing in smart technologies and digital innovations improves citizens' well-being (OECD, 2019). Do these state-of-the-art technology solutions transform cities into smart and sustainable places (Yigitcanlara et al., 2019; Ghasemi 2015)?

This section deals with relevant literature on smart cities and their contribution (if any) towards urban inclusion and, more particularly, how they address the challenges and provides ways and means to enhance the inclusion of vulnerable and marginalised populations who are the focus group of this study.

2.3.1 The vision and goal of a smart city

The thematic orientation of these smart city projects broadly includes Government, environment, people, energy, mobility, planning, and living, with an integrated approach and

application of ICT to urban planning (Caragliu and Del Bo 2019; LazaroIU and Roscia 2012). According to Boyd Cohen's smart city wheel (2012), the smart city performs well across the six characteristics of smart people, smart economy, smart governance, smart environment, smart living, and smart mobility (Giffinger et al., 2007). According to Joshi et al. (2016), the six pillars of smart cities are social, economic, management, legal, sustainability and technology. Shen et al. (2018) claim that the five dimensions of the smart city include people, governance, economy, environment, and smart infrastructure. At the same time, Silva et al. (2018) argue that the four themes of a smart city include the social infrastructure, physical infrastructure, institutional infrastructure, and economic infrastructure combined with generic characteristics such as sustainability, smartness, quality of life and urbanisation.

In this study, to understand a complex and comprehensive urban development model of smart cities, the data triangulation method of multiple data sources (Patton M.Q. 1999) is used by combining the findings from academic journal publications and 60 smart city visions and definitions from global organisations. The strategic vision indicates a coherent and powerful statement of what it should aim to become (Wilson 1992). Furthermore, the strategic vision often refers to the long-term intentions the organisation wishes to pursue to achieve the desired outcome (Ilesanmi O.A. 2011). Therefore, to further understand the concept of a smart city and its focus areas from a strategic vision perspective, nearly 60 definitions and vision statements from different sources such as government, and international organisations, including the development sector, private sector, academic, civil society, and think tank and research sectors are reviewed (as shown in Appendix 4: Definitions of smart city). The diverse set of smart city definitions worldwide gives a sense of comprehensiveness and completeness. The different concepts from across the globe highlight the broad vision and goals achieved through the smart city approach. The definitions are contextual and depend on respective priorities and focus areas; however, they provide an insight into why and what action areas and themes are necessary in their smart city plans.

According to the Merriam-Webster dictionary, 'keyword' is a powerful word from a title or document used primarily to index content. The keywords are ideas and topics that define what the content is about. The keywords in the definitions help to understand the action areas of a smart city, and the logical grouping of these keywords further identifies the broader themes of interest in smart city planning. It may be noted that 'technology' and its other forms, such as ICT, digitalisation, IoT, cloud computing and so on, is the core attribute in all the definitions,

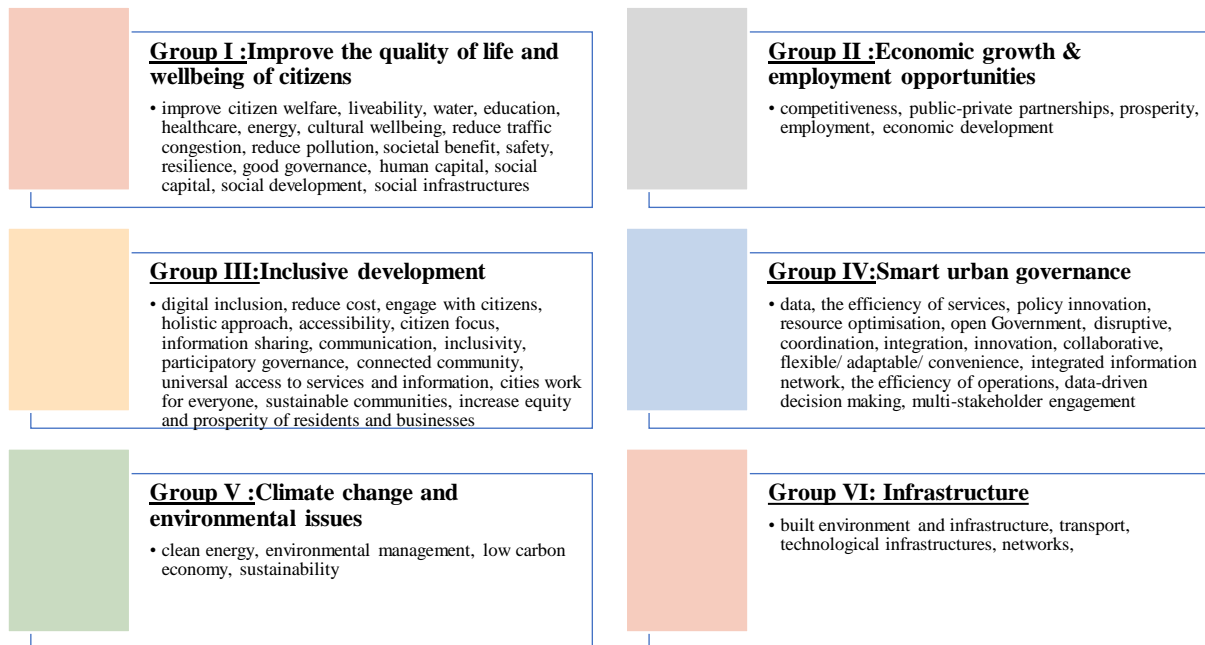
which again indicates and reiterate the fact that technology is the core and fundamental aspect driving the concept of the smart city. Other keywords like smart, urban, city, and development are implicit and mentioned in most definitions; hence, these words have not been captured explicitly as separate keywords. The list of relevant keywords used in the definitions which indicate the key action areas of a smart city are shown in Table 3 below: (*See Appendix 4: Definitions of smart city for more information*)

Table 3 Keywords identified from the vision & definitions of smart city (Source: Author)

<ul style="list-style-type: none"> ▪ data ▪ safety ▪ resilience ▪ inclusivity ▪ prosperity ▪ human capital ▪ social capital ▪ infrastructure ▪ economic development ▪ quality of life ▪ resource optimisation ▪ open Government ▪ wellbeing ▪ collaborative ▪ multi-stakeholder engagement ▪ strategic approach ▪ sustainability ▪ efficiency of operations ▪ increase equity and prosperity of residents and businesses ▪ data-driven decision making ▪ healthcare 	<ul style="list-style-type: none"> ▪ efficiency of services ▪ competitiveness, ▪ social development ▪ environmental management ▪ networks ▪ Flexible/adaptable/convenience ▪ clean energy ▪ transport ▪ citizen focus ▪ information sharing/integrated information network ▪ disruptive ▪ participatory governance ▪ coordination ▪ integration ▪ policy innovation ▪ improve citizen welfare ▪ liveability ▪ low carbon economy ▪ societal benefit ▪ employment ▪ energy 	<ul style="list-style-type: none"> ▪ education ▪ digital inclusion ▪ communication ▪ water ▪ built environment ▪ good governance ▪ cultural well being ▪ sustainable communities ▪ reduce cost ▪ engage with citizens ▪ holistic approach ▪ accessibility ▪ urban planning ▪ public-private partnerships ▪ social and technological infrastructures ▪ connected community ▪ universal access to services ▪ cities work for everyone ▪ social inequality ▪ reduce traffic congestion ▪ reduce pollution
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The keywords from Table 3 above are grouped based on common themes to form six groups, as shown in Figure 5 below:

Figure 5 Grouping of keywords from smart cities definition and vision (Source: Author)



As inferred, the smart city vision broadly can be divided into six themes across six groups where Group I relates to the liveability and welfare of citizens, Group II relates to economic growth and development, Group III relates to inclusive planning and development, Group IV relates to city governance, Group V relates to the environment and Group VI relates to infrastructure. The six themes /groups are not siloed nor water-tight compartments as the sub-themes are cross-cutting and may fall into multiple themes.

The six common themes mentioned above indicate the broad action areas driving the vision and goals of current smart city projects worldwide, where inclusive development is one among them. However, inclusion, which is the key focus of this study, is much broader than the inclusive development approach. Therefore, based on the identified challenges in *Table 2*, the following cross-cutting sub-themes are relevant to enhance inclusion and equality in smart cities:

- improve citizen welfare, liveability, water, education, healthcare, energy, cultural wellbeing, reduce traffic congestion, reduce pollution, societal benefit, safety, resilience, good governance, human capital, social capital, social development, social infrastructures
- prosperity, employment, economic development

- digital inclusion, reduce cost, engage with citizens, holistic approach, accessibility, citizen focus, information sharing, communication, inclusivity, participatory governance, connected community, universal access to services and information, cities work for everyone, sustainable communities, increase equity and prosperity of residents and businesses
- open Government, integration, innovation, collaborative, flexible/ adaptable/ convenience, integrated information network, data-driven decision making, multi-stakeholder engagement
- built environment and infrastructure, transport, technological infrastructures, networks,

Alongside this argument, it is claimed that the digital technologies and smart cities' contribution to enhancing urban inclusion include projects and programmes related to digital inclusion, participatory planning, universal access to services and information, computer access and training for the community, open communication, citizen engagement platform and co-creation.

2.3.2 Smart city-driven sustainability

Renewed urban planning and ICT or digital technologies are considered essential management tools to address the challenges of 21st-century cities (Yigitcanlar and Teriman 2015; Khansari et al., 2013; Demirkan et al., 2011; UN-Habitat 2009; Berry 2008). Where the digital technologies, on the one hand, are expected to provide solutions for efficient decision-making and resource optimisation and delivery of urban services (Tunc Karadag 2013; Ali Mostashari et al., 2011); and are also considered a good platform for citizen engagement in urban planning (Alberti et al., 2019; Karvonen et al., 2018; Smørðal, O et al., 2016; UN-Habitat 2010).

The use of digital technologies is considered to increase transparency and accountability in governance, digital literacy, increased access and coordination, and use of data and collaborative platforms in designing better infrastructure and social inclusion in informal settlements (UN-Habitat 2010); transport and mobility (Alberti et al., 2019). It is also used for resource efficiency, security and surveillance, behavioural change, evidence-based policymaking, and social cohesion (Karvonen et al., 2018).

Due to several expectations and possibilities, digital technologies are increasingly used for the management of resources, improvement in quality of life, allowing participation of all stakeholders, and achieving sustainable development (Anthopoulos and Tougountzoglou

2012). The all-pervasive nature of technology has led to its increased use as a tool for urban planning and smart governance, including achieving the goal of sustainability (Meijer and Rodriguez Bolivar 2015). Therefore, digital technologies are recognised as an integral part of the sustainable development goals (SDGs) process and accepted as a way of enabling and measuring SDGs (UN SDG 2015). The UN SDG 11 focuses on urban development, highlighting the use of ICT for smart urban governance and potentially transforming and contributing to participatory planning and increased collaboration with better responses to social issues and urban development (UN SDG 2015).

It is claimed that the smart urban governance strategy is creating immense potential, such as increased citizen participation and co-creation of new services for improvement in the quality of life (Kolsaker and Lee Kelley 2008); increased data exchange, service integration and collaboration among multiple stakeholders (Maltby 2013); increased efficiency and effectiveness, innovation in decision making, smart administration and cooperation, interconnectedness, openness and participatory governance (Albert Meijer 2013); thus transforming the whole ecosystem of urban development by way of smart urban planning, smart policies, smart transportation, smart grid, use of renewable energy, urban integration, eco-cities, inclusive and liveable cities (Neha Bansal et al., 2015).

It is therefore argued that ICT-based urban planning led many global cities to adopt the smart city model to become competitive and attain a sustainable future (Angelidou 2014; Hoon Lee et al., 2013; Schuurman et al., 2012; Walravens 2012; Schaffers et al., 2011; Hollands 2008; Aurigi 2005). Many governments, irrespective of diverse characteristics and different focus areas, consider the smart city as a technology-driven solution to address all urban problems further to drive local and regional economies and foster civic initiatives (Kitchin, R., Coletta, C., Evans, L. and Heaphy, L. 2018; Lee et al., 2014; Hollands 2008; Eger 2003; Coe et al., 2001;). Global cities view smart urban technologies as potential vehicles to tackle societal, economic and environmental challenges of the present and future (Yigitcanlar and Kamruzzaman 2018). It is claimed to be a panacea for urban diseases like traffic congestion, energy shortage, social inequality, pollution, and shortage of public service, among many others (Shen et al., 2018).

On the other front, some authors argue that a smart city is a fuzzy concept with varying applications based on context or conditions (Tranos and Gertner 2012), and therefore it does not have one single uniform model and should be defined from different perspectives (Giffinger

and Gudrun 2010; Caragiliu et al., 2009). The smart city has different definitions and multiple models across geographies (Nam and Pardo 2011). The majority cites the expectation that a smart city seems more uniform, focusing on developing technology-based solutions for societal, economic, management, and ecological challenges (Yigitcanlar 2016). For example, smart cities in the case of Southeast Asia are used as a vehicle to create national and international identity, grow the local economy through technological innovations and test new solutions on large urban projects; on the contrary, the smart city projects in North America, Oceania and Europe are usually on a small scale with a focus on the quality of life and sustainability. Generally, in most emerging economies smart city is viewed as a new urban development model with the possibility of solutions to all urban issues (Yigitcanlara et al., 2019).

Therefore, as inferred, eventhough the smart city models are different across cities and regions, the majority of authors consider the adoption of the smart city model to improve urban sustainability and quality of life (Simonofski et al., 2019; Silva et al., 2018; Yigitcanlar 2016; Dhingra and Chattopadhyay 2016; Bifulco et al., 2016; Ghasemi 2015; Caroline Colldahl et al., 2013; Alawadhi et al., 2012; Schuurman et al., 2012). It is also considered a city transformation model that is efficient, green, and technologically advanced, influencing all aspects like health, housing, culture, tourism, and high levels of social cohesion, leading to a socially inclusive city (Bifulco et al., 2016; Vanolo 2014). It is claimed that the term smarter in the smart city generally refers to a more efficient, liveable, and sustainable city (Alawadhi et al., 2012) with the increased expectation from the city managers to leverage the benefits of ICT and use the same for efficient delivery of services, for a better quality of life thus achieving UN sustainability goals (Bifulco et al., 2016).

2.3.3 The role and contribution of technology in smart cities to enhance urban inclusion

The survey of diverse use cases suggests that the smart city concept is a modern urban management method using digital tools and state-of-the-art technologies to meet expected results (Winkowska, J., Szpilko, D. and Pejić, S. 2019). Accordingly, the multiple applications of smart city technologies include a solution for the development of new industrial activities (Bronstein, 2009); for efficient public services and liveability (Alawadhi et al., 2012); for collaborations (Albert Meijer 2013); for better management of resources, to develop new business models, to monitor developments, and help citizens to make informed decisions about the use of resources (Hoorweg and Freire 2013); to balance social development and economic

growth and to improve healthcare, education, transportation, energy use, and services into a well-articulated system vision (Letaifa 2015); for mobility, resource efficiency, climate mitigation (Ghasemi 2015); for quality of life, urban aspects and intelligence(Dhingra and Chattopadhyay 2016); to foster urban innovation (Caragliu and Del Bo 2019).

Beginning from the initial years, the critical domains of application of technology across global smart city models, as identified by a few authors, can be summarised in Table 4 below:

Table 4 Key domain (threads) of application of technology in smart cities (Source: Author)

Main threads/Domains and Sub-domains of application of technology	Literature evidence
Economic development	Chamoso et al., 2018; Yigitcanlar and Kamruzzaman 2018; Letaifa 2015; Angelidou 2014; Hoon Lee et al.,2013; Schuurman et al., 2012; Walravens, 2012; Barrionuevo et al., 2012; Chourabi et al.,2012; Kourtit and Nijkamp 2012; Schaffers et al., 2011; Thuar 2011; Nam and Pardo 2011; Bronstein 2009; Eger 2009; Hollands 2008; Aurigi, A 2005; Giffinger et al., 2007; Mahizhnan 1999
Competitiveness, Business, Jobs, Electronic payments, New industries, Innovation, Entrepreneurship	
Infrastructure	Mahizhnan 1999; Eger 2009; Kourtit and Nijkamp, 2012; Chourabi et al., 2012; Lee et al., 2014
Internet, Tourism, CCTV, Smart Street lights	
Quality of life	Huang, C.Y., Wu, C.K. and Liu, P.Y 2022; Temeljotov-Salaj, A. and Bogataj, D 2021; Sobnath, D., Rehman, I.U. and Nasralla, M.M 2020; Simonofski et al., 2019; Chamoso et al., 2018; Silva et al., 2018; Ramirez, A.R.G. and Ferreira, M.G.G. eds., 2018;Yaqoob et al., 2017, Dhingra and Chattopadhyay 2016; Neha Bansal et al., 2015; Skouby, K.E.,et al., 2014;Anthopoulos and Tougountzoglou 2012; Alawadhi et al., 2012; Mahizhnan 1999; Thuar 2011
Smart homes, Assistive Technologies	
Governance	Yigitcanlar et al., 2019; Karvonen et al., 2018 ; Dhingra and Chattopadhyay 2016; Meijer and Rodriguez Bolivar 2015; UN SDG 2015; Yigitcanlar and Teriman, 2015; Neha Bansal et al., 2015; Ghasemi 2015; Lee et al., 2014; Tunc Karadag, 2013; Khansari et al., 2013; Albert Meijer 2013; Maltby 2013; Chourabi et al., 2012; Barrionuevo et al., 2012; Demirkan et al., 2011; Demirkan et al., 2011; Ali Mostashari et al., 2011; Nam and Pardo 2011; UN-Habitat 2010; UN-Habitat 2009; Berry 2008 ; Giffinger et al., 2007
Decision making, Management, Accountability, Urban planning, Resource optimisation, Transparency, Coordination, Security and Surveillance, Intelligence, Political development, Institutional capacity, Interconnections and collaboration, Partnerships	
Environment	Shen et al., 2018; Yigitcanlar and Kamruzzaman 2018; Chamoso et al., 2018; Yaqoob et al., 2017; Ghasemi 2015; Barrionuevo et al., 2012; Chourabi et al., 2012; Thuar 2011; Nam and Pardo 2011; Giffinger et al., 2007
Climate mitigation, Management of natural resources, Waste management, Pollution	
Mobility and transport	Alberti et al., 2019; Shen et al., 2018; Chamoso et al., 2018; Neha Hashem et al., 2016; Bansal et al., 2015; Letaifa 2015; Ghasemi 2015; Giffinger et al., 2007
Mobility, Traffic management	
Social development	Shen et al., 2018; Yigitcanlar and Kamruzzaman 2018; Karvonen et al., 2018; Yaqoob et al., 2017; Hashem et al., 2016; UN SDG 2015; Letaifa 2015; Thuar 2011; Barrionuevo et al., 2012; Kourtit and Nijkamp 2012; Mahizhnan 1999;
Social inclusion, Education, Health, Community living	
Innovation	Caragliu and Del Bo 2019; UN SDG 2015; Lee et al., 2014; Albert Meijer 2013; Thuar 2011; Nam and Pardo 2011
Participatory Planning, Open data, Urban openness	
Human development	Karvonen et al., 2018; Giffinger et al., 2007; Barrionuevo et al., 2012; Kourtit and Nijkamp, 2012; Chourabi et al.,2012
Computer access and training for the community, Behavioural change	
Policy context	Neha Bansal et al., 2015; Maltby 2013; Hoornweg and Freire 2013; Chourabi et al., 2012
Smart policies, Data, Evidence based policy making, Data exchange	
Service innovation	Shen et al., 2018; Karvonen et al., 2018; Bifulco et al., 2016; Lee et al., 2014; Tunc Karadag 2013; Maltby 2013; Anthopoulos and Tougountzoglou 2012; Alawadhi et al., 2012; Ali Mostashari et al., 2011
Delivery of services, Integration	

Citizen engagement	Alberti et al., 2019; Karvonen et al., 2018; Smørdal, O et al., 2016; Hoorweg and Freire 2013; Anthopoulos and Tougountzoglou 2012; UN-Habitat 2010; Kolsaker and Lee Kelley 2008
Citizen engagement platform, Co-creation	
Sustainable development	Simonofski et al., 2019; Yigitcanlar et al., 2019; Silva et al., 2018; Bifulco et al., 2016; Meijer and Rodriguez Bolivar 2015; UN SDG 2015; Meijer and Rodriguez Bolivar 2015; Karadag 2013; Anthopoulos and Tougountzoglou 2012; Demirkan et al., 2011; Ali Mostashari et al., 2011; UN-Habitat 2010
Energy	Shen et al., 2018; Chamoso et al., 2018; Yaqoob et al., 2017; Neha Bansal et al., 2015; Letaifa 2015
Smart grid, Smart meters, Renewable energy	

The key domains of application of technology identified in the above Table are mapped with the keywords identified from the smart city vision and definition (from *Table 3*) and summarised in Table 5 below and then grouped based on common areas of intervention to form the following six broad themes (similar to 6 groups in Figure 5 above) of smart cities where the current projects are concentrated or purported to be designed or implemented:

Table 5 Thematic applications of technology in smart cities (Source: Author)

<i>Themes and Sub Themes</i>	<i>Areas of Intervention/Application of technology</i>
<i>Improve the quality of life and well-being of citizens</i>	<ul style="list-style-type: none"> • Water • Education • Healthcare • Energy • Traffic management • Pollution control • Assistive Technologies for multiple applications such as mobility and quality of life
Improve citizen welfare; Liveability; Cultural well-being; Societal benefit; Safety; Resilience; Human capital; Social capital; Social development; Sustainable development; Good governance;	
<i>Economic growth & employment opportunities</i>	<ul style="list-style-type: none"> • Competitiveness • Business • Jobs • Electronic payments • New industries • Innovation, • Entrepreneurship • Public-private partnerships
Prosperity; Economic development	
<i>Smart urban governance</i>	<ul style="list-style-type: none"> • Policy innovation • Decision making • Urban planning • Data/ Data exchange • Accountability • Transparency • Delivery of services • Integration • Resource optimisation • Open Government • Innovation • Traffic management • Security and Surveillance • Public-private partnerships
Smart policies; Evidence based policy making; Service innovation; Collaborative Management; Intelligence; Political development; Institutional capacity; Behavioural change; Interconnections and collaboration; Mobility; Partnerships	
<i>Climate change and environmental issues</i>	<ul style="list-style-type: none"> • Climate mitigation

Environmental management; Low carbon economy; Sustainability	<ul style="list-style-type: none"> • Management of natural resources • Waste management, • Pollution control • Clean energy/ Renewable energy
Infrastructure	<ul style="list-style-type: none"> • Smart homes & Buildings • Internet • CCTV • Smart Street lights • Multi-modal transport • Smart grid • Smart meters • Integrated information network • Tourism
Built environment; Social infrastructure; Mobility; Technological infrastructure; ICT Networks; Energy	
Inclusive development	<ul style="list-style-type: none"> • Digital inclusion • Participatory Planning • Universal access to services and information • Computer access and training for the community • Communication/ Citizen engagement platform • Co-creation
Social inclusion; Social cohesion; Community living; Open data; Urban openness; Affordability; Accessibility; Holistic approach; Citizen engagement; Information sharing; Participatory governance; Connected community	

A few smart cities use partial assistive technologies to improve the quality of life of vulnerable populations, particularly the elderly and persons with disabilities. It is argued that the rise in smartphones and wearable devices, along with the innovation potential of emerging technologies like artificial intelligence (AI), the Internet of Things (IoT), and virtual and augmented reality (VR/AR), has provided aspirations for the vulnerable populations to enjoy a better quality of life (Sobnath, D., Rehman, I.U. and Nasralla, M.M 2020). According to World Health Organisation (WHO 2018), assistive technology is an umbrella term covering the systems and services related to delivering assistive products and services to maintain or improve an individual’s functioning and independence, thereby promoting their well-being. However, the analysis of the application of digital technologies in current smart cities indicates that minimal solutions are currently catering to address the identified key challenges of equality and inclusion, viz., accessibility, affordability, opportunity, participation, and liveability (from the earlier section). In terms of urban inclusion, the literature survey (*See Section 2.3 Smart city versus urban inclusion*) suggests ten technology application domains that are used for enhancing equality and inclusion in current smart cities, as shown in Figure 6 below:

Figure 6 Application domains of technology for equality and inclusion in smart cities (Source: Author)

Access to information

Access to the Internet

Access to digital infrastructure

Universal access to services

Affordable data

Digital literacy

Digital skills

Assistive technologies

Security and surveillance

Citizen engagement platform

2.3.4 The smart city-driven inclusion: Rhetoric versus Reality

Different cities around the globe have launched smart city projects intending to address the rapid urbanisation and globalisation challenges. Two main emergent approaches to the smart city are the brownfield and greenfield approaches (Ibrahim et al., 2015). The brownfield approach applies to cities such as Berlin, Mumbai, New York, and Tokyo. The greenfield approach applies to upcoming and new cities like Masdar city in the United Arab Emirates, Songdo in South Korea, Belmont, Arizona, USA, The Quayside area of Toronto, Canada, NEOM Saudi Arabia, Dholera (Mumbai, India) among prominent few.

This research exploring the gaps in current development models relates more to the brownfield smart city model than the greenfield. The brownfield smart cities, which are in the majority, take an evolutionary transformation approach focusing on introducing and increasing the ICT capabilities to solve their urban problems (Ibrahim et al., 2015). In contrast, greenfield smart city projects are new developments starting from scratch, requiring significant investments, and are often led by ambitious governments or private-sector entities and investors to try a radical approach to urban development (McKinsey 2018). However, the requirement of the inclusion approach is equally applicable to greenfield smart cities with slight variations in the method, complexity, and cost of retrofitting, among others.

To understand the contribution of a smart city to urban sustainability and, more particularly, inclusion; one should assess its performance across a set of indicators that is also very diverse and highly contextual. Regarding performance, it is argued that no smart city is rated as the best (Shen et al., 2018). Therefore, multiple methods and indicators are proposed to measure a smart city's contribution depending on the context and priority across regions and countries. Some of the leading techniques include measuring skills, knowledge, space and innovation (Komninos 2008); measuring performance across resource management, mobility management and quality of life (Ambroseth 2012); levels of smart transportation (Subramaniam 2012; Debnath et al. (2014)); indicators for public safety (Marco et al., 2015); qualitative indicator system for smart city strategies (Walravens 2015); housing density (Susanti et al., 2016); sustainability (Antropoulus 2017); smartness of energy system in a city (Papastamatiou et al., 2017).

The ASEAN Smart Cities Network (ASCN), a collaborative platform of 26 smart cities in Southeast Asia, has proposed six smart city focus areas as-built infrastructure, civic and social, safety and security, health and wellbeing, quality environment, and industry and innovation (Martinus 2020). According to Tang et al., (2019), the analysis of 60 global smart city models revealed four different approaches such as the essential services model (mobile networks, digital healthcare, emergency management program, e.g. Tokyo, Copenhagen); smart transportation model with a focus on urban congestion and digital healthcare (e.g. Singapore, Hamburg); broad-spectrum model (emphasis on urban services like sewage, water and waste management and seek technology solution for pollution, e.g. London, Beijing, Pune, Chandigarh); business Ecosystem model (digital skills and trained workforce- economic hubs, e.g. Amsterdam, Edinburgh, Toronto).

The Smart Cities Mission in India states that there is no one definition of a smart city, and each city is at liberty to self-define its understanding of smartness (Anand et al., 2018). Praharaj et al. (2018) argue that India's smart city mission is an example of integrating institutional technology, information systems, and policies. Lauriault et al. (2018) introduce the concept of an open smart city where residents, the private sector, academics, civil society, and public officials collaboratively mobilise data and technologies in a transparent, accountable, and ethical way to govern the city.

The priorities of 130 cities participating in IBM's smarter cities challenge in 2010 include administration, citizen engagement, social services, economic development, public safety, education and workforce, transportation, environment, and urban planning (Alizadeh 2017). Shanghai Pudong Smart city development research Institute (SPSCDRI 2012) proposed five dimensions for Chinese smart cities: smart infrastructure, economic development, governance and public services, education, and social safety. China Wisdom Engineering Association (CWEA 2011) proposed a smart city development index evaluation system to measure the smartness of a city and town from multiple perspectives, such as governance, social responsibility, and citizen happiness.

International Standardization Organization (ISO) standards ISO supports three pillars of sustainable development: social, economic, and environmental, with a set of indicators to measure the services and quality of life in cities (ISO standards on Sustainable cities and communities -ISO 37120:2018). ISO 37120: 2018 recommends a holistic set of data points that a city or municipality can use to determine its performance and including improved sanitation access; improved water source access; unemployment rate; municipal voter participation; availability of nursing personnel; balanced distribution of age demographic; basic Internet connections; dedicated cycleways; distribution of the gross domestic product; government fiscal independence; income equality; median household income; hospital capacity; mobile phone usage; natural gender equality; population life expectancy; presentation of child mental health; public access to shelter; emergency services; a number of homelessness; cell phone connectivity; population living in slums; primary student/teacher ratio; tertiary education.

ISO 37122: 2019, which identifies a set of indicators for smart cities, defines 20 sectors and 81 indicators used as guidelines to develop and assess the maturity of smart cities (Kristiningrum, E. and Kusumo, H. 2021). In the 20 sectors, 81 indicators are arranged as the economy (4); education (3); energy (10); environment and climate change (3); finance (2); government (4); health (3); housing (2); population and social conditions (4); wastewater (5); recreation (1); security (1); solid waste (6); sports culture (4); telecommunications (3); transportation (14); urban and local agriculture including food security (3); water (4); urban planning (4) and reporting and maintaining records. There are seven priority sectors: education, health, population and social conditions, housing, wastewater (water), and safety. The mandatory services under these seven priority sectors include education, health, social, public, and regional housing settlement, public works and spatial planning, people, public order and

community protection. The inclusion-focused indicators include education, building for special needs, budgeting for the digital divide, cultural infrastructure, accessibility to broadband, telecommunications connectivity, budget for food, population density, housing, public order and community protection.

The European Telecommunications Standards Institute (ETSI) published a TS 103 463 that defines European smart city indicators (Dall, G. 2020). It is a framework for measuring and monitoring the transition of cities to low carbon and resource efficiency. It defines a set of indicators arranged in a bottom-line sustainability framework. The key themes of this framework include people, planet, governance, prosperity, and propagation. The theme on people includes -education, health, built environment, safety, quality of housing, access to services, social cohesion and diversity. The planet's theme has water and land, energy and mitigation, ecosystem, materials, pollution and waste and climate resilience. The governance theme includes community, organisation, multi-level governance, and involvement. The theme of prosperity has- equity, economic performance, employment, innovation, green economy, attractiveness, and competitiveness. Finally, the theme of propagation includes scalability and replicability. Out of these, the inclusion-focused indicators have safety, housing quality, access to services, social cohesion and diversity, community involvement and equity.

The UN's United for Smart Sustainable Cities (U4SSC) guidance, coordinated by ITU (2021), helps cities transform towards smart and sustainable paths. It consists of 91 key performance indicators and aims to capture the city's performance across three dimensions: economy, environment, society, and culture (ITU 2016). The KPIs for SSC consist of 91 indicators to capture a city's performance in three dimensions: economy, environment, society, and culture. The economic indicators include ICT infrastructure, physical infrastructure, trade, employment, innovation, productivity, and the public sector. Environmental indicators include energy, biodiversity, water and sanitation, noise, and air quality. Society and culture indicators include education, health, housing, safety, and social inclusion. Out of which, the indicators relating to employment, water and sanitation safety, and social inclusion directly relate to inclusion.

The United Nations Department of Economic and Social Affairs (UNDESA) introduced the Local Online Service Index (LOSI) in 2018. This multi-criteria index captures e-government development at the local level by accessing information and services provided by local governments through official websites. The 2022 LOSI comprises 86 indicators relating to five

criteria: the institutional framework (8), content provision (25), services provision (18), participation and engagement (17), and technology (18). The institutional framework dimension focuses on municipal e-government strategy, organisational structure, legislation governing access to information and privacy, and open data policy. The content provision aims to identify the extent to which essential public information and resources are available online. The services provision focuses on the availability and delivery of targeted government services. The fourth dimension, participation and engagement, assess the availability of mechanisms and initiatives for interaction and opportunities for public participation in local governance structures. Finally, the technology dimension focuses on the technical features of the portals to specify how the site and content are made available for users; relevant indicators relate to factors such as accessibility, functionality, reliability, ease of navigation, visual appeal, and alignment with technology standards.

Social inclusion is sampled based on social and gender equity, access to services and infrastructure, equity of income and consumption, public participation, openness, and governance. For example, out of 60 indicators in a study (Lombardi et al., 2012), the relevant indicators identified to address the inclusion of vulnerable populations include the unemployment rate, education levels of people, individual level of computer skills, participation in life-long learning, percentage of households with Internet access at home. According to Lazaroiu and Roscia (2012), designing pedestrian areas and cycle lanes is another inclusion-related initiative. Few other studies focused on ethnic plurality, participation in public life, transparent governance, local accessibility, availability of IT infrastructure, cultural facilities, individual security, and economic welfare as critical aspects of inclusion in the smart city (Borsekova et al., 2018).

The performance indicators used in different models are summarised to measure the impact of current smart cities and grouped in Table 6 below according to the identified six themes of smart cities (referred to in the earlier subsection in Figure 5):

Table 6 Theme-wise elements of performance indicators in the smart city (Source: Author)

<i>Themes</i>	<i>Elements of Performance Indicators</i>
<i>Improve the quality of life and wellbeing of citizens</i>	Citizen happiness; Education and workforce; Cultural infrastructure; Health and wellbeing; Housing; Public safety and security; Built environment; Access to services; Social cohesion Diversity; Water; Land; Energy systems; Population and social conditions; Wastewater; Recreation; Solid waste; Sports culture; Urban and local agriculture including food security; Public order and community protection; Sustainability; Civic and social life; Emergency management; Mobile phone usage; Life expectancy

<i>Economic growth & employment opportunities</i>	Trade; Skills and Employment; Industry; Innovation; Productivity; Green economy; Attractiveness; Competitiveness
<i>Smart urban governance</i>	Urban planning; Spatial planning; Multi-level governance; Resource management; People participation; Scalability; Replicability; Integrated governance (information, policies, and institutions); Open city; Transparency; Accountability
<i>Climate change and environmental issues</i>	Energy; Biodiversity; Water and sanitation; Environmental quality management; Noise; Air quality and pollution; Waste; Climate resilience
<i>Infrastructure</i>	Internet connection; ICT infrastructure; Mobile network; Physical infrastructure; Telecommunications; Mobility and transportation; Digital healthcare; Hospital capacity; Social infrastructure
<i>Inclusive development</i>	Digital skills; Citizen engagement; Social services; Sanitation access; Social inclusion; Access to water source; Voter participation; Unemployment rate; Education levels of population; Availability of IT infrastructure; Percentage of houses with Internet access; Pedestrian areas; Dedicated cycle lanes; Equity; Ethnic plurality; Participation in public life; Local accessibility; Individual security; Social and gender equity; Access to services and infrastructure; Equity of income and consumption; Public participation; Openness; Special needs requirements; Digital divide; Accessibility to broadband; Drinking water; Availability of nursing personnel; Balanced distribution of age distribution; Distributed Gross Domestic Productivity (GDP); Income equality; Median household income; Gender equality; Access to shelter, Number of homelessness; Population living in slums; Primary student/teacher ratio; Participation in public life; Public participation in local governance; Accessibility of websites; Ease of navigation of websites; Economic welfare

Despite several measures to integrate smartness and sustainability of city development, the analysis of current smart city models shows several drawbacks. As may be inferred from Table 6 above, sustainability and quality of life are considered essential attributes of a smart city in many cases. However, the explicit mention of ‘inclusion’, the critical aspect of sustainable development, is missing except for a few indicators broadly referring to it. It is argued that smart cities are throwing similar challenges as e-government studies with an over-emphasis on technology and complete neglect of socio-techno practices (Reuter 2020; Ghasemi 2015). The other challenge with the smart city is its extreme dependency on corporates and their technologies, which are often complex and expensive (Yigitcanlar and Kamruzzaman 2018).

Urban planning plays a crucial role in sustainable growth (Al-Shihri, F 2013). No doubt addressing the inclusion problems requires innovative urban planning tools combined with rights-based approaches to development, leading to the empowerment of vulnerable urban communities (Brown 2015). The traditional urban planning approach of command and control cannot handle the present complex issues of modern cities (Ren Chao et al., 2013). Long-term vision, holistic approach, identification of limits, local approach, and focus on problem-solving are essential for sustainable development (Wheeler 2013). The other components of urban

planning shall include collaborative governance and institutional development (Kim 2010); the social dimension includes rights and participation; spatial dimensions such as housing and infrastructure and access to land; and the economic dimension contains opportunities for all (Shah et al., 2015); including coordination and accessibility (Rachmawati, R 2016; Kim 2010).

The most common social policies worldwide supporting inclusion are minimum income or wage (or food), public education and healthcare programs (Silver, H. 2015). The national strategies also play a crucial role in connecting long-term and short-term visions, including forming the relationship between national and global policies and establishing partnerships between public, private, and civil societies and communities (OECD 2020). Last but not least, several authors emphasised the need for decentralised and participatory governance and citizen participation as a critical aspect of the inclusive smart city (Alberti et al., 2019; Yigitcanlar et al., 2018; Rodriguez Bolivar 2018; HABITAT III 2016; Cossetta & Palumbo 2014; D'Cruz et al., 2014).

When mapped to the key themes of the smart city, the performance indicators no doubt form critical elements of measurement across the multiple civic needs of citizens. The performance indicators such as education, health, access to basic infrastructure and utilities etc, refer to the quality of life and citizens' well-being. The indicators such as job, productivity, competitiveness etc, refer to local economic growth. The set of indicators on governance includes decentralised planning, people participation, transparency, accountability etc. Environment and pollution control are categorised in the climate change theme. The indicators such as mobility, digital infrastructure etc, refer to the need for infrastructure. To have a holistic and balanced development, the theme of inclusive growth covers indicators such as citizen participation, gender equality, accessibility, income equality etc.

As may be summarised from the discussion, various methods of evaluation and performance indicators refer to multiple dimensions and challenges of inclusion, where digital inclusion is one critical dimension. However, it is argued that in an increasingly online world, people need digital skills to live, work and communicate productively (Zelezny-Green, R et al., 2018). Otherwise, those without the required digital skills and literacy face a double exclusion from the real and digital worlds. Therefore, digital inclusion in the smart city context becomes of utmost importance and more relevant to this study. The digital divide that affects millions of populations across the globe refers to "*the gap between individuals, households, businesses,*

and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (OECD 2001 p5). It is noted that the digital gender divide is a reality hindering women and girl's empowerment; at the global level in 2019, only 48 per cent of women used the Internet, as compared to 58 per cent of men; this gender gap ranges from three per cent in developed countries to 43 per cent in the least developed countries (UN DESA 2021; ITU 2019).

According to Silva et al. (2018), the most common challenges for the smart city include connectivity, big data, waste management, performance, sustainability, heterogeneity, cost of operation, information security, system failure and carbon footprint. It is argued that in the age of big data, data availability is still a big challenge in many cities (Alizadeh 2017). The available data is also not transparent, open and available in the public domain. Caragliu and Del Bo. (2019) claim that the priority in a local context is an essential strategy for smart city planning, where smart city technologies conceived for a larger audience need to be localised and customised to the local context before deployment.

Reuter (2020) argues that the implementation of the current smart city projects is in a top-down approach dominated by a corporate-government alliance with minimal citizen input. He further states that the corporate companies work for profit, neglecting the social good and introducing new forms of social regulation affecting privacy, fostering social categorisation, creating security concerns, surveillance and influencing citizen behaviour. Praharaj et al. (2018), on the other hand, claim that the conditions in developing countries are worse and suffer from poor coordination, conflicting and overlapping vision, and a lack of integration of policy frameworks that play a significant role in transforming and shaping the urban and regional development agenda.

Many authors argue that despite their commitment to sustainable outcomes, smart cities are criticised for not doing enough and just being a buzzword (Yigitcanlar 2016; Shelton et al., 2014; Kunzmann 2014). It is claimed that there is a need for more theories to highlight the complex interactions between the social system and technology (Albert Meijer, 2013). On the other hand, smart interventions in cities have been criticised for their fragmented inclusiveness (Walravens 2014), split urbanism (Vanolo 2014) and use of smart just as a label (Hollands 2008).

According to HABITAT III- Issue Papers on Inclusive Cities (2016), political commitment to inclusion and creating mechanisms and institutions to facilitate inclusion are the two key drivers to combat the rising urban exclusion. The suggested tools are participatory policymaking, accountability, spatial planning, universal access to services, and complementary roles of national and local governments in achieving inclusive growth. In addition, it is argued that in the context of climate change and increasing globalisation, good governance, strategic planning, and flexible solutions are essential tools (Keivani 2010).

Some authors argue that empowering citizens and strengthening local administration will build urban resilience and sustainability (Alberti et al., 2019). According to UN-Habitat (2009), effective and accountable local governments and strong civil society play an important role in successful urban planning. It is argued that a robust civil society also promotes participatory planning (Hirt and Stanilov 2009). The benefits of public participation in planning include local and context-based planning, creativity and diversity and avoidance of social exclusion leading to the successful implementation of projects (UN-Habitat 2009). Community-based engagement and monitoring contribute to better results on inclusion. For example, federations and networks of slums and shack dwellers play an influential role in developing inclusive cities. These federations working in partnerships with local governments, achieve desirable results and address the city's problems as allies, partners, and innovators (D'Cruz et al., 2014).

2.4 The role of citizens in designing people-centred inclusive smart cities

There is sufficient data and evidence that show citizen participation in public decision-making delivered better policies, built trust and strengthened democracy (OECD 2020). Therefore, citizen participation is considered one of the essential manifestations of democracy and a critical dimension of governance, where citizens involve in decision-making to control governmental actions (UNDESA 2018; Berntzen and Johannessen 2016; Harrison et al., 2012). It is argued that citizen participation in governance leads to better policy outcomes, greater legitimacy, enhanced public trust, civic respect, and citizen empowerment; inclusive government strengthens integrity, prevents corruption, and counteracts polarisation and disinformation (Peña-López 2020). Further benefits include empowerment in decision-making processes, designing acceptable solutions and adding value as nonexperts (Sovacool 2014).

The various modes of citizen participation include public meetings, focus groups, surveys, public consultations, referenda, and citizen counsels or committees (Viale Pereira et al., 2017). The 'Ladder of Citizen Participation, one of the most influential and widely referenced models in democratic public participation, suggests eight levels (Arnstein, S.R. 1969). The eight levels include- manipulation and therapy (regarded as non-participation), informing, consultation and placation (representing the degree of tokenism) and partnership, delegated power and citizen control (describing the degree of citizen power). Non-participation is as good as no power; tokenism is considered counterfeit power, and degrees of citizen power are treated as actual power.

The OECD (2001) modified the 'Ladder of Citizen Participation and suggested that the interaction between the Government and their citizens spans three different levels. The first level is information only to keep citizens informed about political and managerial issues, where there is one-way communication with no feedback from the citizens. The second level is a consultation on specific topics, two-way communication where a decision is taken, and citizens collect feedback. The third level is participation, where citizens enter a partnership with the city and actively participate in political decision-making.

The scientific literature on smart cities acknowledges the empowerment of citizens and democratisation of innovation as the critical agenda to be incorporated right from the definition stage of a smart city (Perera et al., 2014; Schaffers et al., 2011). It is argued that the citizen interaction proposed by the OECD model (2001) can further be improved using ICT in contemporary digital societies and, more so, the development of smart cities through the contribution of e-participation of citizens (Bolívar and Muñoz 2018). E-participation benefits of e-participation are increased citizen involvement, greater government transparency, and improved government responsiveness with more focus on citizen needs (Vrabie, C. and Tirziu A 2016). Therefore, with increasing smart city implementations, citizen participation becomes one of the strategic approaches for inclusive and sustainable development (UN-Habitat 2020; UN SDG 2015).

According to Ferronato and Ruecker (2018), a smart city with a well-connected network environment uses technology to create more collaborative interaction between government and citizens, thus enhancing the power of communication and a participatory ecosystem to achieve sustainable development. The ICT-based tools allow real-time communication between the citizens and government (Viale Pereira et al., 2017), enhancing participation in democratic and

consultative societal processes (Sæbø, Rose, and Flak 2008). It is claimed that many governments have proven the potential of the application of ICT to generate value through citizen participation and co-creation (Díaz-Díaz and Pérez-González 2016).

Some authors argue that for effective participation of citizens in a digital society, there are specific prerequisites such as suitable infrastructure (wired or wireless); access to technology including impairment needs wherever applicable (own device like a personal computer, tablet or smartphone or through publicly accessible devices); education and training to use technology; legal mechanisms to protect privacy, freedom of expression etc. and trust in, and adoption of the solution (Berntzen and Karamagioli 2010). The suggested tools across three categories of participation include e-mail and webcasts for information sharing; electronic consultation, polling and blogs for consultation; and discussion forums, social networks and participatory budgeting for participation (Berntzen et al., 2009).

Different authors suggested different measures for successful citizen participation. Based on the literature review, the successful methods of citizen participation using digital technologies include: citizen participation is a dynamic process that changes with time and context (Przebylovicz et al., 2020); citizens are more than consumers and data producers (Cardullo and Kitchin 2019a; Hollands 2015; Greenfield 2013); increasing the capacity of citizens to participate meaningfully (Capdevila and Zarlenga 2015; Pateman 2012); involvement of local social stakeholders (like local associations, community groups, civic hacktivists) creates a conducive environment and produces better results (Lea et al., 2015; Sadoway 2012); co-creation and local innovations (Ferronato and Ruecker 2018); bottom-up actions with open and participatory approaches, technology democratisation, empower citizens to contribute better (Ferronato and Ruecker 2018); use of social media (Bekkers et al., 2013); transparent disclosure of information (Berntzen et al., 2009; Lidberg 2009); review and feedback mechanism (Simonofski et al., 2017); access to digital tools and information, offline participation mechanisms, governance approaches, among others (Przebylovicz et al., 2020); digital infrastructure and open data (Simonofski et al., 2017); skilful facilitation and commitment from the Government and quadruple helix approach with involvement of citizens from the beginning (Preston et al., 2020).

According to Castelnovo et al., (2015), effective citizen engagement stimulates participation and leads to social innovations, co-production, and public value co-creation. It is stated that through 'co-creation', all parties come together and provide the services through regular and

long-term relationships between service providers and service users like citizens (Bovaird, T. 2007). The co-creation framework enables organisations to work collaboratively and offer a long-term solution to deliver sustainable public services to city residents (Fujitsu 2017; Pestoff, V 2014). However, the concepts of co-production and co-creation, although used interchangeably, differ in focus on service and production of goods, respectively (Osborne et al., 2018).

The use of digital tools for co-creation is often termed digital co-creation (Fujitsu 2017). According to Lember et al. (2019), the different types of digital technologies used in co-creation and smart city development include sensing technologies (use of AI-based programs in Japan to map and measure litter and anti-littering mobile apps for environmental protection); processing technologies (such as cloud computing, big data and machine learning making data meaningful); communication technologies(wireless networks creating new opportunities to ubiquitously interact with people but also from machine-to-machine); and actuation technologies(robotics, 3-D printing and other technologies supporting mechatronic actions to act independently from humans). Further, it is also claimed that social media can facilitate more interest and responsiveness in policymaking and co-production (Bekkers et al., 2013). Design thinking supports the ecosystem and enhances the co-creation process, adding to social value (Ferronato and Ruecker 2018).

Amann, J. and Sleigh, J (2021) argue that in terms of citizen participation, the other critical issue of concern is the participation of the vulnerable population in smart city development, who are often excluded. Mulvale et al. (2021) put forth the need for a thoughtful, planned, and responsive approach to fully prepare vulnerable participants to engage in co-creation and co-production processes. For example, it is mentioned that the national federation or network of slums and shack dwellers allows active participation of vulnerable populations (D'Cruz et al., 2014). Such institutions are claimed to be engaged in 30-plus countries and have formed an international network (Slum/Shack Dwellers International – SDI) to support and learn from each other, including sourcing funds.

The successful functioning of these federations reveals some best practices for the participation of vulnerable populations, which are worth emulating in smart city planning. According to D'Cruz et al. (2014), the best practices include:

Shift from demand making to participation and partnership with Local Government;

Shift from individual to collective responses;

Leadership change to include women leaders;

Practice gender empowerment;

Securing new opportunities to work with local government and others by implementing precedent-setting initiatives;

Bringing well-designed and cost-effective proposals to local government;

Working with multiple departments to demonstrate their capacity to take on city-wide projects.

2.4.1 The critical elements of citizen engagement strategy in the smart city for enhancing inclusion

As inferred from previous discussions, citizen participation is critical for designing a smart city focusing on inclusion. It is argued that the increasing complexity of policymaking and failure to find appropriate solutions prompted many governments toward collective decisions and public consultations (Peña-López, I. 2020). To substantiate further during the past ten years, a noticeable change took place in the smart cities discourse where the focus has slowly shifted from a techno-economic model to a more human-centric one where people earlier considered negligible and almost non-existent have now entered the scene as one of the crucial dimensions of what makes the city a smart one (Musakwa, W. and Mokoena B. 2017).

Against this background, this section identifies the key elements of a citizen engagement strategy that are relevant to the smart city for enhancing inclusion, as summarised in Figure 7 below:

Figure 7 Key factors for citizen participation pertinent to smart cities (Source: Author)

Citation	Key elements identified
Capdevila and Zarlenga., 2015; Pateman, 2012	Enhancing digital literacy skills
Lember et al.,2019; Ferronato and Ruecker., 2018; Dobrovnik et al.,2018; Anand et al.,2018; Viale Pereira et al.,2017; Praharaaj et al.,2017; Díaz-Díaz & Pérez-González,2016; Kitchin 2014; Berntzen and Karamagioli 2010; Boulianne, S., 2009; Sæbø, Rose, & Flak,2008; Polat, R.K., 2005	Enabling digital ecosystem for e-participation
Preston et al.,2020; Simonofski et al.,2017; Perera, et al.,2014; Schaffers et al.,2011	Citizen participation in the project lifecycle
Amann, J. and Sleigh, J., 2021; Mulvale, et al.2021; Berntzen et.al., 2009	Inclusive tools to reach vulnerable population
Preston, S et al., 2020; Cardullo and Kitchin 2019a; Granier, Kudo, and Scholl 2016; Berntzen and Johannessen., 2016; Sadoway, 2012	Involvement of community through local grassroots organisations and networks & committees
Preston, S et al., 2020; Osborne et al., 2018; Fujitsu,2017; Castelново et al., 2015; Pestoff, V., 2014; European Commission 2009; Bovaird, T., 2007	Co-creation to stimulate citizen participation and develop sustainable social innovations
Peña-López, I., 2020; Kapoor et al.,2020; Przeybilovicz et al.,2020; Ferronato and Ruecker., 2018; Musakwa and Mokoena., 2017; URBACT, I.C ,2015; Bekkers et al., 2013	Renewed policy, governance mechanisms and implementation approach for inclusive citizen participation

Enhancing digital literacy skills

New digital technologies transform how individuals, groups, and societies communicate, work, learn, and govern (Meyers, E.M. et al., 2013). This new socio-technical reality requires participants to possess the skills and abilities to use digital tools. Many scholars advocate that the vision and intention of smart cities can only be achieved by first making the citizens smart and involving them actively in city governance, decision-making and the transformation process (Kapoor et al., 2020; Ferronato and Ruecker 2018). Therefore, citizens’ acceptance should be the focus while transforming a city into a smart city (Ferronato and Ruecker 2018).

To that extent, it is argued that a smart citizen is not someone who is merely living in a smart city; instead, they are an active stakeholder engaging with city administration and participating in the planning, developing, implementation, testing, and evaluation urban decisions, policies and actions (Ferronato and Ruecker 2018). The people should have a voice and say in decisions with equal access to social, political, and physical spaces, including markets (Carretero et al., 2017).

It is argued that for implementing the web-based platform and planning a smart city, the ICT skills of the local population are crucial (Stratigea, A. and Panagiotopoulou, M 2014). The higher the level of ICT skills, the higher the potential for citizen participation in smart city planning (Stratigea A. et al., 2015). Education and communication methodologies are needed to educate the local citizens about their rights and responsibilities (Gaventa, J. and Valderrama, C 1999). In addition to physical access, the digital divide can be tackled through three layers of digital literacy: skills to operate computers and the Internet, skills to look for and analyse information, and the skills to use web 2.0 functionalities (Le Blanc, D 2020). The critical challenge is with the specific population groups like the elderly, the poor and the illiterate who need special attention and deliberate push (Stratigea, A. et al., 2015).

The ‘European Framework of Digital Competencies for Citizenship’, also known as DigComp and now DigComp 2.0, is one good initiative to improve the digital competencies of citizens (Vuorikari, R., Punie, Y., Gomez, S.C. and Van Den Brande, G 2016). It aims to develop essential competencies for personal development, employment, social inclusion, and active citizenship. The key competencies include literacy, science, numeracy, foreign language, digital skills, entrepreneurship, critical thinking, problem-solving, and learning.

According to UNESCO (2011), digital literacy includes a set of basic skills required to use and produce digital media, information processing and retrieval, participation, creation and sharing of knowledge in social media and other professional computing skills. A digitally literate person is expected to understand the basics of digital devices, access and use digital devices, create and share information, carry out cashless transactions using digital financial tools, and access and use online public services (Public Affairs Centre 2018).

Enabling a digital ecosystem for e-participation

ICTs are vital in opening new and innovative citizen-driven initiatives (European Innovation Partnership on Smart Cities and Communities -EIP SCC). ICT allows easier interaction between the government and the citizens and enhances the ability of citizens to co-create and drive public services (Bolívar, M.P.R. and Muñoz, L.A 2018). Meaningful interaction makes citizens better informed about government actions (Mukhtarov et al., 2018). The ICT ecosystem provides the space for amplifying and transforming social activities that can be powerful drivers of development and decentralisation (Yeh, H. 2017; Smith, M.L. and Elder, L 2009).

It is argued that the introduction of Web 2.0 has introduced new possibilities for participation (Le Blanc, D 2020). The advantage of using this new technology is a decrease in the costs of information sharing, the opening of new channels for interaction, the capacity to reach multiple locations, and a structured feedback mechanism (Le Blanc, D 2020). Examples of ICT-enabled features transforming the city include -big data management tools for collecting, processing, storing, visualising, and communicating information; citizen e-participation in the decision-making process; integrated digital platforms aimed at inclusive development and planning of a smart city (Stratigea et al., 2015).

However, the debate on using ICTs for citizen participation in smart city initiatives remains polarised. On one side, there is the optimistic view that ICTs increase opportunities for citizen participation, promoting empowerment and facilitating the transformation of cities (Meijer and Bolívar 2016; Mora, Bolici, and Deakin 2017). Conversely, it is argued that smart 'narratives' reduce citizens to simple consumers of advanced digital solutions (Cardullo and Kitchin 2019a; Greenfield 2013; Hollands 2015). It is stated that the mere increased presence of ICT does not automatically lead to increased e- participation of citizens (Le Blanc, D. 2020). Most often, the vulnerable population cannot afford and use the latest technology (Hernandez, K. and Roberts, T. 2018), so they are left behind. This divergence of opinion needs a robust, empirically driven analysis of citizen engagement and how it unfolds in different local contexts (Cardullo and Kitchin 2019a; Granier et al., 2016).

Based on the literature from the previous section, the prerequisites for e-participation of citizens include (i) digital infrastructure, (ii) access to technology, (iii) free Internet and affordable data, (iv) privacy and security, (v) ease of usability (mobile, social media etc.) and (vi) trust and adoption of the solution. One frequently used diagnostic tool to analyse the barriers to the use of digital technologies proposed by Roberts (2017) is the Five 'A's of Technology- which include: Access, Ability, Awareness, Affordability and Availability.

Many cities have developed digital infrastructure around public transport, events, police and fire service stations, parks, and other outdoor activities (Oliveira et al., 2020). The Internet and high-quality broadband communication infrastructures are still challenging in many countries, particularly in the global south (Stratigea 2012). Transparency, including access to information, and mandatory disclosure, including open government data (OGD), is still a challenge in many cities (UNDESA 2019). Privacy and security in citizens' data is another challenge hindering the active participation of citizens (Le Blanc, D. 2020). The other challenge with technology is

its accessibility and usability requirements for the elderly and disabled population. There has been very little work on smart cities for disabled and older people or design for all approaches to smart cities (Ramirez, A.R.G. and Ferreira, M.G.G 2018).

Citizen participation in the project lifecycle

One of the criticisms of public consultation by the government is that the citizens are generally involved too late in smart city development, which needs to change (Preston et al., 2020). The citizens should be an integral part of the smart city of smart city development and participate right from the planning stage up to project closure, including review and feedback (Simonofski et al., 2017). In inclusive approach quadruple helix innovation model (Carayannis and Campbell 2009), is the right option where all the four principal actors in the system- academia, policy, industry, and society can participate and solve the problems of the people by assessing their specific needs and requirements, respectively (Hass 2019).

Inclusive tools to cover vulnerable population

Availability and access to IT infrastructure (for example, Internet and data), including differential digital literacy and skills, create a digital divide, so it is recommended to use both online and offline activities to cover all population categories (Le Blanc, D 2020). Therefore, some scholars believe that ICT tools cannot entirely replace conventional participation methods. This is truer, particularly for the groups such as the elderly, low-income, and poor groups who are distant from the new technologies (Li et al., 2020). The best practice approaches for engaging vulnerable populations include planning and being resourceful; utilising community intelligence; staying flexible, cultivating meaningful involvement; building their capacity, fostering wellbeing, and recognising their contributions (Amann, J. and Sleight, J 2021).

While engaging citizens, skilful facilitation enhances the contribution of citizens towards better design and innovation (Preston et al., 2020). The contribution of citizen participation increases with the right partnership, delegation, and control (Viale Pereira et al., 2017). The managers driving citizen engagement face significant personal challenges and therefore need full efforts and commitment to lead the change successfully (Preston et al., 2020). The four dimensions that require attention in this regard are decision-making power, citizens' involvement stages, mode of interaction, and tools and methods of interaction such as interview, discussion, and prototyping (Amann, J. and Sleight, J 2021).

Citizen participation through community involvement, local & grassroots organisations, and new social organisations/networks/committees

Most research on e-participation has focused on political involvement and not on community involvement (Berntzen and Johannessen 2016). The participation of local social stakeholders (like local associations, community groups, and civic hacktivists) creates a conducive 'civic-cyber space' and generates better results (Sadoway 2012). Many private and not-for-profit organisations have built successful digital platforms for citizen interaction and feedback alongside the public sector (Le Blanc, D 2020). The Slum/Shack Dwellers International (SDI) model discussed in section 2.3 is a relevant example (D'Cruz et al., 2014).

Co-creation to stimulate citizen participation and develop sustainable social innovations

It is argued that information and consultation usually are top-down approaches to citizen engagement (OECD 2001), whereas participation actively involves citizens and yields better results. In 2014, the United Nations surveyed to find out the level of usage of ICT between the government and citizens, which indicated three methods of the e-participation, namely- e-information (sharing of public information); e-consultation (citizen participation in debates influencing public policies and services); and e-decision-making (citizen involvement in co-design and co-production of public services).

It is argued that this emerging co-creation phenomenon requires new forms of interaction, exclusive platforms, and infrastructure (Ferronato and Ruecker 2018). One example is The Fab city, created by MIT Centre for Bits and Atoms provides space and infrastructure for sourcing knowledge from people (Fab City Global Initiative 2017). The other popular co-creation model is the living lab's citizen engagement model, where citizens participate in research as the users, a user-driven open innovation ecosystem developed in partnership between government, business, and citizens (European Commission 2009). It is recommended that cities create flexible and context-specific co-creation models rather than implement a one-size-fits-all approach for citizen engagement (Preston S. et al., 2020).

Renewed policy, governance mechanisms and implementation approach for inclusive citizen participation

Decentralisation and delegation of power to local authority improve subnational public service delivery due to increased citizen engagement leading to a reduction of corruption and a positive impact on growth (Work, M.D. and Partnerships, S.P.P. 2019). Similarly, local revenue

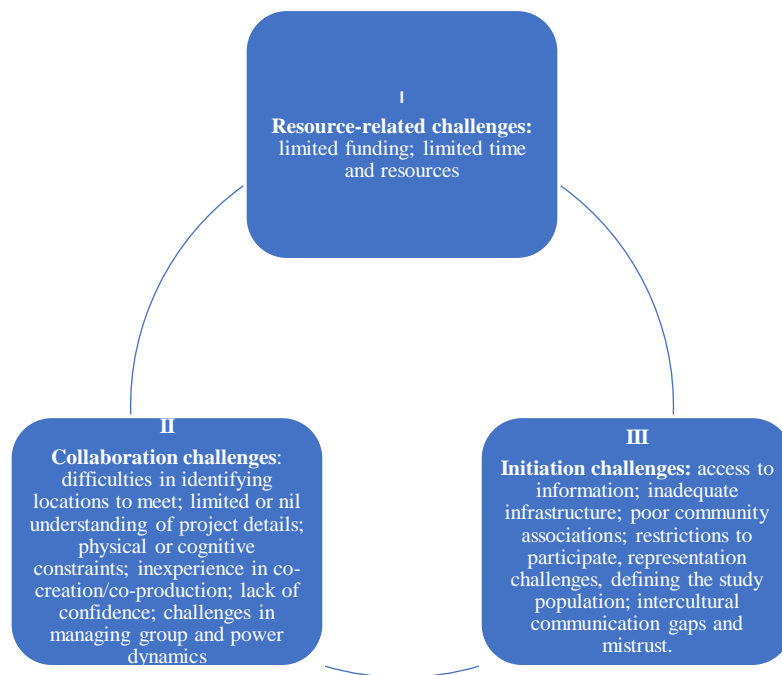
effectiveness and financial efficiency have a positive and significant influence on capital expenditure and the performance of the local government (Bukit, R.B., Saragih, A. and Mulyani, S 2020).

Many e-participation initiatives have been developed and implemented by focusing heavily on technology, neglecting organisational change requirements and broader socio-technological considerations (Le Blanc, D. 2020). The suggested approaches for inclusive citizen participation include a separate budget allocation for citizen engagement and smart city literacy, tackling the digital divide (both in terms of citizens' capability to use ICT and also access ICT) and moving beyond technology to social and institutional factors (Tadili, J. and Fasly, H. 2019). Participatory budgeting lets citizens learn about government functioning, discuss debate, and influence the allocations of public resources (Rajit Sengupta 2020; Clay, E.M. 2007). This is an effective tool for citizens' education, increases public officials' transparency and accountability, and helps curb corruption ((Shah, A 2007).

A social audit is a helpful monitoring mechanism where citizens evaluate or audit the government's performance and policy decisions (Democratic, P.T.T.S 2011). It also improves the interaction and engagement between the citizens and bureaucrats and leads to more informed, constructive, and organised discussions.

When it comes to vulnerable populations, the challenges of their participation are different and much more complex. The summary of challenges concerning the engagement of vulnerable people in designing smart city (Amann, J. and Sleight, J 2021) are detailed in Figure 8 below:

Figure 8 Challenges to engaging the vulnerable population (Source: Author)



On the hand, in terms of inclusive mechanisms, it is stated that there are certainly good practices and principles in public decision-making which are worthy of consideration and include -clear purpose and goal; accountability; inclusiveness; transparency; representativeness; group deliberation; information sharing; integrity; time; and evaluation and privacy (Peña-López, I. 2020). It is also suggested that integrating ICT tools with a range of participatory planning tools like foresight tools, evaluation tools, etc., can strengthen citizen participation and lead to better support for decision-makers in smart city planning exercises (Stratigea, A. et al., 2015).

The 10-point action plan recommended by URBACT to develop an approach to successful co-creation and social innovation in smart cities includes (URBACT, I.C. 2015): behave like a leader and set an example; start where the energy is; pick the low-hanging fruit where quick results can be achieved; co-produce at the middle where citizens are involved (beyond bottom-up or top-down); start with micro initiatives; use both physical and online dialogue to mainstream the idea of social innovation; adopt user-centred approach by connecting all parties in the city; play a brokerage role and bring all stakeholders together; promote capacity-building to empower citizens, government and other stakeholders; use new forms of funding like participatory budgeting.

2.5 Chapter Summary

The literature identified inequality and exclusion as global challenges experienced by certain categories of people living in contemporary cities (see

Figure 2 for details). Supporting the evidence of the existence of inequality and exclusion, it is claimed that it manifests in different forms and dimensions, such as social exclusion, economic exclusion, political exclusion, spatial or physical exclusion, cultural exclusion, financial exclusion, and digital exclusion (Greene et al., 2016; UN SDG 2015; World Bank 2015; Nowosielski 2012). Further drawing on this background and based on the literature review, the five challenges faced by these marginalised populations living in cities are identified as accessibility, affordability, opportunity, participation, and liveability.

On the other front, rapid urbanisation and increasing populations migrating to cities are throwing critical development challenges of the century. This unprecedented phenomenon is making sustainable development unachievable without sustainable urbanisation. Therefore, today many cities have become the testbed for the global sustainable development agenda and are being looked at as the agents of change and forerunners of futuristic human societies. In this race to achieve sustainable development, several studies point to the problem of inequality and exclusion as the critical aspects of sustainable development not to be neglected and ignored, mainly when significant chunks of populations living in cities are vulnerable and marginalised from mainstream development (as discussed in page. 24).

As claimed in this chapter, the emerging concept of the smart city model is increasingly being adopted as a plausible solution to achieve urban sustainability. Urban inclusion is further identified as a critical element towards sustainable development. The literature shows that smart urbanisation with extensive technology innovations can create immense possibilities for achieving an inclusive and sustainable city. A novel data triangulation method of global survey of the vision and definitions of smart cities is done to understand the vision and aspiration of smart cities. The identified themes of the smart city derived from various vision statements and smart city definitions listed inclusive development as one of the priority areas but needed to clearly mention their impact on the vulnerable and excluded populations and their challenges. Needless to say, the COVID-19 pandemic, which has exposed the inequality and exclusion in human societies to its core, also gave a ray of hope where the increasing use of digital technologies is now considered the great equaliser. This puts forth a solid case to explore,

evaluate and adopt the smart city paradigm in terms of its potential contribution toward the inclusion of vulnerable and disadvantaged populations in contemporary cities.

In this chapter, the theoretical assessment of smart cities and the contribution of digital technologies towards sustainable development in general and urban inclusion, in particular, is reviewed and analysed. Further, it is compared and mapped to the empirical studies in terms of performance indicators used to measure the impact of smart cities. The literature shows the intent of smart city vision and also, based on performance metrics, provides immense scope for the contribution of digital technologies toward the inclusion of vulnerable and marginalised populations. However, as the literature suggests, urban inclusion pertaining to vulnerable people remains an elusive goal and one among several milestones to achieve. The smart cities' technology application areas and performance indicators are spread across multiple domains; however, all of them are interrelated, and none of them can be discarded or neglected. But the question is whether the goals and performance on these domains and themes matter to all individuals or only for the elite and advantageous populations.

Framing the necessary background, the literature shows limited studies on the interplay between urban inclusion and smart city development, pointing to several gaps in existing models. Apart from bridging the design and technology gaps, the literature highlights that the role of citizens is considered the primary requirement for inclusive planning and development. The smart prefix is deemed pointless unless all the citizens become smart and equal stakeholders in development. The argument is based on the premise that effective citizen participation leads to better policy outcomes, greater legitimacy, enhanced public trust, civic respect, transparency and accountability, thus preventing corruption and counteracting polarisation and disinformation in society. Drawing from the widely referenced models of democratic public participation (The Ladder of Citizen Participation, 1969), the effective methods of citizen participation are discussed relevant to smart cities and the use of digital tools, purporting to make all citizens smart, and finally recommending a conceptual framework as a reference tool for case study analysis.

Overall, this chapter builds conceptual, theoretical and thematic frameworks relevant and essential to explore further the research aim and objective. Adopting a systematic literature review, the theoretical approach begins with a relevant discussion on the degree and dimension of urban inequality and exclusions in contemporary cities, then identifying the affected

populations and their challenges; and further exploring possibility, scope and potential contribution (if any) of the smart city model through people-centric planning. Finally, against these theoretical frameworks, this research gauges whether smart cities and digital technologies enhance the inclusion of vulnerable and marginalised populations and, if so, how?

Identifying the challenges and gaps in current smart city models vis-à-vis urban inclusion, this chapter highlighted the need for designing an effective smart city model to tackle inequality and exclusion. Beginning with an exploration of the key research aim, the theoretical framework of the literature review identified the main themes and sub-themes, as shown in Table 1 at the beginning of this chapter. Next, the broad findings and gaps from the literature are further narrowed down to a specific study area and finally for framing research questions. The identified gaps in terms of -the category of affected individuals and vulnerable populations and the challenges they face in contemporary cities; the smart city-driven sustainability and the role and contribution of technology in smart cities to enhance urban inclusion and people-centric planning and citizen participation provide a logical approach for framing the research objectives and research questions required for the study.

Finally, based on this literature review, the research questions are framed in the methodology chapter to evaluate the ‘who’, ‘what’ and ‘how’ aspects of urban inclusion in smart cities as explained below:

Who	To identify the excluded population living in contemporary cities
What	Deals with the specific challenges these populations face in their daily lives
How	To explore plausible solution to enhance inclusion and equality in smart cities

Further elaborating on these literature gaps, the framing of the research questions is dealt with in the next chapter in section 3.1, where the identified gaps are used to develop research objectives, and the objectives define the research questions as shown in Figure 9. The overarching aim guides the scope and limitations for the research questions: *Can the smart city*

be equitable; does it address the current challenges of urban inclusion and contribute to the well-being of all citizens, leaving no one behind?

Chapter III

3 Research Methodology

This methodology chapter explains and lays out justifications for the methods employed, starting from framing research objectives and research questions and using suitable methods for specific research questions. Further, it explains and justifies the adopted research approach and design, including selecting an overarching qualitative research methodology and a comparative case study with a semi-structured interview method. The different strategies, processes, and techniques used in collecting and analysing data are explained along with the ethical considerations, including the reliability and validity of research to ensure its quality.

3.1 The Research Questions

The literature review in the previous chapter highlights the existing inequalities in contemporary cities. Most cities exhibit some form of inequality and exclusion; however, the category of excluded populations and their challenges differ among and between cities. This research is an attempt to explore the current challenges of urban inclusion and evaluate further the contribution of smart city model to the well-being of all citizens, leaving no one behind. In more specific terms, how smart city, the new and fast-emerging urban development paradigm, can enhance the inclusion of vulnerable populations living in cities (Schuurman et al., 2012; Meijer and Bolivar 2013; Vanolo 2014; Yigitcanlar et al., 2017). While technology infrastructure and digital innovations remain central to the smart city model, the critical question that remains unanswered or neglected is whether such huge investments in smart technologies and digital innovations ultimately contribute to improving the well-being of all its citizens, fulfilling the global aspirations of UN SDG goals of ‘leaving no one behind’; thus, steering the cities towards inclusive growth and sustainable development (OECD 2019). Do these state-of-the-art technology solutions transform cities into smart and sustainable places (Yigitcanlara et al., 2019; Ghasemi 2015)?

Several theorists argue that some form of inequality and exclusion exists in almost all cities of the world; however, the form, degree and dimension vary from city to city and country to country (Oxfam International 2021; UN 2020; UN Habitat 2020; Van Hoof and Kazak 2018;

Greene et al., 2016; UN SDG 2015; World Bank 2015; Nowosielski 2012; Lombardo and Sangiuliano 2009). Based on the literature study, this research is limited in scope to understand the 'who', 'what' of inequality and exclusion and 'how' in terms of exploring a feasible solution in the smart city paradigm. This, in turn, may lead to understanding the challenges of designing an inclusive city and building 'cities for all' primarily assessing the smart urban governance and smart city models that are purported as potential solutions to the problem of urban inclusion. This argument takes centre stage due to the literature in Chapter II suggesting the growing importance and contributions of digital technologies and the smart city approach to sustainable development (Simonofski et al., 2019; Silva et al., 2018; Yigitcanlar 2016; Dhingra and Chattopadhyay 2016; Bifulco et al., 2016; Ghasemi 2015; Caroline Colldahl et al., 2013; Alawadhi et al., 2012; Schuurman et al., 2012). Also, it highlights the importance of enhancing the inclusion of vulnerable populations and 'leaving no one behind', which is considered the most fundamental aspect of sustainable development (UN SDG 2015).

The literature evidence and the existing challenges point out that the current development models are non-inclusive and unsustainable, while the much-hyped smart city model is criticised for being just a buzzword and not adding much value to sustainability (Trindade et al., 2017; UNESCO 2015; Shelton et al., 2014; Kunzmann 2014). Whatever the development approach across multiple geographies and contexts, rapid urbanisation is an excellent opportunity to reap good benefits for countries' progress and development. However, the rider is if and only if the cities can reinvent themselves to improve the quality of life and explore innovative approaches to solving 21st-century urban problems (Aijaz 2015). While suggesting the need for renewed policies and citizen participation, the literature review findings are mixed in understanding the relationship between the smart city model and sustainability, which still needs to be clarified (Ghasemi 2015; Meijer 2013). Against this backdrop, this research will examine the interplay between smart city and urban inclusion and investigate further the means and ways to enhance the inclusion of vulnerable populations in contemporary cities, particularly the cities adopting smart governance and smart city approach to development. This is relevant, particularly in the context of emerging digital societies, the increased digitisation of the public sector and the emergence of smart city models as a new and dominant urban paradigm.

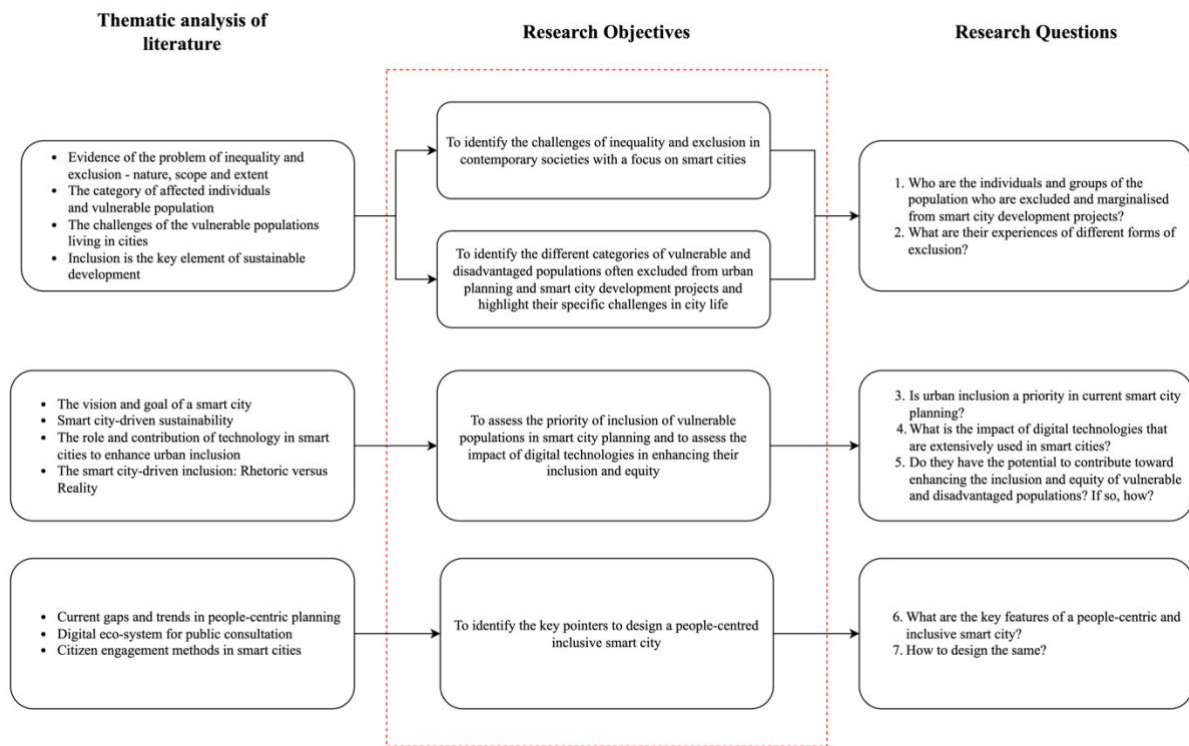
This study does not claim that inequality and exclusion are universal problems existing in all contemporary cities, nor is it any attempt to develop a generic one-size-fits solution for all issues of urban exclusion. Instead, the idea is to identify the affected populations and their specific challenges of inequality and exclusion, particularly in the use and adoption of digital tools regarding accessibility, affordability, opportunity, participation and liveability. When the smart city is assessed based on identified challenges, it is likely to derive common solutions and approaches that may further lead to an integrated framework for urban inclusion to address the intended challenges. This may also provide innovative ideas to develop inclusive technology tools and solutions catering to the needs of vulnerable people living in future smart city development areas.

The literature evidence and identified gaps and challenges from the three case studies from different geographies and across multiple contexts can be used to understand the gaps, scope, contribution, and application of current digital tools towards enhancing inclusion. However, the contextual elements of inequality and exclusion specific to a city and a country always play a crucial role in designing insights and solutions for inclusive smart cities, and each city's exact needs are always considered first. The comparison leads to multiple areas of convergence and divergence among and within the three cases and in turn, will broaden and enrich research findings, highlighting the city-level requirements in terms of the spatial comparisons and the institutional and procedural gaps in smart city planning vis-à-vis sustainable urban development (from an 'inclusion' perspective) among others. The selection of these case studies brings the right context for this research as they represent a mix of commonality and variation with the right environment in terms of numerous smart city projects at different implementation levels. The combination of leading and emerging smart cities in the survey helps to get a holistic understanding and complete perspective of urban inclusion in different smart city models. Without providing any general prescription this study can identify the success factors, the failures, the impediments and challenges across multiple geographies and varied communities; and finally, to understand the linkage and relationship between the smart city components and urban inclusivity as to how digital innovations have and can contribute to equity and inclusion of vulnerable and marginalised population. As discussed in detail in Section 3.2.2, from a comparative case study perspective, the case selection strategy has satisfied a combination of techniques including a broad representative sample of the existing global models of smart cities.

Against this backdrop, the research aim is – ‘*Exploring the design of people-centred inclusive smart cities using integrated inclusion approaches and citizen engagement strategies through case studies of London, Bengaluru, and Kampala*’.

Further, as shown in Figure 9 below, drawing on the findings of the literature review, four research objectives are set out, and these objectives are dealt with through seven research questions:

Figure 9 Framing of research questions (Source: Author)



The seven research questions are further grouped to form three interrelated research questions as stated below:

1. Who are the individuals and groups of the population who are excluded and marginalised from smart city development projects? What are their experiences of different forms of exclusion?

2. Is urban inclusion a priority in current smart city planning? What is the impact of digital technologies that are extensively used in smart cities? Do they have the potential to contribute toward enhancing the inclusion and equity of vulnerable and disadvantaged populations? If so, how?

3. What are the key features of a people-centric and inclusive smart city, and how to design the same?

The above three research questions are examined and analysed through a literature review followed by a comparative study of three diverse smart city case studies of London (UK), Bengaluru (India) and Kampala (Uganda), representing different societies, different governments spread across various continents of Europe, Asia and Africa; and providing an enriching spatial comparison. Within the context of this specific literature review and the proposed three case studies, the first research question gives evidence of the problem, explains the existing inequality and exclusions in contemporary cities, and identifies the affected vulnerable populations and their challenges. Each case identifies the vulnerable people who are excluded from the smart city plan and their challenges in city life. The second research question investigates the priority of inclusion of these vulnerable populations in smart city plans through the three case studies. Further, it examines digital technologies' contribution to enhancing the inclusion and equity of vulnerable people.

The third research question is designed to identify the essential requirements of a people-centred inclusive smart city. Further, it discusses the methods in terms of strategy or approach, policy recommendations and citizens' potential contribution through their active and meaningful participation in smart city planning. The findings suggest the essential guidelines and recommendations for people-centric planning and inclusive smart city development. However, each case has its contextual elements of inequality and exclusion that play a key role in designing insights and solutions, and the exact needs always are considered first. All three research questions are relevant to understand the need and urgency of an inclusive smart city

development approach and suggest the basic and essential guidelines and an integrated framework to address the specific challenges identified in this study. This may be a helpful tool for creating a basis for an inclusive approach toward building future inclusive and equitable cities, leaving no one behind.

3.2 Research approach, design and methods

To attain the aim and objectives of the study, the research design was considered carefully before the commencement of the research. This section explains the selection of a specific research methodology and methods, highlighting the significance and limitations, if any.

The three most common approaches to conducting research are the quantitative, qualitative, and mixed methods approach (Williams 2007). Quantitative research investigates what, where and when of decision-making and measures the quantity or amount in a numerical and non-descriptive way (Rasinger 2013). Qualitative research investigates the why and how of decision-making and involves quality, which is non-numerical, descriptive, and exploratory. The mixed method combines quantitative and qualitative methods and is often used for broad, in-depth understanding and corroboration (Schoonenboom, J. and Johnson, R.B 2017).

The quantitative approach stresses measuring variables in the social world and involves collecting numerical data through surveys and questionnaires, processed statistically and generalised to a larger population (Bryman 2012). Using numerical values or percentages, it generally explores and finds the correlation between two events. On the other hand, qualitative research builds its premise on inductive rather than deductive reasoning and involves discovering new knowledge through a holistic approach (Williams 2007). It is defined in simple terms as research that produces new findings that are not arrived at by statistical procedures or other means of quantification (Rahman, M.S 2020). Thus, it helps explore, describe, and interpret concepts' quality and characteristics. The qualitative method is usually adopted in research involving human subjects and includes a systematic scientific inquiry that seeks to build a descriptive, narrative and holistic understanding of a social or cultural phenomenon (Astalin 2013; Sutrisna 2009). It allows one to explore and understand the complexity of a phenomenon in its natural setting, focusing on interpreting the same in terms of the meaning people bring to the locations (Denzin and Lincoln 1994). A qualitative

methodology allows for exploring concepts and experiences in more detail and from multiple perspectives. It incorporates numerous realities and is about persons' lives, emotions, feelings, behaviours and experiences, including organisational functioning, social movements, and cultural phenomena (Rahman, M.S 2020; Mohajan, H.K 2018). Qualitative research aims to describe and interpret a phenomenon or issue from the point of view of the individual or population being studied and then generate new concepts and theories (Mohajan, H.K 2018).

The mixed method approach combines quantitative and qualitative data within the same study (Williams 2007). The common reason for using this method is for generalizability, contextualisation, and credibility. Integrating quantitative and qualitative processes can occur during data collection, analysis, or results presentation. The advantage of mixed-method research is that the strengths of one type of data often mitigate the weaknesses of the other (Bryman 2012). However, although it seemed to have the best of both methods, the mixed-method approach has some disadvantages and is therefore subject to criticism. The mixed method is criticised for combining quantitative and qualitative methods, two distinct and separate branches of research (Hafsa, N. E 2019). It is argued that qualitative data that is richer and more in-depth and consists of various points of view when quantitating may convert into single-dimensional and immutable data (Driscoll et al., 2007).

Further, the mixed method design may not be suitable for exploratory research (Jalma, K.S 2008), which is the case here. An exploratory study is typically conducted when little is known about a particular research area, and the goal is to gain a preliminary understanding of the topic (Bryant, A. and Charmaz, K. eds 2007). In this context, qualitative research is often considered better suited for exploratory study because it allows researchers to gather detailed and in-depth insights into a phenomenon and to develop a deeper understanding of the topic under investigation (Kivlighan, D.M. and Wampold, B.E 1999). Qualitative methods like interviews, focus groups, and observation allow researchers to collect rich data on participants' experiences, perspectives, and behaviours. These methods also enable researchers to ask open-ended questions and follow-up on participants' responses, which can help to uncover unexpected insights and perspectives. The qualitative methodological approach is argued to have certain specific benefits for this study and therefore considered to have the edge over the choice of mixed methods approach. However, in this study, mixed methods are used within a

predominant qualitative methodological approach because this best helps explore the research aims and questions and adds rigour and validity to the research findings.

3.2.1 Research design

After carefully considering different approaches, this study adopted a predominantly qualitative research methodology as the overarching research design, with a multiple-method qualitative strategy, using qualitative interviews supported with qualitative and quantitative secondary data from multiple literature sources, web resources and document analysis, policy guidelines, project reports and case studies. As demonstrated by the literature review, urban exclusion is a complex phenomenon that involves multi-dimensional factors causing severe effects on human populations. Moreover, the problem of urban exclusion is interpreted as a range of serious issues affecting the very social order of contemporary cities (Nowosielski, M 2012). Therefore, to ensure a pragmatic approach and systematic analysis of the fundamental aim and detailed objectives of the current study, it is proposed to adopt a qualitative research method which enables to understand the complex reality of urban inclusion and the meaning of actions in the given context (Queirós, A., Faria, D. and Almeida, F 2017).

Qualitative inquiry and analysis fit this purpose with stronger sensitivity, allowing the data to speak for itself. The advantage of using qualitative research in this study is due to its holistic perspective, where the complex urban system is considered more than the sum of its parts and its focus on the system dynamics and its complex interdependencies, which cannot be explained in a meaningful by linear, cause and effect relationships or by a few discrete variables (Merriam, S.B. and Tisdell, E.J 2009; Berg, B.L. and Lune, H 2007; Guba, E.G., Lincoln, Y.S. and Denzin, N.K 1994; Marshall, C. and Rossman, G.B 1989). It looks at the whole rather than the parts (Gerdes and Conn 2001). Further qualitative methodology supports the researcher to explore the research of a new, or relatively new, social experience from a beginner's mind allowing better understanding and appropriate solution (Kabat-Zinn 1991). The rich data generated using qualitative research allows to maintain the participant's perspectives intact and provides multiple contexts to understand the phenomenon under study, which can further be used to demonstrate the phenomena vividly or to conduct cross-case comparison and analysis

of individuals or groups (Anderson, C 2010; Merriam, S.B. and Tisdell, E.J 2009; Guba, E.G., Lincoln, Y.S. and Denzin, N.K 1994).

Further, the qualitative method describes participants' experiences, opinions, and feelings (Denzin 1989) and achieves deeper insights into issues (Chalhoub-Deville and Deville 2008). It is often used to answer questions about experience, meaning and perspective from the participant's standpoint (Hammarberg K.et al., 2016). Looking at trends and themes of a specific sample seeks to explain the how and why of the problem (Hale and Napier 2013). Therefore, qualitative research design, as applied in this study, offers high internal validity. The participants and researcher co-create the data as they explore the nature and challenges of inclusion in contemporary urban development paradigms of smart city planning. Lastly, if adopted as an interactive approach, the qualitative research design has a flexible structure and can be constructed and reconstructed per the research requirement (Maxwell 2012). For example, interviews may not be restricted to specific questions and can be substituted by the researcher to suit the real-time need (Anderson, C 2010). The research framework and direction can also be quickly revised with new information.

The qualitative approach is found appropriate and suitable for this study as there is a need to understand the perspectives of participants and explore the meaning they give to the phenomena of urban inclusion and observe the process of inclusion in smart cities in depth (Patton, M.Q. and Cochran, M 2002). This approach is a systematic and rigorous study that can reduce error and bias. It is also helpful to identify explicit evidence of the problem, in this case, the existence of exclusion in cities and further challenging the emergent hypotheses of smart cities' contribution toward sustainability. Qualitative research is excellent for conducting cross-case assessments and analyses. It explains a particular study area, such as 'urban inclusion' in this thesis, by dissecting individual case information and offers a better clarification than other research methods.

To summarise the discussion, after careful consideration of multiple options, the rationale for the choice of a multiple-method qualitative research design for this study is due to- (i) focus on context and the specific issue of inclusion in smart cities and the occurrence of the phenomenon(of inclusion) in a natural setting, reflecting normal everyday life (ii) to capture data from the perspective of social actors and obtain a holistic view with rich descriptions,

given by individuals concerned with the study context, further used to examine the relations among various emerging aspects (iii) the flexibility of using multiple methods, first applying qualitative interview data, and secondary data (both qualitative and quantitative) from case studies, including documents, websites, concepts and brochures etc., including analysis of documents such as texts, images, or videos that provide insights into the cultural or social context of the phenomenon under study (iv) use reflexive, flexible and iterative reasoning, going back and forth between data collection, data analysis and understanding from the theory and literature review (v) opportunity to explore, reflect and interpret the gathered data to explain the how and why of the problem within the urban system dynamics and its complex interdependencies, which cannot be explained in a meaningful way by linear, cause and effect relationships or by a few discrete variables. The overarching research design adopted for this study is shown in Figure 12 Research design (Developed by Researcher).

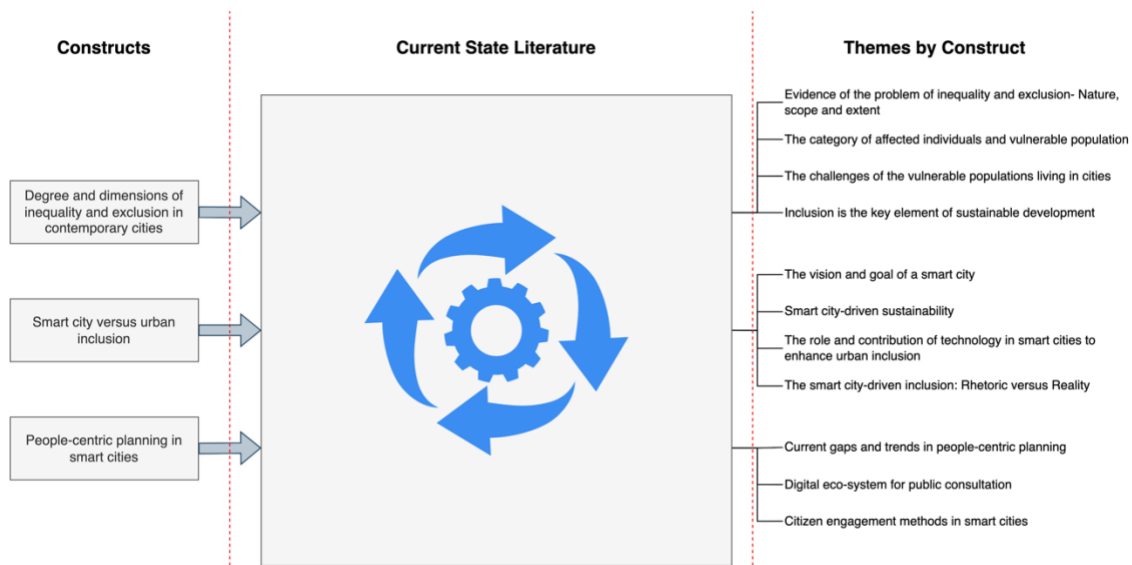
3.2.2 Research methods

The qualitative design of this study is based on two research methods completed in consecutive phases. The first phase employs thematic analysis of literature identifying relevant characteristic themes such as the degree and dimensions of inequality and exclusion in contemporary cities, the key challenges to achieving urban inclusion, and the scope and contribution of digital technologies and smart cities to enhance urban inclusion. Thematic analysis is considered a proven technique to settle disparities among experts and describe characteristic themes defined in literary content (Krippendorff 2018). Using thematic analysis, the relevant data sets are identified and analysed and then repeat patterns within a theme are reported (Braun and Clarke 2006). The advantage of thematic analysis is that it is flexible and not wed to any pre-existing theoretical framework. So it can be used within different theoretical frameworks and to do other things within them. It also allows much flexibility in interpreting the data and allows a straightforward approach to large data sets by sorting them into broad themes. The general themes are then used to develop a theoretical framework relevant to the focus of the study. The second phase applies three-country comparative case studies of London (UK), Bengaluru (India) and Kampala (Uganda), where primary data is gathered for spatial comparison and through which the thematic characteristics identified in the thematic analysis are validated and, if necessary, refined.

The theoretical framework and thematic analysis phase include collecting relevant data from widely available literature and knowledge resources and constructing relevant themes on the focus areas. The research methods used in this study include a review and analysis of pertinent literature on urban inclusion, urban sustainability, and smart city planning. The relevant data is collected from widely available literature and knowledge resources such as peer-reviewed research publications, multi-lateral agency policy instruments, public policy instruments of national and city governments, policy guidelines, smart city planning and project proposals, case studies and various city development models and frameworks, among others. In the policy landscape, the primary literature sources reviewed include international policy recommendations on smart cities from - UN-Habitat, World Bank, ADB, ISOCARP, ICLEI, UCLG, ASEAN, Africa Smart Cities, APEC, EU and private-sector documents, white papers and reports on smart city projects and other agency reports from the think tank, NGO on smart cities including relevant web resources.

This phase is aimed at understanding the nature and manifestation of the multi-dimensional and complex issue of urban exclusion and the needs and challenges for inclusion. It includes a detailed study of urban sustainability and smart governance, including understanding the relation and evidence of smart city versus sustainability and the contribution of digital technologies towards urban inclusion. The primary purpose of this phase is to understand the complexity of the challenge and assess the priority of urban inclusion in city governance and smart city development. Further identify the excluded individuals and groups often differentiated by gender, age, race, religion, class, and persons with disabilities, including migrants and refugees. Furthermore, understand the inclusive development models in smart city theory, principles, and projects to explore the challenges, best practices, technology infrastructure and use cases, if any, from global smart city models. Figure 10 below summarises the thematic analysis approach for inferring themes in the current state literature by analysing the literature texts through the three primary constructs as indicated:

Figure 10 Thematic analysis approach (Adapted from Williams, S., 2020)



The next phase involves qualitative research involving three exploratory case study research featuring city-level initiatives and challenges as critical investigations, followed by inputs from global thematic experts. The case study-based qualitative methods are justified to explore complexities beyond controlled approaches, mainly when normal experiments are not feasible, and little knowledge is available (Gillham, B 2000). This method is expected to give an outcome rather than the significance of the work and is helpful to view the case from the inside out.

Further, it is often argued that one of the most common disadvantages of case studies is the generalisation of findings from a small number of case studies to a larger group (Marrelli, A.F 2007). However, it is argued that multiple case studies allow analogous logic to produce literal or theoretical data replication (Yin, R.K 2009). If the case studies make literal replication of the literature review’s thematic analysis results, there is compelling support for the thematic construct (theoretical framework) found in the existing literature. However, if the case studies produce a theoretical or contradicting replication of the thematic construct, the thematic construct should be reconsidered. The following paragraphs deal with the detailed analysis of case study research, selection and design.

Case study research and Comparative case studies

The five primary qualitative research methods include ethnography, case study, phenomenological study, narratives/biography, and grounded theory study (Creswell, J.W. and Poth, C.N 2016). The data used for qualitative research is usually collected through interviews and focus groups via structured, semi-structured or unstructured topic questions (Saunders et al., 2016). Case study research is deemed suitable when the proposed research addresses a contemporary phenomenon that the researcher has no control over; the analysis is mainly exploratory; and addresses the "how" and "why" questions (Benbasat et al., 1987; Darke et al., 1998; Yin 1994). It is one of the primary methods for data collection, including interviews, observations, archival records or documents, physical artefacts, and audio-visual material. And the structure of a case study is recommended to be the problem, the context, the issues, and the lessons learned (Creswell, J.W. and Poth, C.N 2016). Furthermore, it is stated to be well suited when the contextual conditions are relevant to the phenomenon of the inquiry (Yin 1994). In the case of smart city implementation, where context cannot be distinguishable from the smart city phenomenon, the case study approach is well suited to this study.

The purpose of case study-based intensive studies is to get to the extent possible the complete picture of a phenomenon, event, or situation and to understand the interaction between a specific context and a phenomenon (Jacobsen 2002). The case study method adopted in this research is considered an intensive and in-depth study of a few units with multiple variables (Krusenvik, L 2016). It is often argued that case studies have more potential to achieve higher conceptual validity and new hypotheses and can closely examine the unique causal mechanisms with the capacity for addressing causal complexity (George and Bennett 2005). Lastly, it is argued that the case study method has an advantage as it is grounded, applicable to real-life events and contemporary human situations, and provides in-depth relevant data. It presents a simple and lucid understanding of complex real-life situations and relates directly to the ordinary reader's everyday experience; finally, it presents contextual-based detailed results that help create new theories and strengthen previous research (Linnea Krusenvik 2016).

According to Shakir (2002), a multiple-case study approach is believed to be more appropriate for the study of cases involving information systems implementations, such as the present context of smart city implementations. Within the case study research, the multiple case study

approach increases methodological rigour and strengthens the results' precision and validity, including the findings' stability (Miles and Huberman 1994). The comparative case studies approach covers two or more cases to produce generalisable knowledge about casual questions such as how and why particular programs or policies work or fail (Goodrick 2014). This approach is undertaken to explain how features within a context influence success of a program or policy initiative, which further serves as valuable information to design tailor-made interventions to achieve an intended outcome.

Within case study research, comparative case studies allow us to understand and compare the change process across or within nations by studying the working of institutions and organisations and the practice and policy implementation process, among others (Kenneth 2001). It involves analysing and synthesising similarities and understanding differences and patterns across cases with a common focus or goal, as in this case, the inclusion of vulnerable populations in smart city planning. This is an interpretative approach to gain insight and understand the complex process and meaning of social phenomena, understand concepts and theories, unpack the meaning and generate new ideas (Ritchie Lewis and Elam 2006).

It is argued that the comparative case studies approach takes both human and non-human actors and explores the historical and contemporary processes that have produced a sense of shared purpose, place or identity regarding the central phenomenon (Bartlett and Vavrus 2017). It drives radical rethinking of context and the physical settings of people's actions and aims to understand and influence the perspective of social actors in the study. This approach encourages three axes of comparison: the horizontal comparison of similar policies or a phenomenon that unfold in locations and are connected or socially produced; the vertical comparison, that traces phenomena across scales; and the transversal comparison that traces phenomena and cases across time (Bartlett and Vavrus 2017).

Comparative case studies are usually undertaken over time and emphasise comparison within and across contexts. They cover two or more cases in a way that produces more generalisable knowledge about causal questions – how and why particular programmes or policies work or fail to work. Therefore, this research adopts a comparative case study approach. In the specific context of this research, involving exploring the interplay between smart cities and urban

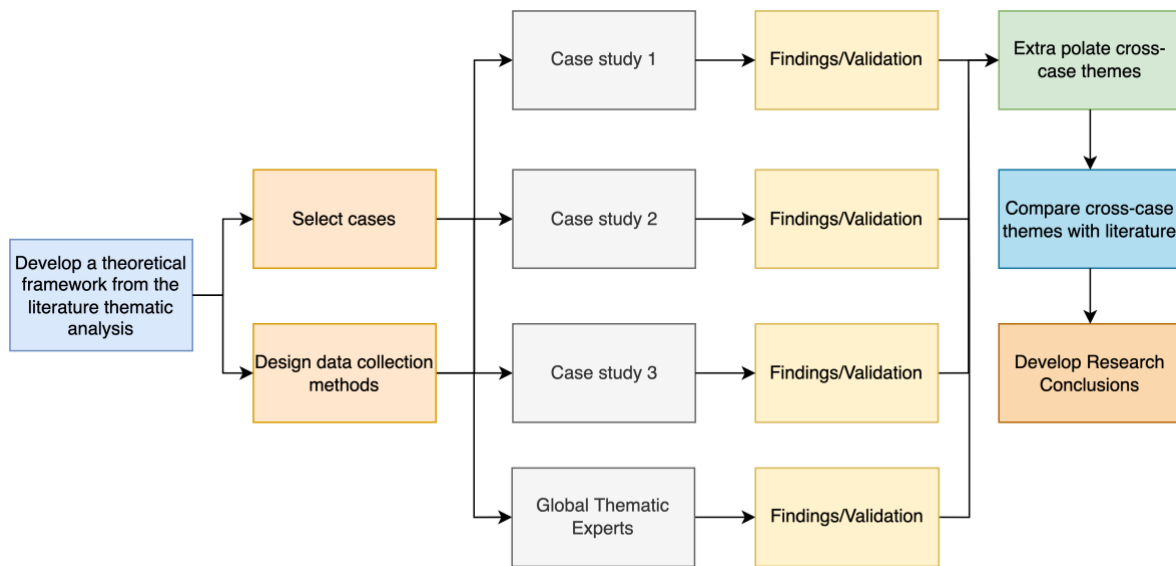
inclusion, it is stated that the comparative case studies as a design option are most suitable under the circumstances such as: when ‘how’ and ‘why’ questions are posed about the processes or outcomes of an intervention; when multiple interventions are being implemented across various contexts with no opportunity for manipulation; there is an opportunity for analysis over the time frame; when the understanding of the context is considered more important in understanding the success or failure of the intervention; and when experimental or quasi-experimental designs are not feasible for practical or ethical reasons (Goodrick 2014).

Overall, comparative case study research can provide a rich, detailed, and contextually embedded understanding of a phenomenon, which can be valuable in exploring complex and multifaceted issues like inclusion in a smart city setting. In addition, the approach can have several advantages, including in-depth exploration of multiple cases, which can provide a comprehensive understanding of the phenomenon under study; exploring multiple cases, comparative case study research can contextualize the phenomenon under study within different settings, which can provide insights into the influence of context on the phenomenon; contribute to theory building by identifying patterns, similarities, and differences across cases that can inform the development of theoretical frameworks; although comparative case study research does not aim to generalize findings to a larger population, it can provide insights into the range of variation within a phenomenon, which can inform future research and theory development; and by using multiple cases and data sources, comparative case study research can enhance the credibility and trustworthiness of the findings through methodological triangulation.

Case study selection and design

In this study, to analyse the universal and complex problem of urban exclusion and situate and construct diversity in primary data and to further substantiate the findings with a global perspective, additional inputs are obtained from 26 global thematic experts from different parts of the world as expert interviews are considered to be widely used qualitative interview methods used for gaining information about or exploring a specific field of action (Döringer, S 2021). The thematic expert interview aims to discover exclusive insights into expert knowledge and information (Mey, G. and Mruck, K 2014). Figure 11 below shows the multiple case study research design logic.

Figure 11 Multiple case study research design (Adapted from Williams, S 2020)



It is stated that the selection of a case is the most crucial part of research and should depend upon the research problem (Starman, A.B 2013). Nine different techniques are identified for selecting cases: diverse, typically extreme, influential, deviant, other, most similar, pathway, and most crucial (Gerring 2008). According to Yin, R.K (1994), to provide the context for judging the sample, the selection and evaluation of a case or case need to be justified and thoroughly documented. To increase the quality of research design, particularly in multiple-case designs, it is recommended that the selection of cases needs to be driven by the two issues of appropriateness and adequacy (Kuzel, D. et al., 1999).

Some authors argue that a case should not be selected based on a representative sample but because it is striking, interesting and unusual and likely to enrich the research objectives by causing changes in the specificities and characteristics (Thomas 2011; Yin 2009). Sometimes the case is selected based on the problem of study and the availability of diverse information (Mesec 1998). While there is criticism of the selection of a case based on the prior knowledge of the researcher leading to favouritism toward specific hypotheses (George and Bennett 2005); however, it is also argued that the selection of a case based on prior knowledge of the researcher leads to a better research plan (Starman, A.B 2013). It is stated that cases with prior knowledge will enable a solid theoretical basis making the procedure of theory testing more rigorous (Starman, A.B 2013).

It is argued that the selection of a case study should not be a haphazard activity (Yin, R.K 1994). Where the single case selection strategy includes critical (testing well-formulated theory), extreme or unique (rare cases), revelatory (inaccessible to scientific investigation), and prelude (exploratory). The multiple-case selection strategy includes-literal replications (three to four cases selected to predict similar results and oppose rival theories) and theoretical replication (three to four cases selected to predict contrasting results and to pursue a few common patterns). Another most adopted case selection method is purposeful sampling, where related phenomenon information-rich cases are identified (Patton, M.Q 1990). In this method, there are sixteen purposeful sampling strategies as detailed in Table 7 below:

Table 7 Description of purposeful sampling strategies for case selection (Source: Author)

Purposeful sampling strategy	Description
Extreme case	Demonstrates unusual manifestation of phenomenon like outstanding success or failure
Intensity case	Information-rich but not extreme
Maximum variation	Has diverse variations but show common patterns
Homogeneous	Minimum variation between cases
Typical case	Typical, normal or average
Stratified purposeful case	Exhibits characteristics of a particular subgroup that can be compared and not for generalisation or representation
Critical case	Permits logical generalisation to other cases- as it is true for this one case it is true for all other cases
Snowball case	Known people, known cases and offer rich information
Criterion	Meet predetermined criterion
Combination	Flexible meet different interests and needs
Opportunistic	Emerge from leads during field work
Theoretical	Emerge from manifestation of theoretical construct
Random purposeful	Selected from large sample for increasing credibility not for generalisation or representation
Politically important case	Politically sensitive
Confirming and disconfirming	Initial analysis to seek exceptions and test variations
Convenience	Basis of minimum effort, time and money

The case selection strategy may include a comparison and a combination of these suggested sixteen strategies. In this study, the cases of London (UK), Bengaluru (India) and Kampala (Uganda) are selected based on multiple factors. For example, the combination of leading smart cities like London and emerging smart cities like Bengaluru and Kampala gives an in-depth understanding and holistic perspective on the priority of urban inclusion in smart cities at different maturity levels. Three continent comparison offers insights into the spatial comparisons and the institutional and procedural gaps in smart cities vis-à-vis sustainable urban development (from an 'inclusion' perspective) across different global regions.

On the other side, all three case studies are similar in terms of adopting identical political and administration set-up, including the same British urban planning system, but in contrast, representing developed and developing economies categorised as high-income countries (UK), lower-middle-income countries (India) and low-income country (Uganda) according to World Bank (2021-2022). Where the different priorities and local contexts influence the public policy and government systems explaining the challenges across multiple geographies and varied communities, finally the idea is to understand the linkage and relationship between the smart city components and urban inclusivity and investigate how digital technologies have and can contribute to equity and inclusion of vulnerable population in various societies and different cultural settings. Lastly, the three comparative cases allow us to investigate and suggest the process of change in urban inclusion and the working of smart city institutions and organisations, the practice and policy implementation process as the desired outcome of this research (Kenneth 2001).

These case studies are relevant to this research as they present the right environment in terms of numerous smart applications and digital innovations, which form the crux of smart city planning and development and bring the proper context for this research. Further, the qualitative research methods will focus on understanding the ground-level requirements of urban inclusion and the day-to-day challenges of the affected people who are vulnerable and marginalised. To sum up, the multiple case selection method adopted in this study includes a combination of nearly ten strategies, as shown in Table 8 below:

Table 8 Multiple case selection strategies adopted for this study (Source: Author)

Case study selection strategy	Description
Diverse	Developed and developing countries from three different continents (high-income country (UK), lower-middle-income country (India) and low-income country (Uganda))
Influential	London is considered one of the leading smart cities of the world and Bengaluru is the IT capital of India
Most similar	Democracy and the British urban planning system
Existence of the problem of the study	Challenges of urban inclusion and sustainable development
Prior knowledge	Researcher lived and worked in Bengaluru and London
Information rich	All three smart cities provide sufficient information in public domain
Criterion	Meet predetermined criteria of smart city vision and planning with reasonable years of project implementation
Random purposeful	Selected from large sample for increasing credibility not for generalisation or representation

Politically important	Fast urbanising countries and regional leaders in the smart city approach with stable governments and strong economies
Convenience	Prior knowledge of the researcher and study with minimum effort, time and money

As discussed in pre-paras, the comparative case study design is found suitable for this study due to the following circumstances:

'How' and 'why' questions are being posed about the processes or outcomes of smart cities vis-à-vis urban inclusion.

One or more interventions are implemented against multiple contexts, and there is very little opportunity to control or manipulate the intervention.

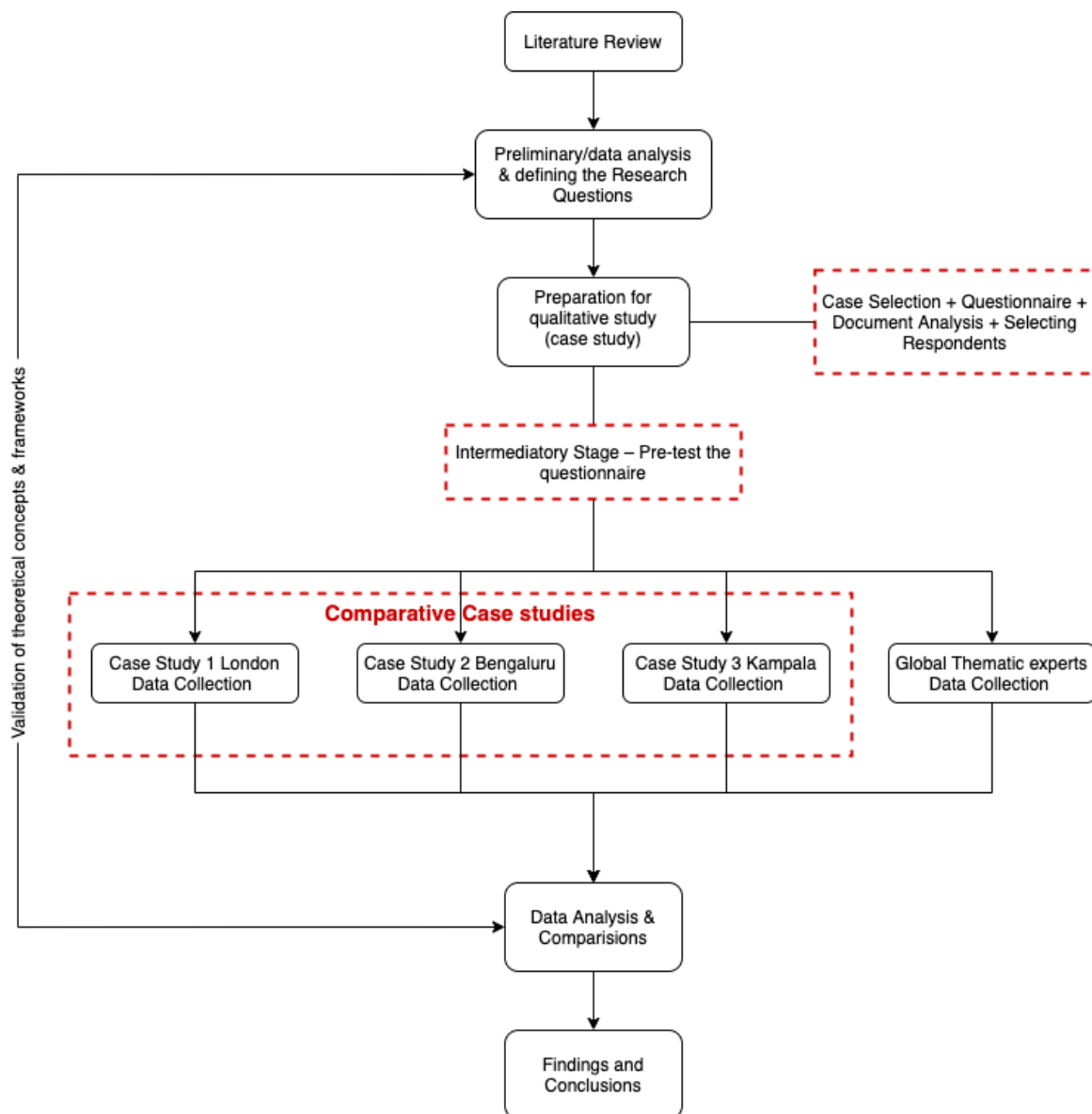
There is an opportunity for iterative data collection and analysis over the time frame of the smart city intervention.

An understanding of the context is more important than understanding the success or failure of the intervention.

When experimental and/or quasi-experimental designs are unfeasible for practical or ethical reasons or to supplement evidence from such evaluation designs.

As inferred, the research approach, methods, and design are considered after a detailed literature analysis and framing of the research aim, objectives, and questions. The proposed research design considered suitable for this study is shown in Figure 12 below:

Figure 12 Research design (Developed by Researcher)



3.3 Data collection and data analysis

Data collection is collecting information from all the relevant sources and then analysing the same to find answers to the research questions (Muhammad, S. and Kabir, S 2016). The secondary data is collected from a literature review and includes multiple sources such as published books, research articles, records, published census and statistical data, data archives, and databases. The primary data, considered more authentic, objective, reliable and not yet published, is collected through different sources such as experiments, surveys, questionnaires, interviews and observations (Muhammad, S. and Kabir, S 2016).

The literature review, which is the initial data collection method, has two approaches: the dedicated approach and the recursive approach. In the dedicated approach, the literature findings are written in a single chapter or series of chapters in one place. In contrast, in the recursive approach, the literature appears in different sections throughout the thesis (Ridley 2012). The two most common types of methods include the traditional narrative literature review, which provides a broad overview of the research topic with no clear methodological approach and the literature being researched from the relevant databases that are generally very selective in the material used. The systematic literature review undertakes a more rigorous process to review the literature with a detailed and comprehensive search strategy. It is often used to answer highly structured and specific research questions (Grant, M.J. and Booth, A 2009). In this research, a dedicated and systematic literature review is adopted. And once the literature review is conducted, a conceptual model is developed, and key themes are identified to address the research gaps identified in the literature review.

In terms of primary data, comparative case studies use qualitative and quantitative data, including data from project documentation, performance measures, surveys, interviews and observation. The qualitative primary data collection techniques in the case study include multiple data collection methods from various sources, including interviews, questionnaires, observations (direct and participant), and relevant documents (Yin 2009). There are three types of interview methods -structured, unstructured, and semi-structured (Pollock, T 2019). In structured interview methods, the questions are pre-planned and created in advance, and all participants are asked the same questions in the same order. In unstructured interviews, the questions are spontaneous, free-flowing, and not prepared in advance, and different participants are asked different questions. The semi-structured interview combines the structured and unstructured interview styles, where the interviewer asks a few predetermined questions and questions that are unplanned (Pollock, T 2019).

The semi-structured interviews are open and flexible as new ideas can be brought up during the interview depending on the interviewee's response (DeJonckheere, M. and Vaughn, L.M 2019). The advantages of a semi-structured interview include positive rapport between

interviewer and interviewee, detailed and in-depth discussion, and complex questions and issues that can be discussed and clarified (Adams, W.C 2015).

In this research, semi-structured interviews are used where a set of relevant open-ended questions are asked to the participants. The interview questionnaire was developed in two stages. A preliminary version was first developed for a pilot study based on literature survey findings, where five individuals took part in the pilot study. Then an improved version was created after changes and suggestions based on the pilot study outcomes. The detailed interview questionnaire is available in Appendix 1 and covers discussion on broad topics such in Figure 13 below:

Figure 13 Broad topics of semi-structured interview questionnaire (Source: Author)

The nature and challenges of urban exclusion/inclusion in contemporary cities

- Different forms of urban inclusion are - social inclusion, economic inclusion, physical inclusion & digital inclusion if any?
- Different categories of vulnerable and disadvantaged populations neglected from city planning/development - Elderly, People with Disabilities, Children, Women, Poor, Youth, Migrants/Refugees, Indigenous population, Religious minorities, Ethnic or caste groups, Lesbian/ Gay/ Bisexual and Transgender (LGBTI) community - who else?
- Problems/critical challenges faced by them? -Accessibility, Affordability, Opportunity, Participation and Liveability; what else?

The priority of inclusion of vulnerable and disadvantaged populations in smart city planning and development

- Does the smart city model reduce inequality and enhance inclusion in contemporary cities? If so, is inclusion a priority in smart cities?
- What is the role & interest of the private sector (tech companies) towards the inclusion of vulnerable and disadvantaged populations in smart city development? What are the challenges to motivating them?

The contribution of digital technologies in enhancing inclusion and equity of vulnerable and disadvantaged populations living in smart cities

- How can digital technologies play an essential role in the inclusion of vulnerable and disadvantaged populations living in cities? Examples (or) Does it foster exclusion?
- What challenges do you foresee in addressing the inclusion of vulnerable and disadvantaged populations using digital technologies?
- The methods of public consultation/engagement using digital technology-Esp... How are the needs and requirements of the vulnerable and disadvantaged population identified and gathered in a smart city?

The key terms and elements on which urban inclusion can be achieved using digital technologies

- What are the challenges /impediments in achieving people-centred inclusive city development? In addition to digital technologies, what other city governance/administration factors can contribute to effectively including vulnerable and disadvantaged populations?

The design/ specifications of a people-centric and inclusive smart city

- What is your definition of a people-centric and inclusive smart city? Can you suggest the key themes for the same- Like the Top three priorities?

Based on the theoretical framework of the literature survey and the interview questionnaire, the case study findings are further analysed and discussed according to the following broad themes and sub-themes, as outlined in Table 9 below:

Table 9 Themes for case study analysis and discussion of research results (Source: Author)

Thematic area	Key sub-themes
Nature of urban exclusion	<ul style="list-style-type: none"> ▪ The evidence of the problem of exclusion ▪ Forms of exclusion ▪ Category of the excluded population ▪ Challenges of the excluded population
Priority of inclusion of vulnerable population in smart city planning	<ul style="list-style-type: none"> ▪ The vision of smart city ▪ Priority of inclusion in smart cities ▪ Smart city projects to benefit the vulnerable population
Contribution of digital technologies in enhancing inclusion and equity of vulnerable population	<ul style="list-style-type: none"> ▪ Benefits /impact of using technology ▪ Digital technology’s role in the inclusion of vulnerable population ▪ Essential digital infrastructure
Key terms to achieve urban inclusion using digital technologies	<ul style="list-style-type: none"> ▪ Challenges and requirements of people-centred inclusive city development ▪ Public consultation methods
Design of people-centric and inclusive smart city	<ul style="list-style-type: none"> ▪ Citizen participation ▪ Strategy /governance/policy

The questionnaire has a participant information sheet at the beginning with details of ethics approval and privacy and confidentiality of the research study. Many participants are recruited through the social network LinkedIn platform and through professional references. The participant recruitment mail is available in Appendix 2. The virtual field study was done between January-March 2021, where 71 respondents participated from case study locations and other parts of the world. Due to the ensuing COVID-19 situation, the interviews were carried out using Zoom, MS Teams or Google Meet applications, and the average time of the interviews was about 30 minutes. The interview conversations were typed and saved.

In addition to semi-structured interviews, the other data sources (case study) accessed include secondary archival data from national and sub-national government reports, newspaper articles, public and private company websites, ICT applications and others. These additional data sources have helped allow data triangulation through constant comparison with the findings from the interviews.

Sample size and sampling strategy

It is recommended that a semi-structured and in-depth interview typically requires a minimum sample size of between 5 and 25 (Cresswell 2007). This study is planned to recruit 15 participants from each case study and 25 from different locations across the globe for 70 participants. However, in terms of the total number of participants, the approach taken in this study is to reach a point of saturation where after several interviews have been performed, it is

unlikely that conducting further interviews will reveal any new information (Glaser & Strauss 1967).

The major sampling strategies explored included: purposive sampling, known as judgmental; selective, or subjective sampling, which seeks elements that meet a specific criterion; snowball sampling-participants are recruited through participant referrals; quota sampling, which selects participants from within several different subgroups; and convenience sampling that gathers data from other participants as per convenience.

As this is a qualitative study to develop an in-depth exploration of a central phenomenon, purposeful sampling strategies are adopted where participants are included apart from experts. To the extent possible, the affected individuals are identified by different categories of people by gender, age, race, religion, class, and persons with disabilities, including migrants and refugees. This way, priority is given to participants who represent vulnerable sections or people who work for the rights and benefits of vulnerable sections, like organisations working for people with disabilities or a technology firm working in assisted technology solutions and products. The broad categories of participants come from backgrounds like citizens (including vulnerable and marginalised populations), public officials and persons from international organisations, and people from the private sector representing technology companies, Non-Governmental Organisations (NGOs), and research and academic bodies.

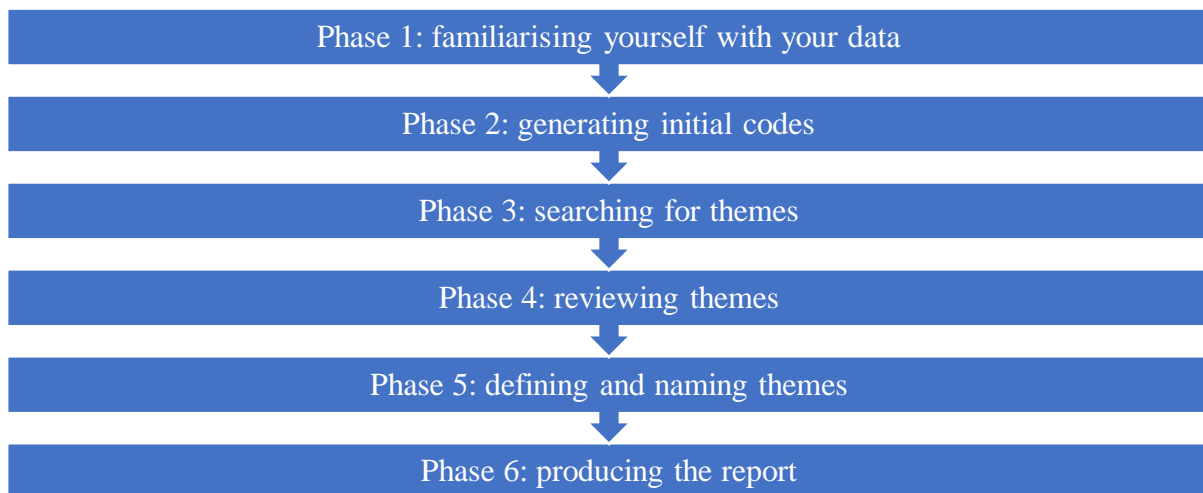
To increase the credibility and validity of qualitative research, this study adopted data triangulation by verifying facts from multiple data sources like varied document analyses and interviews with different people from various locations (Cho & Trent 2006).

Data analysis

In qualitative research, data analysis offers some explanation or interpretation by reducing and making sense of a large amount of information or data collected (Saunders et al., 2016). The typed interview transcripts are transcribed for further analysis. Braun & Clarke (2006) recommend anonymising and analysing the transcribed interviews using an inductive thematic analysis method. In the inductive thematic analysis method, the data has primacy, and the

theme is developed from the data rather than applied to it. This methodology allows for a detailed exploration of data and the identification of new themes and dimensions of the smart city, which could be explored in future studies. The overarching approach for data analysis for this study is the inductive thematic analysis method. As described by Braun and Clarke (2006), the thematic approach to qualitative data analysis applied in this study has the following six phases, as shown in Figure 14 below:

Figure 14 Phases of a thematic approach to qualitative data analysis (Source: Braun and Clarke 2006)



Qualitative data analysis is a complex process and demands clear thinking on the researcher's part (Bergin, M 2011). The latest version of the qualitative data analysis tool NVivo is used for analysis to provide evidence-based implications and ensure rigour in data analysis (Maher, C. et al., 2018; Zamawe, F.C 2015). To the extent possible, care is taken to capture the participant's context, the intensity and frequency of words and feedback, and multiple views of agreement and contradiction, emerging trends and themes are noted. The additional themes can be observed and generated with the required input on the existing model, which this research may not have identified.

3.4 Ethical Considerations

Adherence to ethical norms promotes the key aims of the research, such as knowledge, truth, mutual respect, trust, accountability, fairness and avoidance of error (Muhammad, S. and Kabir, S 2016). It is stated that any research involving human participants requires ethical clearance from the university's ethics committee (Hale and Napier 2013). The ethical approval

confirmation form received from HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA, University of Hertfordshire UK, before conducting the field study is included in Appendix 3: Ethics approval from University of Hertfordshire.

The prior consent of the participants to voluntarily participate in the research is a good practice (Hale and Napier 2013). They need to have enough information about the study before making an informed decision. In this research, a participant information section is provided at the beginning of the interview questionnaire, along with the details of ethics approval from the University. It is ensured that before the commencement of the interview process, all the participants gave oral consent. After getting consent, the participants were informed to participate voluntarily with an option to withdraw from the research at any time. There is also a mention if required to make a complaint to the principal supervisor of the study at the given email id.

Further, in accordance with the ethics approval notification, the protocol number and the name of the approving committee are included on all paperwork and communication, including participant recruitment and online requests, for this study. As proposed in the ethics approval form, all my participants are above 18 years of age, and their participation is purely voluntary, with their consent obtained at the beginning of the process.

3.5 Reliability and validity

The quality of the research is ensured through its reliability and validity (Hale and Napier 2013). To ensure reliability, the participants are asked the same questions based on five broad themes, which included: the nature and challenges of urban exclusion/inclusion in contemporary cities, the priority of inclusion of vulnerable and disadvantaged populations in smart city planning and development, the contribution of digital technologies in enhancing inclusion and equity of vulnerable and disadvantaged population living in smart cities; the key terms and elements on which urban inclusion can be achieved using digital technologies; and the design/ specifications of people-centric and inclusive smart city with slight variations in the sub-questions. The interview conversations are written and typed, then transcribed and further analysed using known qualitative analysis tools such as NVivo.

It is argued that reliability in qualitative research is affected by a small sample size of the participants, as their insight and feedback may not be applicable and generalised to the general population (Cypress, B.S 2017). However, the research attempts to improve reliability by incorporating a large sample size from three countries on three continents and with different cultures to compensate for the difference in perception, if any, and by including participants from both genders. Further, to analyse the universal and complex problem of urban exclusion, situate and construct diversity in primary data, and further substantiate the findings with a global perspective, additional inputs are obtained from 26 global thematic experts from different parts of the world.

To ensure the validity of this research, the maximum number of participants are included from the affected individuals identified by different categories of people by gender, age, race, religion, class, and persons with disabilities, including migrants and refugees. In this study, the participants are anonymised, and their details are hidden so they can speak their minds freely without any consequences.

3.6 Chapter Summary

This chapter explained the overall research framework and methodology used in this study. Considering the complexity of urban dynamics and issues of inequality and exclusions, this study is positioned within the broader context of qualitative research, emphasising three exploratory-based comparative case studies. This approach will give scope for comprehensive data collection to understand and assess complex phenomena such as urban inclusion. It also provides a holistic perspective on complex urban systems giving further scope for understanding the system dynamics, functioning of sub-systems and their interdependencies.

The overarching goal of this research is an analysis of generalisations rather than pure description or ambitious theory building; therefore, the comparative case study approach is chosen as the appropriate research for the investigation of the subject of this thesis. At the beginning of the study, a framework is developed for developing research objectives and research questions with vital, relevant themes based on the analysis of existing literature. To explore the interplay between smart city and urban inclusion, the comparative case study design

is particularly suitable for understanding the “how” and “why” of the process interventions and their outcome.

The proposed comparative case study approach will increase methodological rigour and strengthen the results' precision and validity, including the findings' stability. The thematic analysis of the literature survey and design logic for the comparative case study is explained in detail under the relevant sections, followed by selection criteria for the three cases. Further, to construct diversity in primary data and to further substantiate the case findings with a global perspective, additional inputs are obtained from 26 global thematic experts from different parts of the world.

This chapter then explained the data collection methods and justification in terms of a semi-structured interview, sample size selection and sample strategy, including the recruitment of participants. The virtual interview methods for primary data collection are discussed and dealt with in detail with justification due to the widely prevalent COVID-19 epidemic. The proposed data analysis method is an inductive thematic analysis where the themes are developed from the data rather than applied. Lastly, the chapter discusses this research's ethical considerations and reliability and validity.

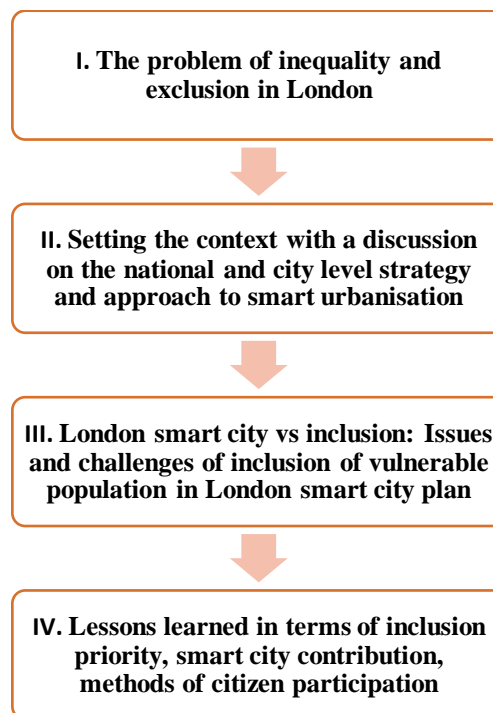
Chapter IV

4 The case study of Smart London

This chapter examines the challenges and priority of the inclusion of vulnerable populations in London's smart city planning. The city of London, the country's capital and the largest city in the UK, is one of the early adopters of technology for urban governance and planning. The Smart London plan was launched in 2013 and aimed to serve London and improve Londoners' lives by using the creative power of new technologies (Smart London Plan 2013). According to Juniper Research (Global Smart City Performance Index 2017), London is considered a leading smart city and is consistently ranked as one of the top smart cities in the world. The global recognition and long years of smart city project planning and implementation make London a well-suited case for this research study. It presents sufficient data and information regarding vision, policy planning and project documents for detailed understanding and further analysis in terms of outcome and contributions of the smart city approach towards inclusion. This case also describes a developed European country's matured and advanced smart city planning model.

The chapter begins by highlighting the problem of inequality and exclusion in London, then sets the context with a discussion on the national strategy and approach with a brief introduction to smart urbanisation in the UK. It then dwells on the specific case by discussing the issues and challenges of inequality and exclusion, the policy and project initiatives, the contribution of digital technologies, and methods of citizen participation in London's smart city, among others. The excluded categories of populations and their challenges in daily life are discussed, followed by a discussion on the priority of inclusion vis-à-vis smart city planning and, in more specific terms highlighting the contribution, gaps and challenges within the scope of smart city and use of digital tools. The case study approach is shown in Figure 15 below:

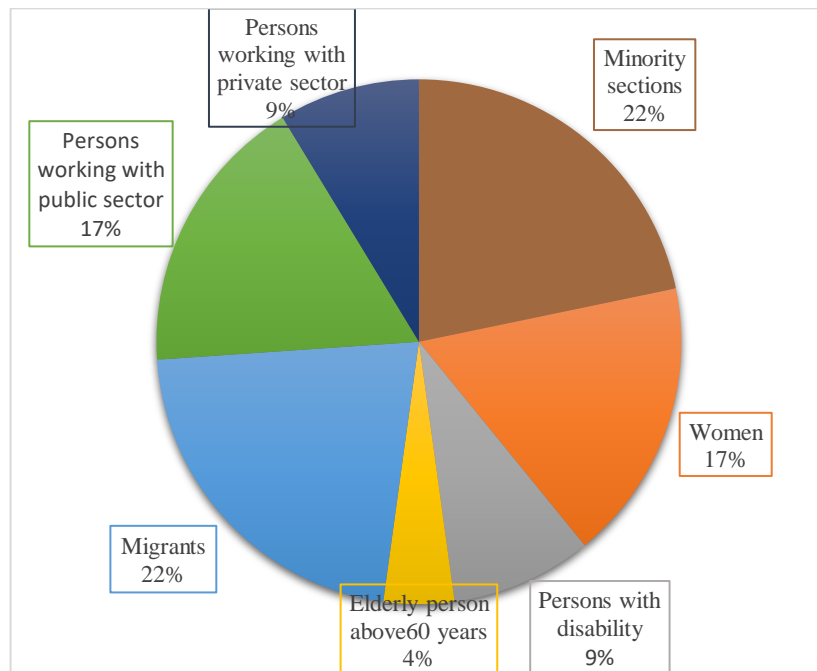
Figure 15 The case study approach for London (Source: Author)



The study includes a detailed document analysis of the case followed by a semi-structured problem-centred interview with nearly 17 residents in London who have some experts from related domains. Compared to the usual case study approach, where experts are typically identified as respondents, in this case study, a deliberate attempt is made to select respondents from all cross-sections and backgrounds since the study focuses on the inclusion of vulnerable populations and treating everyone equally. This approach, detailed in the methodology chapter, allows understanding of the challenges of exclusion directly from the affected persons and individuals.

The interview participants included five people from minority sections, four women, two persons with disabilities, one older person above 60 years, five migrants, four persons working with NGOs, two working with the public sector, and two working with the private sector. The respondents were found very suitable for this study as they were represented by important city agencies/organisations like Transport for London (TfL), Real estate developers, NGO for the disabled, NGO for children, NGO for women, NGO for public policy and social enterprise. The participant's profile is shown in Figure 16 below:

Figure 16 Profile of interviewees from London case study (Source: Author)



As discussed in the methodology chapter, the case study findings are further analysed and discussed according to the following five broad themes and 14 sub-themes:

Nature of urban exclusion

- The evidence of the problem of exclusion
- Forms of exclusion
- Category of the excluded population
- Challenges of the excluded population

Priority of inclusion of vulnerable population in smart city planning

- The national smart urbanisation strategy and the vision of smart city
- Priority of inclusion in smart cities
- Smart city projects to benefit the vulnerable population

Contribution of digital technologies in enhancing inclusion and equity of vulnerable population

- Benefits /impact of using technology
- Digital technology’s role in the inclusion of vulnerable population
- Essential digital infrastructure

Key terms to achieve urban inclusion using digital technologies

- Challenges and requirements of people-centred inclusive city development
- Public consultation

Design of people-centric and inclusive smart city

- Citizen participation
- Strategy /governance/policy

4.1 Inequality and exclusion in London

London is one of the most diverse cities in the United Kingdom (GLA 2013) and is the most visited city and cultural capital of the world, with more than 300 languages spoken within the

Greater London region (London Youth 2018). However, like many other cities, London suffers from inequality and exclusion ((Lupton, R 2011; DFID 2005). This section highlights the evidence and nature of inequality and exclusion in London.

4.1.1 Evidence of the problem

London is claimed to be England's most prosperous city, yet an unequal city with thousands of poor people (Trust for London 2021). According to GIDLEY D (2011), one in three London residents is born abroad, and nearly half of the UK's migrants live in London. London has been a significant destination for European migrants, including those from the 'A8' accession states who joined the enlarged European Union in 2004. Refugees and asylum seekers face several challenges as they live in the UK regarding language barriers, education and skill levels for employment, cultural issues and so on (UNHCR 2020).

4.1.2 Forms of exclusion in London

London exhibits multiple forms of exclusion across social, economic, political, spatial, cultural, digital and financial dimensions. Discrimination occurs in public institutions, including education and health services, the household, and the community (DFID 2005). For example, until 1965, racism and discrimination were not illegal in the UK. The Race Relations Act 1965 was the first legislation to address the prohibition of racial discrimination in the country (UK Parliament). Racist violence was most common until the 1970s and 1980s, and multiple protests were against police. According to the report of the Commission on Race and Ethnic Disparities (2021), it is claimed that outright racism still exists in the UK, whether it surfaces as violence in the street, graffiti on someone's business or prejudice in the labour market.

According to Home Office statistics, between 2012-2015, there were 106,000 racially motivated hate crimes per year on average. Hate crime in England and Wales is defined as *“any criminal offence perceived by the victim or any other person to be motivated by hostility or prejudice towards someone based on a personal characteristic”* (Home Office UK). There are five centrally monitored strands of hate crime: religion or beliefs, sexual orientation; race or ethnicity; transgender identity; and disability. Surprisingly, there is no reliable source of hate crime statistics in England and Wales. Sometimes it is argued that racial violence is underreported mainly to the police (The Institute of Race Relations (IRR) 2020). Over the years, the increase in police recorded hate crimes is partly attributed to greater awareness of reporting hate crimes and better recording methods used.

Poverty and inequality are worse in London than in the rest of the UK, and poverty remains one of the most significant social problems in the UK (Pantazis et al., 2005); in most cases, the poor are likely to be treated unequally and excluded (DFID 2005). Currently, 2.5 million people live in poverty in London, nearly 27 per cent of the total population (Trust for London 2021). The cost of living in London is 15-58 per cent higher than in the rest of the UK (Trust for London 2020). For example, in London, housing costs equal 56 per cent of one's net income as compared to 37 per cent in the rest of England, day by day, this is getting much worse, with housing becoming a significant driver of poverty.

According to Trust for London (2020), an independent charitable foundation, 56,000 households are living in temporary accommodation in London, which claims an increase of 30 per cent compared to five years ago. Similarly, there are considerable inequalities in wealth and shared opportunities in London. It is estimated that four out of ten Londoners do not meet what is deemed an acceptable standard of living. Those in the bottom half of the wealth distribution hold just 6.8 per cent of the capital's total wealth, compared to the top 10 per cent, which has 42.5 per cent (Trust for London 2020). The people living in poor neighbourhoods also experience other disadvantages such as weapons offences, income deprivation, material deprivation, lack of access to necessities, and many others (Mayor of London 2020).

According to Trust for London(2021), which is an independent charitable foundation, 27 per cent of city dwellers live below the poverty line due to high housing costs; there are 270,000 Londoners who were unemployed in 2016; there are 700,000 jobs in London which is close to 18 per cent who are paid below the London Living Wage; the vast majority of poor children live in social rented housing; in 2015/16, 39 per cent of pupils in Outer London and 40 per cent in Inner London did not attain General Certificate of Secondary Education (GCSE) levels. The household income inequality report for the year ending 2020 in the UK (ONS 2021) indicates that the gap between the rich and poor has widened over the past 10-year period, with the income share of the wealthiest 1 per cent increase from 7 per cent to 8.3 per cent.

The pandemic exacerbated existing health inequalities and increased the risk for vulnerable populations with less income, poor living conditions, temporary employment, and poor working conditions (Kenway, P. et al., 2020). In addition, people over 65 were much more at risk of dying due to COVID-19; ethnicity, gender and deprivation significantly impacted this risk for those under 65. Further, the spatial inequality is shown with more clustered boroughs in the east and north-east (Barking, Dagenham, Enfield) and the west (Hounslow, Ealing and

Brent) having a more severe impact of a pandemic than other parts of London (Mayor of London 2020).

Digital and financial exclusion is a colossal challenge in London. According to a 2020 report by Lloyd's bank, nine million people cannot use the Internet without help, and 3.8 million, or seven per cent of the population in the UK, are almost entirely offline. Overall, it estimates that 22 per cent of the UK population is digitally excluded in some way or other. This digital divide both mirrors and reinforces pre-existing social inequalities. It is stated that people in the lowest socio-economic groups, such as the homeless, benefits recipients, elderly and disabled, are three times more likely not to use the Internet and other digital services. This exclusion leads to isolation and financial impact, as people pay extra for goods and utilities while earning less. The report further mentions that the places in and around London, such as Croydon, Lewisham, Tower Hamlets and Hackney, have some of the country's highest rates of digital inequality. The Select Committee on Financial Exclusion, UK Parliament (2017) states that financial exclusion affects people living on low incomes or in poverty. Such populations include older people, unemployed youth, people with difficulty accessing banks and those lacking digital access and digital skills.

4.1.3 The category and challenges of the excluded population in London

The UK population is ageing rapidly, as the number of people aged 65 and over has grown by nearly half in the past 30 years (ONS 2018). There are 2.5 million people aged 50 or over, and 1.1 million aged over 65 are living in London, projected to increase by 86 per cent in the next thirty years (GLA 2018). Several elderly people are living in severe poverty. According to Pension Reforms and Old Age Inequalities in Europe (2018), thousands of older people are at risk in the UK due to low basic pension combined with means-tested supplements. Older people are more vulnerable to mental health problems (Mental Health Foundation 2016). They do not have proper access to healthcare, mobility, and essential services and are often exposed to violence, including isolation, due to a lack of community life and friendship (Clifton, J 2011).

London has 1.2 million disabled people, which accounts for nearly 14 per cent of the city population (Department for Work and Pensions, UK 2017). As stated in the London development policy, the mayor wants to create a more equal, integrated city that works for all Londoners (Mayor of London 2020). Disability is still considered a liability; for example, over the past decade, London's overall employment rate has increased, but the gap between the

employment rate for disabled people (51 per cent) and non-disabled people (79 per cent) remains relatively high (Mayor of London 2019). Life for the disabled is still tricky in London despite multiple mental and physical support systems, including financial support from the government (London Health UK). However, only people with disabilities and over 65 are currently entitled to living allowances, tax reductions, incapacity benefits and attendance allowances.

The London Crime Committee for violence against women and girls confirms the same as an issue for London (Mayor of London 2020). According to the Office for National Statistics (ONS), as of the year ending March 2020, nearly 4.9 million women had been victims of sexual assault, including 1.4 million who had been raped or had faced attempted rape. Tackling violence against women and girls (2018-2021) and making London a safer city for women and girls is identified as one of the priority strategies by the Mayor of London. The gender-based pay disparity is cited as one kind of exclusion by an interviewee. The gender pay gap, calculated as the difference between the average hourly earnings of men and women as a proportion, is measured across all jobs in the UK (Office for National Statistics, UK). According to Office for National Statistics, the gender pay gap across the UK in 2020 was 15.5 per cent and higher in the English region compared to Wales, Scotland, and Northern Ireland.

London is often seen as a young person's city as at present, over half of London is aged 35 and under (Mayor of London 2020) and almost a quarter of Londoners are reported to be under 25 years (London Youth 2018). A pop-up on every street corner, world-class universities, vibrant nightlife, and excellent creative districts all are built for the young. However, youth and children, particularly those from disadvantaged backgrounds, have difficulty accessing education and moving up in life (Trust for London 2021). They are discriminated against based on accent and level of education. It is claimed that children and young people in London suffer from poorer health outcomes than elsewhere in the country (Healthy London Partnership 2021). For young people aged 11-25, it is reported that the schools have improved, and results in London in recent years outstrip the rest of the country (London Youth 2018). However, the lives outside of schools for the successful transition of youth to adulthood are still not up to the mark regarding access to services, support, and opportunities to learn and have fun, including opportunities to participate in sports, arts, and community projects. Also, there is a need for specialised services for young people with specific needs, which is currently missing.

According to the 2015 London Poverty Profile, young people are twice unemployed as adults aged 25 years and over (Butcher and Dickens 2016). Young people also suffer disproportionately from low-paid and insecure work and suffer more benefit cuts than other demographic groups. It is argued that this frustration led to the foundation of 'Take Back the City', a youth organisation founded in March 2015 to remove the city from the super-rich and the corrupt politicians that serve them (Take Back the City 2016a). The People's Manifesto, published by this organisation in 2016, covered the future aspirations of minority groups such as young people, single parents, migrants, refugees and the homeless. It offered a crucial platform for crowdsourced inputs. As a result, over 1,000 Londoners expressed opinions covering core planning topics such as employment, housing and the environment, and social issues, including education policy and policing.

According to the Mayor of London (2017), over 1.1 million families with children live in London; many families do not have the support they need to thrive and make the most of the opportunities. It is estimated that over 40 per cent of all London children and over 50 per cent of inner London children live in poverty, and nearly one in three of London's children are growing up in persistent poverty (Mayor of London 2020). According to a Southwark Council survey (London Borough of Southwark), almost 18 per cent of pupils said they had been bullied quite often at school, 27 per cent of secondary level children claimed to be the victims of crime, 12 per cent spent more than 5 hours a day playing on their computers. The United Nations report (2007) on children's life in London claims that British children did not come out too well regarding their quality of life. There is a constant stream of accounts of violent attacks, knifings and shootings perpetrated by young people in our capital city.

It is estimated that more than 11,000 people sleep rough on the streets of London every year, interestingly, these people come from every walk of life, and many of them want to find a job (Streets of London 2021). It is reported that there are multiple reasons for homelessness, and the key among them are poor mental health, relationship breakdown, alcohol and substance addiction, redundancy, and domestic abuse. In the present circumstances, due to the economic effects of the pandemic combined with benefit cuts, shortage of affordable housing, and cuts in funding for homelessness services, the number of people sleeping rough has increased sharply. The LGBTI community in London face several hate crimes against them in London shared by one interviewee. The LGBTI community in the UK still faces shocking levels of discrimination and hate crimes (Stonewalls 2017; Allen 2017). A study based on YouGov

polling over 5000 LGBTI people reveals that anti-LGBTI abuse extends beyond the acts of hate and violence on the streets. Many LGBTI people still endure poor treatment, whether in their local school, shop, gym or place of worship or while using public services and moving out in public places.

In line with the documentary evidence, all interviewees shared that inequality and exclusion are big concerns in London and complex issues to address. One interviewee from a migrant category took an extreme view and said, “*Exclusion is deep-rooted in British society, and London is highly class-based with the population divided across residential localities, levels of education, type of schools they are educated from and so on*”. Five interviewees representing NGOs and a social enterprise stated that the COVID-19 pandemic had exposed the exclusion levels existing in London. Three interviewees, however, opined that London is much better when compared to other cities, and the city administration is struggling hard to enhance inclusion and equality among different sections of society.

In terms of challenges, the interviewees agreed that the excluded population in London experienced the challenge of accessibility, affordability, opportunity, participation, and liveability. All interviewees mentioned that elderly people were the most excluded population in city life. They do not have proper access to healthcare, mobility, and essential services and are often exposed to violence. To get first-hand information from affected groups, one respondent with a disability was interviewed who manages an NGO for people with disabilities. He stated that life for the disabled is callous in London. However, he said it is better than other cities, but still, a lot needs to be done. One of the main challenges he pointed out is the fragmented approach of city administration toward disability, which added to the problem of poverty and lack of sufficient funding. One of the main reasons he attributes this problem is “*Due to the lack of participation of disabled people in decision making and city governance*”.

To share a relevant example, a test of accessibility of UK high streets was conducted by British Paralympic wheelchair racer Hannah Cockcroft (2018), which revealed that millions of adults with disabilities could not carry out basic tasks on the London high streets. Among respondents, one parent of a child with a disability stated, “*Life for the disabled is a huge challenge in London*”, particularly from the standpoint of accessible public places and acquisition of education and essential skills for employment. Such accessibility issues discourage 6 in 10 disabled adults from visiting London shops. One woman interviewee mentioned that “*Women's safety is a big concern in London*”. Two interviewees claim that racist violence continues to

be a severe problem in London. Three interviewees noted that poverty reduction and ownership of assets is the key to inclusion. Most interviewed mentioned that homelessness continues to be a significant challenge for London boroughs.

Several interviewees have mentioned that there are not enough things for teenagers to do in London, and they often face several challenges in city life. Youth and children, particularly those from disadvantaged backgrounds, have difficulty accessing education and moving up in life. They are discriminated against based on accent and level of education. One interviewee mentioned, "*Knife crime is a piece of frequent news in London and often involves young age groups*". This further takes more prominence due to its linkage with drugs and alcohol, and cigarettes. Another interviewee shared that youth mental health care is a big problem in the city. "*Many young people suffer from depression or low self-esteem because of bullying at school or online. They are not receiving enough help from school or their parents, which leads to bigger problems like suicide or self-harm*". Meanwhile, one interviewee said, "*High living and housing costs, combined with a competitive job market, is excluding more and more youth from the city*".

As may be inferred, the document analysis followed by interviewees' responses indicates that certain sections of the population in London experience exclusion and inequality. The excluded population category broadly includes the elderly, people with disabilities, children, women, poor and homeless, youth, migrants and refugees, minorities, ethnic groups, and the LGBTI community. The different and most prominent forms of inequality and exclusion they face include social, economic, political, spatial, digital, and financial.

4.2 Priority of inclusion of vulnerable populations in smart city planning

In a multi-level governance structure, the national urbanisation strategy influences the city government plans. Hence to contextualise and position the study appropriately, this section first discusses the UK's national smart urbanisation strategy, followed by the vision of London's smart city plan.

4.2.1 Smart Urbanisation in the UK: The national strategy and approach

Over 80 per cent of the population in the United Kingdom (UK) lives in cities that are much more urban than the world average (Miller, J.D. and Hutchins, M 2017). The degree of urbanisation increased to 83.9 per cent in 2020, over a three-percentage point increase over the

past decade, as shown in Figure 17 below. The urban population in the UK is 56.39 million as shown in Figure 18 below. With the increasing urban population, the cities are overstressed and facing several challenges (Department for Business Innovation & Skills (BIS) 2013). Some notable challenges include pressure on urban infrastructure, unemployment; housing and transport; climate change; increased demand for online services; social care for the ageing population, pressure on public finances and local authority budgets, and challenges in alternate funding.

Figure 17 Degree of urbanisation in the UK from 2010 to 2020 (Source: World Bank © Statista 2021)

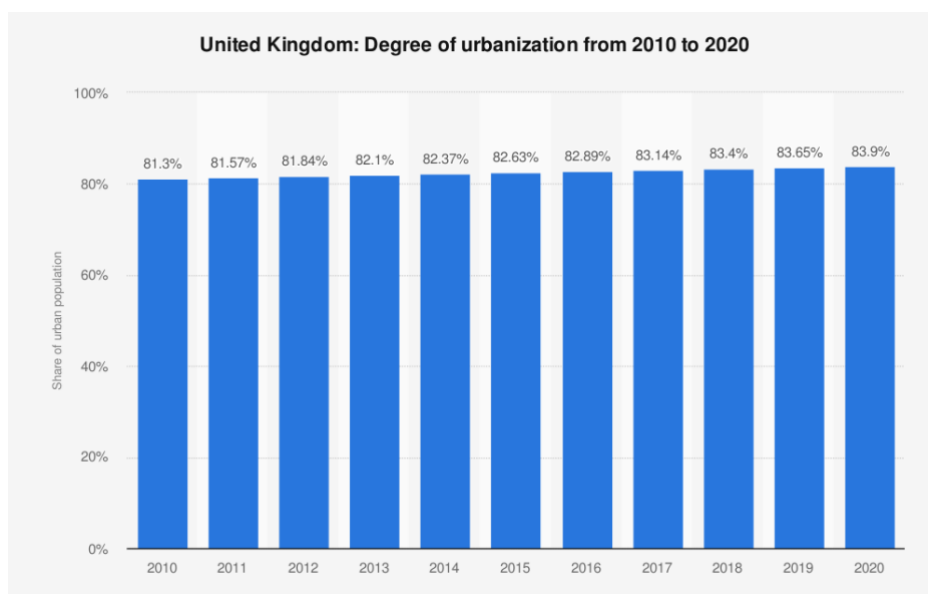
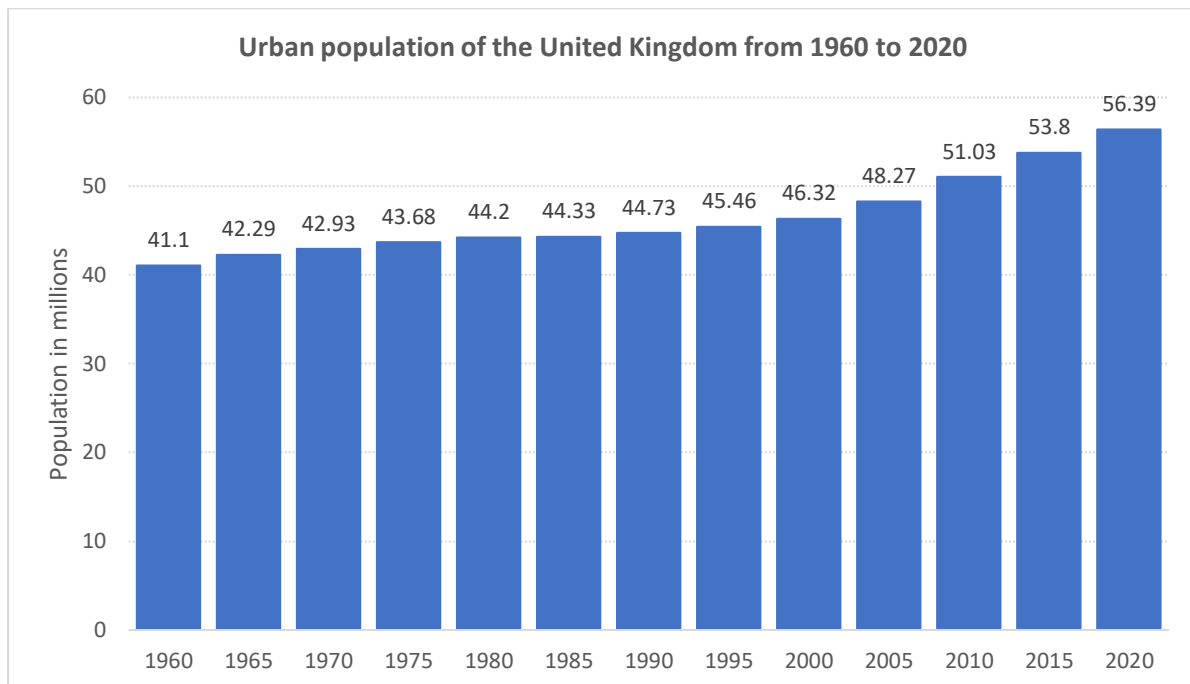


Figure 18 Urban population of the United Kingdom (Source: World Bank © Statista 2021)



The Department for Business Innovation & Skills (BIS 2013) further claims that due to these challenges, the cities are forced to rethink their strategies and explore different options like outsourcing services using outcome-based contracts; online service delivery; service integration (both back office and frontline services); releasing data to enable new services and make citizens take informed decisions like real-time traffic information and promoting independent living thus reducing demand on services, for example, community ageing with less external support. Against this backdrop, smart urbanisation has emerged as one of the alternate approaches to addressing urban challenges in the UK (BIS 2013).

According to the British Standards Institute (BSI 2014), a smart city integrates human, physical, and digital systems in the built environment to deliver an inclusive, prosperous and sustainable future for its citizens. Therefore, in terms of the national government agenda, the critical aspects of smarter approaches include modern digital infrastructure, open access to reusable data; intelligent physical infrastructure like IoT; citizen-centred service delivery; focus on new techniques and new business models; and increased transparency where borough wise city service dashboards enable citizens to compare and challenge among others.

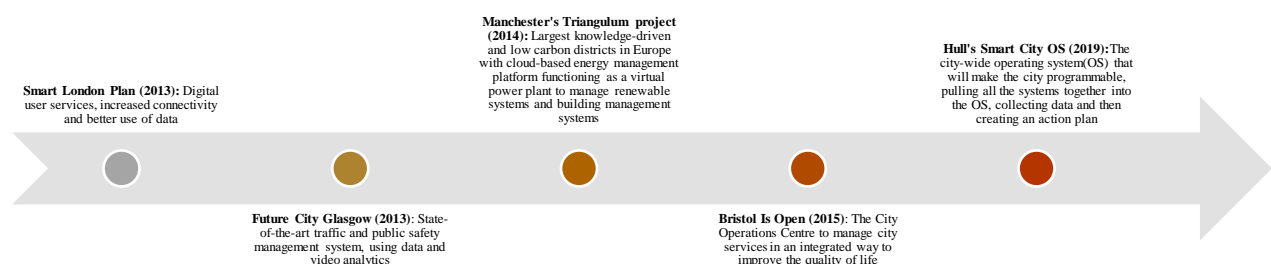
As inferred, the smart city model in the UK focused more on developing the city as an attractive business environment and enhancing citizens' quality of life in consultation with citizens (BIS

2013). The open data platform in London is the right example of this approach (Neirotti et al., 2014). In line with its strategy, the U.K.'s Department of Business Innovation & Skills (BIS-2013) grouped UK smart solutions into five categories: energy, transport, waste, water, and assisted living (Nohrová, Nada 2014). In terms of the smart city agenda, the role of the national government is focused on coordination- bringing different interest groups and stakeholders to establish new platforms for collaborations; funding- infrastructure and demonstrator projects; regulation - to ensure common standards and laws (Nohrová, Nada 2014).

The national government established the smart cities forum to bring all relevant stakeholders across academia, business and government. The government also launched Future Cities Catapult to coordinate the public and private sectors, help cities identify their challenges, and explore new technology solutions. The Future Cities Catapult and the Transport Systems Catapult were later combined in 2019 to form the Connected Places Catapult. According to its official website, this new autonomous agency aims to provide impartial service for public institutions, mobility and built environment businesses and infrastructure providers and catalyse step-change improvements in people's lives, work, and travel.

Some of the notable smart city projects in the UK are shown in Figure 19 below and include Smart London Plan (2013); Future City Glasgow (2013); Manchester's Triangulum project (2014); Bristol Is Open (2015), and Hull's Smart City OS (2019).

Figure 19 UK smart city projects trajectory (Source: APM, 2020)



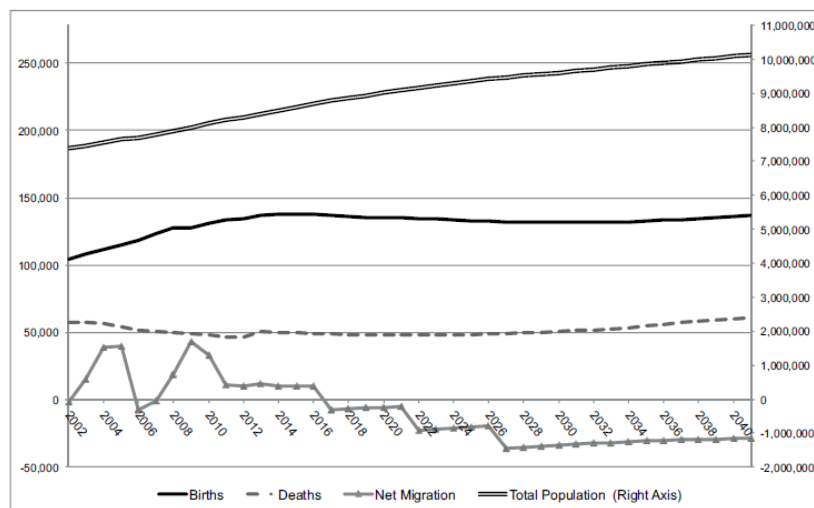
Despite big ambitions and expectations, the UK smart cities face several challenges in being slow and small-scale with funding from third-party special grants with no defined plans or business models to scale up (Nohrová, Nada 2014). According to The Department for Business Innovation & Skills (2013), the smart city plans in the UK are criticised for the involvement of multiple stakeholders with different visions and constrained demand from cities for smart

innovations due to a lack of budget. It is reported that the business models for smart cities are often underdeveloped, and there is the problem of one in five adults in the UK lacking basic digital skills, the low-income communities and older people have limited broadband access, and they do not have skills and confidence to use the Internet or online consultation. There is difficulty in collaborations across departments, a lack of control by cities over other essential services like bus service, gas, and electricity, and concerns about data privacy, security and value. The most critical challenge is the difficulties in citizens' participation and e-services and online consultations that create a risk of social and political exclusion of people from low-income communities.

4.2.2 The vision of the Smart London plan

London, the capital city of the United Kingdom, is a thriving global hub for business, education, culture, and international affairs. London is considered the technology capital of Europe because of the size of its business, the presence of Europe's billion-dollar unicorn companies and the level of investments (Mayor of London 2021). Unicorn is a term given to new startup companies with over a billion valuation. London's population has been growing since the 1990s and hit a new high of 8.9 million in 2018. By 2030, the London population is expected to touch almost 10 million, as shown in Figure 20 below: (Mayor of London 2020).

Figure 20 GLA London population projection 2002-2041 (Source: Greater London Authority, 2012)



The Greater London Authority (GLA), known colloquially as City Hall, is London's devolved regional governance body, with jurisdiction covering the city of London and the ceremonial

county of Greater London. The GLA is a strategic regional authority created to improve the coordination between the local authorities in Greater London, with the Mayor of London being a single person to represent it. The GLA has two political branches: the executive Mayoralty and the London Assembly, with 25-member to serve as checks and balances on the former. It has powers over economic development, transport, police, fire, and emergency planning (GLA 1999).

The GLA is responsible for administrating the 1579 square kilometres (610 square miles) of Greater London, where it shares local government powers with the councils of 32 London boroughs and the City of London Corporation, as shown in Figure 21 below. The division of London into boroughs dates from 1965. Today, the boroughs are the City of London, City of Westminster, Kensington and Chelsea, Hammersmith and Fulham, Wandsworth, Lambeth, Southwark, Tower Hamlets, Hackney, Islington, Camden, Brent, Ealing, Hounslow, Richmond, Kingston, Merton, Sutton, Croydon, Bromley, Lewisham, Greenwich, Bexley, Havering, Barking and Dagenham, Redbridge, Newham, Waltham Forest, Haringey, Enfield, Barnet, Harrow, Hillingdon.

Figure 21 Map of London Boroughs (Source: <https://www.local-government.org.uk/london.html>)

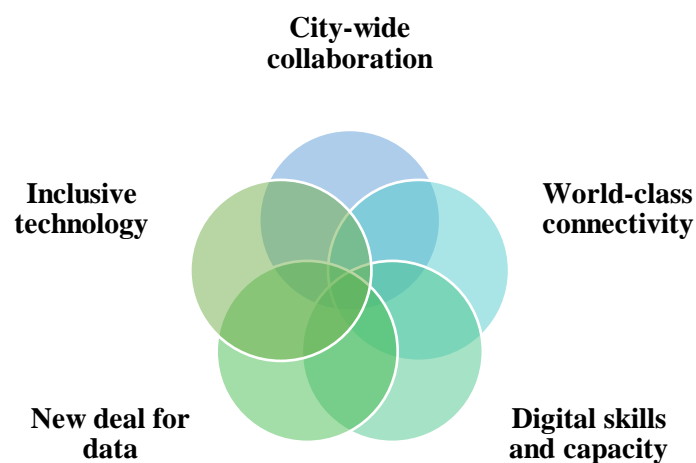


Smart London Plan was initiated in December 2013 and covered the GLA jurisdiction (Pozdniakova, A.M 2018; GLA 2013). Smart London proposes adopting technology and a new

form of collaboration between the Government, Londoners, business, and academia to address the city's challenges in an integrated and holistic manner. The same year Smart London Board was established at the apex level to shape and advise the city's digital strategy from experts and representatives from academics and entrepreneurs. The Mayor and the London Enterprise panel advise on how to use technology and data to enable integrated services to address the challenges of London and make it a more competitive and liveable city in the world. The Smart London plan covers all dimensions of life where innovations and technology solutions are at the core of the strategy.

The thrust areas of Smart London include city-wide collaboration, world-class connectivity, digital skills and capacity, a new deal for data, and inclusive technology are shown in Figure 22 below:

Figure 22 Thrust areas of Smart London (Source: Smart London Plan 2013)



The key features and measures of success of the Smart London plan are detailed in Table 10 below.

Table 10 Key features of Smart London Plan 2013(Source: Smart London Plan 2013)

Key features	Measures of success
1. Londoners at the core	<ul style="list-style-type: none"> ☞ Increase the number of Londoners who use digital technology to engage in London's policy making. ☞ Host hackathons to involve Londoners and businesses in solving the city's growth challenges. ☞ Deliver a pan-London digital inclusion strategy by end 2014. ☞ Double the number of technology apprenticeships by end 2016. ☞ 1,000 people per borough engaged through City Hall's online research community by 2016 (33,000 in total).
2. With access to open data	<ul style="list-style-type: none"> ☞ Creation and wide dissemination of compelling evidence-based stories to demonstrate the power of open data for Londoners and businesses. ☞ Increase the number of Londoners who use digital technology to access information about the city. ☞ Publication of the Mayor's Long Term Infrastructure Investment Plan, which includes plans for open data release, conforming to open standards by 2015. ☞ Evolve the London Datastore into a global exemplar platform by 2016. ☞ Double the number of users on the Datastore and Dashboard by 2018.
3.Leveraging London's research, technology & creative talent	<ul style="list-style-type: none"> ☞ Invest up to £24 million in the provision of affordable ultrafast broadband to SMEs and help up to 22,000 SMEs to gain access by 2016. ☞ Support at least 100 SMEs through a Smart London Export Programme by 2016. ☞ Support an employment increase to 200,000 technology employees by 2020. ☞ Support a continued increase in the number of businesses who are 'innovation active' (at least by 10% up to 2020).
4. Brought together through networks	<ul style="list-style-type: none"> ☞ Establish a Smart London Innovation Network by 2014. ☞ £200 million levered into London to demonstrate smart city approaches by 2018.
5. To enable London to adapt and grow	<ul style="list-style-type: none"> ☞ Make available the city's performance, consumption, and environmental data as open data (energy, water, waste, pollution). ☞ By 2016, develop a robust quantitative understanding of the contributions that smart technical solutions and associated services can make to the management of London's transport and environmental infrastructures. ☞ By 2020, stimulate smart grid services in London to restrict growth in peak electricity demand and associated infrastructure costs, with 10,000 MWh/annum of contracted supply and demand response. ☞ By 2020 showcase a robust 3-D map of all London's underground assets, accessible and updatable in real-time by all asset owners and works planners. ☞ By 2020 ensure London has the best air quality of any major world city, which will require significant (c. 50%) reduction in emissions from London's transport sector. ☞ Work towards a reduction of greenhouse gas emissions to reach 40% below 1990 levels by 2020.
6.And City Hall to better serve Londoners' needs	<ul style="list-style-type: none"> ☞ Increase data sharing between London government (City Hall and boroughs) and stakeholders. ☞ Conduct research to monetise the efficiencies that can be generated, and how service delivery can be improved. ☞ Support the continued increase in the number of SMEs winning public sector contracts or supply chain opportunities.
7.Offering a 'Smarter' London experience for all	<ul style="list-style-type: none"> ☞ Develop an index to benchmark global progress on digital money (at the city level) and establish a digital money demonstrator by end 2015. ☞ Ensure London has one of the fastest wireless networks globally by 2016. ☞ Increase in the number of Londoners who think the use of digital technology has improved London as a city to live in.

In 2016 the Smart London plan was further updated to make London the most incredible and liveable city on earth, offering its citizens a good quality of life (GLA 2016). It sets a vision of what Smart London should look like and deliver. The key features of Smart London are highlighted in Table 11 below:

Table 11 The key features of Smart London 2016 (Source: Smart London Plan 2016)

Smart London Key feature	Description
Londoners at the core (Participation of people)	<ul style="list-style-type: none"> ▪ Ask Londoners what a Smart London should look like ▪ Involve people in hackathons, technology apprenticeships, the online research community ▪ Position Smart London as a vehicle for inclusion ▪ Tackle digital exclusion and skills gap ▪ Mayors fund for London Tech city stars - to equip local young people with digital apprenticeship ▪ London's Tech City Institute to promote the creation of digital products and applications ▪ London's top tier universities to address the higher-level skills gap. ▪ Talk London – bring the community in policymaking through online discussions, live question and answers, events, surveys and focus groups across a range of topics.
Access to open data	Demonstrate the power of open data to Londoners and businesses, increase users accessing information about the city through London datastore
Use data to bring efficiency and scale to London's work management	To better serve Londoners increase data sharing between London government boroughs and other stakeholders
Leverage Londoners research, technology, and creative talent	Affordable broadband to SMEs, support SMEs with smart London export programme, support technology employment increase, support business innovation
Establish a smart London innovation network	To bring together experts from all over the world to work on how London and other cities can take a more integrated approach to the way they plan and function
World-class research innovations through industry partnerships	<ul style="list-style-type: none"> ▪ A Sustainable Cities Initiative by Siemens-The crystal ▪ Intel's Institute for Sustainable Connected Cities with Imperial College and UCL. ▪ Google new UK headquarters in King's Cross-ICT labs- knowledge and innovation community
London Transport System	Congestion charging using numberplate recognition (reduce the number of vehicles in central business district by over 70,000 per day), Intelligent Road Network Management systems, Barclay's cycle share scheme, Wi-Fi on a tube, contactless oyster card using digital money (credit/ debit cards) intently pay and travel and Real-Time Traffic management through CCTV network
Strategic decisions	<ul style="list-style-type: none"> ▪ Develop an index to benchmark global progress on digital money and establish digital money demonstration by 2015 ▪ Ensure London has the world fastest wireless network by 2016 ▪ By 2016 robust plan to use technological technical solutions to manage city transport and Infrastructure ▪ By 2020 manage energy and water through smart grid technologies ▪ By 2020 develop 3D visualisation and map underground assets, reduce unnecessarily, and rejected road works for utilities ▪ Use environmental data as open data to monitor energy, water, waste, pollution ▪ By 2020 ensure best air quality and reduce emissions from London transport by 50%. ▪ Reduce greenhouse gas emissions to 40% below 1990 levels one 2020 ▪ Conduct research to monetise the efficiencies for improved service delivers ▪ Support SMEs winning public sector contracts or supply chain opportunities ▪ Increase in the number of Londoners who think technology has improved life in the city
Innovative projects	<ul style="list-style-type: none"> ▪ Queen Elizabeth Olympic Park as a testbed for innovation

	<ul style="list-style-type: none"> ▪ London’s dashboard visualises the pulse of the capital by displaying tube delays, to have forces and crime rates ▪ The London data store makes available public data open and accessible spurring citizen engagement, innovation and development of new applications ▪ The Centre for advanced spectral analysis at UCL linked London's data to an iPad wall at City Hall – built around the concept of the control room – where the Mayor can visualise the capital's performance in real-time ▪ Team London: Micro - volunteering program to enhance employment prospects of young Londoners ▪ London school affairs - a comprehensive picture of London schools - attendance, demand etc ▪ Smart London innovation challenge ▪ London Green fund ▪ Technology to reduce vehicle collision with cyclists ▪ Care connect - connects NHS for non-clinical aspects ▪ TfL’s innovation portal ▪ The love clean London ▪ 1 million SFT digital quarter for London-to provide space for start-ups, education, and postgraduate research ▪ Legible London - wayfinding system interactive touchscreen panel with electronic map/printed map on reverse
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The Smart London plan was further updated in 2017/2018 through Smart Strategy (GLA 2017) to deliver a secure, interoperable, and open digital environment. The recommendations of Smart Strategy include:

using technology to create opportunities and address challenges with an aim to enhance the quality of life for residents, visitors, and employees;

to incentivise the growth of smart city economic sectors;

embed flexibility and agility in the infrastructure, built and natural environment to accommodate change;

explore and support the use of emerging transport modes and address congestion, enable mobility for all and support efficient freight movement and waste management;

establish an urban digital platform;

create Building Information Modelling (BIM) data for development and infrastructure proposals;

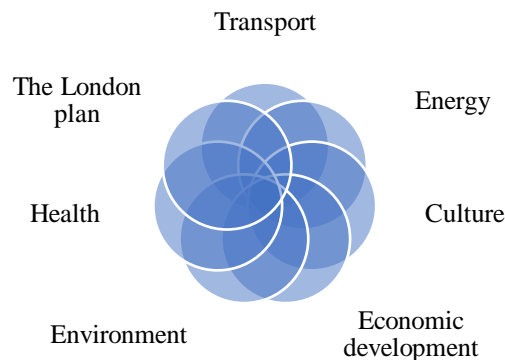
deliver integrated utility infrastructure through sensors to increase efficiencies and minimise disruptions;

improve and support the safety of people and the built environment and

use emerging construction techniques to support the deliver resilient low-carbon and energy-efficient buildings and spaces to address the challenge of pollution.

Again in 2018, the Mayor of London further updated the Smart London initiative with a renewed plan- Smarter London Together (GLA 2018). The Smarter London Together plan focuses on seven strategies: transport, energy, culture, economic development, the environment, health, and the London plan, as shown in Figure 23 below:

Figure 23 The strategic focus of the Smarter London Together plan 2018 (Source: Smarter London Together plan 2018)



The focus of this plan is to develop best practices and drive them as global models, for example, TfL- contactless payments; use of body-worn cameras by Met police; use of data to improve air quality and tackle fuel poverty others. London is currently showcased as a global testbed city for civic innovation, with the best ideas developed, amplified, and scaled. The plan also recommended the appointment of a Chief Digital Officer (CDO). The CDO will support the Mayor of London in the city's digital transformation by providing policy advice and digital expertise and seeking and sharing best practices across London Government and globally. The Smarter London Together has five missions, as shown in Table 12 below:

Table 12 The missions of Smarter London Together (Source: GLA 2018)

Mission	Description
Mission 1	<p>More user-designed services:</p> <ul style="list-style-type: none"> Users in the heart of what we do New approaches to digital inclusions to support London’s access to public services Launch Civic innovations challenge to spur innovations from the tech sector Explore new civic platforms to engage citizens and communities Promote more diversity in tech to address inequality
Mission 2	<p>Strike a new deal for city data:</p> <ul style="list-style-type: none"> Launch London Office for Data Analysis (LODA) to increase data showing collaboration Develop a city-wide cybersecurity strategy Strengthen data rights and accountability to build trust in how public data is used Support an open ecosystem to increase transparency and innovations
Mission 3	<p>World-class connectivity and smarter streets:</p> <ul style="list-style-type: none"> Launch new connected London programme to coordinate connectivity and 5G projects Full fibre to the home for all new developments Enhance public Wi-Fi in streets and public buildings Support new generation of smart infrastructure Promote common standards with smart tech to maximise benefits
Mission 4	<p>Enhance digital leadership and skills:</p> <ul style="list-style-type: none"> Develop workforce digital capability Enhance digital leadership to make public services more open to innovations Support computing skills and digital talent pipeline from early years Recognise the risk of cultural institutions engaging citizens in the digital world

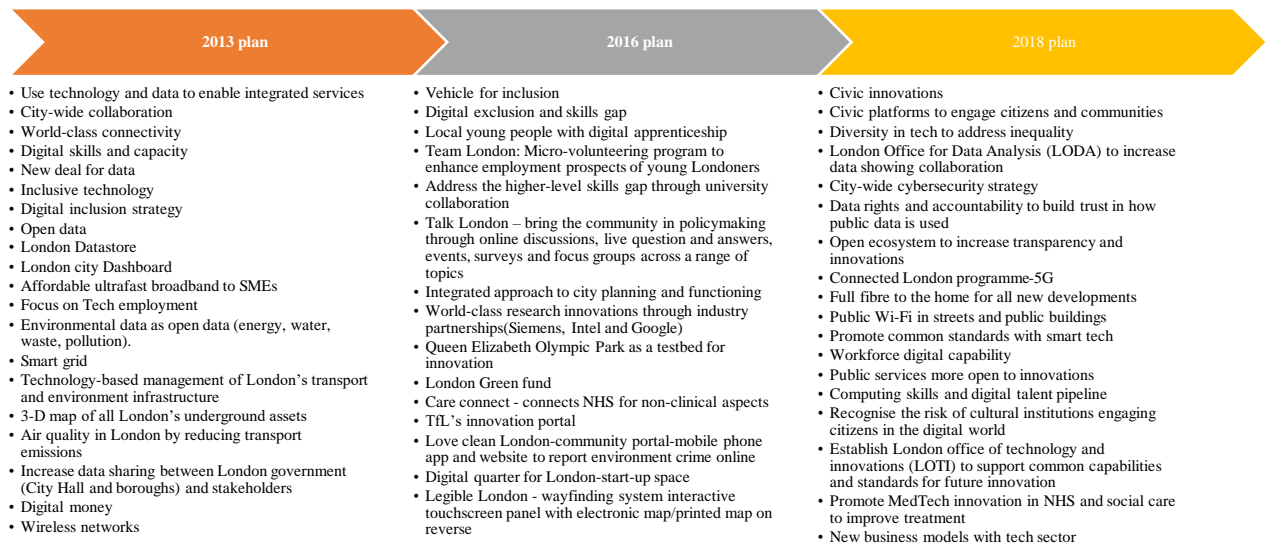
Mission 5	Improve city-wide collaborations: <ul style="list-style-type: none"> ▪ Establish London office of technology and innovations (LOTI) to support common capabilities and standards for future innovation ▪ Promote MedTech innovation in NHS and social care to improve treatment ▪ Explore new partnerships with the tech sector and business models ▪ Support between GLA group digital delivery to improve the effectiveness ▪ Collaborate with other city's in the UK and globally to adopt and share what works
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Smarter London Together is about scaling these initiatives up. It's being overseen by a Smart London Board, including representatives from Nesta, Future Cities Catapult, Accenture, and Transport for London. It's an immense programme, feeding into seven strategies incorporating energy, transport, culture, health, the environment, and economic development.

The Mayor of London published the New London Plan in 2021. The Spatial Development Strategy for Greater London sets out the overarching framework for how London will develop over the next 20-25 years (Mayor of London 2021). The New London Plan is a vast strategy covering everything from promoting economic to social development, and digital and technology are outlined as critical enablers to improving the lives of Londoners and for businesses to thrive. It is more comprehensive and in-depth and contains 100 policies covering 10 topic areas (Sam Wells and Sam Neal 2021). The fundamental guiding principle of this new plan is 'Good Growth', with economic and social inclusion and environmental sustainability. There are six cross-cutting policy objectives, including the use of land, strong and inclusive communities, creating a healthy city, delivering homes, London's economy and efficiency and resilience. The housing sector focuses on affordable homes with specific policies to build to rent, older person housing, and student housing – all supported in principle. Under good economic growth, the focus is on affordable workspace with digital infrastructure and connectivity; new commercial developments in Central Activity Zone (CAZ) further support town centre diversification.

The focus of the New London Plan is on sound design and optimisation of site capacity through design-led solutions. Under environment and sustainability, the goal is to make London a zero-carbon city by reducing all greenhouse gases, promoting energy efficiency, a circular economy, and introducing urban greening factor score for commercial developments and air Quality Neutral developments. Figure 24 below illustrates the phase-wise projects and programs of the Smart London plan starting from 2013 to 2018:

Figure 24 Phase-wise projects and programs of the Smart London plan- 2013 to 2018(Source: Author)



4.2.3 The inclusion focus and relevant projects in the Smart London plan

Londoners are claimed to be at the core of the Smart London plan, aiming to make London's most liveable city by offering its citizens a good quality of life (Smart London 2013). Interestingly, the smart city plan is considered a vehicle for inclusion, using digital technologies to meet diverse health, training, and social care needs. It discusses a pan-London approach to tackle digital exclusion and proposes to deliver a pan-London digital inclusion strategy by the end of 2014. Accordingly, the Digital Inclusion Strategy released in 2015 identifies the barriers people face in getting online and provides an overview of the multi-agency approach and related activities in this area (GLA 2015). It aims to increase the number of Londoners who use digital technology to access information about the city and the number of Londoners who think using digital technology has improved London as a city to live in.

The Smart London plan, updated in 2016, reemphasises the policy of ‘Londoners at the core’ and focuses on engagement with citizens through inclusive digital methods and enhanced digital skills for all (GLA 2016). In terms of future opportunities, the plan proposed increased citizen engagement in the product development and application of smart solutions by integrating more democratic processes into policy development and application. The Smarter London Together (2018), the next updated version of Smart London, further enhanced the focus on people where the first mission aimed at common design standards with the users at heart,

new approaches to digital inclusion for increased access to public services civic innovation challenge to spur innovation from the tech sector, new civic platforms to engage citizens and communities better and promotion of more diversity in tech to address inequality (GLA 2018). Table 13 below indicates the Smart London themes and sub-themes mapped to smart city themes and sub-themes from the literature survey in Chapter II. Further, the areas of intervention for technology application are identified from the plan document. This compilation helps us understand how a smart city contributes to sustainability in London and the focus on inclusion.

Table 13 Mapping of Smart London themes to smart city themes from the literature (Source: Author)

<i>Smart city themes/ sub-themes (from literature)</i>	<i>Smart London themes/ sub-themes</i>	<i>Smart London projects /initiatives (theme wise)</i>	<i>Areas of Intervention/Application of technology in Smart London</i>
<i>I. Improve the quality of life and well-being of citizens</i>			
Improve citizen welfare; Liveability; Cultural well-being; Societal benefit; Safety; Resilience; Human capital; Social development; Sustainable development; Good governance;	<ul style="list-style-type: none"> Leveraging London’s research, technology & creative talent Brought together through networks To enable London to adapt and grow City-wide collaboration With access to open data And City Hall to better serve Londoners’ needs Establish a smart London innovation network Recognise the risk of cultural institutions engaging citizens in the digital world More user-designed services Enhance digital leadership and skills/ Workforce digital capability Open ecosystem to increase transparency and innovations 	<ul style="list-style-type: none"> Care connect - connects NHS for non-clinical aspects Promote MedTech innovation in NHS and social care to improve treatment 	<ul style="list-style-type: none"> Healthcare
<i>II. Economic growth & employment opportunities</i>			
Prosperity; Economic development	<ul style="list-style-type: none"> Focus on Tech employment Digital money Address the higher-level skills gap through university collaboration World-class research innovations through industry partnerships (Siemens, Intel and Google) 	<ul style="list-style-type: none"> Queen Elizabeth Olympic Park as a testbed for innovation Digital quarter for London-start-up space Establish London office of technology and innovations (LOTI) to support common capabilities 	<ul style="list-style-type: none"> Business promotion Jobs /Employment Education/skills Electronic payments New industries/ Digital Innovation Entrepreneurship

	<ul style="list-style-type: none"> • Computing skills and digital talent pipeline • New business models with tech sector 	and standards for future innovation	
III. Smart urban governance			
Smart policies; Evidence based policy making; Service innovation; Collaborative Management; Intelligence; Political development; Institutional capacity; Behavioural change; Interconnections and collaboration; Mobility; Partnerships	<ul style="list-style-type: none"> • Use technology and data to enable integrated services • Integrated approach to city planning and functioning • Use data to bring efficiency and scale to London's work management • City-wide cybersecurity strategy • Data rights and accountability to build trust in how public data is used • Public services more open to innovations 	<ul style="list-style-type: none"> • London datastore • Increase data sharing between London government (City Hall and boroughs) and stakeholders • London city Dashboard • London Office for Data Analysis (LODA) to increase data showing collaboration 	<ul style="list-style-type: none"> • Decision making • Urban planning • Data/ Data exchange • Accountability • Transparency • Delivery of services • Integration • Resource optimisation • Open Government
IV. Climate change and environmental issues			
Environmental management; Low carbon economy; Sustainability	<ul style="list-style-type: none"> • Technology-based management of London's transport and environment infrastructure • Air quality in London by reducing transport emissions 	<ul style="list-style-type: none"> • Environmental data as open data (energy, water, waste, pollution). • London Green fund • Love clean London-community portal-mobile phone app and website to report environment crime online 	<ul style="list-style-type: none"> • Climate mitigation • Management of natural resources • Waste management • Pollution control • Clean energy/ Renewable energy • Community control
V. Infrastructure			
Built environment; Social infrastructure; Mobility; Technological infrastructure; ICT Networks; Energy	<ul style="list-style-type: none"> • World-class connectivity • New deal for data • Open data/ Access to open data • Promote common standards with smart tech • World-class connectivity and smarter streets 	<ul style="list-style-type: none"> • 3-D map of all London's underground assets • Smart grid • London Datastore • Wireless networks • TfL's innovation portal • Legible London - wayfinding system interactive touchscreen panel with electronic map/printed map on reverse • Connected London programme-5G • Full fibre to the home for all new developments • Public Wi-Fi in streets and public buildings 	<ul style="list-style-type: none"> • Smart homes & Buildings • Smart streets • Transport/Traffic management • Internet • Public Wi-Fi • Data • Smart grid • Integrated information network
VI. Inclusive development			
Social inclusion; Social cohesion; Community living; Social inequality; Open data; Urban openness;	<ul style="list-style-type: none"> • Londoners at the core/ Londoners at the core (Participation of people) 	<ul style="list-style-type: none"> • Digital skills and capacity / Focus on digital exclusion and skills gap/ Local 	<ul style="list-style-type: none"> • Digital inclusion • Participatory Planning • Universal access to Internet

<p>Affordability; Accessibility; Holistic approach; Citizen engagement; Information sharing; Participatory governance; Connected community</p>	<ul style="list-style-type: none"> • Offering a ‘Smarter’ London experience for all 	<p>young people with digital apprenticeship</p> <ul style="list-style-type: none"> • Inclusive technology • Digital inclusion strategy • Affordable ultrafast broadband to SMEs • Team London: Micro-volunteering program to enhance employment prospects of young Londoners • Talk London – bring the community in policymaking through online discussions, live question and answers, events, surveys and focus groups across a range of topics • Civic innovations • Civic platforms to engage citizens and communities • Diversity in tech to address inequality 	<ul style="list-style-type: none"> • Computer access and training for the community • Communication/ Citizen engagement platform • Co-creation
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 Smart London-2013
  Smart London-2016
  Smart London-2018

As inferred from the above, the Smart London plan has several initiatives for sustainable and inclusive development of London city. The Mayor’s strategy for equality, diversity and inclusion (2020) has six parts and includes - a great place to live; a great place for young people; a great place to work and do business; getting around; a safe, healthy and enjoyable city; and leading by example. It, therefore, suggests that inclusion is one of the main priorities of London's smart city planning. The New London Plan (2021) also recognises the importance of inclusive development. It, therefore, emphasises the need for inclusive communities and affordable housing for elderly people, including student houses and affordable workplaces.

However, many interviewees stated Smart London is not focusing on inclusion, particularly the vulnerable and disadvantaged populations like the elderly, people with disabilities, children, women, poor and homeless, youth, migrants and refugees, minorities, ethnic groups, and the LGBTI community. Whether a smart city benefits all segments of the population is still unknown. Almost all the interviewees stated that inclusion is not a priority in the Smart London plan. However, they agreed that a smart city plan is a huge change management process and can benefit all segments of the city population if designed and developed inclusively.

Many interviewees said that the missing element in smart city planning in London is widespread public consultation, particularly among vulnerable groups. The current planning approach of the smart city neglects public consultations, and hence the projects are not people-centric. Particularly, the vulnerable populations are marginalised and never consulted in the smart city development process. More than half of the interviewees stated that the current smart city projects are either regeneration-focused real estate projects or projects aiming to automate government services with heavy funding and participation of big multinational corporations. On the contrary, one interviewee said that London is one of the best smart cities. The inclusion approach is visible in TfL projects; for example, seamless one-card payment and free travel for 65+ elders after peak hours are good examples.

One interviewee who is a disabled person and runs an NGO for people with a disability said, *“the people with disability face exclusion in London smart city and are looked at as a cost, not as an asset. Further, they do not have the hardware, the fibre connection nor digital skills to participate meaningfully and enjoy full benefits of city services”*. Further said, *“the current approach to inclusion in London is highly fragmented and distributed. Rather it should be an integrated approach with collaboration and networking of all excluded populations”*.

Many interviewees suggested that inclusion is a complex phenomenon, and the government alone cannot solve it; instead, all the critical stakeholders like the government, the private sector, civil society and citizens need to come together and design integrated solutions with collective responsibility. However, the city government should take the lead and develop the right ecosystem in terms of policy, institutions, and systems. Three interviewees representing NGO for the disabled and a social enterprise gave a radical suggestion stating that for an inclusive society, the elite should take backstep and give a voice and opportunity to a vulnerable and disadvantaged population. They suggested that a few initiatives like smart identity cards, data privacy and security, transparency, equal pay for men and women, digital skills, universal access to services, and affordable education are required to make London more inclusive. The planning and architecture of a smart city should begin with a bottom-up approach and integrated system built on affordable and accessible technology with universal access.

All the interviewees stressed the need for more transparency and accountability in smart city projects as they are investment heavy. In most cases, many public funds are invested to benefit the elite, who form only the minority population of the city. They mentioned a need for a more democratic and participative approach right from the planning and initiation phase of the smart

city. One interviewee said, "*Lack of long-term view and lack of proper coordination and collaboration among various stakeholders is an issue for inclusion in London smart city*". Many interviewees have high expectations from the smart city and look at the range of benefits to all the people living in a city. Five interviewees said that a smart city brings in a lot of efficiency and convenience in service delivery. It may also lead to better collaboration between the government and citizens. Two interviewees, one of whom is a disabled person and the other parent of a disabled child, expressed hope in the smart city approach. They said, "*the smart city approach has given independent life for disabled people by improving city mobility in terms of direction maps, smartphone google apps and also increased the safety and security in accessing their neighbourhood*".

Many of the interviewees shared the opinion that who is the actual custodian and user of data in a smart city is very important for the participation of people. Government should own data, and the private sector and other user organisations can use it to develop a service. All interviewees stated that the digital divide was a big challenge for smart city projects. The groups not online include older people, disabled people and people in social housing. If this issue is not addressed correctly, the majority of the city population can be excluded. Everyone agreed that digital inclusion and equality should be the foundation behind smart city plans. Presently, the government is providing some digital learning sessions, but they are insufficient and not comprehensive in covering the required skills. There is an opportunity to involve civil societies and NGOs and increase the digital capabilities of vulnerable populations.

Several interviewees stated that digital transformation of city governance could not be left to the corporates and private sector as in the current situation; instead, the government should take the driver's seat and lead it, only inclusive development is possible. Corporates often design digital solutions to meet the requirements of a few people; for example, Zoom is an interactive tool but not very useful for children. Another challenge interviewees highlighted is the private sector's role, which is currently neglecting the untapped market opportunity for vulnerable populations. There is a wrong opinion that these populations cannot afford new technology and smart solutions. For example, there is a massive demand for assistive technologies for the elderly and disabled, which can be met with innovative digital solutions.

4.3 Contribution of digital technologies towards equity and inclusion in Smart London

As discussed in Chapter II digital technologies play critical role in sustainable development and inclusion. The previous section confirmed that Smart London initiatives have extensive use of digital technologies across multiple sectors.

4.3.1 The benefits of the use of digital technologies

All interviewees stated that technology is essential in the 21st century, and people are left behind without technical knowledge. Many believed that technology plays an important role and fosters inclusion, while others thought it is only a tool and, depending on its use, may or may not enhance inclusion. Some stated that if we are not careful with technology, it will drive inequality and the digital divide, which is more harmful. One interviewee said, "*technology has the capability, but intellectual capability and capital is a challenge*". Everyone highlighted the use and benefit of technology during the current COVID-19 pandemic. They agreed that technology was used to monitor and control the spread of the epidemic and connect with people and share helpful information.

Many stated that mobile phones are an excellent access tools and easy-to-use appliances serving multiple purposes such as sharing information, communication, market information, and banking-related tasks.




4.3.2 Digital technology's role in the inclusion of vulnerable population

Smart London has several technology interventions aimed at equality and inclusion. The technology application domains for equality and inclusion in the Smart London plan are mapped to the technology domains for equality and inclusion from the literature and then compared to the five inclusion challenges as shown in Table 14 below:

Table 14 Mapping of Smart London technology domains to smart city technology domains from the literature (Source: Author)

Application domains of technology (for equality and inclusion)	Priority in Smart London
1. Access to information	High
2. Access to the Internet	Medium
3. Access to digital infrastructure	Low
4. Universal access to services	Medium
5. Affordable data	Medium
6. Digital literacy	High

7. Digital skills	Green
8. Assistive technologies	Red
9. Security and surveillance	Brown
10. Citizen engagement platform	Green
11. Jobs	Green
12. Education /Skills	Green
13. Urban Planning and Evidence-Based Decision Making	Green
14. Accountability	Green
15. Transparency	Green
16. Public Wi-Fi	Green
17. Integrated Information Network	Green

	Identified priority in Smart London plan		Not a priority in Smart London plan
	They are not clearly stated in the Smart London plan.		

* Smart London Initiative

From the table above, it may be inferred that in the case of the literature-identified technology applications, access to digital infrastructure and assistive technologies is not a priority in Smart London Plan. Further, although mentioned in its strategy, the smart city plan does not clearly prioritise universal access to the Internet, services, affordable data availability, and residents' safety and security. Hence, they are marked brown in colour.

However, in Smart London plan few application domains of technology contribute to equality and inclusion. They include jobs, education /skills, urban planning and evidence-based decision-making, accountability, transparency, public Wi-Fi and integrated information network.

4.4 Key terms to achieve urban inclusion using digital technologies

The use of digital technologies offers multiple benefits to city governments. This study focuses on understanding technology's applications to enhance urban inclusion. The key terms identify the challenges and requirements for a people-centric, inclusive smart city.

4.4.1 Challenges and requirements of people-centred inclusive city development

Mission 1 of Smart London Together (2018) highlights the need for more user-designed services with increased citizen focus. The mission aims to consider users at the heart of what we do and call for new approaches to digital inclusions to support London's access to public

services. In addition, launching a 'civic innovations challenge' is suggested to spur innovations from the tech sector and explore new civic platforms to engage citizens and communities, thus promoting more diversity in tech to address inequality.

In line with these findings, all the interviewees stated that the London government had developed several technology initiatives to benefit the citizens. However, it is still insufficient, and much needs to be done. The availability of fibre, Internet and digital skills is a massive challenge for vulnerable groups across many parts of London. Even though the smart city plan explicitly mentions user-designed services and inclusive technology, there are no technology initiatives aiming to benefit the elderly or disabled population, nor not much use of assistive technology solutions intended to benefit these groups.

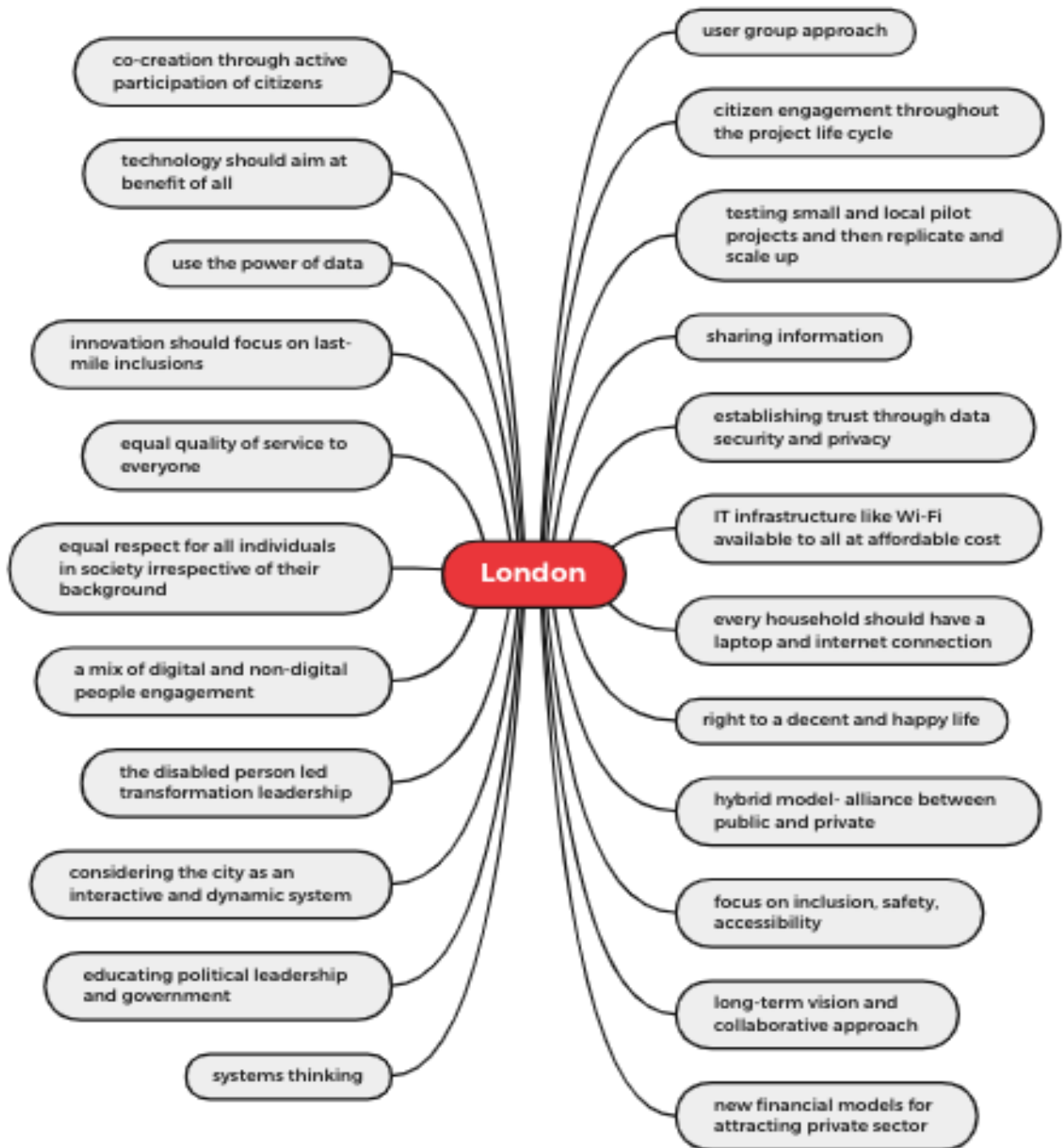
Many interviewees shared that the critical aspects of technology are its usage and affordability by vulnerable people. Lack of Internet connectivity, data, and digital skills is a big obstacle for vulnerable people. At present, smartphones are being used for personalised healthcare, but the affordability of such devices is an issue. Another top executive of an NGO mentioned, *“technology is a democratic resource; it provides a scenario to all individuals equally, equal opportunities at equal cost. However, the vulnerable population must pay a poverty premium to access the digital facilities and benefits the city government provides”*.

One interviewee said, *“Digital skills vary depending on the age, where the young population is easily adaptive to new technologies, and the old are least comfortable”*. For example, most elderly people cannot use smartphones, and many poor and homeless cannot afford Internet and data. It was felt that the technology companies are not designing inclusive technology, particularly for the vulnerable population like the elderly and people with disabilities, who are not a target group for their technical products and services. One interviewee, the chief executive of a social enterprise working for people with a disability, said, *“the disability market is still untapped, and there is huge potential and opportunity for technology companies to innovate and introduce new products and services”*.

Three interviewees mentioned that the quality of life is poor in London. One interviewee said, *“London is a highly crowded and competitive city with constant rat race and stress. The family and community life are missing here”*. Additionally, the city's increasing cost, crowded and polluted places deteriorate its citizens' lifestyle. The 17 interviewees were asked to suggest the

key themes for designing a people-centred smart city in London, and they identified the following requirements as shown in Figure 25 below:

Figure 25 Key themes identified by respondents for designing a people-centred smart city in London (Source: Author)



4.4.2 Public consultation methods

Ineffective public consultation and minimal citizen participation in solution design are a big hindrance to an inclusive approach to smart city planning. An interviewee from a market research company shared, “*Wider people consultations are missing in the government process and projects, public consultation is a misnomer, and surprisingly sometimes it is outsourced*”. She further said, “*London is costly and excludes hundreds of poor population. At present smart city motivation is not to provide services to vulnerable populations. There should be a dedicated team on inclusion in the municipality (to balance people's needs with the smart city vision*”.

All interviewees agreed that technology provides immense possibilities to interact and communicate with people, which can effectively be used for public consultation and inclusive planning. For example, public consultation is possible through social networks like Twitter and Face Facebook, blogs, discussion boards and conversations. The London city administration identifies civic and peer-to-peer technology platforms for citizens and communities to interact and co-create new opportunities for citizens (GLA 2020).

From the beginning, the Smart London Plan gave much thrust to digital connectivity and mobile network and recognised their importance in citizen engagement and participation (Smart London 2016). Smart London initiated the Local Government Digital Service Standard in 2016 to have common digital services and technology standards. These common standards help scale services across organisational boundaries and increase the pace of delivery by sharing data, services and platforms, components, and processes, to serve citizens better (Mayor of London 2020). It is stated that access to ubiquitous, reliable, high-speed data at home, at work, and on the move is critical for London's continued success as a global hub (London First 2019).

In collaboration with Google, the computer vision and machine learning specialists at the University of Lincoln, UK, are embedding an intelligent vision system in mobile devices to help people with sight problems navigate the unfamiliar indoor environment. The emphasis on service design, which is new thinking in London, presents an opportunity to understand users' requirements and look at inclusion afresh (Mayor of London)—for example, ensuring barrier-free and accessible digital services to people with hard of hearing or with cognitive, visual, or motor impairments. The London Wayfindr app also works on a similar idea developed in

partnership with the Royal London Society for the Blind's (RLSB) Youth Forum and ustwo, a product design studio. Using iBeacon technology, the app triangulates the user's position using their smartphone and then transmits instructions audibly based on where the user wants to go. This app will help London's roughly 9,000 visually impaired youth who suffer from a lack of independence in navigating public transport on their own.

The following technology-based civic platforms highlight the renewed participatory approaches in London (GLA 2020):

- Talk London - an online community to tell opinions on London's issues through surveys and discussion forums.
- New crowdfunding platform for London - a digital platform for citizens to propose or develop an idea and coordinate local support, including resources and funding through a public campaign. The City Hall catalyses these initiatives by pledging funds to live campaigns and supporting local groups to make ideas a reality. This initiative has been recognised internationally as an exemplar of Government innovation.
- New platforms – new civic platforms are allowed to be prototyped and tested regularly for delivering citizen-led innovation in partnership with London's tech community.

Citizen Space is another successful digital platform for the democratic involvement of people. It was developed as a joint initiative with the UK government and designed around user needs. It is aimed to be used by public bodies to run public consultations and for citizens to participate in those consultations. One interviewee stated that 'Poll Everywhere' is one good interactive solution- for live activities for teammates, students, and friends (<https://www.poll everywhere.com/how-it-works>). Similarly, 'Miro' is another useful online collaborative platform (<https://miro.com/>) explored in London. Most interviewees believe that Londoners' access and affordability for digital products and services differ for everyone. For example, according to Ofcom (2020), nearly 10 per cent of Londoners do not own a smartphone lacking access to advanced applications and services.

4.5 Design of people-centric and inclusive smart city

This section discusses people-centric planning and highlights the need for citizen participation in smart city planning and the required eco-system for the same.

4.5.1 Citizen participation

The interview responses highlight the need for effective citizen participation and meaningful engagement strategies for designing people-centred and inclusive smart cities. They suggested that there are not enough tools for people's involvement. The approach referred to as the quadruple helix innovation model (Carayannis and Campbell 2009) helps understand the complex issue of 'urban inclusion' from all the four significant actors in the system academic, policy, industry, and society (people). One interviewee stated that despite several odds, there are few solutions available in the market that address a few challenges of people with disabilities in London and include software app for a smartphone for the visually impaired which uses existing accessibility options such as iPhone's Voiceover or Samsung's TalkBack and a hardware device that can be installed on the control box of a crosswalk.

Many interviewees in London are happy with the city administration's information-sharing and public consultation approach. However, they expressed concern that it does not include and cover all sections of the population. The diversity of needs and opinions, particularly from the vulnerable populations like the elderly, people with disabilities, children, women, poor, youth, migrants and refugees, indigenous population, religious minorities, ethnic or caste groups, and LGBTI community, is missing resulting in half-baked solutions to contemporary challenges.

Five interviewees representing diverse organisations like NGOs and the public and private sectors shared that the coronavirus crisis showed that many Londoners can still not benefit from the opportunities the technology provides. People who lacked access to the Internet or a suitable device and could not use online services could not learn or work from home during the lockdown. The current mission of the Mayor of London is that by 2025, every Londoner should have basic digital skills with access to good connectivity and the device or support they need to be online (GLA 2020).

To add greater gender diversity in technology-based innovations, the Mayor of London (2018) initiated Digital Talent Programme, a £7m programme to train and equip more young women and BAME Londoners with digital skills and groom them for digital, technology and creative job roles. The city administration identified the people lacking digital access as the elderly, disabled with learning difficulties, people of specific ethnic origin residing in certain locations, including culture and language barriers, and people from low-income (GLA 2020). These digitally excluded families often don't have fixed broadband access, have minimal data

packages, and only one device for the whole family to use. Regarding digital skills, it is reported that 18 per cent of Londoners lack basic digital skills and hence need to be provided with the same (ONS 2019).

Enhancing digital literacy skills

All the interviewees stated that the involvement of people in smart city planning is minimal and stressed the need for meaningful engagement of citizens for a people-centric smart city. It is argued that a smart citizen is an empowered citizen who uses technology and enhances the power of communication, thus building a sustainable and long-lasting participatory ecosystem in the present digital age (Ferronato, P. and Ruecker, S 2018). Digital access is considered one of the critical foundations of the Smart London Plan. Reliable Internet access and basic digital skills are essential requirements for every Londoner (GLA 2020; Smart London Plan 2016). To make this happen, London draws on the success of smaller projects. One is the Mi-WiFi programme in Lewisham, a digital inclusion project that lent tablets and offered digital training to the unemployed population over their 50s.

All the interviewees highlighted the need for the involvement of people throughout the project life cycle. Otherwise, public consultation will be a mere idea-seeking exercise without real contribution. Many of them also suggested the need for the role of people in decision-making, which will make opinions mandatory in project implementation. One interviewee stated that people's committees and focused group interactions bring expert opinions and user perspectives.

One interviewee said, "*Signing petitions is a widespread practice in London, but to what extent the Government considers this and implements the suggestions is unknown*". To achieve this, the people should be the members of the project governance team and involved throughout the project life cycle from the idea stage to project closure.

Inclusive tools to cover vulnerable population

In London, the City Hall's Community Engagement team is to bridge the gap between City Hall and the communities. The team works on giving communities a platform to be heard, seen, and resourced and more actively engaged in the city's decision-making (Mayor of London 2020).

Three interviewees suggested that continuing non-digital consultation methods is also essential to reach all sections of people without bias, particularly for the inclusion of vulnerable and disadvantaged populations. One interviewee said that social connections could be created using digital technology. He said that we are meeting more people because of technology, so we should use digital and non-digital tools for public consultation. Some practical tools currently used in London are newsletters, postcards, and emails.

One interviewee agreed that public consultation is not easy, consultation fatigue is real, and persuasion and patience are required. Sometimes both top-down and bottom-up approaches will work, depending on how to combine them. True inclusion can be achieved when people develop the city vision and implement the same. One other interviewee opined that there is too much information flow in London which is usually one way. One interviewee stated that the required fund provision is essential for community participation and public consultation; hence, all projects should have a separate budget.

Citizen participation through community involvement, local & grassroots organisations, and new social organisations/networks/committees

Most interviewees suggested that addressing the inclusion challenge needs local and customised solutions involving the people and communities. The neighbourhood forum plays an active role in local planning in London through Neighbourhood plans (GLA 2012). The Neighbourhood plans introduced through the Localism Act of Government in 2011 give the people and local communities a greater sense of ownership in decision-making where people have a say on how their local area looks and develops. The neighbourhood forum, established and approved by the local authority, is expected to comprise a minimum of 21 people who live, work or are councillors in a neighbourhood. The Neighbourhood development plans will take effect only after majority support through the neighbourhood referendum.

Several local and grassroots organisations and civil societies working in London promote people's interests and demands. Civil societies work across multiple domains, such as public policy, education, health, poverty, inclusion, and gender issues, and serve as watchdogs, advocates, or service providers (Cooper, R 2018). However, increased surveillance, funding, media restrictions, and polarisation of civil societies often reduce their contribution and importance.

Impact Hub, the brainchild of a group of students from the UK, opened in London in 2005 as a collaborative meeting & workspace. It has grown into a global community with locations all over the world. It acts as a communal meeting place for community and business innovation and provides events and resources for members.

Co-creation to stimulate citizen participation and develop sustainable social innovations

All interviewees suggested that co-creation is one of the best public consultation methods where people design and own the projects. Recognising the achievements of other cities like Amsterdam's Startup in Residence, New York's NYCx Challenges and CivTech Scotland, the Mayor of London initiated and launched co-creation challenges inviting the active participation of citizens (Mayor of London). The Mayor of London emphasises citizens' active involvement in solving urban problems. The Mayor's Civic Innovation Challenge is part-funded through the London Economic Action Partnership and TfL. It works to fund technology accelerators and start-up firms using technology for social impact (Mayor of London 2020).

Startups participate in this challenge and develop and test their solutions with corporates and public organisations while receiving business support and mentoring from designated mentor organisations. The Challenge provides immense benefits such as customer development, user validation, market access, business support and access to funds totalling £15,000. In the future, the public will be directly involved in deciding the focus of future innovation challenges and may include social domains like housing or education. The Mayor of London's new open innovation challenge programme (2021) is aimed at leveraging the city's innovation and creativity to support the recovery from the impacts of Covid. It aims to deliver a design-led approach to supporting London's Recovery Missions through public collaboration.

Many interviewees suggested that the co-creation strategy should allow small and local pilot projects to replicate and scale. The co-creation strategy for the smart city generally includes i) understanding and exploring the core challenges of citizens and administrations, ii) prioritising and defining the challenge, iii) identifying the most promising solutions and problem-solving approaches(ideation), iv) prototyping and testing ideas that work v) Implementation: how to bring a solution to life (Deutsche Telekom 2020).

All the interviewees shared the idea of local innovations and next-door apps where ideas are taken from the community. Some suggested that a combination of multinational corporates and

SMEs is a better approach to meeting local needs at an affordable cost. Where multinational corporations play a significant role in developing life transformative technology innovations. For example, Microsoft has some apps using AI for disabled persons, and similarly, the voice activation technology of Amazon is also very useful.

Few interviewees suggested that the data of excluded populations is key to designing inclusion projects. London, for example, is not using this data at present. Instead, London should collaborate and network with all excluded people and take their input in designing smart city projects.

4.5.2 Strategy, governance and policy for enhancing inclusion

It is argued that despite community participation being a statutory planning requirement for the last 50 years, there is still a significant gap between participatory policy and practice in the UK (Wood and Fowlie 2009). This gap is particularly noticeable regarding the engagement of so-called hard-to-reach demographics, such as youth, the elderly, and people with disabilities. The Localism Act of the UK Government in 2011, introduced to encourage local people's participation in decision-making, is a critical step in the right direction.

One of the key features of Smart London (Smart London Plan 2013:2016) from the beginning is that Londoners are at the core of the smart transformation process. Therefore, thrust is given for the active participation of people. Drawing from the discussions on Smart London from pre-pages, the focus is to ask Londoners what a Smart London should look like and involve them in hackathons, challenges, technology apprenticeships, and the online research community. On the other hand, for meaningful citizen engagement, tackle digital exclusion and skills gap, equip local young people with a digital apprenticeship, and bring the community in policymaking through online discussions, live question and answers, events, surveys, and focus groups across a range of topics through Talk London are few initiatives contributing to inclusive citizen participation. The chief executive of a children's NGO said, "*equality and inclusion are difficult problems to solve and need the right leadership and innovative solutions*". One public policy expert mentioned that technology offers an opportunity for inclusion, but it is only an enabler and needs a deliberate approach to achieving inclusion. She said, "*the UK government is too centralised, and the city government/local government has less power & resources or autonomy or expertise to develop inclusive and holistic development of the city*".

The new plan of the Mayor of London, the Smarter London Together (2018), identified citizen participation as the most critical mission and adopted specific initiatives like the launch of civic innovations challenges to spur innovations in the technology sector. In addition, new civic platforms are promoted to engage citizens and communities, adding diversity in technology to address inequality. The new London Plan, the spatial development strategy for Greater London, sets out the next 20-25 years of vision for how London will develop (Mayor of London 2021). The London Plan is a vast strategy covering economic and social development, outlining the digital and technology solutions as the key enablers to improving the lives of Londoners.

The Technology Code of Practice (2019), released by the UK Government, sets the standard on the best way for government organisations to design, build and buy technology (The Central Digital and Data Office, UK). It mentions the details of the use and procurement of technology with conditions for defining user needs, its accessibility and inclusivity, open source, the usefulness of cloud, security and privacy, the need for sharing, reusing and collaborating and making better use of data, among others.

4.6 Chapter Summary

The implementation of smart city projects in the UK is considered patchy because of the constraints in functioning cities that control only about 18 per cent of their budgets (Bennett D et al., 2017). It is argued that the political challenges in terms of leadership, lack of a broader community approach, confusion about bottom-up or top-down planning, concerns about privacy and appropriate utilisation of multiple interfaces of smart cities further add to the complexity of smart city planning. According to UK Parliament Post (2021), the main barriers to smart city projects are public policy, procurement, access to physical assets, data and computing resources, regulation and standards and community engagement and trust. With these challenges and gaps in the smart urbanisation agenda, the performance of the UK in terms of achievement of UN-SDGs is found to be still inadequate and far behind expectations (UK Parliament 2019), particularly in combating hunger, food security and establishing effective structures and processes for implementing the goals. This is a relevant input related to inequality and exclusion, which is the focus of this research study.

As literature in Chapter II pointed out, the categories of the vulnerable and disadvantaged population living in London include the elderly, people with disabilities, children, women, poor and homeless, youth, migrants/refugees, indigenous population, religious minorities, ethnic or

caste groups, Lesbian/ Gay/ Bisexual and Transgender (LGBTI) community among others. The documentary evidence and case investigation confirmed that these groups face multiple challenges of inequality and exclusion in their daily life. The different and most prominent forms of inequality and exclusion identified through the literature and confirmed through this case study investigation include social, economic, political, spatial, financial, and digital exclusion. Some of the key challenges faced by these vulnerable populations living in London include:

- Racism and discrimination
- Hate crime
- Poverty
- Homelessness
- Income deprivation
- Material deprivation
- Lack of access to basic necessities
- High housing cost
- Health and mental challenges for the elderly and people with disability
- Unemployment
- Women safety
- Lack of digital skills and capability
- Gender bias
- Education and health inequality
- Abuse of human rights, particularly for LGBTI
- Affordability and living cost

All the interviewees agreed that these vulnerable populations experience inclusion challenges in accessibility, affordability; opportunity; participation and liveability. The documentary evidence and interview respondents agreed that the identified gaps/areas of action for inclusion discussed in the literature review chapter could enhance inclusion in London. All the interviewees stated that technology is a helpful tool to improve inclusion across all the five identified challenges.

The UK Smart city development strategy mentions the need for consultations with citizens as the key to achieving the goal of smart cities. The London Smart city plan places people at the core and mentions smart London as a vehicle for inclusion. The Smart London plan positions Londoners at the core of the strategy with a thrust on city-wide collaboration, world-class connectivity, digital skills and capacity, data-based policy, and inclusive technologies. The plan is claimed to cover all dimensions of life where innovations and technology solutions can create new opportunities for collaboration between the Government, Londoners, businesses, and academia to address the city's challenges in an integrated and holistic manner. Assisted living solutions are considered one of the priority areas in the UK's smarter solutions. A few projects, such as imparting digital skills to citizens, London Datastore for evidence-based policymaking and social innovations, multiple language adaptation in TfL services, the appointment of CDO,

and human-centred technology procurement guidelines, are a few notable initiatives towards enhancing inclusion.

The London case study highlighted the use of smart governance and smart tools to enhance inclusion. Still, the study reveals that the inclusion of vulnerable and disadvantaged populations is not the core focus of the Smart London Plan. Still, a lot needs to be done for London's inclusive and holistic development, particularly in the context of leaving no one behind. All interviewees reiterated that inclusion is not a priority in London's current smart city plan. Many felt that London's smart city strategy is mainly focused on the institutional and digital space rather than the physical. The lack of digital infrastructure, assistive technologies, and the challenge of digital skills, including the cost and affordability of digital products and services, is still a great divider in London and exists across different sections of the city population. In addition, many interviewees stated that the private sector driving digital innovations is not keen to work on inclusion projects as they do not see a potential business case in these areas.

The Mayor of London considerably recognised the role of citizens in designing a people-centred, inclusive Smart London. However, citizen participation at present seems to be restricted to information sharing and consultation at the planning stage. Almost all interviewees stressed the need for citizen participation and acknowledged that inclusion's real success is achieved when people contribute to decision-making, design and own the projects, and drive the change they aspire to. The analysis of the citizen engagement strategy in Smart London indicates a lack of capacity and preparedness of citizens, and a lack of appropriate digital participatory ecosystem and participatory methods and approach. The local drivers, stimulating factors, and co-creation for social innovations are also missing. A few key lessons and practical recommendations for inclusive smart city plans, that emerged out from this case analysis include:

- Vulnerable people-led leadership
- Need for public consultation and inclusion of vulnerable populations like the elderly, people with disabilities, children, women, poor, youth, migrants and refugees, indigenous people, religious minorities, ethnic or caste groups, and LGBTI community in public consultations
- A collaborative approach to the inclusion of vulnerable populations
- The government-led process with multi-institutional participation and action including the private sector, academia, civil society and others

- Bottom-up approach and integrated system built on affordable and accessible technology with universal access
- Increased transparency and accountability in smart city projects planning
- Long term vision
- Data privacy and security policy
- Affordable Internet connectivity and data
- Tackling the digital divide- Digital skills, particularly among vulnerable populations like the elderly, people with disabilities, children, women, poor, youth, migrants and refugees, indigenous people, religious minorities, ethnic or caste groups, LGBTI community.
- Use of assistive technologies for the benefit of the elderly and disabled

Further in-depth and comparative analysis through identified themes is done in Chapter VIII.

Chapter V

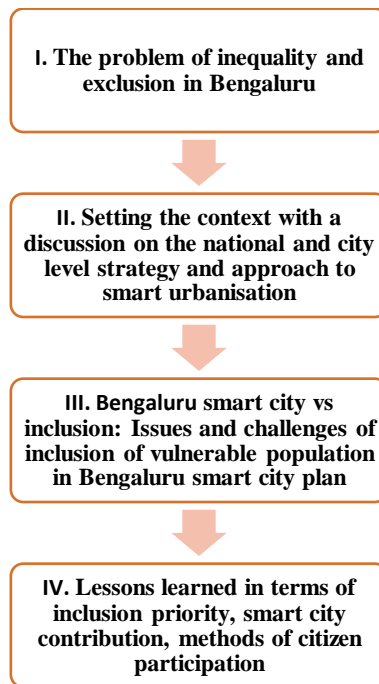
5 The case study of Smart Bengaluru

Bangalore, officially Bengaluru, is the capital of the Indian state of Karnataka. It is located in the south-eastern region of India and is the third most populous city and the fifth most populous urban area. Bengaluru's 2021 population is now estimated at 12,764,935 (World Population Review 2021); officially, it is 9,621,551 as per the Census 2011 (Government of India 2011). Bengaluru is the fastest-growing metropolis in India and is sometimes popularly referred to as the Silicon Valley of India, mainly due to the highest software exports in the country. According to the leading national newspaper, the Indian Express (July 2022), the software exports in India during the current financial year are estimated to be worth USD 170 billion, with Bengaluru contributing an estimated 38 per cent. It is a city with multi-cultures, multiple religions and languages. The most common languages in Bengaluru are Kannada, Tamil, Telugu, Urdu, Malayalam, and Hindi.

This case study notably helps to understand the critical challenges of urban inclusion, the category of excluded populations, and the local smart city plan in lower-middle-income countries (World Bank 2021) and developing countries like India. The Indian government has identified the smart city planning approach as a preferred urban development model and launched a mega national plan in 2015 to develop 100 smart cities across the country (Government of India 2015). Bengaluru city was chosen as a case for the research because it is one of the 100 smart cities and represents the aspiration and ambition of fast-emerging economies experiencing rapid urbanisation in the current century. It also represents a society in a developing country facing rapid urbanisation and growth, overcoming several development challenges across diverse populations with multiple religions, castes and languages (Roy, D. et al., 2018).

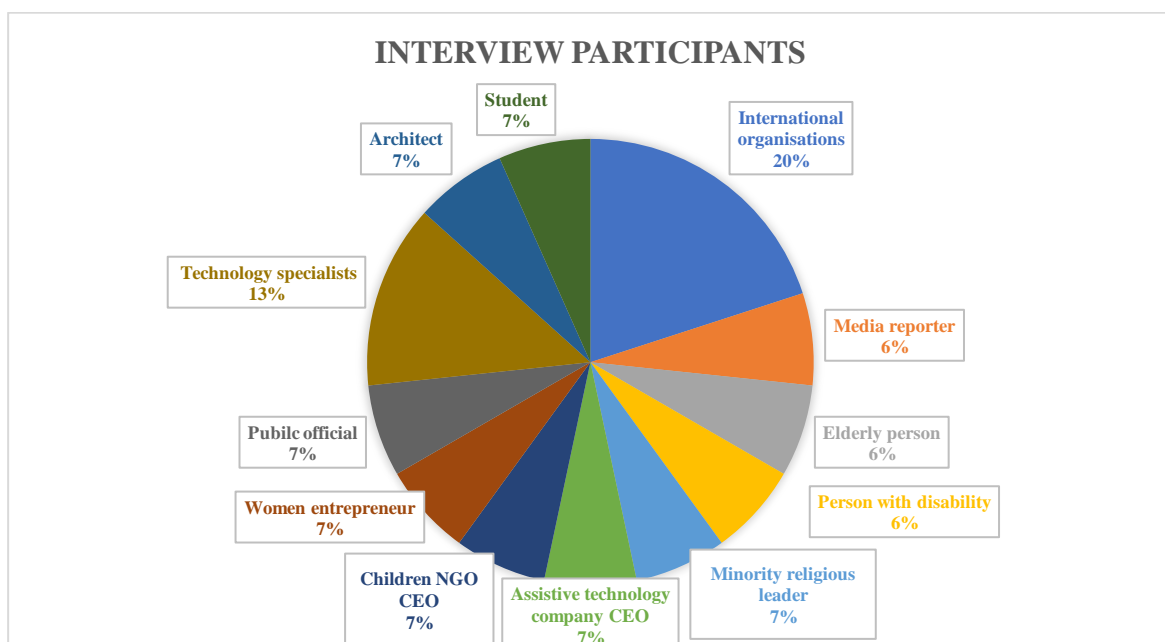
The case study involves a detailed analysis of documentary evidence combined with semi-structured interviews with the relevant stakeholders. The document analysis includes collecting relevant secondary data from widely available literature and knowledge resources such as - smart city planning proposals, policy guidelines, legislation including peer-reviewed research publications and multi-lateral agency reports about India, particularly Bengaluru city. The case study structure is shown in Figure 26 below:

Figure 26 The case study approach for Bengaluru (Source: Author)



The primary data is collected through a semi-structured interview process. The interview participants include 15 diverse individuals from different backgrounds, such as three from international organisations, one media reporter, one elderly person, one person with a disability, one minority religious leader, one person working as a CEO, one assistive technology company, one CEO of a children NGO CEO, one woman entrepreneur, one public official, two technology specialists, one architect, one student as depicted in Figure 27 below:

Figure 27 Profile of interviewees from the Bengaluru case study (Source: Author)



As mentioned in the methodology chapter, the case study findings are further analysed and discussed according to the following five broad themes and 14 sub-themes:

Nature of urban exclusion

- The evidence of the problem of exclusion
- Forms of exclusion
- Category of the excluded population
- Challenges of the excluded population

Priority of inclusion of vulnerable population in smart city planning

- The national smart urbanisation strategy and the vision of smart city
- Priority of inclusion in smart cities
- Smart city projects to benefit the vulnerable population

Contribution of digital technologies in enhancing inclusion and equity of vulnerable population

- Benefits /impact of using technology
- Digital technology's role in the inclusion of vulnerable population
- Essential digital infrastructure

Key terms to achieve urban inclusion using digital technologies

- Challenges and requirements of people-centred inclusive city development
- Public consultation

Design of people-centric and inclusive smart city

- Citizen participation
- Strategy /governance/policy

5.1 Inequality and exclusion in Bengaluru

Indian society exhibits multiple forms of inequality and exclusion. However, the lack of adequate spatial data constrained the research on inequalities within Indian cities. The decennial Census of India provides various variables and information on households and populations. Still, it does not provide data at spatial resolutions below the scale of a municipal ward. However, municipal wards representing a small sub-division of a town or city are highly heterogeneous, and data at that level provides a misleading picture. Therefore, this study attempts to understand the inequality and exclusion challenges at the national level with relevant data input from city-level statistics to the extent possible.

5.1.1 Evidence of the problem

In India, religion, language, and caste have been a source of inequality and segregation for many years (Roy D. et al.,2018). For example, the Dalits (Scheduled Castes) and Adivasis (Scheduled Tribes), who together constitute a quarter of the total population, often lack access to public places, political institutions, and income-earning assets like land, among many others (Byrne, S. and Chakravarti, D 2009). The most marginalised groups in India include scheduled castes, scheduled tribes and rural populations, women, transgender people, minority groups, migrants, and people living with HIV (UNDP 2020).

5.1.2 Forms of exclusion in Bengaluru

In cities, specific other population categories often identified by age, gender, caste, religion and sex experience exclusion and discrimination from mainstream development. Urban poverty is a big challenge in India, where millions of the population struggle for basic amenities and minimum standards of living. In a fast-urbanising city like Bengaluru, these populations experience multiple forms of exclusion across social, economic, political, spatial, cultural, digital and financial dimensions.

5.1.3 The category and challenges of the excluded population in Bengaluru

According to Citizen Matters (an urban knowledge portal funded by non-profits), life expectancy has risen steeply in India due to improved health care. Still, there are no systems to address the needs of old people (Navya PK 2018). As per the 2011 Census, 8.6 per cent of India's population is above the age of 60 and constitutes nearly 104 million; among those, almost 11 million are over 80 years old, and most of them live in cities. With the changing family structure and value system, elderly people face financial insecurity, isolation, and domestic abuse and violence (Khan, Z.R 2019). A recent study showed that around 18 per cent of elderly men and 26 per cent of elderly women in India suffer from disabilities because of chronic diseases (India Human Development Survey 2011). A survey on elder abuse conducted by Help Age India, which included around 218 elderly Bengalurians, indicates that almost half of the elderly in India suffer some form of abuse (Help Age India 2018; 2015). Of those who faced abuse, 73 per cent said they had faced disrespect, 52 per cent had faced neglect, and a small percentage experienced verbal, physical or economic abuse.

In India, the population of disabled people is enormous, and resources are scarce; further, with the social stigma attached to disability, their problems are more complex and difficult to address (Srivastava, P. and Kumar, P 2015). There are challenges in linking the disabled to labour markets (Shenoy, M 2011). The disabled population face challenges across multiple dimensions. According to a recent survey by a Delhi-based NGO National Centre for Promotion of Employment for Disabled People (NCPEDP 2020), during the COVID-19 pandemic, the disabled population faced severe challenges due to the lockdown in India. The survey reported difficulties such as financial crisis and lack of access to healthcare and medical aid. It is said that a similar situation prevailed in other cities of India, including Bengaluru.

According to the National Institute of Urban Affairs (NIUA 2016), India is home to 472 million children under the age of 18 years and comprises nearly 39 per cent of the country's total population. Out of the 128.5 million children residing in urban areas, close to 7.8 million children under the age of 6 still live in abject poverty and poor conditions in informal settlements. There is an imperative to build sustainable and inclusive cities from the children's perspective. It is argued that urban planning and governance had not considered the needs of children, especially very young children (below 3 years), whose needs are unique and particular and include the provision of local day-care, health care, nutrition and a safe and healthy environment which is accessible, equitable and affordable. The lack of provision of such services has an immediate effect on the health outcomes of children. According to UNICEF India (2022), Karnataka and Bengaluru report a high incidence of child marriage, child labour, and child trafficking and have a significant population of children lagging on several human development indicators.

Gender inequality in India persists despite high economic growth rates and is particularly apparent among marginalised groups (UNDP 2020). The most critical challenges for women in India include increasing violence against women, nil or under-representation of women in decision-making, and discriminatory laws governing land, marriage, property, and inheritance (Menon, S. and Sharma, S. 2020). According to the 'Crime in India - 2016' report by the National Crime Records Bureau, Bengaluru is ranked third in crimes against women (NCRB 2016). The plight of women in India is terrible, and unlike men, women cannot even access public spaces freely unless they are moving out for a specific purpose (Citizen Matters 2020).

Muslims constitute India's largest minority community and second-largest religious group (Bisht, M 2018). Despite having several schemes and initiatives for their development, most Muslims in India are backward, often deprived, marginalised and experiencing hate-related violence in their daily lives. Several instances of majoritarian violence in Bengaluru have occurred against minorities, particularly Muslims, affecting their social and economic lives (Rajesh Ranjan 2022). Migrants occupy significant space in India's large urban centres, with the Census of 2011 indicating that almost 46 per cent of India's urban population is migrants (S. Irudaya Rajan and R.B. Bhagat 2021).

Being one of the progressive states of India, Bengaluru is a hub for many industries, which attracts migrant populations from neighbouring regions. However, due to the government's apathy towards the migrated labourers and lack of a structured migration process, they end up

in slums (Andini, V. and Rao, S 2017). The labourers and their children face challenges in acquiring essential services such as education, healthcare, and social security measures like the public distribution system. Displaced labourers depend on intermediaries to avail of jobs and often get exploited.

Homosexual behaviour is criminalised in India. There is clear evidence of stigma and exclusion for LGBTI people in India as they face housing challenges, health disparities, lack of education and so on (Badgett, M.V 2014). The government conducts several skill development programs regarding employment opportunities for the people, but there is a disconnect between skills training and youth aspirations (Upadhyya, C. and Roy Chowdhury, S 2021). The poor quality of employment available to youths is also a significant concern, especially for those in the scheduled castes, scheduled tribes, and minority communities like Muslims (Mamgain, R.P. and Tiwari, S 2015).

According to the Census of India (Government of India 2011), the urban slum population residing in distinct and separate habitats are socially excluded from the rest of the city and lack access to adequate water and sanitation, shelter, and essential services such as education, healthcare including decent quality of life (DFID 2007). The number of slums in Bangalore has grown from 159 in 1971 to over 2000 slums (notified and non-notified) in 2015. In Bengaluru, nearly one million poor live in slums, and about one-third of slum dwellers fall below the poverty line.

In agreement with the documentary evidence, all the interviewees in Bengaluru stated that the elderly, people with disabilities, children, women, poor, youth, migrants/refugees, indigenous population, religious minorities, ethnic or caste groups, LGBTI communities are significant categories of the population who are most vulnerable and often excluded from city development projects and programs. In addition, one interviewee pointed out a specific class of the people, such as domestic workers, rag-pickers, burial, and construction workers, who also experience inequality and exclusion in city life. Another interviewee mentioned that *“street children, beggars, and women in prostitution (street women) are other sections of the population in Bengaluru who are excluded and treated unequally”*.

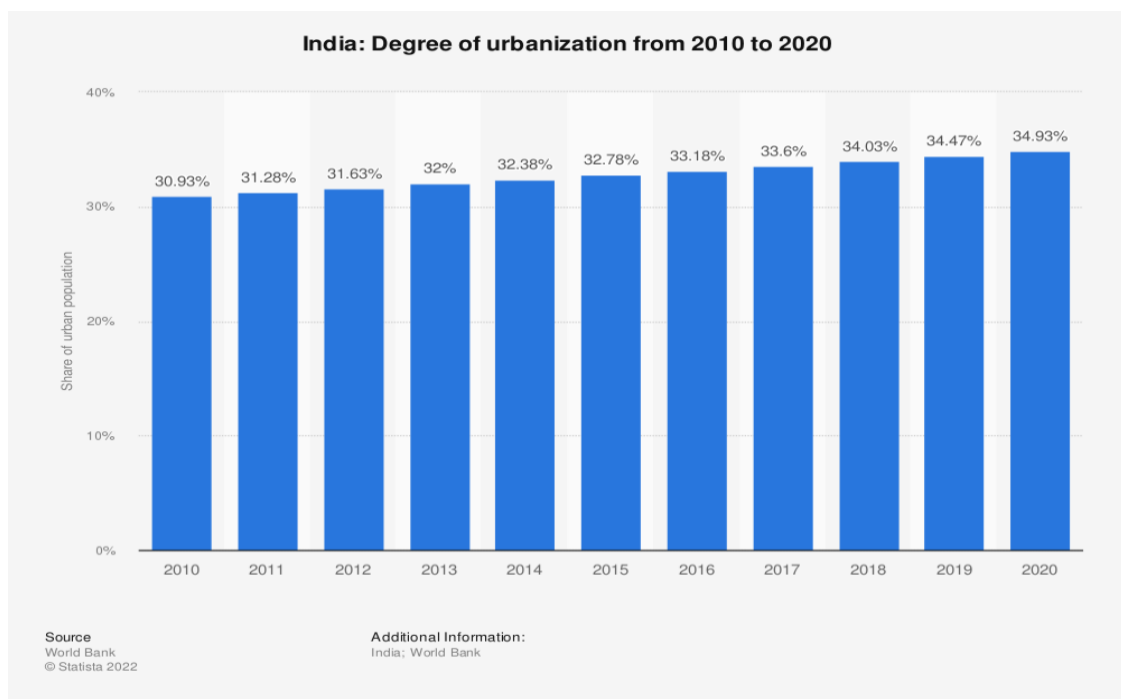
5.2 Priority of inclusion of vulnerable populations in smart city planning

In a multi-level governance structure, the national urbanisation strategy influences the city government plans. Hence to contextualise and position the study appropriately, this section first discusses India's national smart urbanisation strategy, followed by the vision of the Bengaluru smart city plan.

5.2.1 Smart Urbanisation in India: The national strategy and approach

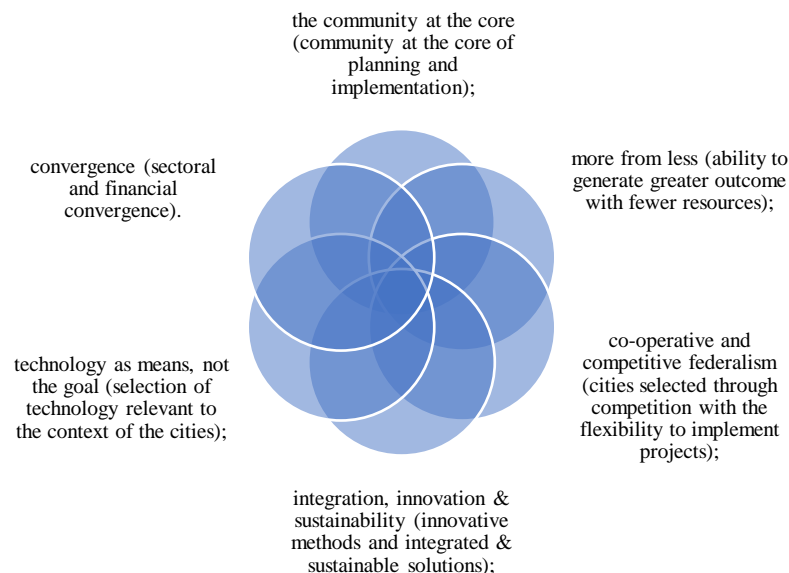
The pace of urbanisation in India increased in 2000 due to economic reforms and the growth of the service industry. According to the 2011 census (Government of India 2011), 377 million urban population constitute 31.16 per cent. By 2030 the urban population is expected to reach 600 million, which is 40 per cent of the total population (UN-New Climate Economy Report by The Global Commission on the Economy and Climate 2017). The degree of urbanisation is shown in Figure 28 below. Urban expansion is happening at such an unimaginable speed and, if not appropriately managed, will place enormous stress on the already constrained system. India needs to work on multiple areas to manage its complex urbanisation and tackle the challenges of overcrowding, growing slums, water shortages, large-scale migration from rural areas, increasing pressure on metro cities, inequality, and social, economic, and physical exclusion, among others (Kandpal, V.et al., 2017).

Figure 28 Degree of urbanisation in India from 2010 to 2020 (Source: World Bank © Statista 2021)



The Government of India rolled out the 'Smart Cities Mission' in 2015 to improve the quality of life and drive economic growth in 100 selected cities (the list of 100 smart cities is in Appendix 5). The scheme enables local development through smart solutions by harnessing technology. The mission's main objective is to develop cities with core infrastructure, a clean and sustainable environment, and smart solutions for their citizens' decent quality of life. The mission focuses on sustainable and inclusive development and drives the city's social, economic, physical, and institutional pillars by creating replicable models that act as lighthouses to other aspiring cities. The Indian smart cities are based on the following six fundamental principles, as shown in Figure 29 below:

Figure 29 Fundamental principles of Indian smart cities policy (Source: Smart Cities Mission, 2015 Government of India)



The smart city approach in India has four focus areas: Area Based Development(ABD), aiming at plugging infrastructure gaps in around 500 acres through retrofitting of existing city areas identified in consultation with citizens; Redevelopment proposed in consultation with citizens aims to provide enhanced infrastructure in identified 50 acres land using mixed land use plan; Greenfield projects in 250 acres developed through innovative planning and new financing methods like land pooling with affordable housing for the poor; and Pan-city development by application of smart solutions to existing infrastructure (Pathak, C.R 2020).

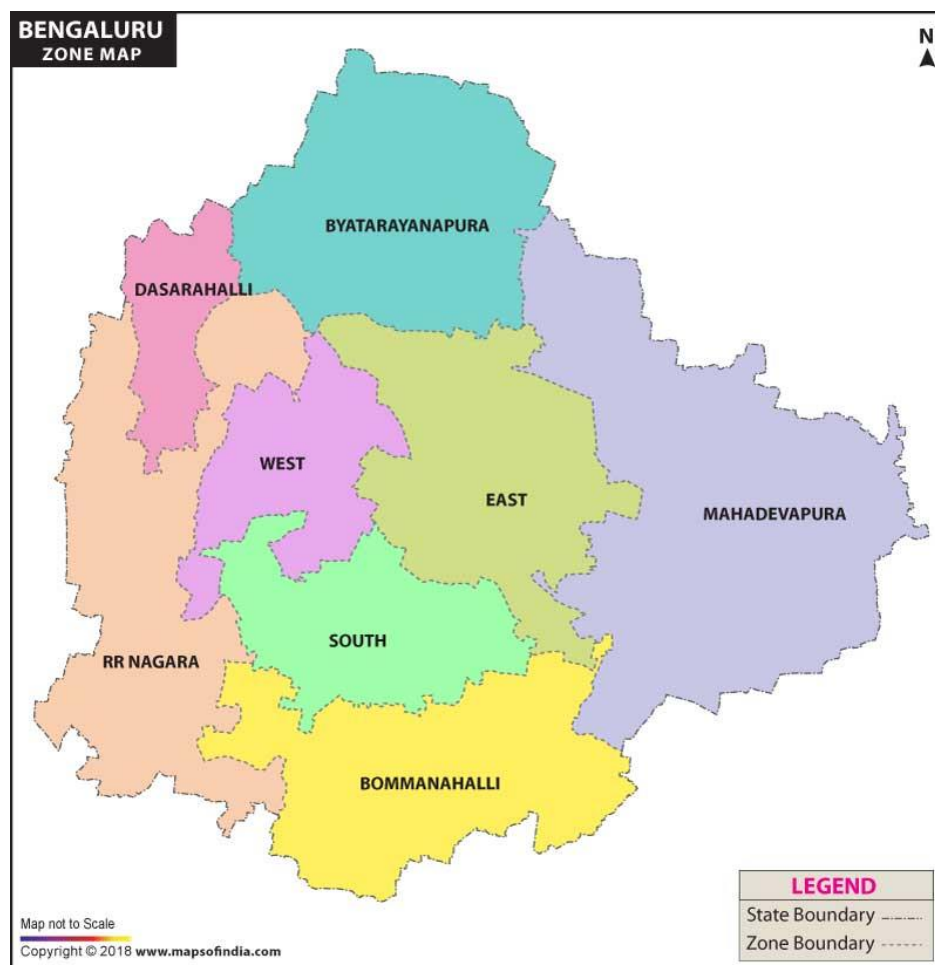
The Union Ministry of Urban Development, Government of India, implements the smart city mission in association with the state and city governments of the respective cities. The mission is planned to be implemented across 100 cities between 2019-2023, where each city will create a company as a Special Purpose Vehicle (SPV) with a full-time CEO and support staff. The centre and state governments will each provide the company with ₹ 50 million in funding. The company will raise additional funds from the financial market as debt or equity. The mission uses ICT, especially mobile-based tools, to enhance people's participation (Chauhan, P. and Kumari, S. 2021).

5.2.2 The vision of the Bengaluru Smart City

The Bengaluru smart city plan launched in 2017 has a vision for 'Livable Bengaluru' through 'Connected, Vibrant and Healthy Communities' that is sustainable on three fronts- environment, economy and equity (Bengaluru Smart City Plan 2017). The 'connected communities' are enabled through integrated mobility, enhanced safety and security in public places and promoting barrier-free movement. Connected communities include empowering citizens through accessible information on public services and grievance redressal portals on digital networks towards inclusive growth. The 'vibrant places' to be created by activating street edges, creating inclusive public spaces, revitalising markets, promoting affordable housing, and establishing a solid place identity by reconnecting city landmarks towards a thriving urban centre. Lastly, improving urban health through the restoration of the city's natural assets like parks and lakes and linking public nodes by a continuous network of walking and cycling ways (Bengaluru Smart City Plan 2017).

The Bengaluru smart city plan is expected to cover all 198 municipal wards of the municipal corporation -*Bruhat Bengaluru Mahanagara Palike (BBMP)*, as shown in the map below in *Figure 30*:

Figure 30 Map of Bruhat Bengaluru Mahanagara Palike (BBMP) (Source: Maps of India)



The identified development sectors and transformative goals of the smart city plan are highlighted in Table 15 below:

Table 15 The goals of the Bengaluru smart city plan (Source: Bengaluru Smart City Plan 2017)

Sectors	Goals
Sector 1: Mobility	<ul style="list-style-type: none"> ▪ Encourage major roads redone as per Tender S.U.R.E standards ▪ Promote contiguous walkability along roads with safe crossings, including for the differently abled ▪ Provide sustainable mobility choice through electric transport and improve last-mile connectivity
Sector 2: Water supply and Sanitation	<ul style="list-style-type: none"> ▪ Assured supply of 135 LPCD water through public delivery channels ▪ The flow of untreated sewerage into stormwater drains and lakes cut by 70 per cent in the ABD ▪ All public places in the ABD have access to public toilets, thereby reducing open defecation and urination by 70 per cent
Sector 3: Solid Waste Management	<ul style="list-style-type: none"> ▪ Reduction in open garbage dumps on roads and in market centres ▪ 100 per cent of garbage related grievances were resolved within 12 hours ▪ Garbage sent to landfills from bulk producers was reduced by 40 per cent

Sector 4: Equity and Inclusion; Safety and Security	<ul style="list-style-type: none"> ▪ 50,000 new affordable housing stock created ▪ Reduction in crimes, including crimes against women and children ▪ Enhance neighbourhood safety and security
Sector 5: Power	<ul style="list-style-type: none"> ▪ Uninterrupted and reliable power supply for all citizens in Bengaluru ▪ 10 per cent of aggregate power demand met through the renewable energy source
Sector 6: Governance and Citizen participation	<ul style="list-style-type: none"> ▪ 30 per cent of city budgets planned and utilised through participatory budgeting processes ▪ Maximise reach and range of service in the existing platform of e-governance
Sector 7: Financial Management	<ul style="list-style-type: none"> ▪ Own revenue increase by 40 per cent p.a; cost escalation in establishment costs at <= 10 per cent p.a. ▪ The monetisation of land and properties (FAR, market-linked lease rentals, PPPs) ▪ Enhance municipal credit rating
Sector 8: Economic Revitalization with focus on identity and culture	<ul style="list-style-type: none"> ▪ Create a replicable model of a revitalised economic centre ▪ Through cutting-edge urban design interventions, rejuvenate 5 historical landmarks in the city that are associated with its identity towards vibrant destinations ▪ Connect such landmarks by non-motorised transportation network towards a vibrant urban precinct

Further, the overall improvement in liveability and sustainability of the city is proposed to be measured through the ward quality score on 17 key indices, as shown in Table 16 below:

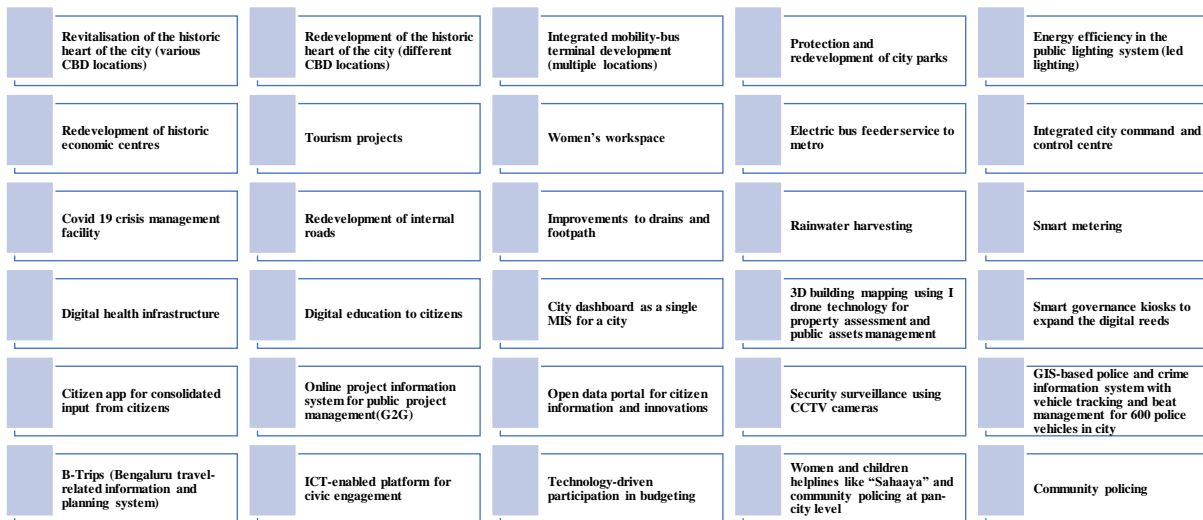
Table 16 Liveability and sustainability indices of Bengaluru Smart city (Source: Bengaluru Smart City Plan 2017)

Identified Sectors	Key indices
A. Mobility	<ol style="list-style-type: none"> 1. Percentage increase in NMT modal split 2. Improvement in quality of mobility infrastructure
B. Economic development	<ol style="list-style-type: none"> 3. Increase in commercial and office spaces in the CBD 4. Increase in reach of digital public services
C. Housing for All	<ol style="list-style-type: none"> 5. Increase in affordable housing stock 6. Increase in access to basic amenities like water and toilets for the slum population
D. Environment	<ol style="list-style-type: none"> 7. Improvement in water quality of Lakes and Nallahs 8. Increase in use of sustainable energy sources
E. Safety and security	<ol style="list-style-type: none"> 9. Increase in the number of police stations adopting community policing towards increasing neighbourhood security 10. Reduction in crime and accidents
F. Public amenities and services and governance	<ol style="list-style-type: none"> 11. Increase in the number of public toilets 12. Increase in Wi-Fi access in public places 13. Reduction in NRW 14. Increase in smart metering 15. Increase in revenue collection 16. Percentage of G2C transactions made online 17. Average response time for grievances received

The Special Purpose Vehicle (SPV) established by Bengaluru Smart City Limited will implement smart city projects in Bengaluru. The operating principles that will guide the vision and mission include citizen and stakeholder focus to respond to their needs and interests in a

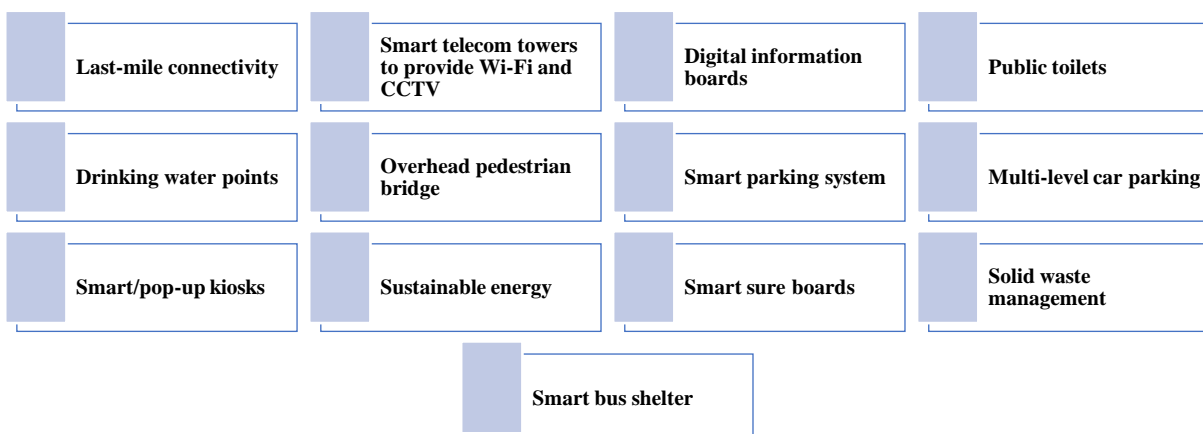
reliable, respectful, and professional manner; safety awareness of fellow employees and the public; environmental responsibility giving priority to natural resources and the environment; employee inclusiveness to respect and value the contributions of employees. The list of smart city projects proposed in the Bengaluru Smart City Plan (2017) is shown in Figure 31 below:

Figure 31 List of smart city projects proposed in the Bengaluru Smart City Plan (Source: Bengaluru Smart City Plan 2017)



The list of smart city projects proposed in Public Private Partnership (PPP) mode in the Bengaluru Smart City Plan (2017) are shown in Figure 32 below:

Figure 32 List of smart city projects proposed in Public Private Partnership (PPP) in the Bengaluru Smart City Plan (Source: Bengaluru Smart City Plan 2017)



The other ICT-based projects initiated in Bengaluru city before the launch of the smart city plan in 2017 are:

- Bengaluru one portal

- Integrated G2C and B2C services
- The Sakala portal has 70+ departments listed under the guarantee of services to citizens Act of 2011
- Attendance monitoring across all government agencies through Aadhar enabled the biometric system.
- GIS-based city master plan for 2031
- Interactive dashboard for Air Quality Index
- Integrated mobility with CCTV surveillance, wayfinding and energy-efficient lighting

5.2.3 The inclusion focus and relevant projects in the Bengaluru smart city

As an aspiring smart city, Bengaluru developed an exciting proposal for smart infrastructure. The city claimed several credits in terms of being the fastest-growing city in India and a major economic centre with a billion-dollar economy and leader in Forex and export earnings. It made significant advances in the field of energy, mobility, safety and security, environment, civic participation, and governance redressal. Few innovation projects focused on inclusion include participatory budgeting, community policing, affordable housing, accessible information, governance redressal, safety and security and maximising the reach and range of digital services through existing e-governance platforms (Bengaluru Smart City Plan 2017).

Interestingly the inclusion approach of the Bengaluru smart city is deemed to be met through the citizen participation approach (van Gils, B.A. and Bailey, A. 2021). The focus of inclusion in smart city planning is dealt with under the 'equity and inclusion' section. Citizen engagement is considered one of the critical aspects of smart city planning. The city government consulted numerous citizen groups Bengaluru agenda task force BATF 2010, the BBMP restructuring committee, the Kasturirangan committee, ABIDE and the Bengaluru Blueprint Action Group (BBPAG) 2016. The visions and goals set by this group, with the involvement of citizens and other elected representatives, promote the city's long-term, sustainable, and inclusive functioning. Inputs for the smart city mission were taken from multiple sources like online/offline portals, social media networks, smart city apps, the official website of BBMP (bbmp.gov.in) and mygov.in. It further included in-person interviews with the resident welfare association, schools and offices, 50 Lac SMS and missed calls for the awareness campaign. All these efforts yielded open, structural and trackable goals for the Bengaluru smart city plan.

Over 1.5 million citizen inputs were collected, and 5 million citizens were contacted for the smart city proposal.

One of the plan objectives is listed as reducing crime in the city, including crime against women and children (van Gils, B.A. and Bailey, A. 2021). The reduction in crime rates is planned to be achieved through a pan-city digital project focused on neighbourhood safety and security, which involves a top-down security surveillance network and a bottom-up community policing initiative. The project includes nearly 5000 CCTV cameras linked to a hi-tech centralised command centre with video analytics and GIS-based police and crime information system. The other initiative claimed to be part of inclusion is participatory budgeting, where 30 per cent of city budgets are spent through participatory budgeting processes (van Gils, B.A. and Bailey, A 2021). The citizen inputs are planned to be connected through an online citizen application.

In addition, specific targeted projects include women and children's helplines like 'Sahaaya' (grievance redressal platform) and Community policing at the pan-city level, added with CCTV surveillance through 1350 cameras. The Bengaluru City Police recently launched an innovative and easy-to-use mobile App, SURAKSHA, meaning "safety" in English. This Bengaluru City Police SOS is a fully integrated personal safety app for women's safety with policing. During an emergency, this App turns the user's smartphone into a discreet personal safety device with a call of service to the police that can be triggered by simply activating the SOS button's icon on the user's cell phone.

It is proposed to have differently-abled friendly features like tactile paving, Pelican (Promoting Emotional Literacy in Children with Additional Needs), and Toucan on city roads at 75 crossings. Smart kiosks are installed in several public places across the city to increase the digital reach and accessible information to citizens. Outside the smart city plan, an Elders Helpline has been operational in Bengaluru as a joint initiative between the Nightingales Medical Trust (NMT) and the City Police since 2002 (Murthy, R. et al., 2021). This is a unique and first-of-its-kind project in India, which is now launched nationally in 2021.

Table 17 below indicates the Bengaluru smart city plan themes and sub-themes mapped to smart city themes and sub-themes from the literature survey. Further, the areas of intervention in the application of technology are identified in the plan document.

Table 17 Mapping of Bengaluru smart city plan to smart city themes from the literature (Source: Author)

<i>Smart city themes/ sub-themes (from literature)</i>	<i>Bengaluru smart city plan themes/ sub-themes</i>	<i>Bengaluru smart city projects /initiatives (theme wise)</i>	<i>Areas of Intervention/Application of technology in Bengaluru smart city</i>
<i>I. Improve the quality of life and well-being of citizens</i>			
Improve citizen welfare; Liveability; Cultural wellbeing; Societal benefit; Safety; Resilience; Human capital; Social development; Social development; Sustainable development; Good governance;	<ul style="list-style-type: none"> • Water supply and Sanitation • Solid Waste Management • Safety and Security • Focus on identity and culture • Housing for All 	<ul style="list-style-type: none"> • Revitalisation of the historic heart of the city (various CBD locations) • Redevelopment of the historic heart of the city (different CBD locations) • Protection and redevelopment of city parks • Electric bus feeder service to metro • Covid 19 crisis management facility • Redevelopment of internal roads • Improvements to drains and footpath • Digital health infrastructure • Digital education to citizens • Open data portal for citizen information and innovations • B-TRIPS (Bengaluru Travel-Related Information and Planning System) • Last-mile connectivity • Digital information boards • Public toilets • Drinking water points • Smart sure boards • Solid waste management • Rainwater harvesting 	<ul style="list-style-type: none"> • Healthcare • Digital literacy • Utilities
<i>II. Economic growth & employment opportunities</i>			
Prosperity; Economic development	<ul style="list-style-type: none"> • Economic Revitalization 	<ul style="list-style-type: none"> • Redevelopment of historic economic centres • Tourism projects 	<ul style="list-style-type: none"> • Tourism
<i>III. Smart urban governance</i>			
Smart policies; Evidence based policy making; Service innovation; Collaborative Management; Intelligence; Political development; Institutional capacity; Behavioural change; Interconnections and	<ul style="list-style-type: none"> • Governance • Financial Management • Public amenities and services 	<ul style="list-style-type: none"> • Integrated city command and control centre • City dashboard as a single MIS for a city • 3D building mapping using drone technology for property assessment 	<ul style="list-style-type: none"> • Decision making • Urban planning • Data/ Data exchange • Transparency • Accountability • Delivery of services • Integration • Resource optimisation

collaboration; Mobility; Partnerships		<ul style="list-style-type: none"> and public assets management • Smart governance kiosks to expand the digital needs • Online project information system for public project management(G2G) • Technology-driven participation in budgeting 	
IV. Climate change and environmental issues			
Environmental management; Low carbon economy; Sustainability	<ul style="list-style-type: none"> • Environment 	<ul style="list-style-type: none"> • Sustainable energy 	<ul style="list-style-type: none"> • Renewable energy
V. Infrastructure			
Built environment; Social infrastructure; Mobility; Technological infrastructure; ICT Networks; Energy	<ul style="list-style-type: none"> • Mobility • Power 	<ul style="list-style-type: none"> • Integrated mobility-bus terminal development (multiple locations) • Energy efficiency in the public lighting system (led lighting) • Overhead pedestrian bridge • Smart parking system • Multi-level car parking • Smart bus shelter • Smart metering • Smart telecom towers to provide Wi-Fi and CCTV 	<ul style="list-style-type: none"> • Mobility • Smart streets • Smart parking • Smart metering • Public Wi-Fi
VI. Inclusive development			
Social inclusion; Social cohesion; Community living; Social inequality; Open data; Urban openness; Affordability; Accessibility; Holistic approach; Citizen engagement; Information sharing; Participatory governance; Connected community	<ul style="list-style-type: none"> • Equity and Inclusion • Citizen participation 	<ul style="list-style-type: none"> • Women’s workspace • Citizen app for consolidated input from citizens • Security surveillance using CCTV cameras • GIS-based police and crime information system with vehicle tracking and beat management for 600 police vehicles in city • ICT-enabled platform for civic engagement • Technology-driven participation in budgeting • Community policing • Smart/pop-up kiosks • Digital education • Women and children helplines like “Sahaaya” and community policing at pan-city level 	<ul style="list-style-type: none"> • Participatory Planning • Communication/ Citizen engagement platform • Participatory budgeting • Women and children safety/security

As inferred from the above, the Bengaluru smart city plan has several initiatives for sustainable and inclusive city development, suggesting that inclusion is one of the priorities. In contrast,

out of fifteen interviewees, fourteen stated that inclusion is not an essential priority in the current smart city plan of Bengaluru as it does not cater to the needs and requirements of vulnerable populations like the elderly, people with disabilities, children, women, poor, among others. The smart city plan mentions citizen centricity and inclusion only on paper, with few siloed projects and no long-term and holistic vision crippled with a lack of integrated approach.

According to one media company staff: *“The smart city has the potential to enhance inclusion; however, it is still evolving and is in a nascent stage in India. The technology solutions driving the smart city paradigm can greatly help bridge the gap and inequality. Still, it is only a means, not an end”*. An interviewee who is an elderly person said, *“Smart City does have the potential to reduce the equality and enhance inclusion in contemporary cities. However, there are certain barriers like literacy, ability to communicate, lack of opportunities etc., where a smart city can play a role by creating the bridge to fill up the gap”*. Another interviewee working in an NGO mentioned: *“Conscious and sensibility of inclusion is missing in the current smart city plan of Bengaluru”*.

All the interviewees stated that the excluded populations experience different forms of exclusion, constituting a significant chunk of the city population in Bengaluru. Two interviewees working with an international development agency stated that the exclusion starts at the city government level, where the vulnerable population are least represented, with no opportunity for decision-making for their benefit and inclusion. One interviewee who is a person with a disability mentioned that inclusion should be considered at two levels one is at an individual level for independent living and the second at the community level for group living. This interviewee believed that the current technologies, to some extent, fulfil people's personal needs. However, he pointed out, *“There are few technologies designed to help people with disabilities to live independently, but there are no technologies which are helpful to these groups to connect to the community”*.

The interviewee with a media company background mentioned that the current smart city projects do not help society's vulnerable and marginalised sections. *“The city administration responds only to the pressure groups, and there is always a focus on infrastructure projects neglecting the social infrastructure”*. However, an international development expert shared a different view: *“Smart city often widens the gap between rich and poor and those with and*

without access to technology and therefore unless a particular and deliberate effort is made, inclusion cannot be achieved”.

An interviewee stated that: *“at present smart city is being looked from an efficiency and productivity perspective and not an inclusion perspective. However, the smart city has potential if resources are equitably distributed”.* A minority religious leader shared an exciting example: *“The present Bengaluru smart city plan is like a fifth-floor building without lift or staircase, it is inaccessible to the majority population, and many people do not know how to use it”.* He pointed out the difficulties of the most vulnerable and marginalised groups who are neglected from mainstream development and often find no place and are marginalised in city development projects and programs.

An interviewee mentioned that *“an Integrated Command and Control Centre is a successful initiative in Bengaluru smart city project”.* As a news blog reported (Naveen Menezes 2020), this project has been envisaged to be the city's brain, handling day-to-day affairs and disaster management. There is a standard helpline number, a dedicated mobile application, and a web portal where citizens can lodge and track complaints. The authorities can use this platform to regulate city operations by institutionalising data-driven decisions. However, another interviewee stated, *“the smart city has not done enough, and it has so far addressed the convenience for large communities -not inclusions”.*

All the interviewees believed the plight of vulnerable and disadvantaged populations remained the same even after implementing smart city plans in Bengaluru; nothing much has changed for them. All the interviewees stated that while planning for smart city projects, enough consultation and discussions were not done with all the stakeholders, particularly the citizens; therefore, the desired outcome was not achieved. An interviewee who is a person with a disability mentioned that *“during the 'accessibility campaign' in India, the stakeholders were not consulted and therefore, as of now, not even one single milestone is met”.* He states, *“The government should have a vision, and urban planners should be motivated to work on inclusion. All countries have signed UN SDG declaration where accessibility is crucial; hence, smart city development should be looked at from the lens of SDGs”.*

And further stated, *“There are serious lacunae in the development of smart city plans, and the minimum inclusion which exists now is by chance, not by choice. Urban planning should include all the stakeholders; empathy alone does not work; there should be a change of attitude*

and behaviour. The leadership should be from the stakeholder group and affected parties, then only the right results are seen". Another interviewee believed that the inclusion of vulnerable and disadvantaged groups in the smart city requires immense support from political groups. Another interviewee stated that "*the concept of 'Area Based Development (ABD)' in smart city mission is the first level of exclusion where a limited area in the city is chosen for a specific smart city development project benefiting only minority people in the whole of the city*". The Area Based Development (ABD) is the suggested strategy for the smart city mission of the Government of India (Smart Cities Mission Statement & Guidelines, Government of India 2015). It aims at three kinds of development plans such as city improvement (retrofitting) covering an extent of more than 500 acres of land identified in the city, city renewal (redevelopment) covering an area of more than 50 acres of city land and city extension (greenfield development) surrounding an extent of more than 250 acres of land identified for the purpose.

Currently, mass migration to cities is increasing the hardships and adding to existing fundamental problems, like water shortages, traffic congestion and overcrowding, testing the levels of city development models (Kandpal, V. et al., 2017). One interviewee who works as a CEO of one children's NGO stated, "*the issue of migrants is always neglected in urban planning and therefore, they are not considered important stakeholders in smart cities. They face all kinds of issues like-know your customer (KYC) proof, language barriers, housing, and basic services, including health, education, etc. They are often deprived of basic rights and lack basic amenities within their work and living spaces*". Further stated, "*Migrants suffered a lot, particularly during COVID-19 lockdown as they lost jobs with no money to travel back home. As a result, the migrant issues have surfaced and made national headlines*".

Many interviewees mentioned that every citizen should be smart and capable of accessing digital infrastructures like the Internet and data in an actual smart city. An assistive technology company CEO said: "*The smart city is still overlooking inclusion and not focusing on it. The main reason is that the representation of the disabled population and related stakeholders are minimal in the decision-making or smart city board*". About challenges in addressing the inclusion of vulnerable populations, five interviewees mentioned that it is a big challenge for many smart cities. The CEO of an NGO said, "*These populations do not have sufficient knowledge to use technology, and neither can afford the digital tools and services. Their*

literacy levels are low; hence they face language barriers and cannot access online content and voice enablement”.

Many interviewees mentioned that the government should encourage people and provide them with necessary handholding, such as accessibility to digital devices and training for the vulnerable and disadvantaged. Unequal access to remote and online learning during the COVID-19 crisis is a stark example. For example, during the school closures due to the COVID-19 turmoil, the most vulnerable learners have been those with little access to hardware and connectivity and poor digital skills. An interviewee stated that prioritising the needs of different voices is challenging for the city administration. Another innovation expert interviewee said, *“Cities should leverage digital tools such as online voting and help identify the needs that have maximum upvotes”.* An urban architect mentioned, *“For the vulnerable and disadvantaged population, the basic education should be raised to different levels so that the students become aware of the digital technology world and be prepared for the requirement”.*

Three interviewees mentioned that data and information about vulnerable and disadvantaged populations are essential to design relevant policies and projects. Often the vulnerable population is loosely spread and much diversified across the city. Very little sub-national and local data is available to measure the exposure and risk of the vulnerable and marginalised population (Pinchoff 2018; Patel et al., 2016). Where data exists, it is not disaggregated by critical vulnerability measures like sex, age, poverty status and so on (Patel et al., 2016). One interviewee stated that *“the vulnerable populations often do not have complete information about government schemes for inclusion. Their understanding of using it and their accessibility to it in terms of economic and educational status is very low”.* Another interviewee shared the view that *there should be a targeted and incentivised approach to cover the vulnerable populations in smart city planning”.* Then further added: *“The planning process should start with them by understanding their basic needs and requirements without pushing the solution to them”.*

Regarding the role of other stakeholders, all the interviewees mentioned that the government is the leading player in driving the smart city agenda with inclusion priority. In contrast, the different stakeholders like the private sector, academia and civil society can strengthen the government functions and contribute towards inclusive and sustainable development. An interviewee shared the idea that *“the private sector is not interested in the inclusion of*

vulnerable populations as they do not see a business case. The government should encourage the private sector to develop inclusive projects through subsidies and corporate social responsibility jointly". Another interviewee made an interesting point: "The Government should introduce innovative policies to engage with technology companies and civil society. There is a lack of proper communication from the government to collaborate with other stakeholders".

An interviewee stated that *"civil society is playing some role but often becoming a voice to select groups and communities"*. Another interviewee who works with an international organisation suggested that if the private sector is engaged appropriately, several digital innovations can be developed to include vulnerable populations and mentioned, *"at present, the city governments are not working much on this agenda"*. He mentioned the relevant example of the partnership between Google and WHO to develop surveillance solutions for public health. Another interviewee working as an international urban expert said: *"The data is a valuable asset to the private sector, and it can be used to develop new and innovative business ideas"*. A few interviewees mentioned that academic and research institutions could be crucial in including vulnerable and disadvantaged populations by developing scientific evidence. A public policy expert interviewee said: *"Inclusion is squarely the mandate of governments; the private sector can only be the delivery partners as per mandate"*. Another interviewee came up with an exciting idea: *"the private sector must train and employ more people from vulnerable communities. Also, they must use corporate social responsibility funds to train the vulnerable populations and break the digital divide"*. However, he further added, *"many corporates lack concern and interest to include the disadvantaged populations"*. Another interviewee is an elderly person who stated that, *"the Government should encourage some incentives for the private sector and technology companies who are engaged in the implementation of the above and betterment of the youth"*.

5.3 Contribution of digital technologies towards equity and inclusion in Smart Bengaluru

The literature evidence in Chapter II suggests that digital technologies play a critical role in sustainable development and inclusion. The previous section confirmed that Bengaluru's smart city plan extensively uses digital technologies across multiple sectors; hence the impact and outcome of the same are discussed here.

5.3.1 The benefits of the use of digital technologies

As stated in Chapter II, digital technologies offer several advantages in urban planning, city management and development (Alberti et al., 2019; Karvonen et al., 2018; Smørdal, O et al., 2016; Yigitcanlar and Teriman 2015; Khansari et al., 2013; Tunc Karadag 2013; Ali Mostashari et al., 2011; Demirkan et al., 2011; UN-Habitat 2009; Berry 2008).

Several interviewees shared the opinion that India is an excellent adapter of technology. There are several successful examples of technology contributing to society's holistic and inclusive development. For instance, India experienced remarkable success in enhancing financial inclusion through digital payment systems. The technology adoption in the banking sector and Direct Benefit Transfer (DBT) led to the financial inclusion of millions of vulnerable and disadvantaged populations. The program aimed at the direct transfer of subsidies and cash benefits through their Aadhaar-seeded bank accounts (Aadhaar is a verifiable 12-digit identification *number* issued by the Government of India to the resident of India); substantially reducing leakages and delays in a multi-hierarchy of the government administrative offices (National Informatics Centre, Government of India).

Financial inclusion increased exponentially with the Pradhan Mantri Jan Dhan Yojana (PMJDY) launch in 2014 (Government of India 2014). This scheme contains a holistic approach to financial inclusion. It includes benefits such as a no-frill account, life cover, interest on deposits, accidental insurance, overdraft facility, Direct Benefit Transfer facility of the government scheme, facility of Rupay debit card and access to insurance and pension products, among others (Srivastava, V. and Ojha, P.K 2020).

The interviewee, a person with a disability, stated that technology supports the needs of persons with disabilities by making them independent. For example, new navigation tools and apps of Google and Apple help the visually impaired move around in cities. To highlight an innovation, an AI backpack developed by an Indian computer vision researcher named Jagdish Mahendran won an Intel AI competition. This solution is designed to address the navigation struggles of his friend, who is blind (a blog report 2021). The backpack idea uses cameras and AI sensors to analyse an environment and give instant feedback to the users.

An interviewee working as a technology consultant mentioned that digital technologies accelerate citizen service delivery and improve the experience for all, including vulnerable

communities. For example, recently Jan Sevak programme was introduced in Bengaluru (Government of Karnataka), through which citizens can demand government services at their doorsteps by paying a service charge. The citizens can call a toll-free number or avail of the service through the Jan Sevak Portal to avail of the service. The delivery personnel will visit the house and collect copies of applications and supporting documents, and they will later apply for the service at the department concerned.

There are several inclusion-enabling digital technologies. Few interviewees mentioned that social and assistive technologies enhance the inclusion of vulnerable populations like elders and persons with disabilities. Social technologies can bring positive change by connecting people at different scales and creating a powerful unified voice like, for example, Arab Spring in 2011, where social technology-facilitated social interactions and people's movement for change (Gartner 2021; Skaržauskienė, A. et al., 2013). Similarly, assistive technology covers the systems and services related to delivering assistive products and services and includes hearing aids, wheelchairs, communication aids, spectacles, prostheses, pill organisers and memory aids (WHO 2021). According to WHO, more than one billion people need one or more assistive products worldwide. Further, with the rise of an ageing population and non-communicable diseases, more than two billion people across the globe will need at least one assistive product by 2030; the estimation is that many older people might need two or more assistive products (WHO 2021).

Another interviewee stated that technology is a positive contributor to inclusion. Still, it currently serves society's top and middle layers and excludes the bottom layer that represents the vulnerable and disadvantaged population. Factors such as sex, age, income, ethnicity, location, and disability are significant predictors of access to ICTs and the Internet (UN DESA 2021). This expert said: *“Suitable and affordable technology solutions should be made available to meet the needs of the bottom layer of society who are often left behind”*. A public policy expert interviewee suggested, *' In a country like India, integrated technology services delivery centres can better meet all sections of society's requirements and enhance inclusive delivery of government services. She added, "To serve the vulnerable population, the existing digital access methods, including reliable, cheap or free broadband as well as data costs, are not enablers of inclusion. However, suppose service kiosks are made available with wi-fi enabled technologies, free of cost or call centres or voice-enabled information (like eSeva*

centres) actively promoting grievance gathering processes supplemented by citizen surveys. In that case, digital tech can enable inclusion”.

India's eSeva (Electronic Service) project is an excellent example of the government's integrated technology services delivery project. It is an e-Government project initiated in India in 2001 by the State Government of Andhra Pradesh (Rao, S.J 2003). The eSeva project aimed at integrating and offering a wide range of government-to-citizen (G2C) services at a single location. Citizens can transact on government matters, pay utility bills, and avail of trade licenses and other facilities. Inspired by the success of this initiative, the Government of India rolled out this project across pan-India as Common Service Centres (CSC). The CSCs would provide high-quality and cost-effective data, voice and video services in e-governance, health, education, entertainment, and telemedicine, including certificates, utility payments such as water, telephone and electricity bills, application forms and other private services (National eGovernance Plan (NeGP), Government of India 2006). The highlight of the CSCs is that they will offer web-enabled e-governance services in remote rural areas.

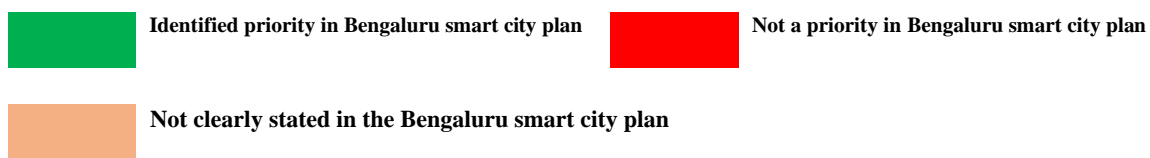
On a similar model, BangaloreOne renders efficient and useful Government to Citizen (G2C) and Business to Citizen (B2C) services to the citizens of Bangalore. Launched on April 2, 2005, BangaloreOne benefits citizens from the 14 hi-tech citizen service centres spread across the city. It covers utility bills, police, transport, passport, stamps and registration and many other services delivered online under one roof (Government of Karnataka, India). Many interviewees mentioned that mobile-based technology solutions foster better inclusion as they are within reach, easy to use and relatively affordable compared to other technologies. According to one blog, mobile technology accelerates smart city development (Pragnesh Modh 2018) because today, mobile is ubiquitous in every home and every pocket.

5.3.2 Digital technology's role in the inclusion of vulnerable population

The Bengaluru smart city plan initiatives have several technology interventions for equality and inclusion. To further assess the specific applications of technology for their contribution toward equality and inclusion, the application domains of the Bengaluru smart city plan are mapped to the technology domains for equality and inclusion from the literature, as shown in Table 18 below:

Table 18 Mapping of Bengaluru smart city plan technology domains to smart city technology domains from the literature (Source: Author)

Application domains of technology (for equality and inclusion)	Priority in Bengaluru smart city
18. Access to information	
19. Access to the Internet	
20. Access to digital infrastructure	
21. Universal access to services	
22. Affordable data	
23. Digital literacy	
24. Digital skills	
25. Assistive technologies	
26. Security and surveillance (<i>Women and child safety*</i>)	
27. Citizen engagement platform	
28. Participatory budgeting*	



* Bengaluru smart city initiative

As inferred from the above, few technology-related solutions contribute to inclusion in the Bengaluru smart city plan except for women and child safety and citizen engagement platform. However, Bengaluru works in participatory budgeting, where the application of technology tools has tremendous scope for promoting inclusion and equality.

Conversely, technology adoption may lead to several barriers and exclusions if not done appropriately. An interviewee stated that technology literacy is very important for the participation of all stakeholders, particularly people from vulnerable populations. This interviewee further said: “*Digital technology has its limitations in terms of accessibility and ease of use for the underprivileged but application of the same along with awareness can give positive results*”. It is argued that the accelerated pace of digital transformation sometimes increases the risk of social exclusion of vulnerable groups which are not digitally literate or connected (UN DESA 2021). All the interviewees shared that the digital divide is a critical challenge in promoting inclusion. The gender digital divide is a big issue in India.

Another interviewee shared an example that during COVID-19, children from vulnerable populations did not have access to digital education and were left behind. It is argued that the

'digital divide' issues pose a herculean task before the government of India to provide the maximum benefits to the stakeholders (Kaur, K. and Singh, J 2016). The government should focus on capacity augmentation, connectivity issues, competence building, content creation, cost reduction, community participation, core technologies creation, and exploitation. A commitment to the deprived and disadvantaged would help bridge the digital divide. Many interviewees shared that affordable digital connectivity is the foundation to tackle the digital divide and digital literacy issue, which is presently not there in Bengaluru. Five interviewees mentioned that privacy and security are essential to driving the digital participation of citizens. One minority religious leader said: *“Lack of willingness in the Indian bureaucracy to give up control and foster transparency is a hurdle for digital inclusion”*.

5.4 Key terms to achieve urban inclusion using digital technologies

On one front, the all-pervasive nature of technology has led to its increasing use in smart cities. However, the key terms that identify the challenges and requirements for people-centric, inclusive smart city planning are to be considered first.

5.4.1 Challenges and requirements of people-centred inclusive city development

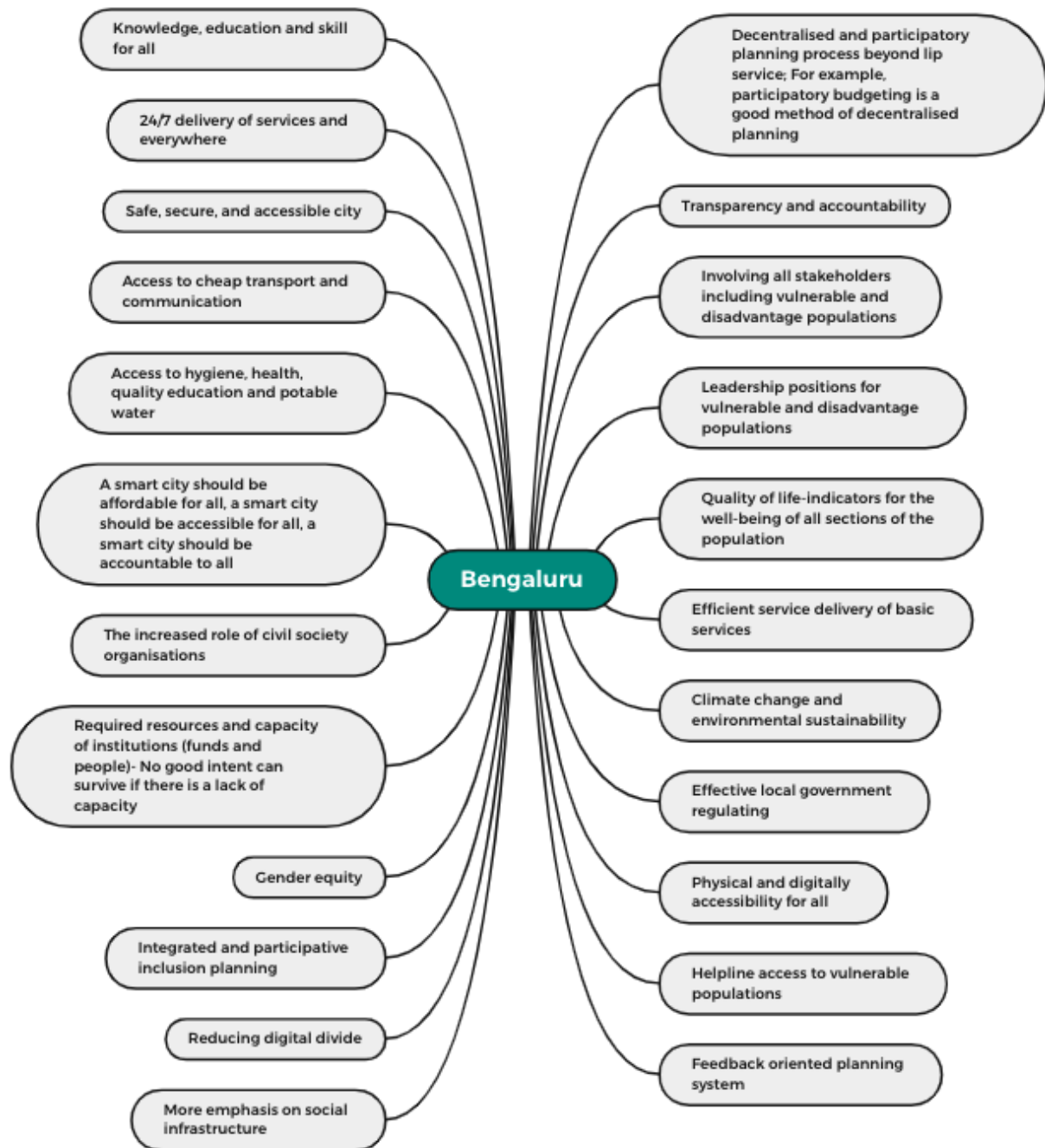
One interviewee who works as an architect said: *“An inclusive smart city is user-friendly with accessible design and which caters to the needs of all its citizens irrespective of their economic status, social or cultural status”*. Another interviewee, a technology innovation expert, said: *“In India, class and caste barriers are major challenges to achieving inclusive development. The projects envisioned by the government should benefit all, and involving citizens during every project stage will increase its impact and effectiveness”*. All the interviewees stated that public engagement and citizen participation is the most crucial component of smart city planning. Few interviewees said that, at present, only select groups or creamy layers of society are included in people's consultations. It should be a bottom-up approach and include all stakeholders.

Few interviewees mentioned challenges regarding reach and technique of data collection through citizen engagement. An interviewee who is an elderly person said that *“the public consultation using digital technology should be exposed to the vulnerable population for them to understand the digital world of tomorrow”*. This interviewee added: *“An appropriate cell or task force to be created with trained personnel to interact with such disadvantaged population and they should constantly be at it for certain years till such time the entire area where the*

disadvantaged population is living to understand and appreciate the benefits thereon for their future status of living”.

The 15 interviewees were asked to suggest the key themes for designing a people-centred smart city in Bengaluru, and they identified the following requirements as shown in Figure 33 below:

Figure 33 Key themes identified by respondents for designing a people-centred smart city in Bengaluru (Source: Author)



5.4.2 Public consultation methods

All the interviewees shared the opinion that the involvement of people in smart city planning is the key to developing inclusive cities. However, in the case of Bengaluru, they said there were few consultations with people who are either digitally connected or represented through a few residential associations. Further, with the challenges of digital connectivity, digital literacy and language barriers, only select populations could participate in the consultation process.

All the interviewees mentioned that public consultation still is a farce in India. One is that it does not include all population categories; two, it merely shares project information without involving the public in all project stages. For example, during the methods and ways of consultations in the Bengaluru smart city visioning exercise were appreciated, however, the feedback mechanism was narrow and skewed. For example, the visits to web pages and a mere indication of likes and dislikes were considered citizen consultations which is not true (Anand et al., 2018).

Enhancing digital literacy skills

Many interviewees identified a lack of digital literacy skills among residents as the most critical factor in the effective participation of citizens. They claimed that the digital divide in India is a big issue, with the illiteracy rate at 25-30 per cent and digital illiteracy even higher. According to ITU (2017), India ranks 134 out of 176 countries in the ICT Development Index (IDI). The reasons for the digital divide are illiteracy, language barriers, affordability and accessibility to appropriate hardware and software (Public Affairs Centre 2018).

As a newspaper reported (NV Vijayakumar 2018), the first Digital Literacy Centre for advancing the community's technical literacy was launched in Bengaluru in 2018 as a partnership initiative between an IT consulting firm and an NGO. The centre aims to benefit approximately 1,000 people from underserved communities by providing training on computers, mobile phones, and other digital devices. Except for a few NGO organisations, there is no other initiative to promote citizens' digital literacy.

5.5 Design of people-centric and inclusive smart city

This section discusses the people-centric planning methods beginning with the need for citizen participation in smart city planning.

5.5.1 Citizen participation

In the Indian Smart Cities Mission, an ICT-based citizen engagement tool was launched through a specific website (mygov.in) where citizens are engaged in vision sharing, debates, e-voting, essays and discussions on smart city service prioritisation. Most of the 100 cities engaged citizens through this online platform which was a pre-condition for accessing central grants for rolling out smart city projects. The portal has six interactive mediums for citizens engagement: group-based discussions; online and on-ground tasks, including essay submissions on given topics and participating in vision, logo, or tagline design competitions; discussions on specific local themes; surveys and polls where citizens can vote and select services and projects; writing blogs and sharing of experiences, and post real-time talks and invite citizens to engage in dialogue with political figures and policymakers.

This initiative is hosted and managed by the national government and is considered a highly top-down approach (Praharaj et al., 2017). Many scholars criticise it as a non-inclusive approach. How this e-participation drives and attracts different populations within the selected cities were unknown. The city citizen participation process is vague and sketched without much meaningful contribution (Anand et al., 2018). In the context of the penetration of the Internet and the existing digital divide, it is argued that the promise of ICT-based citizen engagement and e-participation in developing countries like India faces constraints and specific challenges (Praharaj et al., 2017; Boulianne, S 2009).

At the city-level inputs for the smart cities, the mission was taken from various portals- online and offline. Social media campaigns were done on Facebook, Twitter, the Smart city app and the official websites of BBMP (bbmp.gov.in) and the Government of India (mygov.in). It is reported (Bengaluru Smart City Plan 2017) that for the development of the Bengaluru Smart city plan, the citizens were actively involved through multiple methods and different ways of public consultation, which included: engagement and crowdsourcing of the city's vision involving 1380 citizens including stakeholders, eminent personalities and domain experts participating in a blueprint building exercise; nearly 15,20,414 responses were gathered for the campaign to make Bengaluru a smart city.

These were through apps, social media, direct interactions and mainstream media; citizen inputs were specifically recorded on their vision for the BBMP budget; nearly 67,114 responses were categorised into different targetable goals; in-person interviews were done with resident welfare associations, schools and offices; over 5 million SMSs and missed calls were sent to raise awareness and urge citizens to vote for proposals; online portals hosted the vision for the city receiving views and more than 32000 votes; social media posts and pages caught the interest of more than 49000 citizens; through the Sahaaya portal, inputs were collected through emails, WhatsApp, SMS, social media dashboards, phone calls, Sahaaya App, newspapers, Mobile one and direct inputs from the mayor and commissioner. These totalled to 1,01,634.

The city's needs were collated based on the consultations to create a shared vision with quantifiable goals. The open, structured, and trackable plans for the city were derived. The results were sorted into different categories: roads, pedestrian infrastructure, crime and safety, health, sanitation, etc. The inputs could then be analysed for the optimal development of targets. These create a detailed roadmap in each sector with the sustained efforts of sector experts, elected representatives, civic leaders, corporate leaders, resident welfare associations (RWAs), and senior press members.

All the interviewees mentioned that appropriate digital infrastructure is a prerequisite for effective citizen participation in the current digital age. There are 624 million Internet users in India, with 45 per cent Internet penetration (Sandhya Keelery 2021), and 23 per cent of the urban population has computer access, as per National Statistical Office (NSO). According to a report by the Internet and Mobile Association of India (2019), Internet penetration for Karnataka was 42 per cent, and Bengaluru was home to 6.6 million Internet users. However, the fifth National Family Health Survey (NFHS) 2019-2020 revealed that only 35 to 50.1 per cent of women in Karnataka's urban areas had used the Internet. All the interviewees stated that affordable and accessible Internet is a critical factor for the participation of citizens.

Several interviewees said the private sector plays a role in the vital ecosystem and the government. For example, Cisco Systems plans to develop the 332-acre Electronics City in south Bangalore into a smart city and develop Asia's first Internet of Things (IoT) innovation hub. The scheduled services include smart street lighting, smart parking, smart water management, smart CCTV surveillance, and community messaging.

Similarly, the city administration recently collaborated with an IT infrastructure company to provide one-hour free wi-fi to visitors at 4000 prominent public places and tourist attractions. The private company offers this service at the cost of nearly £10 million under corporate social responsibility without any fund support from the government. But these facilities again benefit select groups and populations. The issue of digital infrastructure for vulnerable populations is still not on the radar of priority projects by the city government. A few interviewees mentioned that the security and privacy of data and trust in online services are still a challenge in Bengaluru. It is better than other cities in India but still needs an appropriate directive and policy from the government.

Inclusive tools to cover vulnerable population

According to a UNICEF report (2020), just 24 per cent of Indian households have Internet connections, and there is a significant gender divide and gap across high, middle, and low-income families. Several interviewees believed that both digital and non-digital methods of public consultation are helpful. The visioning exercise of Bengaluru smart city included comprehensive public talks using non-digital sources, including special newspaper reports on the smart city proposal, independent discussions on radio about smart cities involving the citizens, workshops with RWAs, 200+ meetings at different locations in the city, inputs from schools, colleges, urban poor, trade unions and the corporate sector to gauge a broad spectrum of responses. In the process, nearly 2,52,422 citizens were contacted through direct ballots, 2,00,000 handouts and public banners were distributed, 200 flex posters were used, and 200 Bus stops, auto-rickshaws and eight mobile vans displayed hoardings. However, several interviewees mentioned that in Bengaluru, predominantly educated people from wealthy backgrounds or middle-class families participated in public consultations. There was complete neglect of vulnerable and poor populations.

The recent citizen activism in Bengaluru to scrape the steel flyover project has caught the attention of both Indian and international media. This is a sign of active citizen participation influencing local government matters. However, several interviewees mentioned that there is selective participation of citizens. It is non-inclusive as poverty, widespread illiteracy, and a profoundly hierarchical social structure are critical challenges for equal participation of diverse populations.

The growth and deepening of democratic roots in India can be traced to the passing of the 73rd and 74th amendments to the Constitution, which empowered citizens in urban and rural areas in governance matters. However, still, citizens do not enjoy any decision-making power in local government affairs except for electing representatives and participating through citizen forums. The stages of involvement of citizens also vary from region to region. Each city has developed its mode of interaction and tools and methods of interaction.

One key aspect of the Bengaluru city administration is placing a quarterly report on the programme of works on a ward-wise basis and seeking feedback and further inputs from the citizens. This document is called 'Arthika Darpana', a financial mirror of the ward-level activities and finances. This is the first time in the country that a civic agency is openly placing a detailed report of all its activities before its citizens. This led to transparency and accountability through structured citizens' participation and paved the way for the implicit acceptance of the idea of participation.

In the case of Bengaluru, most of the public consultations happen through elected representatives, political parties, members of civil society and citizens' forums and residential associations (Bruhat Bengaluru Mahanagara Palike (BBMP) 2021). Except for elected representatives, other platforms do not have any decision-making power except advisory services. The city is divided into 198 territorial zones called 'wards' and has 198 elected representatives. Citizen participation is through ward committees, residential associations, and other NGO forums. Despite the loosely structured and powerless citizen forums, a few citizens' initiatives in Bengaluru that recently changed the government's policies have been the Bellandur lake restoration and the decision.

Another shortcoming in present public consultation methods is the lack of proper codification of the citizens' participation, which allows the political leadership to ignore the suggestions simply. It has also led to the politicisation of sections of the civic movement. This is an area that needs the involvement of the political establishment. It requires a concerted and joint effort on the part of all civic activists.

Citizen participation through community involvement, local & grassroots organisations, and new social organisations/networks/committees

All the interviewees mentioned that local and grassroots organisations play an essential role in public engagement. The Bangalore Agenda Task Force, set up in the 1990s, includes corporate leaders who helped turn Bangalore into an IT hub. This task force managed to get commitments from all the public agencies on a shared vision. The Public Affairs Centre, a non-profit, established citizen report cards and a user feedback mechanism to hold public services accountable.

Bengaluru always had the active participation of citizens. More recently, civil society has shifted from advisory to consultation and advocacy. It all began with the citizens' platform, Janaagraha, which was floated with the primary objective of providing citizens with a forum to collectively interact with elected representatives and share their idea of development. It is a unique initiative that uses civic accountability to hold the government accountable. One NGO argues in Bengaluru that citizen participation became the enabling provision for the transformation of a representative form of democracy to that of a participatory style and ensured the objective of keeping elected representatives alive to the needs and aspirations of the community (N.S. Mukunda 2020). NGO and civic organisations like CIVIC, ESG, Hasiru Usiru, Malleswaram Swabhimana, and CAF, to name a few, have been around for decades fighting on behalf of citizens on the streets and in courts.

Before the formation of Janaagraha, many Residential Welfare Associations (RWAs) in various localities worked in isolation to the extent that they were unaware of each other's existence. However, the last decade saw a dramatic increase in public participation as social media brought like-minded people together at lightning speed. It gave a fillip to civic activism in the form of RWA formation at the ward level and other specific interest groups to interact with the authorities continuously.

One of the important achievements of civic activism in Bengaluru is bringing all contesting candidates in a constituency on a shared public platform for open interaction. This was started in 2008 during the Lok Sabha elections, where many civic and federations, including RWAs, held interactive meetings across the city. The other significant movement that has caught the public's attention and the government alike is Citizens for Bengaluru (CfB), a community-based organisation. This movement has succeeded in its fight against infrastructure projects

like the steel flyover, giving an impetus to the commuter rail movement and, most importantly, the birth of ward committees or sabhas.

Another successful example is the Tender SURE guidelines prepared by civil society organisations before being adopted by the BBMP and the state of Karnataka. The Tender SURE project demonstrates that a bottom-up approach within the system can positively influence integrated planning and push government actors toward integration. The Tender SURE project demonstrates the potential for new ways of working across sectors for improved service delivery. This project is an excellent example of how private and civil sector participation in Bangalore has been key to delivering non-networked infrastructure, even without a formal public-private partnership. The process of preparing and advocating Tender SURE guidelines to upgrade roads was entirely carried out by non-governmental organisations and private firms without any legal commitment from the public sector at the early stages – thus marking a significant turning point for governance in the city. However, once the government was convinced, Jana Urban Space Foundation, one of the vital private agencies in advocacy, entered into a design and technical partnership with the city and state governments for project delivery (Bangalore City Connect Foundation 2012).

Bangalore Political Action Committee (B.PAC) is a citizen's group that aims to improve governance and enhance the quality of life. It works in good governance, integrity and transparency within the government, quality of infrastructure and identification and supports strong candidates for public office.

Recently, the catalyst for creating ward committees in Bengaluru came with the Steel Flyover Beda movement (Aruna Natarajan 2019). The ward committees were formed after the Karnataka High Court ruling to decentralise solid waste management. At present, there are ten members in each ward committee, and the corporator, who is the chairperson, has veto power. The members are selected from among the voters in the ward. To the extent possible, the committee represents all sections of the population with reservation of memberships for women, marginalised groups and resident welfare associations.

In terms of shortcomings of civic activism in Bengaluru, it is argued that the orientation of civic activism is towards the fulfilment of middle-class aspirations, ignoring the needs of the urban poor and hence very elitist.

Co-creation to stimulate citizen participation and develop sustainable social innovations

Several interviewees stated that citizen-led co-creation is more encouraged by Bengaluru's private sector and civil societies. For example, there are nearly 10,000 plus tech start-ups in Bengaluru. The most successful start-ups offering urban services include Ola (An app-based platform offering ride-hailing services), Swiggy (An online platform for food ordering and delivery), and Sharechat (A provider of vernacular-based social media platforms).

The Janaagraha Centre for Citizenship and Democracy, an NGO, leads social innovations and co-creation through citizens, government, and the private sector. For example, Janaagraha's I Change My City platform enables citizens to report problems and later get feedback after addressing the issue (Haris Zargar 2010). Similarly, other civic innovations of this organisation include Bala Janaagraha, a civic education program for children who are future citizens; I Paid a Bribe (IPAB), an online platform started by Janaagraha that focuses on corruption; The Community Policing (CP) programme creates awareness and provides inputs to police from citizens to solve neighbourhood-level security and crime concerns; ASICS-Annual Survey of India's City-Systems (ASICS) is used to benchmark cities through a systemic framework.

5.5.2 Strategy, governance and policy for enhancing inclusion

In terms of policy landscape, Bengaluru city suggests few good initiatives. In 1992, the 73rd and 74th amendments to the Constitution of India were passed, giving constitutional status to urban and rural local bodies. It was one of the significant country-wide initiatives to promote grassroots-level governance focusing on inclusion and decentralisation with the devolution of powers. To give representation to all sections of society, seats are reserved for scheduled castes and scheduled tribes (who are officially designated disadvantaged groups in India), and one-third of the seats are reserved for women. In line with these reforms, the provincial government relevant to Bengaluru introduced Karnataka Municipal Corporations Act to form Area Sabhas and Ward Committees to facilitate people's participation at the grassroots level. In Bengaluru, the local authority Bruhat Bengaluru Mahanagara Palike (BBMP) consists of 198 administrative units called wards and each of these wards is represented by an elected representative. The details and functions of the ward committees are discussed in an earlier sub-section. Another related legislation is the Karnataka Guarantee of Services to Citizens Act, 2012, which was implemented where government departments promised to render 151 services under the Bill.

As per the 74 constitutional amendment act, BBMP and other service and utility agencies in Bengaluru like BESCOM, BMTC, and Police (Traffic and Law and Order) have introduced citizens' participation in some of their functions. In addition, Bengaluru became the first city in India to experiment with community-led participatory budgeting in 2001. This was possible due to the My City My Budget campaign, launched by a non-profit organisation called Janaagraha, which sensitised resident welfare associations to influence the municipal budget. As per the latest available data, this initiative receives over 9700+ budget inputs from citizens every year.

Further, four types of planning and financial tools enabled integrated planning in Bengaluru. They include legal tools, agreements and guidelines, financial tools, and rule-setting for monetary transfers. The legal tools include masterplans and government orders; Agreements and policies include memoranda of understanding (MoU), special committee reports, and technical guidelines (such as construction guidelines), which are influential due to their high-level political endorsement and bureaucratic involvement; Financial tools: grants, loans, and pooled financing, as well as efforts to sell bonds to private investors and user fees for service; Rules that set conditions for financial transfers to include revolving funds like the Mega-City Scheme¹⁸ for slums.

Despite several initiatives, the Bengaluru Smart city faces multiple challenges in citizen engagement. It includes issues like financial indiscipline, trust deficit reflected in corruption and leakages in civic works, and inflated contract values, often considered the norm. Poor infrastructure and inefficient service delivery also have led citizens to distrust BBMP. Lack of accountability is another challenge in the meaningful engagement of citizens. The state of affairs of Bengaluru city with mounting garbage, potholed roads, lack of walkable footpaths, encroachments, building violations, and delayed projects often leads to a blame game and lack of interest among citizens. The presence of multiple agencies and disintegrated approaches is often cited as a reason for these problems. Lack of transparency is another issue where the operations and finances of city administration are often shrouded in secrecy.

5.6 Chapter Summary

India's 'Smart Cities Mission' project launched in 2015 is an ambitious development plan aimed at revamping and modernising urban governance and administration. It has several innovative strategies such as the community at the core (community at the core of planning and

implementation); more from less (ability to generate greater outcome with fewer resources); technology as a means, not the goal (selection of technology relevant to the context of the cities; sectoral convergence and integration.

However, the Smart City Mission is criticised for its top-down implementation approach, dependency on huge investments, challenges of public-private partnerships, and lack of inclusive approach (Kandpal V. et al., 2017). Another criticism is that a smart city is not just installing seamless digital connectivity or making physical infrastructure more efficient and reliable; it should instead provide adequate housing and access to essential services and tackle high rates of violence and crime being reported against women, children, minorities, and Dalits (Housing and Land Rights Network 2018). Some academic experts criticised the area development model proposed in this mission as non-inclusive (Rumi Aijaz 2016). The mission 'area-based approach' is claimed to cover only eight per cent of the city population, with more than 80 per cent of the investment (Ahmed, A. and Ali, S 2021; Housing and Land Rights Network 2018). With its notion of inclusiveness and convergence, the smart city mission fails to integrate disability as a vital issue in city planning and development (FICCI and NCPEDP 2016). For example, the core infrastructure elements in the smart city plans do not include accessibility solutions for persons with disabilities. Therefore, the smart city approach is considered fragmented, with technical and financing concerns and political, financial, individual, social, and service gaps added to a lack of accountability and large-scale corruption (Ahmed, A. and Ali, S 2021). It is argued that creating basic amenities for the masses, a big concern in Indian cities is not a priority of the smart city mission (Kandpal, V. et al., 2017).

Therefore, it is recommended that the mission change the strategy from piecemeal and project-based interventions to a plan to address structural inequalities and inadequacies in Indian cities (Housing and Land Rights Network 2018). According to some critics, the mission requires a fundamental re-envisioning exercise, placing inclusion and excluded people at the centre, not technology and profit (Ahmed, A. and Ali, S 2021). It is criticised that the scheme is not people-centric; even though the Twitter and Facebook data was considered, it did not cover the significant group of people who are not on social network groups and would directly or indirectly be affected by the scheme.

The Bengaluru case study contributed uniquely to the smart city's national and city-level vision. The Bengaluru Smart city plan, which had the community at the core of development, highlighted the need for renewed vision and strategy to achieve sustainable development. As

discussed in the literature, this case study confirmed the existence of exclusion in city life and identified the category of excluded populations who are neglected and left behind. The challenges of these vulnerable populations confirm the findings of the literature. All the interviewees agreed that the current smart city plan is not focusing on inclusion, and a lot more needs to be done. The current smart city plan is criticised for being a top-down approach and lacking public consultation, particularly the participation of vulnerable populations identified in this research study. The citizen participation methods were criticised for being skewed and biased, favouring only digitally connected ones. And civil society promoted citizen participation was restricted to middle-class populations who worked as pressure groups to get required services from the civic authority.

The inclusion challenges in Bengaluru are similar to other cities. They include a lack of digital literacy, a substantial digital divide, connectivity issues, Internet /data availability, last-mile connectivity, etc. The other major impediment to inclusion was the lack of collaboration between the line departments of the city administration, thereby affecting the delivery of citizen services in a timely and integrated way. While in terms of participation of civil society, Bengaluru presented a bright picture with significant collaborations at the grassroots level. There is strong evidence of social innovations led by civil society organisations that are sustainable and worth replication in many other cities. The integrated e-governance service delivery model of eSeva, where the government directly provides online services to citizens, is an excellent example of a technology leveller.

The other good practices worth emulation include the 74 constitutional amendments empowering urban local bodies and allocating certain legislative and executive seats for vulnerable and unrepresented groups. This ensures the participation of the vulnerable population in contesting local elections. The ward committees-led monitoring of local development at the ward level is another good initiative leading to increased transparency and accountability. The direct benefit transfer (DBT) also ensures the subsidy and benefits for vulnerable and disadvantaged populations are directly credited to the beneficiary bank accounts. Similarly, community-led participatory budgeting allows residents to decide and allocate funds for local development.

To sum up, a few key lessons and practical recommendations for inclusive smart city plans that emerged out of this case analysis include:

- Representation of vulnerable groups in city governance and participation in decision making
- Need for public consultation, particularly for the vulnerable population
- Digital literacy
- Need for more social infrastructure
- Need for sub-national and local data
- Provide the right information and access to the affected population
- Government should be in the driving seat of the smart city, not the technology companies that lack the holistic and inclusive approach
- Need for an integrated and collaborative approach by all stakeholders to the inclusion of vulnerable populations

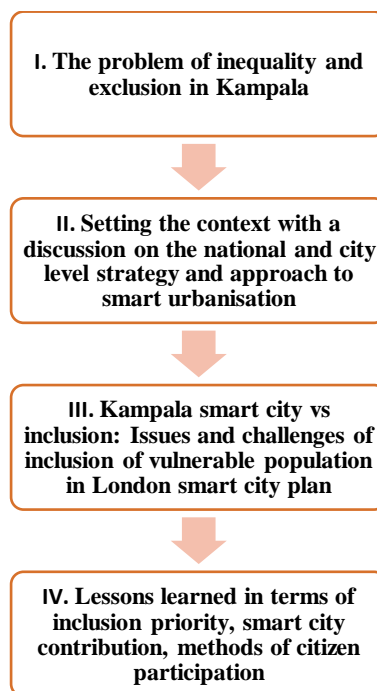
Further in-depth and comparative analysis through identified themes is done in Chapter VIII.

Chapter VI

6 The case study of Smart Kampala

This is a qualitative case study of Kampala city in Uganda. It also presents Kampala's aspiring smart city model in terms of an ambitious vision and numerous smart applications and digital innovations that form the crux of smart city planning and urban development and brings the proper context for this research. This third case selection strategy includes a combination of diverse, varied, effective pathways and similar and different techniques. The choice of an African case study is very relevant to this research because, after Asia, Africa is the second-fastest urbanising region in the world and has over 25 of the world's 100 fastest-growing cities (Richmond, A. et al., 2018). Uganda is one of the low-income countries in Africa (World Bank 2020 rankings). However, it is poised to leap forward to the following levels of development through its ambitious plan premised on the second National Development Plan (2015/16) for achieving sustainable wealth creation, employment, and inclusive growth. The case study structure is shown in Figure 34 below:

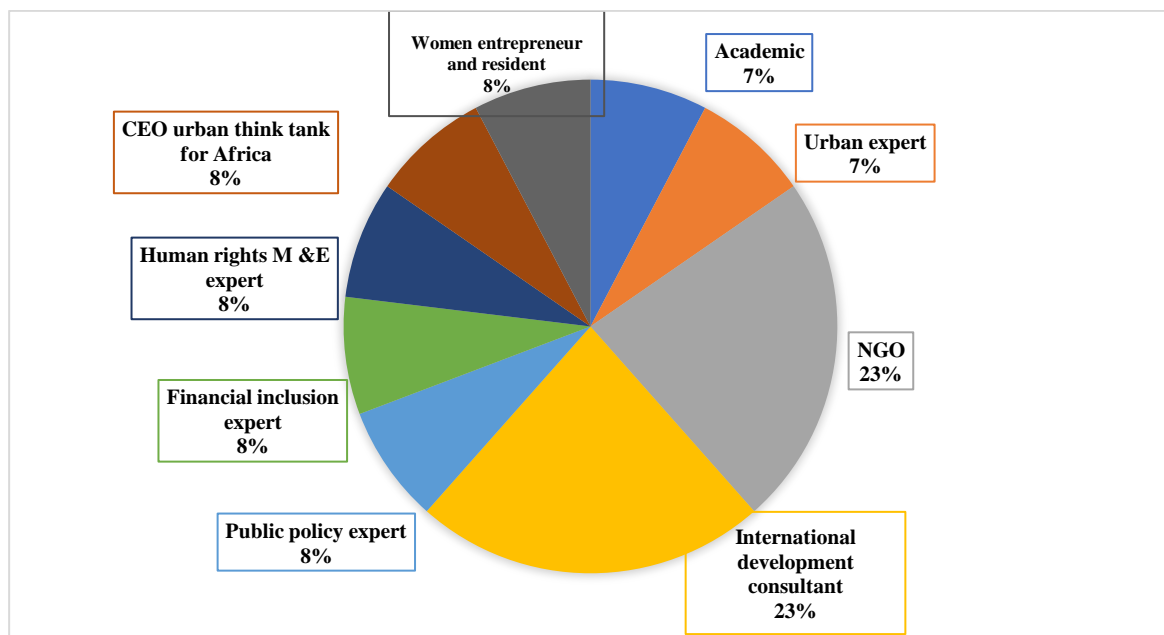
Figure 34 The case study approach for Kampala (Source: Author)



The case study involves a detailed analysis of documentary evidence from academic and empirical studies combined with semi-structured interviews with the relevant stakeholders. The chapter first introduces Uganda's challenges and urban development plans, followed by a

detailed Kampala smart city plan analysis. Then the inclusion challenges vis-à-vis smart city are discussed, followed by the importance of citizen participation towards achieving a people-centred inclusive smart city. A total of 13 participants, in this case, the study included: one academic, one urban expert, three representatives from NGOs, three professionals working as international development consultants, one public policy expert, one financial inclusion expert, one human rights M&E expert, one CEO of an urban think tank for Africa, one woman entrepreneur and one resident as shown in Figure 35 below:

Figure 35 Profile of interviewees from Kampala case study (Source: Author)



As mentioned in the methodology chapter, the case study findings are further analysed and discussed according to the following five broad themes and 14 sub-themes:

Nature of urban exclusion

- The evidence of the problem of exclusion
- Forms of exclusion
- Category of the excluded population
- Challenges of the excluded population

Priority of inclusion of vulnerable population in smart city planning

- The national smart urbanisation strategy and the vision of smart city
- Priority of inclusion in smart cities
- Smart city projects to benefit the vulnerable population

Contribution of digital technologies in enhancing inclusion and equity of vulnerable population

- Benefits /impact of using technology
- Digital technology's role in the inclusion of vulnerable population
- Essential digital infrastructure

Key terms to achieve urban inclusion using digital technologies

- Challenges and requirements of people-centred inclusive city development
- Public consultation

Design of people-centric and inclusive smart city

- Citizen participation
- Strategy /governance/policy

6.1 Inequality and exclusion in Kampala

Inequality exists in multiple forms in Kampala city. Many groups of the population experience exclusion and discrimination in their daily lives. This section highlights the evidence and nature of inequality and exclusion in Kampala city.

6.1.1 Evidence of the problem

Uganda is a country of enormous diversity with different ethnic, linguistic, and religious groups influenced by historical migrations and interactions (Minorityrights. Org 2019). There are over 40 other ethnic groups; among them, the north and north-eastern regions are marginalised and constitute minorities (Human Rights Council, 2011). Speakers of Bantu languages comprise the majority and constitute about two-thirds of the population in Uganda (Minorityrights. Org 2019). In Uganda, the marginalised and vulnerable groups include women, children, youth, older persons, persons with disabilities and ethnic minorities (UNPF 2017). Altogether, these categories constitute over 80 per cent of Uganda's population; however, they continue to face exclusion, marginalisation, and discrimination (Human Rights Council 2011).

6.1.2 Forms of exclusion in Kampala

The interviewees stated that exclusion and inequality are universal problems and include multiple dimensions like social, economic, physical and digital exclusion. All of them agreed that the primary category of the excluded population consists of the elderly, people with disabilities, children, women, poor, youth, migrants, refugees, indigenous population, religious minorities, ethnic or caste groups and the LGBTI community. In addition, some interviewees mentioned that other groups who experience exclusion and discrimination include people involved in the informal economy, petty and small traders, street vendors, mentally sick, street children, transporters like Boda Boda and tupu riders, etc. homeless people.

6.1.3 The category and challenges of the excluded population in Kampala

Uganda is a low-income country and among the poorest countries in the world (World Bank 2020). In Uganda, 41 per cent of people live in poverty. Uganda has been struggling for decades with issues of poverty, and Kampala is no exception (Maybelline Martez 2014). It also hosts the largest refugee population in Africa, with one million refugees seeking asylum in Uganda who live in abject poverty in a new country. The migrants travelling from rural to urban areas have led to living in poverty in the capital. The poor of Kampala live in slums without proper access to clean and safe water, exposed to diseases due to water contamination, and many of them end up begging in the streets (Maybelline Martez 2014).

There is little respect or protection for minorities in Uganda as migrants constantly suffer the right to recognition, language, and development (Human Rights Council by Minority Rights Group International 2011). In Uganda, during the 1970s and 1980s, gross human rights abuses occurred under the Amin, Obote and Okello regimes (Minorityrights.org 2019). Recent years have seen some form of stability, but the legacy of past conflicts remains a mobilising factor in Ugandan politics. The Ugandan Asians expelled by Amin in 1972 can now reclaim their possessions and confiscate property. Uganda has widespread inequality and poverty due to laws and policies governing the land (Oxfam 2021). It affects vulnerable people and marginalised communities such as women, pastoralists, youth, and smallholder farmers. Despite efforts to reduce absolute poverty, nearly 10 per cent of the households in Uganda continue to live in chronic poverty, with significant differences across geographical areas (Ssewanyana, S. and Kasirye, I 2012). Education is critical to income inequality (Ssewanyana, S. and Kasirye, I 2012).

Refugees in Kampala have significant humanitarian and long-term needs distinct from those facing the city's urban poor, yet few can access support. For example, South Sudan refugees lack the qualifications to work in Uganda as their earlier academic qualifications are not recognised or considered inferior in Uganda (Irene Among and Michael Mutemi Munavu 2019). Migration has an essential impact on the socio-economic development of Uganda (OIM 2015). For example, more than 50 per cent of investments in 2012 were done by foreigners, mainly from South Asia. Urban refugees often live in Kampala's slums as the urban poor face distinct challenges, such as a lack of access to housing, employment, and essential services, including local networks and language barriers (Alex Silberman, SEEFAR 2020). Lack of English skills is a central barrier preventing refugees from accessing jobs or services in Kampala. There are also reports of sporadic intercommunal violence in areas of Kampala affecting refugees. While data on Ugandan perceptions of refugees is mainly positive, incidents like a significant riot in Bwaise three years ago, which displaced the entire Somali refugee community in the area, highlight further vulnerabilities facing Kampala's refugees.

Urban planning in Kampala is complicated primarily due to its complex land tenure system (Richmond, A. et al., 2018). There are five different land tenure systems in Kampala, often many of them overlapping. Where different land types offer different levels of security. Heavy metal pollution and water contamination are widespread in Kampala. Similarly, the demand for municipal infrastructure in Kampala is vast, with water, sanitation, and many others challenges. There is widespread urban poverty with housing shortages (Richmond, A. et al., 2018).

According to the Uganda Bureau of Labour Statistics (2020), over 87 per cent of total employment in Kampala is in the informal sector. It is estimated that nearly 50 per cent of residents in the Greater Kampala Metropolitan Area live in slums, occupying just 16 per cent of total land (WHO 2020). Kampala represents a unique case where slums are widely dispersed throughout the city and not concentrated in pockets as in other cities. These informal settlements form a critical part of the city's fabric (Richmond A. et al., 2018). During the pandemic, informal workers experienced high job risks of loss of income and livelihood. The poor experience several challenges like lack of employment opportunities; lack of productive assets; lack of support systems and social networks; illiteracy & ill-health; lack of access to community-level infrastructure; lack of access to markets and; lack of essential commodities;

vulnerability to hazards and shocks; and domestic violence such as alcoholism (Lwanga-Ntale, C et al.,2008).

In Uganda, older persons constitute 4.3 per cent of the total population, with 54 per cent being women and more than 98 per cent living outside Kampala (The Republic Of Uganda Ministry Of Gender, Labour And Social Development 2020). In Uganda, sickness and disability are considered inevitable and natural processes of old age. Older women are considerably more likely to have a profound disability than men. In Uganda, HIV/AIDS is a significant public health challenge where affected people experience discrimination and exclusion from the community (The Republic of Uganda Ministry of Gender, Labour and Social Development 2020).

Nearly 12.4 per cent of the national population, approximately 4.5 million Ugandans, lives with some form of disability (Uganda Bureau of Statistics Census Report (UBOS 2016). Surprisingly disability is more prevalent among women (15 per cent) than men (10 per cent). The challenges of people with disabilities include inaccessible transport and public services, unemployment, low skills and education levels, and discrimination, where children, girls and women with disabilities are the worst sufferers (Rohwerder, B 2020). Disability is predicted to increase substantially across all age groups by 2050 (The Republic of Uganda Ministry of Gender, Labour and Social Development 2020).

According to the Global Gender Gap 2016, Uganda ranks 61 out of 144 countries in addressing the gender gap. Uganda's Vision 2040 statement prioritises gender equality as a critical enabler for the country's socio-economic transformation, focusing on increasing women's participation in politics and lowering gaps in education. The National Development Plan II (NDP II 2015-2020) prioritises women's empowerment and gender equality for inclusive growth and social development. Despite progress in the political and decision-making arena, gender inequality in Uganda remains a challenge. The women have limited access and control of land, limited employment opportunities; limited access to education and health services; limited access to decision-making platforms and political representation; they often experience sexual and gender-based violence, among many others (UNPF 2017). They also suffer from harmful traditional practices and socio-cultural norms like forced child marriages and teenage pregnancy.

In any society, children are the primary victims of poverty (Humanium. Org 2020). In Uganda, due to extreme poverty, children are sent to live in towns and cities and end up as street children. It is estimated that at least 10,000 children live on the streets in Kampala city (Humanium. Org 2020). The challenges they face include child abuse, malnutrition, right to identity, prostitution, lack of access to health care and education, child labour, street children, shelter deprivation, exposure to crime conditions, lack of freedom of expression and opinion, and constantly fighting to survive.

More than 77 per cent of Uganda's population is under 30 (AFIDEP and University of Southampton 2015). The country has one of Africa's highest youth unemployment rates, at 13.3 per cent (Irene Among and Michael Mutemi Munavu 2019). The youth bulge and high levels of unemployment in Uganda call for urgent action and innovative solutions. The challenges include the uselessness of having graduated from university, lack of employable skills and lack of access to formal jobs. The demand for good jobs is reported to exceed the supply, and there is limited access to internship opportunities (Irene Among and Michael Mutemi Munavu 2019).

Uganda hosts the third-largest population of refugees in the world and is widely recognised as having some of the most generous and refugee-friendly policies (UNDP 2017). There are 1.3 million refugees from the Democratic Republic of the Congo, South Sudan, Burundi, Somalia and others (Alex Silberman 2020). Refugees in Uganda are given access to healthcare, employment, identification documents and freedom of movement, access to essential services and rights that are often missing in other refugee-hosting contexts. Uganda launched the Comprehensive Refugee Response Framework (CRRF) and diligently integrated refugees into legislation, policies, and programmes. The policy of generous land distribution has led most of Uganda's refugees to live in rural areas; however, many refugees live in Kampala for better livelihood opportunities. An estimated 65,000 refugees live in Kampala (Alex Silberman 2020). This figure represents just 5 per cent of Uganda's total refugee population, but the actual figure is much more than this. For example, the Young African Refugees for Integral Development estimated that Kampala hosted upwards of 200,000 refugees, meaning that one in every eight people in Kampala could be a refugee.

Currently, increasing numbers of LGBTI people are open about their identity in Uganda. This is likely because there are more mechanisms to support their human rights. The Takao

Foundation, which works to strengthen the wellbeing, health, and livelihoods of marginalised groups in Uganda and Eastern Africa, claim that despite progress, LGBTI people are still denied access to education, housing, and employment, face arbitrary arrest and detention, and are subject to verbal, sexual and physical violence. The biggest challenge for this community in Uganda is the lack of legal framework access.

All the interviewees shared the opinion that exclusion leads to challenges of accessibility, affordability, opportunity, participation, and liveability. One interviewee who works in a bank in Kampala mentioned that exclusion is sometimes people's perception. For example, rural and poor people coming to the bank remove their shoes or bow before the staff. One interviewee, who is a CEO of a financial services company, said: *“In Kampala, there is huge migration from rural sides and added with increasing youth population there is a severe problem of unemployment along with insufficient housing and infrastructure leading to growing slums and spatial inequalities”*. Additionally, he noted: *“Financial exclusion is a big problem in Uganda as bank account maintenance cost is very high and poor people cannot maintain savings account and due to high taxation and lack of access to capital, small entrepreneurs face hindrance to growth and opportunity”*.

6.2 Priority of inclusion of vulnerable populations in smart city planning

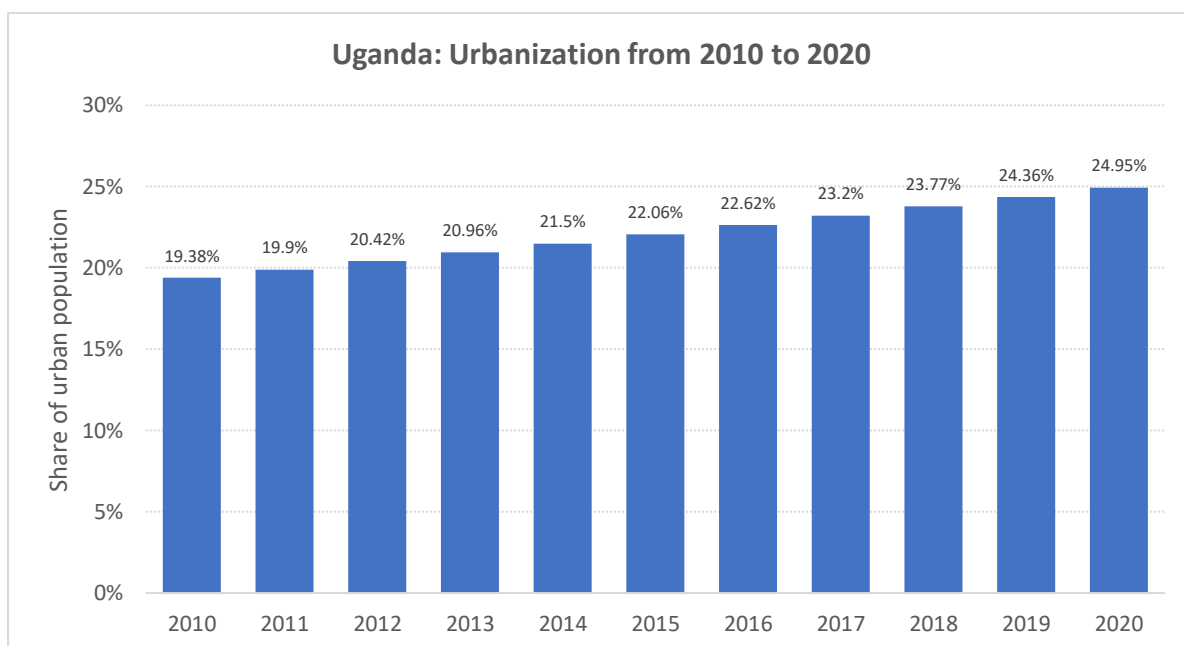
In a multi-level governance structure, the national urbanisation strategy influences the city government plans. Hence to contextualise and position the study appropriately, this section first discusses Uganda's national smart urbanisation strategy, followed by the vision of the Kampala smart city plan.

6.2.1 Smart Urbanisation in Uganda: The national strategy and approach

Presently, urbanisation and the young population are considered the key drivers of growth and development in Africa (Deloitte 2017; KPMG 2012). By 2030, 50 per cent of Africans will be living in cities (The Brenthurst Foundation 2015). Even in the early stages of urbanisation, African countries are interested in smart technology solutions to tackle urban challenges and therefore adopting the smart city approach (Brookings 2017; Deloitte 2017). The mobile phone is considered a tool for entrepreneurship, innovation, creativity, and invention (KPMG 2012). Africa's cities increasingly use mobile phones with Internet access for trade and industry, and as of now, the mobile penetration across the continent is above 72 per cent (Deloitte 2017).

The Republic of Uganda is a landlocked country in East Africa bordered by the Democratic Republic of Congo to the west, Kenya to the east, Tanzania and Rwanda to the south and South Sudan to the north. The population of Uganda has been proliferating over the last ten years and, at present, has a population of 36 million people (UBOS 2020). The rate of urbanisation is very high in Uganda and is estimated at 5.2 per cent growth per annum, as shown in Figure 36 below. Nearly 20 per cent of Uganda's population lives in urban areas, and it is projected that by 2050, about 50 per cent of Uganda's population will be living in cities (The Uganda National Urban Policy 2017). According to National Population and Housing Census 2014, Republic of Uganda (2017), the country's total urban population as of 2016 is 7.5 million persons and spread across 259 urban centres. Kampala, the national capital city, is the most populous urban centre, with 1.5 million persons (National Population and Housing Census 2017).

Figure 36 Degree of urbanisation in Uganda from 2010 to 2020 (Source: World Bank © Statista 2021)



The National Urban Policy (The Uganda National Urban Policy 2017) is the national-level legislation to guide and provide a policy framework for organised and systematic urban development in Uganda. The Vision of the National Urban Policy is "Transformed and Sustainable Urban Areas" (The Uganda National Urban Policy 2017 p7). At the same time, the Goal is "To promote livable urban areas that are organised, inclusive, productive and sustainable" (The Uganda National Urban Policy 2017 p7). The policy provides strategies and plans to address significant issues affecting Uganda's urban sector. The current urban

challenges discussed as a matter of concern include- Slum and Informal Settlements; Poor Solid Waste Management; Deteriorating Urban Environment; Weak Urban Economy; Urban Sprawl; Inadequate Urban Infrastructure and Services; Urban Transportation Challenges; Increasing Urban Insecurity; and Ineffective Urban Governance and Management. Many of these challenges are typical and similar to the problems experienced by other developing countries across the globe. Implementing this new urban development policy is expected to contribute to attaining the Country's Vision 2040 objectives of the second National Development Plan and other development agenda goals.

Uganda's 'Vision 2040' aims to make the country a middle-income country by 2040. It identifies national economic opportunities across key sectors like oil and gas, agriculture, tourism, ICT business, industrialisation, trade, and materials to be transformed using a large labour force, geographical location, and water resources (Uganda Vision 2040). Urbanisation is a critical driver of the development process among its strategic plans. The growth model of the government is based on Asian examples, focusing on integrated physical planning, investment in commercial and industrial zones and land-use optimisation. Against this backdrop, Uganda Vision 2040 identifies five regional and five strategic cities as key to national urban growth. Each strategic city has a sector focus, such as oil, tourism, industry, mining, industrialisation, efficient government service delivery system, and planned urbanisation.

In line with this approach, the government of Uganda approved the creation of 15 new cities in 2020 (Oscord Mark Otile 2020). Regarding smart city planning in Uganda, Kampala City Council Authority (KCCA) has been the only city implementing the concept of smart cities. However, the creation of more cities is considered an opportunity that the increased use of ICT can facilitate. Therefore, the government intends to exploit the existing legal, institutional and policy framework to create new cities where ICT is used to transform the changes (Oscord Mark Otile 2020). The current and relevant policies and frameworks include -the Constitution, 1995; Access to Information Act, 2005; the Data Protection and Privacy Act, 2019; Electronic Government Regulations, 2014; Government of Uganda Website standards and Guide, 2014; Government of Uganda Social Media guide, 2013; Guidelines for E-Waste Management in Uganda, 2016; The ICT Policy for Uganda, 2014; The National E-Government Policy Framework, 2011; The Computer Misuse Act, 2011; The Electronic Transactions Regulations, 2013; and E-Government Regulations, 2014 among others.

The smart city approach to development resonates with the 'Digital Uganda Vision', which seeks to empower Ugandan citizens to achieve the goals of sustainable development, universal inclusion, poverty eradication and economic progress using digital innovation (Ministry of ICT Uganda). The priority sectors identified for the electronic delivery of services include education, agriculture, health, banking, justice, communication, and social security.

The 50-year action plan-Agenda 2063 is Africa's blueprint and master plan for transforming Africa into the global powerhouse of the future (African Union 2013). Further accounting for the ambitious aspirations and vision for a pan-African renaissance engrained in Agenda 2063; the smart city strategy is considered a possible solution for reinventing urban spaces, including megacities, medium cities, and small and new cities (Slavova, M. and Okwechime, E 2016). Many African countries, including Uganda, have adopted the smart city approach as a future development agenda (Slavova, M. and Okwechime, E 2016). It aims to develop software and hardware companies and create entrepreneurial citizens. The agenda also includes developing smart citizens who can participate in urban innovation and reinvention. It also targets the development of the urban-rural continuum with the new middle ground and shared spaces between the urban and rural countryside, further driving towards technologically driven infrastructure; financing through grants or seed funding for cities or entrepreneurs who offer a more innovative approach to urbanisation and development.

Despite the ambitious plans and strategies discussed above, the critical challenges before smart urbanisation in Uganda include -uncoordinated urban planning leading to the uncontrolled sprawling of the significant towns; growth of slums and informal settlements; fast-growing youth populations; dilapidated housing, poor sanitation; weak administration and institutions; inefficient legal framework; privatisation of urban development; poor connectivity; lack of basic infrastructure and services like water, sanitation and energy; and encroachment of public places (UN-Habitat 2016).

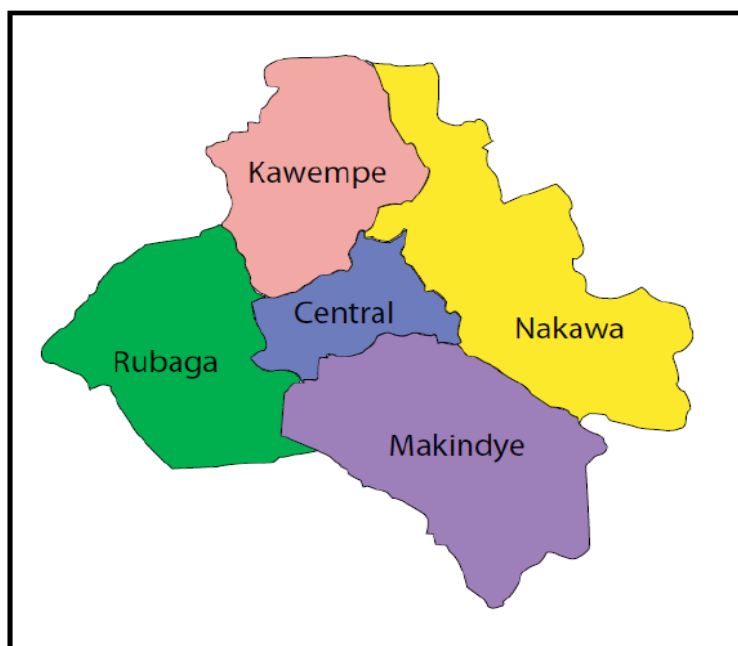
6.2.2 The vision of the Kampala smart city

Kampala city is ranked the best city to live in East Africa. Kampala city, the capital of Uganda, counts 1.5 million inhabitants, or 31 per cent of the total urban population of Uganda, with a further estimated total metropolitan population exceeding 3.5 million (KCCA 2019). The city population is projected to increase to 10 million by 2040. It contributes 60 per cent to Uganda's

GDP. Kampala city was recently selected among twelve cities identified by French Development Agency (AFD) under African Smart Towns Network (ASToN) to develop digital practices together to create more sustainable and inclusive cities (KCCA,2019). Some initiatives include Revenue Management System (e-Citie), Smart Permits, Traffic Control Centre, and Digital Communication.

The transformation journey of Kampala started in 2011 after Kampala Capital City Authority replaced Kampala City Council (KCC) through an act of parliament (KCC Act 2010). The Kampala Capital City Authority (KCCA) was created as a corporate body responsible for administering Kampala Capital City on behalf of the central government and within the provision of the KCC Act 2010. The top leadership comprises the elected political leaders and the appointed technical management team, with one Executive Director and 10 Service directorates. Figure 37 below shows the Kampala city map with five divisions of Kawempe, Rubaga, Kampala Central, Nakawa and Makindye (Kampala Capital City Authority 2019).

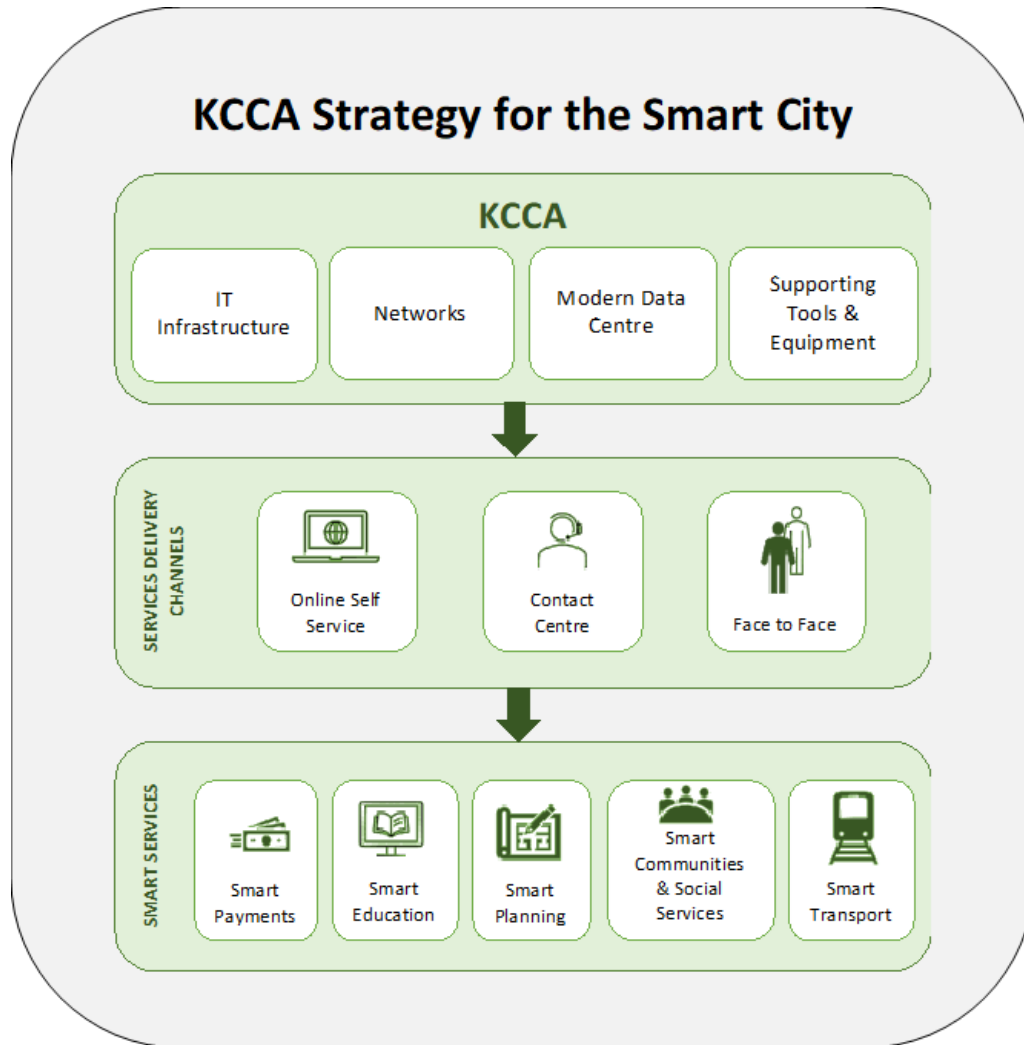
Figure 37 Map of Kampala city (Source: Kampala Capital City Authority 2019)



KCCA first launched the smart plan strategy in 2016 with a vision -to be a vibrant, attractive, and sustainable city (Kampala Capital City Authority, 2014/15-2018/19). The mission focuses on providing quality services with the application of ICT to facilitate public services through efficient and effective administration. The plan initially identified and focused on services like communication, online self-service, improved governance and accountability to the citizens,

improved mobility and transportation networks, citizen engagement and participation in development, good education services and improved health services. The KCCA smart city strategy is as shown in Figure 38 below:

Figure 38 Kampala smart city strategy (2016) (Source: Kampala Capital City Authority)



The Kampala smart city plan (2016) is a well-developed strategy with the identification of the critical challenges and the proper emphasis on institutional efficiency, community innovations and local technologies, as shown in Table 19 below:

Table 19 Key themes of Kampala smart city plan (2016) (Source: Kampala smart city plan 2016)

Theme	Description
Identification of key challenges	conflicting priorities, low e-learning due to difficulty in access to devices, delayed adoption of technology due to insufficient technical capacity, lack of funds and challenge of e-waste disposal.
Focus on institutional efficiency	unified collaboration, enterprise content management using workflows; KCCA mobile App; secure private cloud for hosting citizen applications.
Promote community innovations	Kampala special interest groups and associations (such as traders, architects) to provide useful information in terms of people’s expectations from smart city; Professional groups to contribute through policy formulation; Academic institutions to involve in research and development; promotion of incubation hubs. ICT Association of Uganda to act as an advisory body to government entities. ICT service providers like telecoms to provide annual funds for recognition of innovations in technology.
Apply locally relevant technologies	Enhance the role of local science, technology and community innovation in designing and managing cities by using national backbone infrastructure, mobile technology solutions and communication platforms.

Learning from the first plan, KCCA launched a new smart city plan called KCCA Smart City Strategic Plan (2020-2026), also known as KCCA Information Systems Strategic Plan (2020-2026). This initiative, started by the Department of ICT, focuses on people and recognises that civic leadership and community make Kampala a great place to live, work, and play. It focuses on data-driven decision-making, engagement of stakeholders with relevant information, and for better experience and outcomes, incorporating users' feedback in service and program design.

The definition of a Smart City adopted for use in this Strategic Plan is: “A City area that solves its core issues through innovation and collaboration, and that applies new technologies and data for the benefit of all” (KCCA Smart City Strategic Plan (2020-2026) p5). The focus areas are detailed in Table 20 below:

Table 20 Focus areas of Kampala Smart City Strategic Plan (Source: Author)

Focus Areas	Description
SMART People	“Connect, support, and empower citizens to innovate for sustainable development”.
SMART Mobility	“Improving the efficient movement of people and goods within and through Kampala city”.
SMART Governance	“Be open and transparent, accountable, efficient and accessible through the use of digital services and technologies that improve customer service”.
SMART Economy	“Facilitating the success of existing businesses and attracting innovative businesses and entrepreneurs to Kampala City”.
SMART Environment	“Supporting effective environmental monitoring and sustainability through technology”.
SMART Living	“Applying Smart systems to improve quality of life, public services, and safety of citizens”.

KCCA Smart City builds on the current strengths of Kampala city further to address the future challenges involving the core SMART values of – “Sustainability, Mobility, Accessibility, Resiliency, and Transparency” (KCCA Smart City Strategic Plan (2020-2026), p8). Kampala Smart City is designed to look inward and build the capacity and understanding of staff to adapt to change. Therefore, the strategic plan details four foundational goals identified as key objectives as described in Table 21 below:

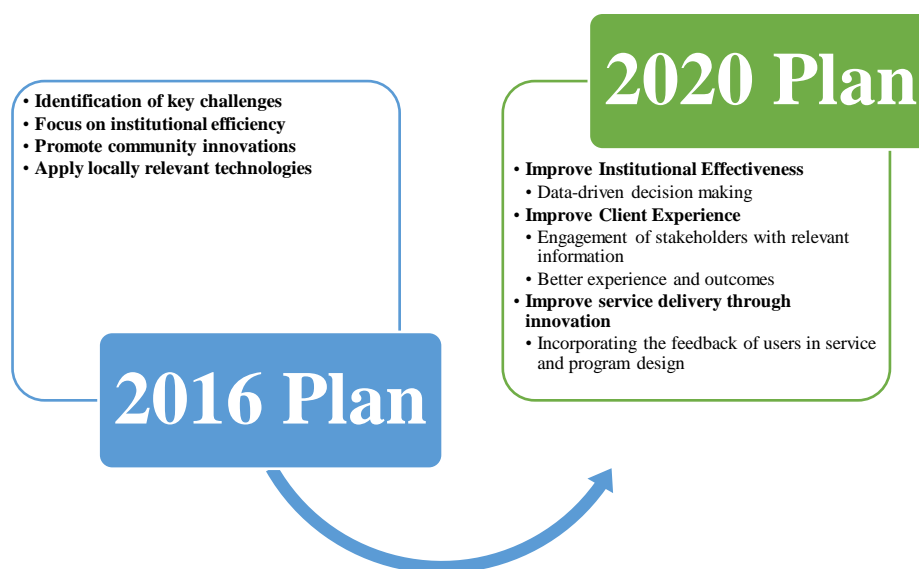
Table 21 Foundational goals of Kampala Smart city (Source: Author)

Objectives	Core objectives	Focus areas
1. Improve Institutional Effectiveness:	<ul style="list-style-type: none"> To re-engineer, automate and integrate business processes for effective service delivery; To enhance the capacity of ICT staff and end-users; To improve network connectivity, availability, security, and access in across the city; Apply data analytics and business intelligence solutions for decision making; To acquire, develop and maintain ICT applications; 	SMART Governance SMART Environment
2. Improve Client Experience:	<ul style="list-style-type: none"> Enhance client participation in the delivery of SMART City services; Improve the Quality of ICT Services through the adoption of the Information Technology Service Management (ITSM) Framework; Improve citizen-centric initiatives to obtain feedback about city services; Support inclusion and accessibility to services through digital technology; and Engage with customers and key stakeholders in the sourcing, implementation and development of new technologies. 	SMART People SMART Living SMART Environment SMART Mobility
3.Improve Collaboration Experience:	<ul style="list-style-type: none"> Champion the formation of consortiums with public entities for effective service delivery; Enhance Public-Private Partnerships in providing and promoting Smart City services; and Enhance relationships with development partners for resource mobilisation. 	SMART People SMART Economy SMART Mobility

4. Improve service delivery through innovation:	<ul style="list-style-type: none"> • Enhance the ICT Innovation Framework. • Enhance partnerships; and • Foster community-based innovation and digital literacy through defined programs, public education, and co-creation initiatives. 	SMART People SMART Living SMART Environment SMART Mobility
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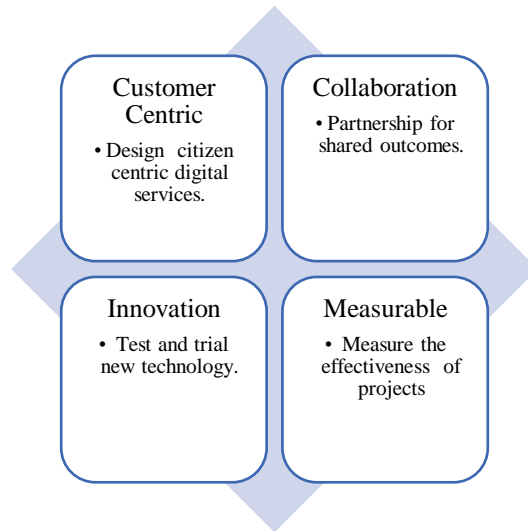
The new Kampala Smart City Strategic Plan is built on the previous work focusing on further integration and strategic direction. This plan adds value in terms of future-proofed infrastructure and neighbourhood planning. The governance of a Smart City is through the office of the Executive Director, with the Deputy Director of Information Systems, to coordinate, monitor and evaluate the implementation of Smart City Initiatives. The ICT Steering Committee, appointed by the Executive Director with clear terms of reference, ensures that the authority's activities are aligned with its strategic and corporate objectives. The steering committee consists of ICT leaders from across the directorates. The Smart City Framework provides for the scope, development and implementation of services and related digital projects. Figure 39 below illustrates the phase-wise themes of the Kampala smart city plan in 2016 and 2020:

Figure 39 Phase-wise themes of the Kampala smart city plan (Source: Author)



The guiding principles for the implementation of smart city projects in Kampala are shown in Figure 40 below:

Figure 40 Guiding principles for the performance of smart city projects in Kampala (Source: Author)



The Kampala, smart city plan, highlights the need for public engagement on an ongoing basis. The user departments are engaged through focused group discussions. The select list of current smart city projects is shown in Figure 41 below:

Figure 41 Select list of smart city projects in Kampala (Source: Author)

Electronic payment through mobile phones	Electronic banking and point of sale terminals	Smart Permit (Online Plan approvals)	Digital City Addressing- Computer address modelling to facilitate street naming and assignment of the postcodes	Smart Lighting-Street light management using auto solar streetlights
Automation of traffic management- Network installation and traffic signals	E-Health	Computer aided property valuation integrated with geo-based mobile data devices	Mobile value added services	Free Wi-Fi spots
One stop centre for business promotion	Plantation of 5 million trees	Enterprise content management system	Automation of municipal revenue collection	Modern data centre for consolidation of all application hosting and data storage
Interactive web portal	Unified messaging for computer and mobile users	Automation of human resources processes	KCCA Call centre solution	Fiber Network Connectivity of Service Centers
Automation of City Payments including utilities (Water and Power)	Deployment of a Client Contact Center	Sanitation Mobile App- Weyonje – to support garbage collection in the City	Deployment of a Pilot Traffic Control Center	Online Services, Tree Audit, City Tourism
Safe City – (City CCTV through UPF)	Smart Properties (Property Management)	Citizen Participation	Signalisation of 30 road Junctions to enhance Traffic flow management in the City	Enhance Smart City ICT Infrastructure
Institutional Process Alignment.	Support Open Data exchange	Improve Information Security	Support Social inclusion through digital technology	Enhance Technology Innovation

6.2.3 The inclusion focus and relevant projects in the Kampala smart city

The vision of Kampala's smart city is to be a vibrant, attractive and sustainable city. Its mission is to deliver quality services to the city. Kampala Capital City Authority (KCCA) identified low e-learning, difficulty in accessing devices, and delayed adoption of technology due to insufficient technical capacity as critical challenges for successfully implementing the smart city plan (KCCA,2016). The core guiding principle is to design customer-centric digital services for inclusion and accessibility, further fostering community-based innovations and digital literacy through defined progress, public education and co-creation. One smart city project aims to support social inclusion through digital technology.

Table 22 below indicates the Kampala smart city themes and sub-themes mapped to smart city themes and sub-themes from the literature survey in Chapter II. Further, the areas of intervention for technology application are identified from the plan document.

Table 22 Mapping of Kampala smart city plan to smart city themes from the literature (Source: Author)

Smart city themes/ sub-themes (from literature)	Kampala smart city themes/ sub-themes	Kampala smart city projects /initiatives (theme wise)	Areas of Intervention/ Application of technology in Kampala smart city
I. Improve the quality of life and well-being of citizens			
Improve citizen welfare; Liveability; Cultural wellbeing; Societal benefit; Safety; Resilience; Human capital; Social capital; Social development; Sustainable development; Good governance;	<ul style="list-style-type: none"> • Identification of key challenges 	<ul style="list-style-type: none"> • E-Health • Sanitation Mobile App-Weyonje – to support garbage collection in the City • Safe City (City CCTV through UPF) 	<ul style="list-style-type: none"> • Healthcare • Solid waste management • Safety
II. Economic growth & employment opportunities			
Prosperity; Economic development		<ul style="list-style-type: none"> • One-stop centre for business promotion 	<ul style="list-style-type: none"> • Business promotion • Electronic payments • Innovation
III. Smart urban governance			
Smart policies; Evidence based policy making; Service innovation; Collaborative Management; Intelligence; Political development; Institutional capacity; Behavioural change; Interconnections and collaboration; Mobility; Partnerships	<ul style="list-style-type: none"> • Focus on institutional efficiency • Apply locally relevant technologies • Improve Institutional Effectiveness: <ul style="list-style-type: none"> ○ Data-driven decision making 	<ul style="list-style-type: none"> • Smart Permit (Online Plan approvals) • Digital City Addressing-Computer address modelling to facilitate street naming and assignment of the postcodes • Computer aided property valuation integrated with geo- 	<ul style="list-style-type: none"> • Policy innovation • Decision making • Urban planning • Data/ Data exchange • Delivery of services • Integration • Resource optimisation • Open Government

		<ul style="list-style-type: none"> based mobile data devices • Enterprise content management system • Automation of municipal revenue collection • Automation of human resources processes • Automation of City Payments including utilities (Water and Power) • Smart Properties (Property Management) • Support Open Data exchange • Institutional Process Alignment • Improve Information Security • Enhance Technology Innovation 	
IV. Climate change and environmental issues			
Environmental management; Low carbon economy; Sustainability		<ul style="list-style-type: none"> • Plantation of 5 million trees 	<ul style="list-style-type: none"> • Management of natural resources
V. Infrastructure			
Built environment; Social infrastructure; Mobility; Technological infrastructure; ICT Networks; Energy		<ul style="list-style-type: none"> • Smart Lighting-Street light management using auto solar streetlights • Automation of traffic management- Network installation and traffic signals • Mobile value-added services • Free Wi-Fi spots • Modern data centre for consolidation of all application hosting and data storage • Interactive web portal • Unified messaging for computer and mobile users • KCCA Call centre solution • Fiber Network Connectivity of Service Centers • Deployment of a Client Contact Center • Deployment of a Pilot Traffic Control Center • Online Services, Tree Audit, City Tourism • Signalisation of 30 road Junctions to enhance Traffic flow management in the City 	<ul style="list-style-type: none"> • Transport/Traffic management • Smart streets • Mobile technologies • Public Wi-Fi • Portal services • Call centre • Integrated information network

		<ul style="list-style-type: none"> Enhance Smart City ICT Infrastructure 	
VI. Inclusive development			
Social inclusion; Social cohesion; Community living; Social inequality; Open data; Urban openness; Affordability; Accessibility; Holistic approach; Citizen engagement; Information sharing; Participatory governance; Connected community	<ul style="list-style-type: none"> Promote community innovations Support Social inclusion through digital technology Improve Client Experience: <ul style="list-style-type: none"> Engagement of stakeholders with relevant information Better experience and outcomes Improve service delivery through innovation <ul style="list-style-type: none"> Incorporating the feedback of users in service and program design 	<ul style="list-style-type: none"> Citizen Participation Electronic payment through mobile phones Electronic banking and point of sale terminals 	<ul style="list-style-type: none"> Communication/ Citizen engagement platform Financial inclusion



Kampala smart city plan-2016



Kampala smart city plan-2020

All the interviewees mentioned that inclusion is not a priority in Kampala city's current smart city planning. An urban expert interviewee stated that “urban plans are obsolete and therefore smart city planning is a good initiative” and said, “However, the current smart city plan is focusing on technology whereas technology is one dimension of smart city management”. Another urban expert interviewee said, “Cities are being managed for the interest of minorities and neglecting the majority needs and requirements”. An interviewee who works with an NGO mentioned that “Uganda does not have a devolved and decentralised governance system, so most decisions are centralised, and projects are implemented in a top-down approach. However, community engagement is good as compared to other places”. Another interviewee working with an NGO said: “The ownership and use of data in a smart city are not clear; therefore, people are suspicious and hesitate to participate in smart city planning”. Interviewee working with an urban think tank for Africa opined that, “smart city at present does not pay attention to the community and hence non-inclusive”, she further added: “the logical implication of smart city is wrong because smart does not mean just use of technology, but it is a right and efficient way of doing things. Furthermore, the smart city as an instrument of management with the right digital access and digital integration will help inclusion”. She highlighted the benefits of a smart city as “Smart city a real-time learning instrument with a possibility to self-correct and move forward”.

All the interviewees mentioned that smart cities could contribute to inclusive and holistic development; however, there is challenging to include vulnerable populations in the planning process. An interviewee who is an academic in Kampala supported the smart city initiative and stated that "*a smart city enables confidence in people*". Interestingly there were several suggested methods to increase inclusion in smart cities. An interviewee who is working with an NGO said that "*the smart city planners should adopt- More from Less for More (MLM) strategy which is a powerful innovation method for inclusion*", where the MLM strategy or MLM paradigm aims at inclusive growth by achieving more performance, by using fewer resources and benefitting more people (R A Mashelkar 2015). Another interviewee, a financial inclusion expert, said that "*smart cities should be localised and embedded in the culture of people*".

An interviewee who is an M&E expert with a Human rights organisation said, "*Smart city is an excellent development strategy as it facilitates the efficient delivery of services to citizens, helps to monitor environmental degradation, improves governance system by optimisation of resources including open and transparent information sharing which is critical for good governance and inclusion*". A women interviewee working with an NGO stated that, "*the smart city approach reduces gaps and enhances equality and inclusion*". The interviewee who is working with an urban think tank for Africa said, "*At present smart city is driven by suppliers and not the government. If the smart city adopts a doughnut economic model, it can contribute to inclusion*". The Doughnut, or Doughnut economics, is a visual framework for sustainable development, which is shaped like a doughnut combining the concept of planetary boundaries with the complementary concept of social boundaries (Raworth, K 2012). The main goal of the new model is to re-frame economic problems and set new goals by meeting all twelve social foundations without overshooting the nine ecological ceilings. This situation, represented by the area between the two rings, is considered by its creator as a safe and just space for humanity.

One other interviewee, an international development consultant, said, "*A smart city can achieve inclusion through scenario planning method combined with PESTLE analysis*", where Scenario planning is a practical tool for collective strategic thinking in organisations, especially when external uncertainty is high (Schoemaker, P.J 1995). Scenario planning identifies the driving forces and the critical uncertainties, and then a range of plausible scenarios are developed. PESTEL is a complementary tool to SWOT (Strengths, Weaknesses, Opportunities, and

Threats). It expands on the analysis of external context by looking in detail at specific issues that frequently impact the implementation of projects and initiatives (UNICEF Toolkit 2007). The term ‘PESTEL’ refers to the domains it considers: Political, Economic, Social, Technological, Environmental and Legal. The more complex the context or operating environment is, the more value PESTEL can offer by identifying factors that would be missed by SWOT alone.

All the interviewees mentioned that the current smart city model does not support inclusion and has several challenges, like digital infrastructure and connectivity. One interviewee who works with an NGO stated that one of the main challenges with the smart city is access to a smartphone, electricity, and Internet data. An academic interviewee identified the verification and authenticity of the free flow of digital information as another challenge. She further stated that *"diversity of languages is a key challenge in delivering services to refugees. Similarly, the elderly do not have the right space in the current smart city model.* She further added, *"If people use the smart city as a utility, it will serve the purpose if and only if it is open, transparent, and free of cost"*. An interviewee who is working with an urban think tank for Africa smart cities said: *"The smart city practitioners are ignoring social, economic, and cultural factors and therefore developing half-baked solutions."*

6.3 Contribution of digital technologies towards equity and inclusion in Smart Kampala

As discussed in Chapter II, digital technologies play a critical role in sustainable development and inclusion. The previous section confirmed that Kampala’s smart city plan has extensive use of digital technologies across multiple sectors. Hence this section discusses the contribution of digital technologies toward equity and inclusion.

6.3.1 The benefits of the use of digital technologies

Chapter II points out several applications of digital technologies in smart cities. The applications vary across multiple sectors like healthcare, education, transportation, energy use, mobility, resource efficiency, climate mitigation, quality of life, urban innovation and intelligence, among many others (Caragliu and Del Bo 2019; Dhingra and Chattopadhyay 2016; Letaifa 2015; Ghasemi 2015). Similarly, the Kampala smart city plan seems to adopt

multiple applications of these technologies for urban governance, planning and city development.

All the interviewees expressed the opinion that technology plays a crucial role in the inclusion of all populations from different groups. An interviewee in a university in Kampala said: “*At present, we are in a digital age, and information is easier to share and more accessible. It is much cheaper to design, and it has wider reach; hence the use of technology becomes inevitable*”. Three interviewees mentioned that local and grassroots-level digital innovations are crucial to inclusion. For example, the STDM (Social Tenure Domain Model) is mentioned as the grassroots technology that supports inclusion which was developed by slum dwellers backed by UN-Habitat and is now used for the reconstruction of Syria. The STDM, according to the website (<https://stdm.gltm.net/>), is a pro-poor land information tool that offers a complimentary land administration system which is pro-poor, affordable, gender-sensitive, and sustainable. It can also be linked to the cadastral system to integrate all information (Lemmen, C et al.,2007).

6.3.2 Digital technology’s role in the inclusion of vulnerable population

The Kampala smart city plan initiatives have some technology interventions for equality and inclusion. The technology application domains for equality and inclusion in the Kampala smart city plan are mapped to the technology domains for equality and inclusion from the literature and then compared to the five inclusion challenges as shown in Table 23 below:

Table 23 Mapping of Kampala smart city plan technology domains to smart city technology domains from the literature (Source: Author)

Application domains of technology (for equality and inclusion)	Priority in Kampala smart city
1. Access to information	Orange
2. Access to the Internet	Red
3. Access to digital infrastructure	Red
4. Universal access to services	Orange
5. Affordable data	Orange
6. Digital literacy	Red
7. Digital skills	Orange
8. Assistive technologies	Red
9. Security and surveillance	Green

10. Citizen engagement platform	
11. Financial inclusion*	

	Identified priority in Kampala smart city plan		Not a priority in Kampala smart city plan
	Not clearly stated in the Kampala smart city plan		

* Kampala smart city initiative

As inferred from the above Kampala smart city plan only focuses on a few domains relating to inclusion, where technology contributes and marks green in colour. However, Kampala works in financial inclusion-related technology domains to promote inclusion and equality.

However, several interviewees thought that the current method of use of technology in smart cities poses several challenges that need to be addressed. A public policy expert interviewee said, “*At present digital technology is developed by standard players for standard users in a fixed paradigm without understanding the local needs, culture and requirements*”. Another interviewee, an international development consultant, shared that “*the first question that needs to be answered is done we need technology to solve this issue or if it can be done otherwise*”. He claims at present, this thinking is missing in city governments. While he agrees that technology is a means to advance better lives, at present, they are commercial, and affordability is a big question.

Another academic interviewee said: “*In the current smart city model, special devices and applications are missing to include all population categories. For example, for the elderly, it needs to be simplified and easy to use, similarly for refugees, it has to be translated into different languages*”. An interviewee who is an urban expert said that “*transparency in the application of technology is essential because people should know how and why technology is being used*”. He further added: “*Technology can be a good force during benign situations however it can be the evil force if used for wrong purposes. For example, the excessive surveillance of citizens in China is a bad use of technology*”.

Another interviewee, a public policy expert, said: “*For inclusion, technology should accommodate varying experiences of different population categories. Also, technology should be complementary to people participation providing wider access and reach*”. Further, she

stated that technology-induced exclusion needs to be tackled at three levels: the fundamental disparity in terms of infrastructure, the educational inequalities by way of competency, and a combination of both. An international development expert interviewee stated that *the technology is neutral regarding inclusion or exclusion; however, rating different technologies allows us to understand the degree of exclusions. For example, smartphones promote inclusion, the digital ID if not fully covering the entire population leads to more exclusion, and SIM card registration (for want of KYC etc.) has a risk of exclusion*".

Five interviewees mentioned that technology should emerge from local ideas and innovations to meet local conditions. The eSeva project of the Government of Andhra Pradesh (India) is an excellent example of a locally customised facilitation centre for citizen services. Similarly, the local innovations of Taiwan are good examples of local technology solutions. An interviewee stated that *"the availability of free Wi-Fi and digital infrastructure is essential for promoting inclusion. For example, financial inclusion through mobile money in Uganda. Another interviewee said: "Enough research and people training should be done before digital systems are introduced"*.

Many interviewees identified several technological barriers to including vulnerable and marginalised populations. An interviewee mentioned that *"the design and implementation of smart city projects are in a top-down approach, and there is a risk of non-participation of the relevant stakeholders, particularly the vulnerable and marginalised populations"*. Another interviewee stated that *"Uganda is a relatively young population, but young people do not have smartphones and are therefore unable to connect and use online services. Many schools offer IT training services, but many children from poor backgrounds do not attend school"*. One other interviewee stated that public infrastructure should be improved along with digitisation. A few interviewees also shared that the technology developed by standard players challenges local understanding, including local culture and population needs.

6.4 Key terms to achieve urban inclusion using digital technologies

The key terms identify the challenges and requirements for a people-centric, inclusive smart city.

6.4.1 Challenges and requirements of people-centred inclusive city development

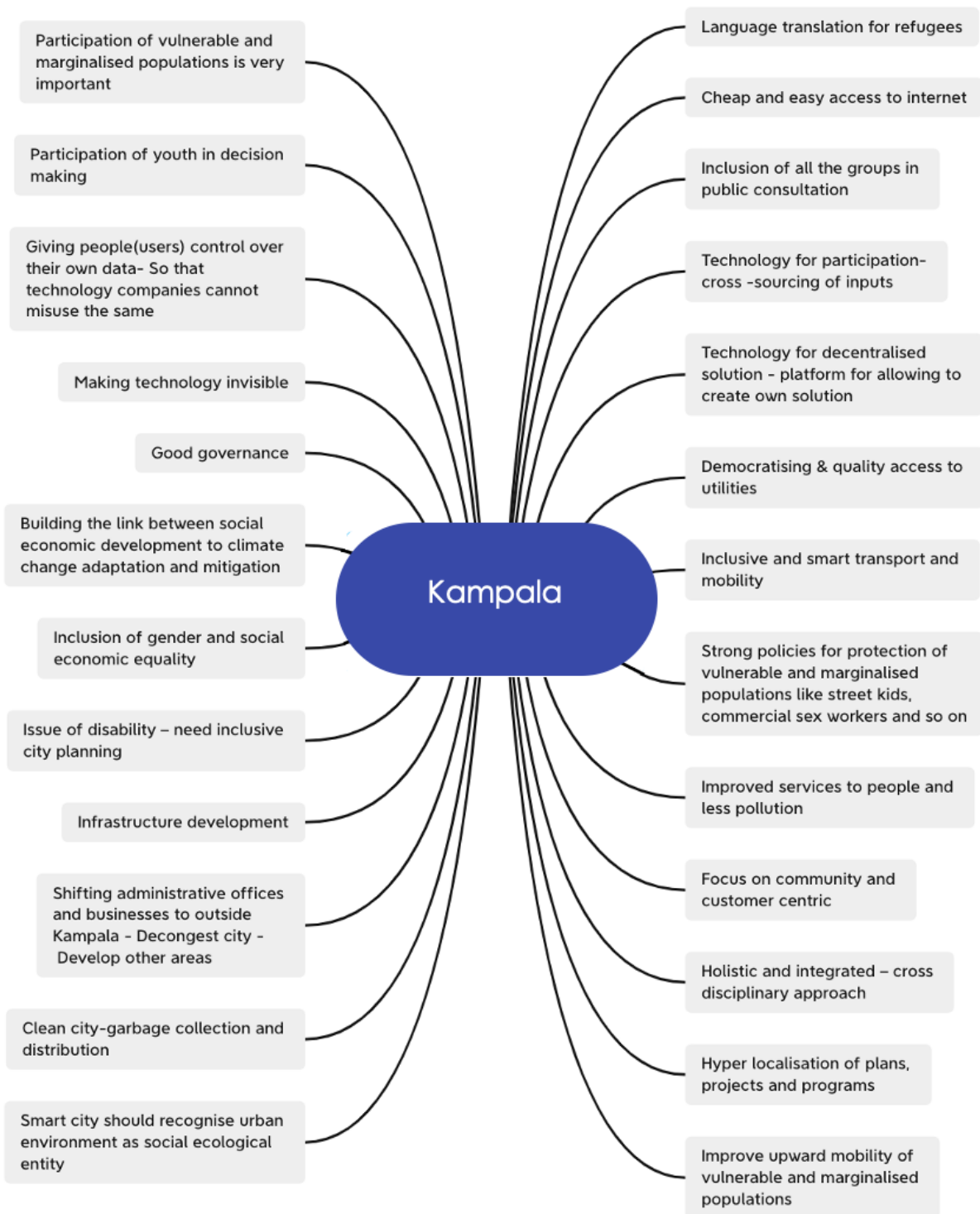
All the interviewees talked about the role of multiple stakeholders like government, the private sector, civil society, academia, and citizens in designing smart cities. They stated that the city or local government implementing smart city projects has less autonomy and resources and is heavily dependent on the national government. The weak city government with limited funding cannot direct and influence the private sector to develop solutions for the social good. However, all the interviewees stated that government alone could not solve society's complex issue of exclusion and inequality.

The other stakeholders, like the private sector, civil society and academia, must play an active and valuable role. An interviewee said: *“The private sector is missing the big picture and at present neglecting the vulnerable and marginalised populations who otherwise is a huge market opportunity for digital services and innovations like assistive technologies”*. Another interviewee said: *“The government should encourage private participation particularly the technology companies, academia and grassroots organisations through right regulation support and develop innovative digital solutions that can contribute to enhancing inclusion of vulnerable populations”*.

One other interviewee, an academic expert, said: *“The smart city business models need to be worked from a holistic perspective and benefit all stakeholders. For example, good public infrastructure is beneficial to everyone. Drain or stormwater is a big problem in Kampala. Floods will affect business groups also. Smart street lighting is useful for the public and private sector”*. Three interviewees mentioned that NGOs should play a more critical role at community and grassroots levels and support the government and the private sector in the participatory planning process.

The 13 interviewees were asked to suggest the critical themes for designing a people-centred smart city in Kampala, and they identified the following requirements as shown in Figure 42 below:

Figure 42 Key themes identified by respondents for designing a people-centred smart city in Kampala (Source: Author)



6.4.2 Public consultation methods

Drawing on the literature review, the prerequisites for citizens' e-participation are digital infrastructure, access to technology, free Internet and affordable data, privacy and security, ease of usability (mobile, social media etc.), and trust and adoption of the solution.

All the interviewees agreed that technology is a great leveller and, if used appropriately, can enhance inclusion due to its broad reach and scale. However, Uganda's population remains unconnected due to high costs and poor digital infrastructure, including a lack of electricity supply (Apolo Kakaire 2021). All the interviewees mentioned that Internet connectivity does not cover all parts of the city. Even if available, the data cost is too high, discouraging vulnerable and poor citizens from remaining aloof from online services. A Women of Uganda Network (WOUGNET) report notes that even the few women that make it onto the Internet have become victims of a new form of gender-based violence commonly referred to as “technology-assisted violence against women and girls”.

The World Bank recently approved £175 million in financing to expand access to high-speed and affordable Internet, improve digitally-enabled public service delivery efficiency, and strengthen digital inclusion in Uganda (World Bank 2021). This new Uganda Digital Acceleration Project-GovNet (UDAP-GovNet) aims to support the extension of 1,000 km of the national backbone fibre infrastructure, an additional 500 km of fibre optic network links between towns added with mobile broadband connections for 900 government offices and service centres in underserved areas, and 828 Wi-Fi hotspots in select locations to serve peri-urban, and unserved communities.

KCCA's smart city planning claimed to make the best of social media, targeting approximately 150,000 followers to encourage citizen participation. But the Parliament of Uganda recently passed the Excise Duty Amendment Act, which ordered social media users to pay Shs. 200 (£0.05) each day to access it discouraging people from connecting through social media. The other issue raised by several interviewees is the need for more security and privacy in the use of digital services, which, according to them, is the major trust factor for the participation of citizens.

Enhancing digital literacy skills

All the interviewees stated that citizens could participate and contribute meaningfully only if they have the required capabilities and infrastructure in the current digital age. An interviewee who is a financial inclusion expert said: *“Smart city concept is alien to a commoner unless disseminated appropriately. The average citizen in Kampala is unaware of many smart city innovations and their benefits. Due to poor consultations, many good projects die early without achieving the desired goal”*. Many interviewees mentioned that the participation of vulnerable and marginalised populations is still not up to the mark, and a lot more needs to be done by the government. Whereas the government’s move to provide e-learning is commendable, it is underscored by the current digital divide in the country, as many people still lack access to ICT and the Internet (Internet society-Uganda chapter 2020).

In Uganda, just 48 per cent of people use the Internet (Uganda Communications Commission 2019). An interviewee mentioned that the three main obstacles to Internet use are a lack of free or affordable access to technology, a lack of computer and online literacy skills, and limited awareness about the wealth of information, education, communication, employment, and other opportunities offered. Several interviewees stated that women and unemployed youth are mainly marginalised from the computer and Internet access. Women and girls have limited independent sources of income, lower literacy levels, and lack the confidence to use technology. Also, unemployed young people struggle to afford Internet access and data.

There are few initiatives to enhance digital literacy in Uganda. The EIFL Public Library Innovation Programme (EIFL-PLIP) has partnered with organisations in Uganda and the USA in a project that seeks to narrow the digital divide by enabling women and unemployed youth to participate in the digital society. Similarly, digital skills and inclusion through libraries in Uganda (*‘Digital skills @ your local library for short*) is a two-year project that will improve the capacity of 25 public and community libraries that already have computers and the Internet for public use. The libraries will specifically offer women and unemployed youth digital skills training and connect them to free online learning opportunities.

Other initiatives include the project led by UNICEF and its partners project-Digital Drum (UNICEF USA 2011): a rugged, solar-powered computing kiosk that is the centrepiece of a robust digital inclusion program of IT skill-building and access to educational content. This

project also supports youth entrepreneurship as youth managers assume responsibility for kiosks. The Digital Drum, a robust computing kiosk sourced and constructed locally and one of Time's 50 Best Inventions of 2011, serves as the centrepiece of a program of digital inclusion to advance education, ICT skill-building, and youth entrepreneurship. Similarly, Digital Literacy Initiative (DLI) is a not-for-profit organisation that provides Information Communication Technology (ICT) awareness and works to ensure a safe Digital space in Uganda and Africa.

6.5 Design of people-centric and inclusive smart city

This section discusses the people-centric planning methods beginning with the need for citizen participation in smart city planning.

6.5.1 Citizen participation in Kampala smart city plan

All the interviewees stated that public consultations and citizen participation are crucial to designing inclusive policies and projects in the smart city. Also, people-centric innovations are the key to sustainable development. An international development consultant interviewee said: *“Political and civil participation of citizens is key to achieving inclusion and equity”*. An interviewee working with a human rights organisation said: *“People consultations often happen through elected representatives like Members of Parliament etc. though not structured. The city government also consults representatives of different sections of the population. However, the big question is if their inputs are taken seriously and whether these decisions are implemented”*? Many interviewees thought that public consultation is happening at different levels in Kampala city authority but integrating and implementing the decisions is still a problem. Another interviewee criticised the level and depth of public consultation and said: *“Providing accessible information, which is more often the case in Kampala, is considered by city authorities as active engagement of citizens which is just insufficient.”*

All the interviewees mentioned that community involvement is limited in Kampala, and digital and non-digital solutions should be used for effective public consultation. Many of them suggested a need to create community awareness on programmes and projects that are currently very limited. One interviewee indicated that *“radio, SMS, WhatsApp is a good tool for disseminating useful information at lower prices and with better reach, but one should be*

careful with fake news on WhatsApp". She further advised the use of augmented virtual reality for the benefit of people with disabilities. Another interviewee, a public policy expert, said: *"Co-creation method is the best for citizen participation. However, there needs to be shared ownership with clear mandates and responsibilities. Further, the co-creation strategy should have a stakeholder engagement strategy, mapping them for decision making to action levels, design of projects and programmes"*. She further added that *"public consultation methods can involve survey geographic location-wise, community engagement in groups and public sentiment analysis"*.

KCCA is committed to ensuring effective citizen participation. In Kampala, the smart city requirements were gathered through citizens survey, Kampala Special Interest Groups, associations such as traders, architects and professional groups, and academic institutions (Martin Ssekajja 2016). However, the KCCA's approach to public consultation is often criticised as a top-down model; therefore, it is claimed to have resulted in mistrust between the community and the city government (Richmond, A. et al.,2018). The review of the Smart Kampala plan and interviewee responses in terms of the seven key elements of citizen engagement strategy (refer to the theoretical framework developed through literature review in Chapter II) for enhancing inclusion identified many gaps as discussed below:

All the interviewees stated that the current levels of citizen participation in Kampala are only for information sharing with rare feedback and input collection occasions. There are few instances of deeper consultation and the least examples of participation. Mainly the vulnerable populations are still not effectively involved in making choices and influencing decisions.

Inclusive tools to cover vulnerable population

Many interviewees stated that mixed methods of digital and non-digital tools are required to include all population categories. KCCA recognised this fact and attempted to reach different types of the population through online and offline sources where the inputs and suggestions for smart city projects were collected. One key challenge is the data and details of vulnerable populations in different categories and locations across the city.

Involvement of community through local grassroots organisations and, networks & committees

All the interviewees agreed that along with the government, other stakeholders like the private sector and civil society need to play a significant role in public consultation, which is presently lacking in Kampala.

Co-creation to stimulate citizen participation and develop sustainable social innovations

All the interviewees suggested the need for the involvement of citizens in smart city projects and programs. An interviewee who is a public policy expert said: *“The government should be an intelligent customer and drive the participation of the private sector under shared ownership and using co-creation methods for achieving the desired outcome as per the theory of change methodology. Further, the private sector should be motivated to balance profit and social development goals and contribute to society”*.

Kampala has several incubation hubs, such as The KCCA Employment Service Bureau and Hive Colab, that develop software solutions catering to local needs. Furthermore, the ICT Association of Uganda acts as an advisory body to government entities. In addition, ICT service providers such as telecoms provide annual funds for recognising technological innovations. However, there is a need for citizen-led co-creation activities focusing on the smart city's key domains, which is possible through the right partnership between the government, private sector, citizens, and academia.

6.5.2 Strategy, governance and policy for enhancing inclusion

Kampala administration acknowledges that strategy, governance and policy play a key role in designing people-centric inclusive smart city. The Constitution of the Republic of Uganda provides decentralisation as the vital principle for local governance to ensure people's participation and democratic control in decision-making. Further, Article 38, Article 41 and Article 176 of the Constitution of the Republic of Uganda, Part I (ii) of The National Objectives and Directive Principles of State Policy of the the1995 Constitution of the Republic of Uganda all promote decentralisation and guarantee the active participation of citizens.

Constitutionally, Uganda has a real possibility for democratic participation and decision-making from the village to municipal levels. It is argued that Uganda's multi-level local council system has brought the government closer to its citizens (Devas, N. and Grant, U 2003). In addition, the release of conditional grants for local development from the central to the local level has increased and proved helpful in reaching targeted objectives and involving citizens in decision-making. Further, it is stated that budget conferences have the potential to increase accountability; therefore, steps are being taken to make these conferences more inclusive and conducive to participation from ordinary citizens.

In the case of Kampala, the criticism is that citizens do not have access to information (Initiative for Social and Economic Rights 2018). Many interviews suggested that Kampala's information dissemination and community sensitisation modalities must be revisited and strengthened. Particular attention requires rethinking some modalities to disseminate information to vulnerable and marginalised groups. It is recommended to constitute the committees more transparently involving all community members and giving opportunities to everyone. It is also suggested to create functional platforms, particularly for vulnerable populations, through which they can raise concerns and make their voices heard. Three interviewees suggested a need to provide new laws for citizen participation with explicit provisions for the inclusion of vulnerable groups. Two interviewees stated that elections are the best means to assure people's consent and approval. For effective citizen participation, it is suggested to conduct regular, free and fair elections, budget conferences and meetings between local councils and civil society organisations and impartial media (Devas, N. and Grant, U 2003).

Three interviewees shared the opinion that the politics and leadership of a country are essential to design inclusion policies. One public policy expert interviewee said: *“Inclusion should be a national policy and need to be implemented with an integrated approach and broad framework sub-divided into program and project level goals”*.

6.6 Chapter Summary

In Uganda, urbanisation is considered a critical driver of the development process, and therefore, the top priority is given to it in its strategic plans. Based on the literature review, which included academic sources and policy documents, it may be inferred that smart city and technology has been identified as a critical initiative to transform Uganda's urban landscape

towards more inclusive and sustainable development. Uganda's 'Vision 2040' and National Urban Policy (NUP2017) and Second National Development Plan (2015/16) aimed to achieve sustainable wealth creation, employment, and inclusive growth, where ICT is recognised as one of the key contributors. However, like any other developing country, Uganda is grappling with rising poverty, growth of slums and informal settlements, fast-growing youth populations, lack of basic infrastructure and services, and weak administration and institutions.

This chapter discussed the details of smart urbanisation in Uganda, particularly the smart city planning of Kampala, the capital city of Uganda. The Kampala smart city mission focuses on providing quality services with the application of Information Technology to facilitate efficient and effective administration of the city in assisting with identified objectives, focus areas and implementation plans. The smart city plan was further fine-tuned and updated as the KCCA Smart City Strategic Plan (2020-2026), which is more detailed and specific in terms of coverage of projects and domains. Both the plans focussed on citizen participation as the key contributor to smart city planning. It involved a lot of information sharing followed by a few consultations from different user groups. However, the participation of citizens is not commensurate with the plans and particularly the vulnerable populations like the elderly, people with disabilities, children, women, poor, youth, migrants/refugees, indigenous population, religious minorities, ethnic or caste groups, LGBTI community remain marginalised and neglected. A few unique hindrances to achieving inclusion in Kampala are the complicated land tenure system, where there are five different land tenure systems, often many overlapping. More than 50 per cent of residents in the Greater Kampala Metropolitan Area currently live in slums, occupying just 16 per cent of the land. Nearly 10,000 children are homeless and live on the streets in Kampala city, and over 87 per cent of total employment in Kampala is in the informal sector, among many others.

A few projects, such as mobile phone use in trade and industry, immensely contributed to the financial inclusion of vulnerable populations in Kampala. The STDM is another excellent example where people are involved in local land administration. While the assimilation of the refugee population is appreciated in Uganda, the settlement of refugees in urban locations is still a challenge. They need jobs, English language training and other employment skills, including housing and basic amenities. The digital literacy initiatives need to be further increased to cover more people. Similarly, the excise duty on social media users is criticised by all interviewees as a deterrent to the free participation of people.

To sum up, a few key lessons and practical recommendations for inclusive smart city plan, that emerged out of this case analysis include:

- A devolved and decentralised governance system
- Ownership and use of data in a smart city
- Inclusion of vulnerable populations in the planning process
- Smart cities should be localised and embedded in the culture of people
- Smart city practitioners are ignoring social, economic, and cultural factors and therefore developing half-baked solutions.
- Technology should be complementary to people's participation providing wider access and reach.
- The availability of free Wi-Fi and digital infrastructure is essential for promoting inclusion.
- The private sector is missing the big picture and currently neglecting the vulnerable and marginalised populations who otherwise are a huge market opportunity for digital services and innovations like assistive technologies.
- Smart city business models need to be worked from a holistic perspective and benefit all stakeholders.

The three cases confirmed the evidence of the problem of exclusions and inequality in contemporary city life. As evidenced by the three cases, various categories of the vulnerable population are identified by gender, age, race, religion, class, and persons with disabilities who are marginalised and neglected in the smart city development plan.

In the case of London, accessibility, affordability and discrimination are considered critical challenges for inclusion. Housing and access to the Internet and digital infrastructure, including affordability of transport and data and racial discrimination, are mentioned as London residents' challenges. For the Bengaluru case, accessibility, affordability and opportunity remain a big challenge. The eight action areas of accessibility, the six action areas of affordability and four action areas of opportunity are partly or wholly considered inadequate in Bengaluru smart city plan. Equality by means of participation, gender and human rights remain gap areas in this smart city planning. In the case of Kampala, in addition to accessibility, affordability and opportunity, participation remains a critical challenge to tackle. The key challenges of Kampala residents include access to land, access to information, access to credit and finance, access and

affordability of Internet and data, jobs and employment, including representation and participation in local governance.

The three case studies reiterated the use and benefit of technology to enhance the inclusion of vulnerable populations. The smart city model with the right strategy of an integrated and inclusive approach combined with an appropriate citizen engagement plan seemingly has the potential to contribute to designing a people-centric, inclusive smart city. Further in-depth and comparative analysis through identified themes is done in Chapter VIII.

Chapter VII

7 International perspective from thematic experts

To understand the challenges of urban inclusion at the global level and further substantiate the findings from the case studies, I interviewed 26 international participants who included chief executives and senior thematic experts: four working in UN organisations, four working in World Bank, five working at Global urban think tanks like ICLEI/ UCLG/ ISOCARP/ Cities Alliance, five working with Multinational technology companies, two from academia and research, two from Global disability organisations, three working in the private sector and one international NGO. In addition, there were seven women participants and 19 men out of 26 experts.

This addition helps analyse the universal and complex problem of urban exclusion, situate and construct diversity in primary data, and further substantiate the findings with a global perspective. As expert interviews are considered widely used qualitative interview methods for gaining information about or exploring a specific field of action, these additional inputs are obtained from 26 global thematic experts from different parts of the world (Döringer, S 2021). The thematic expert interview aims to discover exclusive insights into expert knowledge and information (Mey, G. and Mruck, K 2014).

7.1 The focus of inclusion in smart city planning

All the interviewees agreed that exclusion is a critical development challenge in cities and a universal issue. The different forms of urban exclusion include social exclusion, economic exclusion, physical exclusion & digital exclusion. All of them agreed that the current smart city models are not prioritising the inclusion of vulnerable and disadvantaged populations like the elderly, people with disabilities, children, women, poor, youth, migrants/refugees, indigenous population, religious minorities, ethnic or caste groups, LGBTI community among others. The key challenges this population encounters in their daily lives include accessibility, affordability, opportunity, participation, and liveability.

The chief executive of a global disability institute in the USA stated widespread exclusion in cities and that millions of people face discrimination and inequality. "*The current smart city*

plans do not address exclusion, and it is still not considered a priority". According to her, "if the disabled persons are on board and in decision-making roles, then inclusive initiatives are possible". An international urban planning body official based in the Netherlands stated: "The current smart city models are profit-driven and not people-centric and increasingly propagated by ICT and business sectors; therefore, the inclusion of all citizens is not a priority". The interviewee mentioned that one of the critical challenges is that urban planners are reluctant to use the smart cities approach to urban planning. The isolated ICT projects are artificial, and planners should push city leaders to increase collective territorial intelligence. The interviewee said, "The core activity of a smart city should be keeping the community interests as a top priority. The government needs to define the parameters and should drive the smart city planning by use of proper ICT frameworks, increasing the capacity of institutions for social good and meeting the needs of the whole community."

Another interviewee working with the UN system in Singapore stated that the current smart cities are not focusing on inclusion. He mentioned: *"The cities should recognise the existence of the vulnerable and disadvantaged populations which is always overlooked". An expert working with a market research agency stated, "many cities are adopting a smart city approach mainly to attract investments and because other cities are doing it. The key motivation is not to provide services to vulnerable and marginalised people". An international urban expert from the Netherlands stated that "inclusion is a key aspect of sustainable development and is often neglected in smart city planning". According to him, few cities worldwide are seriously trying to tackle the challenges of exclusion but in a disintegrated and siloed manner. "There is a lack of a holistic and comprehensive approach towards inclusion. To some extent, Amsterdam city is trying a holistic approach towards inclusion through political leadership and support who design policies and then draft technology solutions only if required". An interviewee working with a global urban think tank based in Berlin stated that "people living in peri-urban areas and informal settlements also face exclusion and inequality". He says: "Smart city has potential to improve or exacerbate social equity, and it depends on the city administration as to why and how is it used".*

Another international smart city expert based in the UK mentioned, *"Current smart city models are not giving enough priority to vulnerable and disadvantaged communities. The key challenges to be addressed are digital inequality and the lack of customised solutions for vulnerable populations. For example, language barriers for migrants are an issue in many*

cities across the globe". A technocrat from a multinational company in the USA mentioned that a smart city has the potential to deliver inclusive solutions. He said: "As compared to the human-centred design approach, which is inside to outside, the inclusive design community is a better approach where people are referred by need, and edge cases come first-outside to inside model". An innovation strategist working with the UN system in Singapore was positive on the contribution of the smart city towards the inclusion of all populations and stated that: "A few years ago inclusion was not a priority for smart cities, but now things have changed and due to increased demand from citizens more smart projects are focusing on inclusion".

A management expert working with the big four consulting companies in Europe stated that the current smart city projects across the globe are not focusing on the inclusion of vulnerable and disadvantaged populations. He says, "strong political will and good and transparent governance is the key to inclusion". He mentioned that there is a challenge of accessibility, usability, affordability, and capability of participation in the current smart cities, which develops gaps and exclusion. In addition to participation, smart cities should also be responsible for accountability and transparency. He mentioned: "The Covid situation has thrust upon a new development model which is more just, green and digital." A smart cities researcher from Norway stated that "inclusion is not a priority in current smart city planning; it is in the marginal radar of smart city planning". He added that the smart city approach is highly technocratic and implemented in a top-down approach. He says, "The smart city is an add-on version of urban planning and is beyond the imagination and reach of an average person. Inclusion is defined differently in different societies and automatically creates some exclusions. Inclusion must be holistic and comprehensive, starting from urban planners' perspective".

A senior academic from the Netherlands stated: "In theory, the smart city has the potential to address the challenges of inclusion, but it is not the case in practice". According to her, the current smart city models are exploring opportunities and the feasibility of working on inclusive development. However, it is still not clear what the primary purpose of a smart city is. Is it an instrument for change or a new policy approach for better governance? According to her, some challenges of exclusion in current smart city models include accessibility, Internet, and language barriers.

Another interviewee, an official from UN-Habitat, Nairobi, mentioned that "exclusion and inequality are big problems in many cities. The smart city model is still evolving and is

currently dominated by technology companies. The government is not in the driving seat. Cities cannot design technology initiatives, and smart city ICT requirements are too specialised domain for city governments". A smart city expert from Portugal gave a different perspective and mentioned that *"a smart city with a focus on UN-SDGs has the potential to enhance the inclusion of vulnerable and disadvantaged populations"*. Three global technology solutions company industry experts mentioned that a smart city addresses a few inclusion challenges. For example, several apps are available for the use of disabled people but focus more on physical accessibility. They further shared that the problem is not with technology. The problem is with the city government, as they do not design many projects focusing on inclusion. However, over time, the cities are maturing in the smart city area, but still, the focus on social and inclusion aspects is minimal. According to them, one of the critical challenges in smart cities is to make people digital literate. For example, Amsterdam is making young and old people less vulnerable to digital threats. The chief executive of a global urban think tank from Spain stated that *"smart cities are not focusing on inclusion, and it remains an elitist model"*.

All the interviewees stated that government has a significant role in designing inclusive smart cities. An expert working with a market research agency said, *"there should be a separate department in the municipality which exclusively focuses on inclusion and is staffed with dedicated resources"*. According to one global urban think tank official, for building inclusive solutions, there is a need to increase the capacities of local government staff and encourage local entrepreneurs to develop relevant local social innovations. Three interviewees working as technologists stated that city governments should identify societal challenges and then design projects and programs through an interdisciplinary approach. The target population should be first identified, and then the solution design should start with how, why, and what? The model could identify the issue, fund the pilot and then scale up with future investments. According to the chief executive of a global urban think tank, the city government needs to lead smart city planning, identify all its population's needs, and play a crucial role in designing appropriate technologies. He added, *"To address urban inclusion, the city government should have a holistic and comprehensive approach to governance level followed by a specific and individual approach at the operational level"*.

All the interviewees believed that involving the private sector and the business model is critical. One expert working with a market research agency said, *"the private sector is neglecting the vulnerable populations and missing a huge market opportunity. Suppose the government*

supports the technology companies and subsidises the cost. In that case, they can provide services to these communities at a reduced price". An international urban expert suggested that *"the city government has a huge buying capacity to influence the private sector and enforce social responsibility clauses. In contrast, procurement of goods and services"*. An interviewee, a technical expert from a multinational company, said: *"Revenue is the key driver for private sector participation, and therefore the public-private partnerships (PPP) should be built around the same. Suppose the corporates serve vulnerable communities and develop innovative solutions. In that case, the government should give tax subsidies and encourage them"*. A global think tank official suggested that *"international organisations can drive multinational corporations to develop suitable technology solutions for vulnerable populations. For example, the recent WHO initiative on COVID vaccination and insurance is the right approach."* A smart city management consulting expert said, *"the private sector can contribute to inclusion through Corporate Social Responsibility (CSR) or Environmental, Social and Corporate Governance (ESG). There is a strong case for businesses to benefit from the digital economy"*.

A co-founder of a global inclusion organisation from the USA stated that *"at present, inclusion is being addressed in silos and a disintegrated manner"*. He suggested an integrated and whole-society approach to inclusion where the excluded populations are treated evenly and justly without discrimination. He further stated that political support is critical for designing inclusive policies. Three interviewees working as technologists suggested that *"to encourage the participation of the private sector, the city governments should set up challenges with funding the pilot projects or give access to the market if the problems are solved"*. Many interviewees believed that *"the local NGOs and grassroots organisations can help identify the vulnerable populations and involve them in the consultation process. This will be useful when the affected groups cannot articulate their vision for the smart city"*.

7.2 Does technology advance equity and inclusion in smart cities?

An urban expert from the UK shared the view that technology is a positive enabler and has the potential to enhance inclusion. He stated: *"Today, we are meeting more people because of technology"*. Another interviewee said, *"technology can contribute to inclusion, but it needs to be designed and delivered in an integrated model"*. Another expert working with a market research agency said, *"technology enhances inclusion, but it does not address exclusions"*. A senior development professional working with the World Bank in the USA stated: *"Data plays*

a critical role in evidence-based policymaking which is required to tackle the complex issue of urban inclusion. Therefore, the focus of smart cities should be to develop and pilot data infrastructure and demonstrate to policymakers and planners to understand how to use the information to design policies and projects based on the same,”. While another technical expert from a multinational company in the USA stated, *“technology drives both inclusion and exclusion based on usage. Technology can access and share information, build online communities and empower vulnerable communities”*.

An international urban expert interviewee stated that technology is not a solution for most cases and therefore needs political will and leadership. At present, cities are pushing technology solutions without understanding the problems at the ground level. He added: *“There is no point in trying to solve all the city problems at one go, instead try to implement pilot projects in smaller areas of the city and then scale it up across the city”*. Another interviewee, a global urban think tank expert, stated, *"technology has become an inevitable part of our lives, and it is impacting all aspects of life. However, privacy remains one key issue of concern. A clear and transparent approach by local bodies will enhance the utilisation of technology, further improving community life and inclusion. There are several challenges in the use of technology including social hesitation, security, and privacy, the familiarity of people to use, accessibility and so on”*. An innovation strategist stated that *“technology is a useful tool for enhancing inclusion and depends on its usage and ability to solve real-life problems. Often pressure groups influence inclusion, and to address inclusion, the city governments should work in an integrated way; otherwise, it will lead to an uneven and skewed approach to development”*. According to her, mapping vulnerable and disadvantaged populations is a big challenge for many city governments.

A UN official from Turkey stated that *“technology has an inherent bias, and it depends on group decisions to work on inclusion. However, the smart city technology should be platform agnostic with an inclusive approach and plan to leverage local capabilities”*. He further suggested co-creation and human-centred design as the best method for inclusion. Similarly, two public finance experts from World Bank said that technology could play a role but, if not used appropriately, can be an obstacle and lead to further exclusion. Also, the private sector should reduce the cost of technology solutions and enable a more extensive user base. An interviewee who is an innovation expert working with global cities organisation stated that the use of technology depends on its application saying, *“Technology is only a tool, and its*

application is highly context driven. For the success of any project, there should be buy-in from the whole society, and public consultation throughout the project life cycle and co-creation methods are highly recommended”. She further added: - “Continuous feedback loops from the final user of the technology should be ensured for constant improvement and making the solutions more sustainable.”

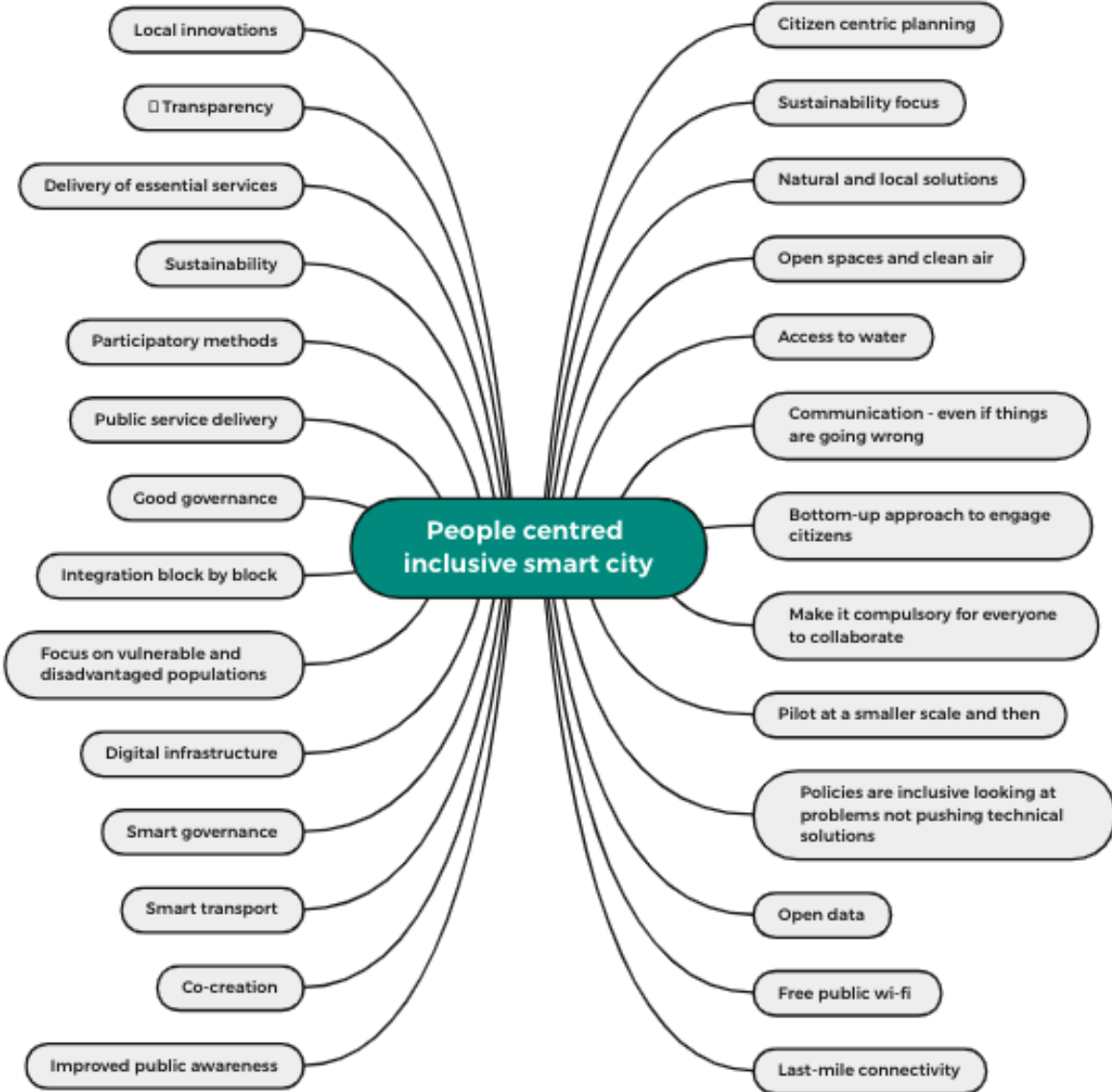
An interviewee who is an UN-Habitat official gave a mixed opinion about technology, saying, *“Those earlier digital technologies were great levellers, but now due to the existing digital divide, they are creating more inequality and exclusion often affecting majority sections which are vulnerable”*. He further added, *“There is a general perception that the vulnerable and disadvantaged populations are in the minority which is not the case. At the city level, planning professionals take a holistic and inclusive approach to urban planning, whereas the technologists designing smart city solutions do not take this approach. They broadly focus on either design or technology and neglect the usability aspects; therefore, there is a challenge of exclusion”*. According to him, urban planners and architects have a strong functional relationship. In contrast, urban planners and technologists do not have a similar relationship, creating a lack of trust and understanding from both sides, leading to several gaps, including urban exclusion. An interviewee, a chief executive of a global urban think tank, mentioned several challenges in using technology, including the challenge of the digital divide, saying, *“Technology has the potential to enhance inclusion, but the digital divide needs to be addressed first. At present, technology is supplying only individual services, no community services. And the availability and cost of hardware is a huge problem for many city governments”*.

7.3 The role of citizens in designing a people-centred inclusive smart city

One of my main interview questions in this study was what is a people-centred and inclusive smart city, and how to design it?

Based on the interviewees with 26 participants, the following key themes emerged for designing a people-centred smart city, as shown in Figure 43 below:

Figure 43 Key themes identified by respondents for designing a people-centred smart city as per global thematic experts (Source: Author)



All the interviewees stated the need for public consultation for inclusive smart city planning. Two public finance experts from World Bank noted that citizen participation is the key to designing inclusive cities. An international smart city expert interviewee said, “*public consultation is an essential exercise while planning a smart city and citizens from all walks of life should be involved throughout the project life cycle*”. An interviewee, a global urban think tank expert, stated that public engagement should be throughout the project life cycle and with a sense of ownership and belongingness, not mere participation. A smart cities researcher believed that citizen participation is crucial for inclusive development. “*However, the hearing process itself is exclusionist. Not homeless people can participate, but only urban developers*

and the elite can participate. Middle-class people have the confidence to speak in public, participate in public forums and share their views. Therefore, different methods are required for reaching out to different people and addressing the issues of different groups". He added, "The smart city approach and democratic participation are at the cross ends, where smart city focuses on efficiency and quick results. In contrast, democratic participation is a time-consuming process. How to combine and balance these two is a big question"?

An interviewee associated with an international urban planning body highlighted the need for people's capabilities to participate, where smart citizens can participate meaningfully, saying, *"Cities are smart if the community is smart. Digital technologies play a crucial role in public consultation - COVID-19 is a good example. However, ICT is not only for the elite; cities should plan and utilise a citizen participation approach using cyberspace in the current digital age. For example, in Africa, common people are using smartphones for survival and trading".* Similarly, an interviewee who is a market research expert from Italy mentioned the need for the participation of smart citizens, saying, *"Smart citizen is the key aspect of inclusive development and citizens can actively participate through local NGOs and grassroots organisations. However, in the current smart city projects, wider people consultations are missing, public consultations are a misnomer, and sometimes it is outsourced".*

Another interviewee, an urban expert, suggested using digital and non-digital methods for public consultation to reach out to all sections. For example, he said newsletters and postcards are excellent sources for information sharing. He further added: *"To enhance reach and access, we should use the best of both digital and non-digital methods of consultation. The approach should include representative governance structure, targeted stakeholder groups covering all sections of society like- disabled persons, women, youth, etc., social media posts, community engagement grants as part of project cost, and involvement of local NGOs".* According to him, a people-centric city should start with the people, identify different groups, particularly more vulnerable and disadvantaged groups, along with their needs and develop appropriate solutions. Another interviewee, an innovation expert working with global cities organisation, stated, *"The people-centric inclusive smart city should focus on participation from people and civil society, multi-stakeholder collaboration, and an accountable and transparent governance system with appropriate use of data addressing privacy issues".* Several interviewees mentioned that the complex issue of inclusion should be tackled through an integrated approach.

The interviewees shared the challenges of participation in vulnerable populations. One interviewee stated. *“While using technology for public consultation, the people’s capability, digital literacy and access are key considerations. The question is -Are ICT Solutions already biased against vulnerable populations? Is it designed for few people?”* He further discussed Google Maps, which works for many people but not for people with disabilities, as it does not provide information for wheelchairs. Another interviewee suggested the need for an inclusive city to start from the people's needs saying, *“But how do vulnerable population articulate their vision”?* Few interviewees mentioned that many citizens, particularly vulnerable people, are suspicious of extensive data collection in smart cities. They fear that the data is used against their requirement.

According to one interviewee, *“The ICT should help them address the day-to-day challenges of the common citizen and start from more marginalised groups. Government and urban planning authorities should relook at their expertise and focus on vulnerable populations. All cities are different, so do not buy off-the-shelf solutions; instead, develop customised solutions meeting the city requirements”*. According to the chief executive of a disability institute, the priorities of a people-centric inclusive smart city include *“nothing about us without us (PWD), our exposure should be valued as anybody else and nothing smart about a city; which is not focusing on preparedness, the inclusion of PWD, focus on emergencies, climate justice, community resilience.”* She stated that poverty is not always the divider saying, *“sometimes poor societies manage disability very well than rich societies”*.

According to one interviewee, the priorities of an inclusive smart city should be accessible and human-centric technology, where smart city technologies should be standardised from human factors, not pushed by industry. Three interviewees working as technologists stated that inclusive smart cities could be achieved by a change in thinking and increased citizen participation through affordable and accessible technologies. In terms of essential requirements, the chief executive of a global urban think tank shared that the key priorities of an inclusive smart city should be universal Internet access as an essential service, co-creation by the vulnerable, and consultations with all categories of the population.

7.4 Chapter Summary

In line with the literature evidence and the three case study findings, all 26 global thematic experts shared that exclusion and inequality are universal problems and exist in all cities worldwide. Apart from income levels, certain groups of the population are discriminated against and marginalised based on gender, age, sex, race, class etc., and often include the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, ethnic and religious minority groups and the LGBTI community.

All the participants agreed that technology is a great tool to address this gap however felt that the current smart city approach is not prioritising this issue. They suggested the need for inclusion in smart city planning. They recommended that a people-centric, inclusive smart city can be achieved only through appropriate policy innovations, an integrated governance mechanism and the active participation of citizens. Following are some new suggestions offered by these experts that enriched the case study findings further:

- The smart city should keep the community interests as a top priority
- The cities should recognise the existence of vulnerable and disadvantaged populations, which is always overlooked
- Inclusion is a key aspect of sustainable development and is often neglected in smart city planning
- People living in peri-urban areas and informal settlements also face exclusion and inequality
- The key challenges to be addressed are digital inequality and the lack of customised solutions for vulnerable populations
- Strong political will and good and transparent governance is the key to inclusion
- As compared to the human-centred design approach, which is inside to outside, the inclusive design community is a better approach where people are referred by need, and edge cases come first out to the inside model
- The Covid situation has thrust upon a new development model which is more just, green and digital
- Current smart cities are not focusing on inclusion, and it remains an elitist model
- The city government has a huge buying capacity to influence the private sector and enforce social responsibility clauses

- International organisations can drive multinational corporations to develop suitable technology solutions for vulnerable populations
- At present, inclusion is being addressed in silos and a disintegrated manner
- Technology drives both inclusion and exclusion based on usage. Technology has the power to access and share information, build online communities and empower vulnerable communities
- Technology has become an inevitable part of our lives, and it is impacting all aspects of life. However, privacy remains one key issue of concern. A clear and transparent approach by local bodies will enhance the utilisation of technology, further improving community life and inclusion. There are several challenges in the use of technology, including social hesitation, security, privacy, the familiarity of people to use, accessibility and so on
- Technology is a useful tool for enhancing inclusion and depends on its usage and ability to solve real-life problems. Often pressure groups influence inclusion, and to address inclusion, the city governments should work in an integrated way; otherwise, it will lead to an uneven and skewed approach to development.

The international perspective highlighted the need for creating a business case for inclusion where the private sector can invest and create a win-win situation for everyone. It is suggested that at present smart city is driven by the corporate sector, which needs to change, and the government should take the lead in driving the smart city vision in line with the needs of its citizens. A few relevant recommendations for the inclusion of the vulnerable population are setting up a separate municipality division to deal with inclusion challenges.

Further in-depth and comparative analysis through identified themes is done in Chapter VIII.

Chapter VIII

8 Analysis and Recommendations

The three case studies of London, Bengaluru and Kampala were undertaken to investigate the challenges of urban exclusion and inequality in contemporary cities and, in particular, explore the interplay between urban inclusion and the new and emerging urban development paradigm of smart cities. To analyse the problem of urban exclusion and situate and construct diversity in primary data, additional inputs were obtained from 26 global thematic experts worldwide. The study assesses the potential contribution (if any) of the digital technologies extensively used in the smart city model to advance equity and inclusion in smart cities. This study is limited to the five identified challenges of inequality and exclusion experienced by vulnerable people and include-accessibility, affordability, opportunity, participation and liveability. The key question guiding this research is: Can smart city be equitable; does it address the current challenges of urban inclusion and contribute to the well-being of all citizens, leaving no one behind?

The literature review in Chapter II established evidence of exclusion and inequality in contemporary cities. It identified individuals and groups of the population commonly excluded from mainstream development, including the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, and ethnic and religious minority groups, including the indigenous population and the LGBTI community. The case studies confirmed these categories of excluded populations. The study further identified additional types of the excluded population specific to each city, such as homeless people in London, domestic workers, rag-pickers, burial workers, construction workers and a few caste groups like scheduled caste and scheduled tribes in Bengaluru. The street children, informal traders and street vendors, and certain minority tribes in Kampala. For this research, these other population groups are considered under the category of poor or ethnic and religious minority groups, as applicable.

This chapter attempts to answer the following three research questions set out for this study and further suggest key findings by analysing and comparing the results of the case studies in the light of the literature review and theoretical concepts and discussion:

Who are the individuals and groups of the population who are excluded and marginalised from smart city development projects? What are their experiences of different forms of exclusion?

Is urban inclusion a priority in current smart city planning? What is the impact of digital technologies that are extensively used in smart cities? Do they have the potential to contribute towards enhancing the inclusion and equity of vulnerable populations? If so, how?

What are the key features of a people-centric and inclusive smart city, and how to design the same?

8.1 The challenges of urban exclusion and inequality

Through analysis drawing on data from previous chapters, this section seeks to answer the first research question:

Who are the individuals and groups of the population excluded and marginalised from smart city development projects? What are their experiences of different forms of exclusion?

Despite tremendous progress on several fronts, human societies are suffering from exclusion and inequality. Apart from income, inequalities are determined by age, gender, and sexual orientation (WHO 2021; Oxfam 2021; UN 2020). The academic literature (Goldin, I. and Muggah, R 2020; Van Hoof and Kazak 2018; Greene et al.,2016; Khan et al.,2015; Fredmen and Goldblatt 2015; Akhavan 2012; Nowosielski 2012; Lombardo and Sangiuliano 2009) in Chapter II and policy documents (Oxfam 2021; UN 2020/2017/2015; WHO 2020/2015; UNHCR 2016/2015; World Bank 2015; OECD 2013; UN-Habitat 2011/2010) in Chapter II have highlighted the existence of inequality, discriminations, and multiple forms of exclusion. It further indicated that exclusion is not a linear model. Instead, it manifests and affects different forms and variants, such as social, economic, political, physical, cultural, financial, and digital exclusion. The three case studies and 26 global thematic expert interviewees confirmed these characteristics of inequality and exclusion in contemporary cities, particularly in the context of smart city planning and development.

The literature in Chapter II identified the vulnerable and disadvantaged population who are marginalised and neglected in smart city development projects as the senior citizens and elderly people (UN DESA 2015a); persons with disabilities (Neto and Kofugi 2016); women (Abitbol et al., 2017); children (UN-Habitat 2011); youth (Dhakal et al., 2018); migrants and refugees (Bauder 2020; Costa and Ewert 2014); poor (Shah, 2013; Demirguc-Kunt and Klapper 2012; UN-Habitat 2009) ethnic and religious minorities and indigenous population (Basu 2011; Hunter 2005/2000); and LGBTI individuals (Poku et al., 2017). The three case studies of London, Bengaluru and Kampala, including the 26 global thematic experts, confirmed these categories of populations to be vulnerable and marginalised from smart city planning and mainstream development. The case wise issues and intensity differ but the affected population groups remain same with few additions specific to each case. The case wise details of excluded populations and their challenges are dealt in detail in Chapter IV, V and VI.

In London, the elderly lack access to efficient healthcare services and live in poverty and isolation due to low pension schemes and lacking community life. Disability is still considered a burden with limited mobility access across city areas. Women face sexual harassment and low pay for similar jobs compared to their male colleagues. Children-centric urban planning is missing in many parts of London except for new development and regeneration projects. Many children are victims of crime, drugs and bullying. Accessing education and employable skills for youth from vulnerable groups remains difficult. The migrants, refugees and poor live miserable lives with sparse incomes, unemployment and lack of affordable housing. In Bengaluru, the elderly lack digital skills and face financial insecurity, isolation, domestic abuse, and violence. Disability is considered a social stigma and a curse with the least acceptance across urban spheres. Gender inequality and increasing violence against women is a huge challenge. Children and youth are never considered essential for urban planning and city development. Migrants and minorities face severe discrimination in their day-to-day lives. The caste and tribe politics is prominently visible in city governance and administration. The slum areas where the poor reside lack basic amenities and suffer for their livelihoods. In Kampala, old age is considered a burden with minimal institutional support mechanisms. As in the case of Bengaluru, disability is regarded as a social stigma and a curse with the least acceptance across urban spheres. Women lack access to jobs and business support. The city faces unemployment challenges, and education and skills remain inaccessible and unaffordable to vulnerable families. Street children are often subject to violence and abuse. The tribal groups are divided, and few remain isolated and marginalised. As far as the LGBTI groups are

concerned, each city has its challenges of exclusion. London fairs well in terms of inclusion of LGBTI but still reports inequality and discrimination in public places. In Bengaluru, LGBTI is considered a social stigma, and crimes are often reported against this population. In Kampala, this is strictly prohibited by law and invites imprisonment and death penalty.

The case-wise excluded category of the population is shown in Table 24 below; (this table merely identifies and summarises the broad categories of excluded population in smart city planning of London, Bengaluru and Kampala respectively; and the scope and intensity of exclusion vary from case to case as summarised in pre-paragraphs and other relevant sections of Chapter IV, V and VI respectively)

Table 24 Category of the excluded population in London, Bengaluru and Kampala (Source: Author)

Category of the excluded population	London	Bengaluru	Kampala	Remarks*
Elderly people	√	√	√	London has few interventions such as imparting digital skills, travel discounts to benefit elderly.
People with disabilities	√	√	√	Better accessibility in London as compared to other two cases
Women	√	√	√	Women crime is a big challenge in Bengaluru & financial access for women entrepreneurs is a challenge in Kampala
Children	√	√	√	All 3 cases neglect children centred city planning
Youth	√	√	√	London and Bengaluru have few digital skills programs for youth employment
Migrants	√	√	√	Migrant related challenges are huge in Bengaluru and Kampala
Refugees	√	√	√	Bengaluru does not have any specific refugee related interventions at city level
Ethnic and religious minorities**	√	√	√	This is a huge challenge in Bengaluru and Kampala as compared to London
Caste groups**		√		The caste-based differentiation is widely prevalent in rural India and partly in Bengaluru
Tribe groups**		√	√	This is a big challenge in Bengaluru and Kampala
Poor**	√	√	√	The case wise poor categories are highlighted: In London the homeless are identified as poor; In case of Bengaluru, domestic workers, rag-pickers, burial workers, construction workers and slum dwellers are identified as poor; In case of Kampala Street vendors and slum dwellers are identified as poor
LGBTI	√	√	√	London fairs well in terms of inclusion of LGBTI but still there is report of inequality and discrimination in public places. In Bengaluru LGBTI is considered a stigma and often crimes are reported against these population. In Kampala this is strictly prohibited by law and invites imprisonment and death penalty etc.

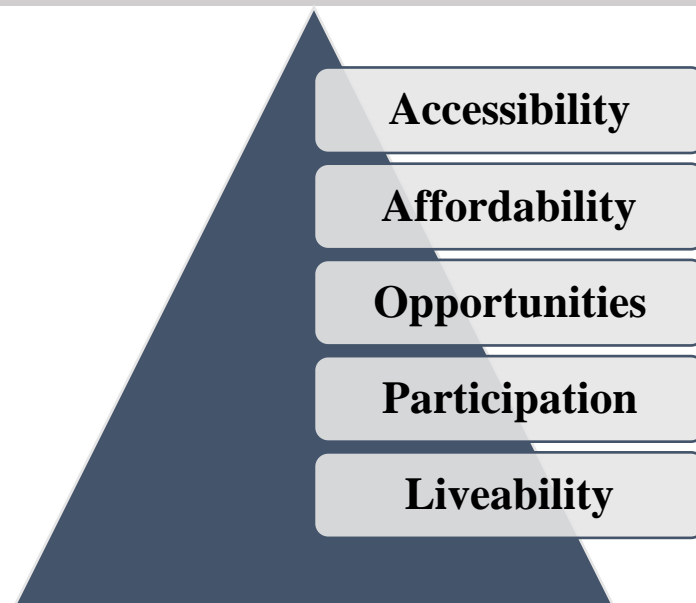
* The case specific highlights are summarised. The discussion in pre-paras describes the intensity and scope of exclusion that varies from case to case. The case wise details of excluded populations and their challenges are dealt in detail in Chapter IV, V and VI.

**For this research, the additional population groups, such as the homeless, domestic workers, rag-pickers, burial workers, construction workers, street children, informal traders, and street vendors identified in the case studies, are considered poor. The caste, tribe and indigenous population are considered under the category of ethnic and religious minorities.

Hence, the commonly excluded populations identified as vulnerable populations in this study include the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, ethnic and religious minority groups, and the LGBTI community.

These populations are found to be voiceless, often neglected and excluded from mainstream development and hence need to be included in smart city planning and development. All the case studies pointed out that these categories of populations, even though they form the majority of the city population, are excluded and face several challenges and hardships in day-to-day city life.

The literature in Chapter II identified multiple challenges these vulnerable populations face, which are broadly grouped into five main challenges accessibility, affordability, opportunities, participation and liveability.



The five key challenges are further analysed in detail by summing up the literature evidence and identifying the critical action areas for each challenge, as shown in Table 25 below:

Table 25 Action areas for inclusion challenges identified by literature survey (Source: Author)

Key challenge	Action areas
I. Accessibility	1. Access to land, housing, built environment and infrastructure
	2. Access to public places and social infrastructure
	3. Access to transport and mobility
	4. Access to water, sanitation, hygiene and energy
	5. Access to the Internet and digital infrastructure
	6. Access to information (language barriers)
	7. Access to services (including emergency services)
	8. Access to credit and finance
II. Affordability	1. Adequate food and nutrition
	2. Affordable necessities such as housing, water, energy and sanitation, including land and other essential assets
	3. Affordable education and healthcare
	4. Affordable data
	5. Affordable mobility
	6. Affordable services and public facilities
III. Opportunity	1. Fair and equitable opportunity
	2. Jobs and employment
	3. Essential skills and knowledge development
	4. Business support and market reach
IV. Participation	1. Right to autonomy
	2. Representation and participation in community, governance and public offices
	3. Labour rights
	4. Equality and Non-discrimination
	5. Gender equality
	6. Human rights
	7. Capability and know-how
V. Liveability	
	1. Safety and security (crime and violence prevention)
	2. Resilience from climate and environmental risks and other stressors
	3. Job security and minimum wages and social protection
	4. Local or neighbourhood amenities
	5. Good governance and anti-corruption
	6. Work-life balance
7. Health and wellbeing	
	8. Community living & Social connectedness

Summing up the findings across the three case studies and global thematic expert interviewees, it is confirmed that the five challenges and the above-mentioned 33 critical action areas are essential requirements for the inclusion of vulnerable populations living in cities. The case-specific findings, however vary. In the case of London, accessibility, affordability and discrimination are considered critical challenges for inclusion. Housing and access to the Internet and digital infrastructure, including affordability of transport and data and racial discrimination, are mentioned as London residents' challenges. For the Bengaluru case, accessibility, affordability and opportunity remain a big challenge. The eight action areas of accessibility, the six action areas of affordability and four action areas of opportunity are partly or fully considered inadequate in Bengaluru smart city plan. Equality by means of participation, gender and human rights remain gap areas in this smart city planning. In the case of Kampala,

in addition to accessibility, affordability and opportunity, participation remains a critical challenge to tackle. The key challenges of Kampala residents include access to land, access to information, access to credit and finance, access and affordability of Internet and data, jobs and employment, including representation and participation in local governance.

8.2 Exploring digital technologies and smart cities as part of the solution for urban exclusion and inequality

The literature in Chapter II points out that there is extensive use and multiple applications of digital technologies in smart cities. The diverse applications include tools and solutions for economic development, environment management, mobility and transport, citizen engagement, governance and improving quality of life. Among these, digital inclusion, participatory planning, universal access to services and information, computer access and training for the community, co-creation, and citizen engagement platforms are purported to enhance inclusion. The three case studies and 26 global thematic expert interviewees also confirmed that digital technologies, if used appropriately, can enhance inclusion and equity, and the smart city models using such innovative digital solutions can provide an opportunity to enhance the inclusion of vulnerable populations.

Therefore, this section seeks to answer the second research question:

Is urban inclusion a priority in current smart city planning? What is the impact of digital technologies that are extensively used in smart cities? Do they have the potential to contribute toward enhancing the inclusion and equity of vulnerable populations? If so, how?

8.2.1 The smart city vision and its action areas

The smart city is considered one of the effective urban governance tools of the 21st century to mitigate urban problems and challenges (Lee et al., 2014). To increase economic competitiveness and improve quality of life, the local and national governments are increasingly adopting a smart city approach by integrating technology developed by private enterprises (Vu, K. and Hartley, K 2018).

Even though smart cities are at times considered to be in the infancy and evolving stage, today it has become a global buzzword (Tariq et al.,2020; Tang et al., 2019). Many cities are actively developing strategies to become 'smart' and manage city resources more efficiently while addressing development and inclusion challenges (Joshi et al., 2016). The multiple definitions

of smart cities vary across countries, cities, organisations, and institutions based on the geopolitical context, local priorities, issues and needs (OECD 2020; Tang et al., 2019). However, in most cases, smart cities revolve around the use of digital innovations for efficient delivery of urban service, increasing business competitiveness, and improving community living quality.

The literature review of 60 definitions and vision statements of smart cities to understand the strategic vision and the desired outcome has indicated six broad focus areas of current smart cities. They include- improved quality of life and well-being of citizens, economic growth and employment opportunities, inclusive development; smart urban governance; climate change and environmental issues, and infrastructure. The literature broadly confirms these six focus areas of the current smart city models and further identifies the following set of action areas as shown in Table 26 below:

Table 26 Action areas of current smart city models (Source: Author)

<ul style="list-style-type: none"> • Improved quality of life and wellbeing of citizens: improve citizen welfare, liveability, social infrastructures (water, education, healthcare, energy, cultural wellbeing) reduce traffic congestion, reduce pollution, safety, resilience, good governance, human capital, social capital, social development
<ul style="list-style-type: none"> • Economic growth and employment opportunities: competitiveness, public-private partnerships, prosperity, employment, economic development
<ul style="list-style-type: none"> • Inclusive development: digital inclusion, reduce cost, engage with citizens, holistic approach, accessibility, citizen focus, information sharing, communication, inclusivity, participatory governance, connected community, universal access to services and information, cities work for everyone, sustainable communities, increase equity and prosperity of residents and businesses
<ul style="list-style-type: none"> • Smart urban governance: data, service efficiency, policy innovation, resource optimisation, open government, disruptive, coordination, integration, innovation, collaboration, flexible/adaptable/convenience service delivery, integrated information network, efficiency of operations, data-driven decision making, multi-stakeholder engagement
<ul style="list-style-type: none"> • Climate change and environmental issues: clean energy, environmental management, low carbon economy, sustainability
<ul style="list-style-type: none"> • Infrastructure: built environment, infrastructure, transport, technological infrastructures, communication networks

From the above, it may be inferred that most smart city projects are being developed under the broad categories of these six theme areas. The inclusive development relevant to this research study is identified as one of the six themes. Based on the definition and vision statements, this inclusive development is aimed to achieve through digital inclusion, engagement with citizens, holistic approach, accessibility, cost reduction, citizen focus, information sharing, communication, participatory governance, connected community, universal access to services

and information, reducing social inequality, sustainable communities, increase equity and prosperity for residents and businesses. This indicates that few cities have recognised the need for inclusion in smart city planning and development; however, the extent to which the intent has delivered the results is unknown. Therefore, to investigate the ground situation, three smart city case studies, including interviews with 26 global thematic experts, have been conducted and dealt with in the subsequent sections.

8.2.2 Is inclusion a priority in smart city planning - Comparative learnings from the case studies

The achievements of the smart city model are claimed to be less studied and often limited to single dimensions (Shen et al., 2018). The relevant literature (Yigitcanlar and Kamruzzaman 2018; Yigitcanlar 2016; Ghasemi 2015; Kunzmann 2014; Shelton et al., 2014; Albert Meijer 2013) suggests that the smart city is still evolving and contextual with little evidence of its contribution to sustainable development and particularly urban inclusion. It is Traditionally, the discourse and scientific examination of urban digitalisation and its impact have been dominated by computer science, data science, and engineering approaches with little evidence of its impact on social dimensions (Reuter 2020). There is very limited analysis of smart cities as socio-technical systems that combine both the social and technical domains and study their effect on the other, including their interrelationships (Ghasemi 2015).

This research involving three diverse smart city case studies combined with interviews of 26 global thematic experts is expected to shed more light and clarify the interplay between smart city development and the critical challenge of urban inclusion in contemporary cities. The three cases of London, Bengaluru and Kampala are situated in different continents of Europe, Asia, and Africa and are subject to different socio-political environments and governance systems. The three cases represent the varied development models of the high-income country (UK), lower-middle-income country (India) and low-income country (Uganda), influencing the smart urban governance strategy and approach differently. The varied cases from different geographies and cultures, being at different levels of development, are expected to suggest a broad and more generic global perspective on current smart city approaches to mitigate the challenges of urban inclusion.

At the national level, the UK smart city plans are knowledge-driven and predominantly focus on improving citizens' quality of life using technology. Major initiatives cover five domains: transport, water, waste, energy, and assisted living solutions. The smart city mission of the Government of India identifies technology as one of the six fundamental principles to drive economic growth and develop smart solutions for improved quality of life of city residents. Uganda's vision 2040 identifies ICT as one of the critical resources for national development. The creation of 15 new cities in Uganda is planned to be facilitated by ICT, and there exist several legislations at the national level that advocate extensive use of technology for urban development. This shows that all three nations will use digital technologies and smart governance solutions for urban development, thus providing the right environment for this research. Table 27 below summarises the vision, approach /objective, initiatives and challenges of smart urbanisation in the UK, India and Uganda:

Table 27 Comparison of smart urbanisation approach in UK, India and Uganda (Source: Author)

	United Kingdom	India	Uganda
National vision/ Definition of smart city	A smart city integrates human, physical, and digital systems in the built environment to deliver an inclusive, prosperous and sustainable future for its citizens	To develop cities with core infrastructure, a clean and sustainable environment, and use of smart solutions for a decent quality of life to their citizens	To empower Ugandan citizens to achieve the goals of sustainable development, universal inclusion, poverty eradication and economic progress using digital innovation
Key focus /objective	<ul style="list-style-type: none"> • An attractive business environment • Enhancing citizens' quality of life in consultation with citizens 	<ul style="list-style-type: none"> • Integration, innovation & sustainability • Co-operative and competitive federalism • The community at the core • Sectoral and financial convergence • Ability to generate greater outcomes with fewer resources • Technology as means, not the goal 	<ul style="list-style-type: none"> • Urbanisation is identified as a key driver of the development process • Integrated physical planning • Investment in commercial and industrial zones and land-use optimisation • Five strategic cities with sector focus • Focus on industrialisation • Focus on efficient government service delivery system • Focus on planned urbanisation
Role of national government	<ul style="list-style-type: none"> • Coordination/collaboration • Funding infrastructure and demonstrator projects • Regulation - to ensure common standards and regulations 	<ul style="list-style-type: none"> • National policy • Program management • Part funding • Common standards and guidelines 	<ul style="list-style-type: none"> • National vision • National policy and guidelines
Key initiatives	<ul style="list-style-type: none"> • Digital infrastructure 	<ul style="list-style-type: none"> • Mixed land use 	<ul style="list-style-type: none"> • New urban policy

	<ul style="list-style-type: none"> • Open data • Intelligent physical infrastructure like IoT • Citizen-centred service delivery • New business models • Transparency • City dashboards 	<ul style="list-style-type: none"> • Housing and inclusiveness • Creating walkable localities • Reduce congestion • Multi-modal transport • Reduce air pollution • Reduce resource depletion • Boost local economy • Promote interactions and ensure security • Preserving and developing open spaces • Citizen-friendly and cost-effective governance • Online services to bring accountability and transparency (use of mobile technologies for cost-cutting and ease of operations) • Specific identity to the city • Smart Solutions to infrastructure and services 	<ul style="list-style-type: none"> • New urban planning • Economic planning • Smart industrial policy • Development of municipal finance
Identified Challenges	<ul style="list-style-type: none"> • Top-down planning • Policy innovation • Complex procurement process • Access to physical assets data and computing resources • Lack of regulation and standards • Lack of community engagement • Lack of trust • Lack of basic digital skills • Limited broadband access • Poor collaborations across departments • Lack of control by cities over other essential services like bus service, gas, electricity • Concerns about data privacy & security 	<ul style="list-style-type: none"> • Top-down approach • Dependency on huge investments • Lack of basic infrastructure and services like water, sanitation and energy • Challenges of public-private partnerships • Lack of inclusive approach • Fast growing population • Lack of accountability • Corruption 	<ul style="list-style-type: none"> • Uncoordinated urban planning • Fast-growing youth populations • Weak administration and institutions • Inefficient legal framework • Privatisation of urban development • Poor connectivity • Lack of basic infrastructure and services like water, sanitation and energy • Encroachment of public places

As inferred, the vision for smart urbanisation, even though different for the three countries is aimed at certain common goals such as sustainable development, quality of life and citizen focussed approach. The national development visions identify ICT as one of the main tools for achieving the desired goals, which encourages the city governments to implement smart city plans and projects. In terms of the three comparative case studies undertaken in this study, the

vision and key themes/thrust areas of the three smart cities are compared and summarised in Table 28 below:

Table 28 Comparison of smart city thrust areas in London, Bengaluru and Kampala (Source: Author)

	London	Bengaluru	Kampala
Vision	To adopt technology and a new form of collaboration between the Government, Londoners, business, and academia to address the city's challenges in an integrated and holistic manner	'Livable Bengaluru' through 'Connected, Vibrant and Healthy Communities' that is sustainable on three fronts- environment, economy and equity	A City area that solves its core issues through innovation and collaboration, and that applies new technologies and data for the benefit of all
Key themes	<ul style="list-style-type: none"> • City-wide collaboration • World-class connectivity • Digital skills and capacity • A new deal for data • Inclusive technology 	<ul style="list-style-type: none"> • Integrated mobility, enhanced safety and security in public places and promoting barrier-free movement • Empowering citizens through accessible information on public services and grievance redressal portals on digital networks towards inclusive growth • Activating street edges, creating inclusive public spaces, revitalising markets, promoting affordable housing, and establishing a solid place identity by reconnecting city landmarks towards a thriving urban centre • Improving urban health through the restoration of natural assets of the city like parks and lakes and linking public nodes by a continuous network of walking and cycling ways 	<ul style="list-style-type: none"> • Improve Institutional Effectiveness • Improve Client Experience • Improve service delivery through innovation
Key features	<ul style="list-style-type: none"> • Londoners at the core • Access to open data • Leveraging London's research, technology & creative talent • Offering a 'Smarter' London experience for all • Use data to bring efficiency and scale to London's work management • Establish a smart London innovation network • World-class research innovations through industry partnerships 	<ul style="list-style-type: none"> • Mobility • Economic development • Housing for All • Environment • Safety and security • Public amenities and services and governance 	<ul style="list-style-type: none"> • Design citizen centric digital services • Mobile money and financial inclusion • Partnership for shared outcomes • Test and trial new technology • Measure the effectiveness of projects

	<ul style="list-style-type: none"> • London Transport System • Enhance digital leadership and skills 		
Focus areas/sectors	<ul style="list-style-type: none"> • Transport • Energy • Culture • Economic development • The environment • Health • The London plan 	<ul style="list-style-type: none"> • Mobility • Water supply and Sanitation • Solid Waste Management • Equity and Inclusion; Safety and Security • Power • Governance and Citizen participation • Financial Management • Economic Revitalization with focus on identity and culture 	<ul style="list-style-type: none"> • SMART People • SMART Mobility • SMART Governance • SMART Economy • SMART Environment • SMART Living

As inferred from above, the Smart London initiatives focus on city planning, economic growth, quality of life, efficient delivery of services, environmental management, city transport and exploring new business opportunities. Priority is given to regeneration and real estate projects and automation of government services with heavy funding and participation of big multinational corporations. The focus of London's smart city on open data led to evidence-based decision-making, technology innovations and research. It supports to build several solutions like intelligent transport (road, tube, cycle), digital money, connectivity, energy and water management through smart grids, 3-D map of underground assets, waste management, pollution control, monitoring of greenhouse gas emissions, technology to reduce vehicle collision, NHS support, TfL portal, Legible London (wayfinding system) among others.

One of the features of London's smart city is to enhance the participation of people and use Smart London as a vehicle for inclusion (Smart London Plan, 2013:2016). Some innovative projects initiated aimed at inclusive planning and development include London Datastore, London Dashboard, London Innovation Network, Industry partnered to research, Civic innovation challenges, civic platforms, digital inclusion, smart infrastructure, London Green fund, Legible London, London Office of Technology and Innovation (LOTI), MedTech. According to one interviewee who is a senior executive at Transport for London (TfL), TfL visibly has several inclusion-related initiatives such as discounted off-peak fares for the elderly and children, a multilingual ticketing system, along with improved accessibility for disabled persons. The findings show that even though businesses and the private sector drive the technology-led city transformation, the city government is taking steps to play the lead role and

to ensure the same a Chief Digital Officer (CDO) has been appointed recently to lead the digital transformation of London.

In the case of Bengaluru, the strategic focus and smart city plan highlight a conscious directive for sustainable choice, informed decisions through continued civic participation in city management, and further building on public-private partnerships for infrastructure projects in the city (Bengaluru Smart City Plan 2017). The Bengaluru smart city plan identified priority sectors like mobility, solid waste management, water supply and sanitation, equity and inclusion, including safety and security, power, governance and citizen participation, financial management and economic revitalisation with a focus on identity and culture. A few projects that are aimed at inclusive planning include providing safe crossings for people with disabilities, last-mile connectivity, public toilets, affordable housing, women's safety, participatory budgeting, and plans to maximise the reach and availability of digital public services.

The Kampala smart city plan (2016) aims to use ICT to provide quality services and facilitate efficient and effective administration of the city in the provision of services. The smart city plan's key themes include identifying challenges, focusing on institutional efficiency, promoting community innovations, and applying locally relevant technologies. The new plan (KCCA Smart City Strategic Plan 2020-2026) focused areas are identified as SMART People, SMART Mobility, SMART Governance, SMART Economy, SMART Environment and SMART Living. Smart city projects like enterprise content management systems, data centres, automation of human resources, automation of revenue collection, and computer-aided mass valuation mainly focus on institutional efficiency. Other projects like an interactive web portal, unified messaging, KCCA call centre, and mobile money and financial inclusion promote participatory planning and inclusive development.

The three case studies indicate that smart city plans are very broad and encompass multiple city governance domains, and inclusion is considered one part of the development priority. However, the case studies and global thematic expert interviewees confirmed that smart cities focus more on technology and infrastructure, and inclusion is not a priority. All three case study respondents mentioned that the priority of inclusion depends on the priority of city administration and political leadership. Currently, the city administration responds only to pressure groups and serves the privileged interest, leading to an elitist model of a smart city

benefitting limited groups of city residents. Several participants shared that smart city projects that do not focus on inclusion will give more power to powerful and elite communities and disrupt social order and harmony. For in-in-depth understanding, the smart city projects and initiatives across the three cases are mapped to the six smart city themes (constructed based on literature evidence from Chapter II) and tabulated below in Table 29.

Table 29 Comparison of theme-wise smart city projects and initiatives in London, Bengaluru and Kampala (Source: Author)

Six themes of a smart city (identified by the author from the literature)	Smart London projects /initiatives	Bengaluru smart city projects /initiatives	Kampala smart city projects /initiatives
I. Improve the quality of life and well-being of citizens	<ul style="list-style-type: none"> Care connect - connects NHS for non-clinical aspects Promote MedTech innovation in NHS and social care to improve treatment 	<ul style="list-style-type: none"> Revitalisation of the historic heart of the city (various CBD locations) Redevelopment of the historic heart of the city (different CBD locations) Protection and redevelopment of city parks Electric bus feeder service to metro Covid 19 crisis management facility Redevelopment of internal roads Improvements to drains and footpath Digital health infrastructure Digital education to citizens Open data portal for citizen information and innovations B-TRIPS (Bengaluru Travel-Related Information and Planning System) Last-mile connectivity Digital information boards Public toilets Drinking water points Smart sure boards Solid waste management Rainwater harvesting 	<ul style="list-style-type: none"> E-Health Sanitation Mobile App-Weyonje – to support garbage collection in the City Safe City (City CCTV through UPF)
II. Economic growth & employment opportunities	<ul style="list-style-type: none"> Queen Elizabeth Olympic Park as a testbed for innovation Digital quarter for London-start-up space Establish London office of technology and innovations (LOTI) to support common capabilities and standards for future innovation 	<ul style="list-style-type: none"> Redevelopment of historic economic centres Tourism projects 	<ul style="list-style-type: none"> One-stop centre for business promotion
III. Smart urban governance	<ul style="list-style-type: none"> London datastore City-wide cybersecurity strategy 	<ul style="list-style-type: none"> Integrated city command and control centre City dashboard as a single MIS for a city 	<ul style="list-style-type: none"> Smart Permit (Online Plan approvals) Digital City Addressing-Computer address

	<ul style="list-style-type: none"> • Increase data sharing between London government (City Hall and boroughs) and stakeholders • London city Dashboard • London Office for Data Analysis (LODA) to increase data showing collaboration 	<ul style="list-style-type: none"> • 3D building mapping using drone technology for property assessment and public assets management • Smart governance kiosks to expand the digital reeds • Online project information system for public project management(G2G) • Technology-driven participation in budgeting 	<ul style="list-style-type: none"> • modelling to facilitate street naming and assignment of the postcodes • Computer aided property valuation integrated with geo-based mobile data devices • Enterprise content management system • Automation of municipal revenue collection • Automation of human resources processes • Automation of City Payments including utilities (Water and Power) • Smart Properties (Property Management) • Support Open Data exchange • Institutional Process Alignment • Improve Information Security • Enhance Technology Innovation
IV. Climate change and environmental issues	<ul style="list-style-type: none"> • Environmental data as open data (energy, water, waste, pollution). • London Green fund • Love clean London-community portal-mobile phone app and website to report environment crime online 	<ul style="list-style-type: none"> • Sustainable energy 	<ul style="list-style-type: none"> • Plantation of 5 million trees
V. Infrastructure	<ul style="list-style-type: none"> • 3-D map of all London's underground assets • Smart grid • London Datastore • Wireless networks • TfL's innovation portal • Legible London - wayfinding system interactive touchscreen panel with electronic map/printed map on reverse • Connected London programme-5G • Full fibre to the home for all new developments • Public Wi-Fi in streets and public buildings 	<ul style="list-style-type: none"> • Integrated mobility-bus terminal development (multiple locations) • Energy efficiency in the public lighting system (led lighting) • Overhead pedestrian bridge • Smart parking system • Multi-level car parking • Smart bus shelter • Smart metering • Smart telecom towers to provide Wi-Fi and CCTV 	<ul style="list-style-type: none"> • Smart Lighting-Street light management using auto solar streetlights • Automation of traffic management- Network installation and traffic signals • Mobile value-added services • Free Wi-Fi spots • Modern data centre for consolidation of all application hosting and data storage • Interactive web portal • Unified messaging for computer and mobile users • KCCA Call centre solution • Fiber Network Connectivity of Service Centers • Deployment of a Client Contact Center • Deployment of a Pilot Traffic Control Center • Online Services, Tree Audit, City Tourism • Signalisation of 30 road Junctions to enhance Traffic flow management in the City • Enhance Smart City ICT Infrastructure

VI. Inclusive development	<ul style="list-style-type: none"> • Digital skills and capacity / Focus on digital exclusion and skills gap/ Local young people with digital apprenticeship • Inclusive technology • Digital inclusion strategy • Affordable ultrafast broadband to SMEs • Team London: Micro-volunteering program to enhance employment prospects of young Londoners • Talk London – bring the community in policymaking through online discussions, live question and answers, events, surveys and focus groups across a range of topics • Civic innovations • Civic platforms to engage citizens and communities • Diversity in tech to address inequality 	<ul style="list-style-type: none"> • Women’s workspace • Citizen app for consolidated input from citizens • Security surveillance using CCTV cameras • GIS-based police and crime information system with vehicle tracking and beat management for 600 police vehicles in city • ICT-enabled platform for civic engagement • Technology-driven participation in budgeting • Community policing • Smart/pop-up kiosks • Digital education • Women and children’s helplines like “Sahaaya” and community policing at pan-city level 	<ul style="list-style-type: none"> • Citizen Participation • Electronic payment through mobile phones (financial inclusion) • Electronic banking and point of sale terminals
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As inferred from the Table above, inclusion is one theme of smart city plans with fragmented and piecemeal approaches. In the case of London, the inclusion focus is limited to digital skills, inclusive technologies and citizen participation. In the case of Bengaluru smart city, the inclusion-related focus is on women's and children's safety, participatory budgeting, and smart information kiosks. For Kampala, smart city inclusion is limited to citizen participation and financial inclusion.

In concurrence with the documentary evidence, several interviewees across the case locations mentioned that the current smart city models ignore social, economic, and cultural factors. The implementation model is in a top-down approach and too technocratic, driven by ICT suppliers and related business sectors. For example, in the case of London, one interviewee working with NGO for disabled persons stated that *“the people with disability face exclusion in London smart city and they are looked at as a cost, not as an asset. Further, they do not have the hardware, the fibre connection, nor digital skills to participate meaningfully and enjoy full benefits of city services”*. In the Bengaluru case, one interviewee who is a person with a disability mentioned, *“There are serious lacunae in development of smart city plans and the minimum inclusion which is existing now is by chance not by choice”*. Similarly, an interviewee from Kampala who is an urban expert stated that, *“The current smart city plan is focusing on technology. In contrast, technology is one dimension of smart city management”*. Another interviewee, also

an urban expert, said, "*Cities are being managed for the interest of minorities and neglecting the majority needs and requirements*".

Across all three case studies, many smart city projects are commercially oriented, prioritising high investment returns. In terms of utility, the current smart city services appear to widen the gap between rich and poor, those who have access and no access to the Internet, unless a particular and deliberate effort is made to include the vulnerable populations. Several participants in the case locations and elsewhere shared that cities aspire to be labelled smart cities because other cities are becoming smart and attracting investments, new businesses, and private corporates. Their motivation is not to provide services to vulnerable people. In the absence of a clear inclusion strategy, the trickle-down approach to development does not work. One of the 26 global thematic expert interviewees reiterated this: "*The current smart city models are profit-driven and not people-centric and increasingly propagated by ICT and business sectors; therefore, the inclusion of all citizens is not a priority*".

All the interviewees from three case studies and the 26 global experts mentioned that the smart city approach is a good urban planning instrument. The use of digital innovations can deliver efficient and effective solutions to urban challenges, make life easy, and potentially enhance the inclusion of vulnerable populations. The challenge is how to include the vision for inclusion in the smart city planning process. All interviewees stated that multiple flaws in the current smart city development methods should be overcome. One chief executive of an African urban think tank said, "*The first confusion with the smart city is whether it is a management instrument or tool or a utility for the benefit of citizens. If it is a utility, does it serve the purpose of all citizens equally*"? She further added, "*the logical implication of a smart city is wrong; smart does not mean just the use of technology; it is a smart way of doing things, doing right and in an efficient way.*"

The case studies further indicated that the urban planners and smart city experts are not working in tandem, and hence there is a lack of a holistic approach to smart city planning. All the participants suggested the need for innovations and methods in the smart city approach to contribute to the inclusion of vulnerable populations. One innovation consultant working with the UN on smart and sustainable cities seemed optimistic and stated that the scenario had changed slightly during the last five to seven years. Due to increasing demand from the citizens, some cities are adopting the inclusive smart cities approach. However, with such rapid

urbanisation around the corner, the piecemeal approach toward inclusion is not desirable. Hence, the need and urgency for the priority of inclusion in smart cities are now being discussed at the global level.

One of the severe drawbacks identified by all the interviewees from the case studies and global thematic experts is the level of community involvement in smart city planning, which is limited and, therefore, not people-centric city development. In the case of London, one interviewee from a market research company mentioned, "*Wider people consultations are missing in London government process and projects, public consultation is a misnomer, and surprisingly sometimes it is outsourced*". An interviewee from Bengaluru who is a person with a disability said, "*Urban planning should include all stakeholders; empathy alone does not work; the leadership should be from the stakeholder group. The attitude should change; people are looking from an efficiency and productivity perspective, not an inclusion perspective*". In the Kampala case, one interviewee said, "*Providing accessible information, which is more often the case in Kampala, is considered by city authorities as active engagement of citizens which is just insufficient.*"

Several interviewees working in the disability sector shared that representation of such relevant stakeholders is minimal in smart city planning, leading to skewed and biased decisions. Very few smart city examples exist where persons with disabilities are represented on the governing board or at any other decision-making level. An international development expert interviewee said, "*No smart city is looked through the lens of UN-SDGs and does not focus on inclusion except 10 to 20 cities across the globe who look at inclusion*". According to many participants, the case of a few cities considering inclusion as part of a smart city vision is also skewed and narrow because inclusion is approached in a fragmented and disintegrated way and not a holistic and integrated manner. In such cases, the inclusion approach focuses on a single category of vulnerable populations like elderly-friendly cities, disabled-friendly cities, and women-friendly cities; the smart city planning process is criticised for not involving all the stakeholders and not paying required attention to the community needs.

The findings show that the current smart city models are addressing the convenience of large and elite communities and not the inclusion of vulnerable populations like the elderly, people with disabilities, children, women, poor, youth, migrants and refugees, indigenous population, religious minorities, ethnic or caste groups, LGBTI community. The 26 global thematic expert

interviewees from different places around the world reiterated and confirmed the above gaps in existing smart city plans. This study further suggested that corporates lead smart city projects and usually work with a profit motive. There should be a new approach with a strong political will for inclusive development. The city government needs to play a lead role in smart city planning, identify the needs of its population, and play a crucial role in designing appropriate technology solutions.

The documentary evidence and respondents in three case study locations, directly and indirectly, referred to and confirmed all these challenges and action areas. The summary of action areas and gaps vis-a-vis the case is tabulated in Table 30 below:

Table 30 Action areas /gaps in London, Bengaluru and Kampala smart city planning vis-à-vis identified challenges (Source: Author)

Relevant action areas to tackle challenges of London	Relevant action areas to tackle challenges of Bengaluru	Relevant action areas to tackle challenges of Kampala
<ul style="list-style-type: none"> • Access to land, housing, built environment and infrastructure • Access to the Internet and digital infrastructure • Access to information (language barriers) • Access to credit and finance • Affordable necessities such as housing, water, energy and sanitation, including land and other essential assets • Affordable data • Affordable mobility • Fair and equitable opportunity • Jobs and employment • Essential skills and knowledge development • Business support and market reach • Equality and Non-discrimination • Gender equality • Human rights • Capability and know-how • Safety and security (crime and violence prevention) • Resilience from climate and environmental risks and other stressors • Local or neighbourhood amenities 	<ul style="list-style-type: none"> • Access to land, housing, built environment and infrastructure • Access to public places and social infrastructure • Access to transport and mobility • Access to water, sanitation, hygiene and energy • Access to the Internet and digital infrastructure • Access to information (language barriers) • Access to services (including emergency services) • Access to credit and finance • Adequate food and nutrition • Affordable necessities such as housing, water, energy and sanitation, including land and other essential assets • Affordable education and healthcare • Affordable data • Affordable mobility • Affordable services and public facilities • Fair and equitable opportunity • Jobs and employment • Essential skills and knowledge development 	<ul style="list-style-type: none"> • Access to land, housing, built environment and infrastructure • Access to public places and social infrastructure • Access to transport and mobility • Access to water, sanitation, hygiene and energy • Access to the Internet and digital infrastructure • Access to information (language barriers) • Access to services (including emergency services) • Access to credit and finance • Adequate food and nutrition • Affordable necessities such as housing, water, energy and sanitation, including land and other essential assets • Affordable education and healthcare • Affordable data • Affordable mobility • Affordable services and public facilities • Fair and equitable opportunity • Jobs and employment • Essential skills and knowledge development

<ul style="list-style-type: none"> • Work-life balance • Community living & Social connectedness 	<ul style="list-style-type: none"> • Business support and market reach • Right to autonomy • Representation and participation in community, governance and public offices • Labour rights • Equality and Non-discrimination • Gender equality • Capability and know-how • Safety and security (crime and violence prevention) • Resilience from climate and environmental risks and other stressors • Job security and minimum wages and social protection • Local or neighbourhood amenities • Good governance and anti-corruption • Work-life balance • Health and wellbeing • Community living & Social connectedness 	<ul style="list-style-type: none"> • Business support and market reach • Right to autonomy • Representation and participation in community, governance and public offices • Labour rights • Equality and Non-discrimination • Gender equality • Human rights • Capability and know-how • Safety and security (crime and violence prevention) • Resilience from climate and environmental risks and other stressors • Job security and minimum wages and social protection • Local or neighbourhood amenities • Good governance and anti-corruption • Work-life balance • Health and wellbeing • Community living & Social connectedness
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8.2.3 The role of technology in advancing equity and inclusion in smart cities

The literature (Alberti et al., 2019; Yigitcanlara et al., 2019; Karvonen et al., 2018; Smørdal, O et al., 2016; Bifulco et al., 2016; Yigitcanlar and Teriman 2015; Neha Bansal et al., 2015; UN SDG 2015; Meijer and Rodriguez Bolivar 2015; Khansari et al., 2013; Albert Meijer 2013; Alawadhi et al., 2012; Schuurman et al., 2012; Ali Mostashari et al., 2011; Demirkan et al., 2011; UN-Habitat 2010 2009; Aurigi, A 2005) in Chapter II highlighted the trends of using technology solutions for mitigating urban challenges. ICT and digital technologies are claimed to drive global smart urbanisation strategies. The technology is primarily being used for efficient decision making and optimal utilisation of resources, and good governance (Karvonen et al., 2018; UN SDG 2015; Ali Mostashari et al., 2011; UN Habitat 2010) for transport, mobility, digital literacy and citizen engagement (Alberti et al., 2019; Karvonen et al., 2018; Smørdal, O et al., 2016; UN Habitat 2010) for security and surveillance, behavioural change, evidence-based policymaking, social cohesion (Karvonen et al., 2018) for participatory planning, collaboration (UN SDG 2015; Albert Meijer 2013; Anthopoulos and Tougountzoglou 2012) for inclusion and sustainability (Alberti et al., 2019; Bifulco et al., 2016; UN SDG 2015; Neha Bansal et al., 2015; Schuurman et al., 2012; Anthopoulos and

Tougountzoglou 2012; UN Habitat 2010) among many others. The documentary evidence for the domain-wise applications of technology in the three cases identified several initiatives as summarised in Table 31 below:

Table 31 Comparison of the domain-wise applications of technology in London, Bengaluru and Kampala smart cities (Source: Author)

Six themes of a smart city (identified by the author from the literature)	Technology application areas in Smart London projects /initiatives	Technology application areas in Bengaluru smart city projects /initiatives	Technology application areas Kampala smart city projects /initiatives
I. Improve the quality of life and well-being of citizens	<ul style="list-style-type: none"> Healthcare 	<ul style="list-style-type: none"> Healthcare Digital literacy Utilities 	<ul style="list-style-type: none"> Healthcare Solid waste management Safety
II. Economic growth & employment opportunities	<ul style="list-style-type: none"> Business promotion Jobs /Employment Education/skills Electronic payments New industries/ Digital Innovation Entrepreneurship 	<ul style="list-style-type: none"> Tourism 	<ul style="list-style-type: none"> Business promotion Electronic payments Innovation
III. Smart urban governance	<ul style="list-style-type: none"> Decision making Urban planning Data/ Data exchange Accountability Transparency Delivery of services Integration Resource optimisation Open Government 	<ul style="list-style-type: none"> Decision making Urban planning Data/ Data exchange Transparency Accountability Delivery of services Integration Resource optimisation 	<ul style="list-style-type: none"> Policy innovation Decision making Urban planning Data/ Data exchange Delivery of services Integration Resource optimisation Open Government
IV. Climate change and environmental issues	<ul style="list-style-type: none"> Climate mitigation Management of natural resources Waste management Pollution control Clean energy/ Renewable energy Community control 	<ul style="list-style-type: none"> Renewable energy 	<ul style="list-style-type: none"> Management of natural resources
V. Infrastructure	<ul style="list-style-type: none"> Smart homes & Buildings Smart streets Transport/Traffic management Internet Public Wi-Fi Data Smart grid Integrated information network 	<ul style="list-style-type: none"> Mobility Smart streets Smart parking Smart metering Public Wi-Fi 	<ul style="list-style-type: none"> Transport/Traffic management Smart streets Mobile technologies Public Wi-Fi Portal services Call centre Integrated information network
VI. Inclusive development	<ul style="list-style-type: none"> Digital inclusion Participatory Planning Universal access to Internet Computer access and training for the community Communication/ Citizen engagement platform Co-creation 	<ul style="list-style-type: none"> Participatory Planning Communication/ Citizen engagement platform Participatory budgeting Women and children safety/security 	<ul style="list-style-type: none"> Communication/ Citizen engagement platform Financial inclusion

All case studies highlighted that technology enhances democratic participation and contributes to the inclusion of broader sections of people in society. The application of technology leads to better city governance, improved decision-making, and optimum utilisation of resources. For example, transparency and access to information are the fundamental requirements for social empowerment, which is easily possible using technology. It is suggested that more social connections can be created using digital technologies, which was earlier difficult. Due to increased mobile penetration, for example, in Africa, millions of people are benefitted with communication and online trading options leading to better social life and livelihood opportunities.

As inferred, technology application domains relating to inclusive development include digital inclusion, participatory planning, universal access to the Internet, computer access and training for the community, communication/ citizen engagement platform and co-creation for the London case. The Bengaluru case includes participatory planning, communication/ citizen engagement platform, participatory budgeting, and women and children safety/security. Kampala it includes a communication/ citizen engagement platform and financial inclusion. However, there are a few other initiatives in other themes which have the potential to contribute indirectly towards inclusive development. They include jobs, education /skills, urban planning and evidence-based decision-making, accountability, transparency, public wi-fi and an integrated information network in the case of London. The Bengaluru case includes digital literacy, urban planning and evidence-based decision-making, accountability, transparency, and integration of service delivery, including public wi-fi. Kampala's smart city includes urban planning and evidence-based decision-making, integration of service delivery, open government, mobile technologies, and an integrated information network.

All the interviewees in the three case study locations, including global thematic experts, mentioned that technology is essential in the present digital age and is predominantly used in municipal administration, urban planning, and other city activities. Several participants mentioned that technology is an inevitable tool and much helpful in solving real-life problems. For example, many of them shared the use and benefit of technology during COVID-19 to monitor and control the pandemic and for other social engagements like online education, remote working and telemedicine and so on. In addition, some interviewees mentioned that the two-way communication between the government and the public has improved, due to technology, leading to more participatory planning.

According to a few respondents who are persons with disabilities or managing a related NGO, the technology is helping people with disabilities and allowing such individuals to lead an independent life, for example, used for easy navigation in cities. They mentioned that technology provides all individuals with equal opportunities at equal cost and, therefore, is a great leveller. An interviewee from London made a tall claim saying, “*advanced cities using technology have few social issues and are more homogeneous*”. In the case of Bengaluru, many participants discussed the benefits of the use of technology for direct benefit transfer leading to the financial inclusion of millions of vulnerable and disadvantaged populations. In the case of Kampala, one interviewee said: “*At present, we are in a digital age, and information is easier to share and more accessible. It is much cheaper to design, and it has wider reach; hence the use of technology becomes inevitable*”.

The London case advocates using digital technology for urban planning and managing development, delivery of public services, creating opportunities and addressing challenges, and enhancing the quality of life for residents, visitors and employees (Smart London Plan 2017). All the interviewees in London mentioned that technology is an essential tool in the 21st century, and people are left behind without technical knowledge. One interviewee from London said, “*technology can enhance inclusion, but intellectual capability and capital is a challenge*”. In addition, most interviewees believed technology improved two-way communication between the government and the people. For example, social media is a helpful platform for expressing views, opinions, and suggestions on government policy, programs, and projects.

In the Bengaluru case, the importance of technology was highlighted to empower citizens through accessible information on public services and grievance redressal portals on digital networks towards inclusive growth (Bengaluru Smart City Plan 2017). One interviewee working for a media company mentioned that technology is useful and helps to do routine work easily. For example, online retail services and medical consultations have helped reach inaccessible locations during COVID-19 and benefitted millions of people. One interviewee, who is a person with a disability, stated that many cities do not plan technology as an accessible infrastructure on par with other infrastructure. Indeed, technology is more amenable, adaptable and usable than the physical infrastructure and can create immense possibilities for accessibility, including the scalability of city services. He further mentioned: “*Accessible technology should be an initial thought before the start of the design stage and not an*

afterthought". One interviewee, a founder of an assistive technology solutions company, stated that people with disabilities are no different from the average population. For example, physical, cognitive, or temporary inability is the same for everyone. Technology is a great leveller and can work as a catalyst to reduce the gap between the abled and the less abled. He added, "*Technology has augmented and increased the capacity and capability of persons with disability.*"

In the case of Kampala, ICT is used to improve working environments for urban institutions and other stakeholders, thus transforming life (Oscord Mark Otile 2020). All the interviewees mentioned that technology is an excellent tool to reach and include everyone. One interviewee said financial inclusion is possible in Uganda due to mobile money banking, where technology plays a key role. One other interviewee stated that managing COVID-19 was more convenient due to digital technologies. Another interviewee said that in Kampala, traffic management is being done using cameras which is very helpful in controlling traffic and booking hit-and-run cases, including other crimes.

One senior development professional working with World Bank in the USA among global thematic experts stated that technology is beneficial for reaching excluded communities. "*There are several instances, such as COVID-19 and other disasters like floods, when technology has played a crucial role in saving the lives of millions of vulnerable and disadvantaged populations. Technology can generate big data and other tracking devices, including decision support systems, e-payment, and e-procurement, allowing optimal utilisation of scarce resources. Also, the Internet economy benefits the rich and poor communities and is extensively helpful for trading and business communications. The success of African micro-entrepreneurs is a good example.*"

While recognising and appreciating the contributions of technology to enhance inclusion, the case studies threw several questions and challenges associated with using technology. One of the challenges with technology is the need for massive investments, which the city governments cannot afford. In terms of affordability of users, there is a limitation, the vulnerable populations cannot afford to use digital services effectively, which may lead to exclusion and marginalisation of a big chunk of the people. For example, one interviewee who works for a local NGO in Kampala was of the view that digital innovations have tremendous scope to include vulnerable and marginalised populations like the elderly, people with

disabilities, women, the poor, and refugees. Still, the challenge is whether they can afford and use these services. She said: *"In Uganda, the wealthy and educated have better access to utilities like electricity and Internet than others, which is a great divider"*.

Similarly, the digital divide in access and capability is a big issue in many cities. According to UN-Habitat (2020), nearly 3.6 billion people do not have access to the Internet, and many millions of people lack basic digital literacy skills. The findings show that the digital literacy and capabilities of vulnerable populations like the elderly, people with disabilities, poor are very low to nil. The three cases and additional global perspectives have shown that technology, if used inappropriately, may lead to exclusion as it divides people into haves and have-nots.

Therefore, grassroots innovations with simplified technology and essential functions are suggested to be helpful and inclusive. One exciting view emerged from the London case: it is argued that technology is primarily developed in advanced countries with more homogeneous societies with fewer social issues. The same technology solutions may not be suitable to tackle the complex social problems of a developing country. This reiterates the need for local digital innovations. One other interviewee, an international development expert, shared the view that technology is a means to advance better lives; however, they are being used more for commercial purposes and not for social purposes. He further said, *"technology should not be used for suppressive purposes like citizens surveillance and control by the State; therefore, people should be aware of why and where technology is used"*.

An interviewee from global thematic experts stated that there is a need for social thinking among IT professionals. The low-cost and easy-to-use technology for vulnerable and disadvantaged populations is yet to come, and more corporates need to assess the requirements of these populations and develop use cases and pilot studies through digital innovations. The devices and applications valid for these groups are currently missing as technology is not designed for vulnerable populations like the elderly and people with disabilities. According to a global disability Institute (USA) chief executive, technology has potential, but the current focus is not on universal design and accommodation. Moreover, the technology currently supports independent living and is not helpful for community living. Many participants agreed with this view and stated that the elderly population in their families could not use digital devices, including smartphones, so where is the contribution of technology towards the inclusion of these populations?

However, as indicated in the literature review in Chapter II and further agreed by all participants, technology is inevitable in the current digital age. Still, it should be considered only as an enabling tool for inclusion, not the end goal. Therefore, the city government should take a deliberate approach, take a balanced view, and combine digital and non-digital solutions in a hybrid manner after consultations with all the stakeholders and users at every development stage.

An interviewee stated that the application of technology demands careful dovetailing of ICT by using proper frameworks and developing the capacity of institutions for social good and the whole community's power. In the London case, the Chief Technology Officer of Transport for London (TfL) mentioned that the continuation of the dual entry method (manual and automatic) of entry for passengers using London tube services is found to be more convenient, unlike many metro cities where the manual process is replaced by the fully automatic use of smart travel cards. The manual entry method is useful for elders and persons with disabilities who use the smart travel card (Oyster card) in London without any complications.

The three cases also pointed out that the digital infrastructure in cities is fragmented, and there is an issue of integration and interoperability due to multiple suppliers and vendors. The London and Bengaluru cases where there is enormous use of technology, highlighted the need for a more integrated and robust digital infrastructure that can connect seamlessly without any problems. There are few international standards for the benefit of technologies in smart cities that should be updated from time to time and adhered to strictly. The London case illustrated the use of 'The Technology Code of Practice that sets standards for designing, building, and buying technology by the government. It is a cross-government agreed standard of the UK Government used for the spending control process and the Local Digital Declaration by the Cabinet Office.

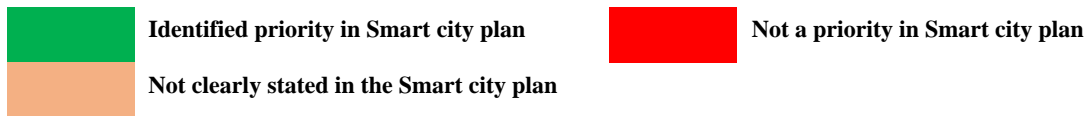
The case studies and global thematic experts confirmed that technology is a positive enabler in enhancing inclusion in contemporary cities. However, it further stated that it is only a means or tool to achieve the desired outcome; finally, the result depends on the context and people's capabilities, application, and appropriate use. The literature evidence and respondents in three case study locations referred to several application domains of technology that contribute to equality and inclusion in smart cities. Table 32 below summarises the prioritised technology

domains vis-à-vis the smart city plans of the three case studies of London, Bengaluru and Kampala:

Table 32 Comparison of prioritised technology domains across the smart city plans of London, Bengaluru and Kampala (Source: Author)

Application domains of technology (for equality and inclusion)	London	Bengaluru	Kampala
1. Access to information	Green	Brown	Brown
2. Access to the Internet	Brown	Brown	Red
3. Access to digital infrastructure	Red	Red	Red
4. Universal access to services	Brown	Brown	Brown
5. Affordable data	Brown	Brown	Brown
6. Digital literacy	Green	Brown	Brown
7. Digital skills	Green	Brown	Brown
8. Assistive technologies	Red	Red	Red
9. Security and surveillance	Brown	Green	Green
10. Citizen engagement platform	Green	Green	Green
11. Participatory budgeting	Red	Green	Red
12. Financial inclusion	Red	Red	Green
Application domains with indirect contribution (for equality and inclusion)			
1. Jobs	Green	Brown	Brown
2. Education /Skills	Green	Brown	Brown
3. Urban Planning and Evidence-Based Decision Making	Green	Green	Green
4. Accountability	Green	Green	Brown
5. Transparency	Green	Green	Brown
6. Public Wi-Fi	Green	Green	Brown

7. Integrated Information Network	Identified priority in Smart city plan	Not clearly stated in the Smart city plan	Identified priority in Smart city plan
8. Integration Of Service Delivery	Not clearly stated in the Smart city plan	Identified priority in Smart city plan	Identified priority in Smart city plan
9. Open Government	Not clearly stated in the Smart city plan	Not clearly stated in the Smart city plan	Identified priority in Smart city plan
10. Mobile technologies	Not clearly stated in the Smart city plan	Not clearly stated in the Smart city plan	Identified priority in Smart city plan



As inferred from the table above the literature evidence and case study investigations suggested 12 application domains of technology that can potentially contribute towards equality and inclusion and 10 application domains of technology that can indirectly contribute to equality and inclusion of vulnerable populations.

8.2.4 The role of key stakeholders in enhancing inclusion in smart cities

The literature (Brown 2015; Al-Shihri, F 2013; Ren Chao et al., 2013; Keivani 2010) identified good governance, innovative urban planning, and rights-based approach as the critical requirements for inclusion and empowerment of vulnerable populations and achievement of sustainable development. The findings show the need for national strategies (OECD 2002) with long term vision, a holistic approach with local perspective (Wheeler 2013), collaborative governance and institutional development (Habitat III 2016; Kim 2010) partnership between public, private, and civil societies and communities (OECD 2002) participation of civil society (Hirt and Stanilov 2009) and citizen participation (Alberti et al., 2019) as the essential requirements for inclusive development.

All the case studies and international participants confirmed the critical role of the government in smart city planning. It is stated that the political systems and citizen movements play a crucial role in mainstreaming vulnerable populations. Many interviewees mentioned that as far as smart city planning is concerned, at present, the government is not doing enough, and neither is it in the driving seat; hence not much is happening on the inclusion front. It is suggested that the right policy directions and initiatives from the national governments will play a critical role in the inclusive development of cities. The process should start with identifying the vulnerable

populations and then preparing the priorities and needs of the city government, followed by initiatives based on national directives.

Many countries are signatories to global sustainable development goals (UN SDG 2015), where inclusion is the key aspect of sustainable development. There is a need to integrate inclusion goals into their development agenda. The three case studies indicated the need for an integrated approach toward inclusion in smart city planning. One interviewee said, "*make all excluded and vulnerable populations into one big group or coalition, and design integrated policies and programs to tackle their problems*". Many interviewees mentioned that the current digital solutions have better scope and opportunity for increased collaboration and integration, which should be harnessed appropriately.

In terms of technology adoption, the findings of this study suggest that the government be an intelligent customer with a clear vision and the right regulatory approach to engage with the technology companies more meaningfully. Two interviewees suggested indicated that, at present, the private sector is driving smart city development and recommending the use and adoption of various technologies. The process should be another way round, where the city government should go to the technology companies seeking solutions for their problems.

Many interviewees across the three case studies and global experts believed that city governance should include diverse categories with equal representation of vulnerable populations. All interviewees shared the idea that the representation of the disabled population and vulnerable people is minimal in smart cities' governance. The case studies highlight city governments' and ancillary institutions' lack of capacity for effective smart city planning as it is considered too specialised and technical. It is suggested that the government alone cannot address the challenges of rapid urbanisation and inclusion. Hence, it should create awareness and invite the participation of all other stakeholders like the private sector, academia, civil society, and the community. This recommendation working on the lines of the quadruple helix innovation model (Carayannis and Campbell 2009), brings a holistic perspective to the complex problem of urban inclusion and helps to understand the issue from all the four major significant actors in the system- academia, policy, industry, and society.

In the case of London, the non-representation of vulnerable populations (such as persons with disabilities) in smart city planning is identified as a critical problem hampering inclusive

development. The other suggested requirements from the case include legislation, policy support, integrated approach, accountability and transparency and capacity building of public institutions. Citizen empowerment through increased awareness and training, including last-mile connectivity mechanisms, were also identified critical key enablers of inclusion. In the case of Bengaluru, the governance structure of the particular purpose vehicle (SPV) is criticised for being an elitist model with the slightest opportunity to participate in vulnerable populations. In the case of Kampala, the lack of an evolved and decentralised governance system was considered a hindrance to inclusive smart city planning. All three case studies highlighted the need for appropriate funding mechanisms for smart city projects and programs with clear explicit budget allocations benefitting vulnerable communities.

This study found that the private sector is an essential stakeholder in smart city development as a provider of technology solutions and digital innovations. However, all the case studies and global experts felt that the private sector is business focused with more emphasis on return on investments and not keen to work towards the inclusion of vulnerable populations. Therefore, it is suggested that the government adopt innovative methods to attract the private sector towards inclusive development and design suitable partnership models. Few participants suggested the corporate social responsibility (CSR) model as the preferred model for private sector participation. The other suggested proposed models for increased private sector participation are strong regulations, government subsidies, tax breaks, the promotion of local SMEs, and social entrepreneurship. One interviewee suggested that governments have high buying power and, therefore, should enforce stronger regulations and influence corporates on social responsibility towards the inclusion of vulnerable populations.

On the other hand, many interviewees suggested that the private sector is not seeing the big picture and missing a huge market opportunity by neglecting the needs and requirements of vulnerable populations. An interviewee, a chief executive of a global disability institute, stated that the private sector is not keen to work for disabled people. She mentions, "*It is a mistaken notion among corporates that the excluded people are not worth investing in as they are poor and cannot afford; however, people with disability are a huge community with good purchasing capacity, and there is the market potential of nearly £ 1.66 trillion which businesses cannot neglect*".

All the case studies suggested that a robust civil society will enhance the participation of vulnerable populations. However, it is mentioned that few civil organisations are working selectively and becoming a voice to select groups of people and communities, which is not good. Finally, the citizens are considered the most crucial stakeholders in inclusive intelligent city planning. The citizens are the key stakeholders in smart city planning (Dameri 2014; Holland 2008), and smart city goals cannot be achieved without understanding their needs. All 45 interviewees from the three case studies and 26 global thematic experts confirmed citizens' important role and contributions to inclusive planning and sustainable development. The details of citizen participation are discussed in section 8.3.1.

8.3 The key features of a people-centric, inclusive smart city

This section, along with the following sections, seeks to answer the third and final research question:

What are the key features of a people-centric and inclusive smart city, and how to design the same?

The key features of a people-centric, inclusive smart city are first identified from the literature survey and then compared and mapped with the case study investigations and interview respondents.

The literature review indicates the essential features of an inclusive smart city as described in Table 33 below:

Table 33 Essential features of an inclusive smart city identified by literature survey (Source: Author)

Success factors for inclusion	Literature evidence
1. Long term vision	Keivani (2010); Ren Chao et al., (2010); Healey (2006); Wheeler (2013); OECD (2002)
2. Collaborative & holistic approach/ Integration	Committee on Social Affairs, Council of Europe Member States (2019); Shah et al., (2015); D'Cruz et al., (2014); Kim (2010); Grizans (2009); Wheeler (2013)
3. Inclusive & participatory planning/ Local and context-based approach /Community engagement	Committee on Social Affairs, Council of Europe Member States (2019); UNIDO (2016); HABITAT III (2016); Shah et al. (2015); D'Cruz et al., (2014); ADB (2009); Hirt and Stanilov (2009)

4. Community monitoring	Committee on Social Affairs, Council of Europe Member States (2019); HABITAT III (2016); D'Cruz et al., (2014)
5. Community & women empowerment	UNIDO (2016); Brown (2015)
6. Sustainability	Committee on Social Affairs, Council of Europe Member States (2019); Li- Yin Shen et al., (2011); Ren Chao et al., (2010); UN-Habitat (2009); Wheeler (2013)
7. Climate change	Keivani (2010)
8. Urban resilience	Alberti et al., (2019)
9. Innovation	Brown (2015)
10. Political commitment	Rachmawati (2016); HABITAT III (2016);
11. Good governance	HABITAT III (2016); UN-Habitat (2009)
12. Institutional development	Kim (2010)
13. Citizen participation in decision making	Alberti, et al., (2019);
14. Citizen empowerment	Committee on Social Affairs, Council of Europe Member States (2019); Hirt and Stanilov (2009); WHO (2007)
15. Multi-level and decentralised governance (Local Governance)	Committee on Social Affairs, Council of Europe Member States (2019); Alberti et al. (2019); Cartwright et al., (2018); HABITAT III (2016); UN-Habitat (2009);
16. e-democracy & local elections	Committee on Social Affairs, Council of Europe Member States (2019);
17. Accessible information	WHO (2007)
18. Transparency	Committee on Social Affairs, Council of Europe Member States (2019); UN-Habitat (2009)
19. Accountability	Cartwright et al., (2018); HABITAT III (2016); UN-Habitat (2009)
20. Strong civil society	UN- Habitat (2009); Sonia Hirt and Kiril Stanilov (2009)
21. Efficiency & effectiveness of public services	Cartwright et al., (2018); UN-Habitat (2009);
22. Government coordination	HABITAT III (2016); Rachmawati (2016);
23. Overarching national policy on inclusion	Committee on Social Affairs, Council of Europe Member States (2019); OECD (2002)
24. Universal access to services	New Urban Agenda/ HABITAT III (2016), Rachmawati (2016); UN-Habitat (2010)
25. The universal design of buildings, housing & infrastructure	Hanson, (2004); WHO (2007); New Urban Agenda (2016)
26. Rights-based approach & non-discrimination	Committee on Social Affairs, Council of Europe Member States (2019); HABITAT III (2016); UNIDO (2016); Brown (2015)
27. Inclusive spatial planning	HABITAT III (2016);
28. Minimum wages	Silver (2015)
29. Public education	Silver (2015)
30. Healthcare	
31. Gender equality & Women safety	UNIDO (2016); UN Women (2011)

32. Needs of children, elderly, migrants, refugees & poor/inclusion of migrants	Committee on Social Affairs, Council of Europe Member States (2019); Ssekatawa (2016); UN-Habitat (2010)
33. Needs of people with disabilities	Committee on Social Affairs, Council of Europe Member States (2019)
34. Spatial, Social & Economic inclusion of disadvantaged and vulnerable population	ADB (2017); Shah et al., (2015)
35. Social housing	Committee on Social Affairs, Council of Europe Member States (2019)
36. Mixed land use pattern	Agenda, I.U-The Global Network on Disability Inclusive and Accessible Urban Development (DIAUD)
37. Multi-modal and accessible transport	WHO (2007); Agenda, IU -The Global Network on Disability Inclusive and Accessible Urban Development (DIAUD)
38. Culture, history & heritage conservation	Agenda, IU - The Global Network on Disability Inclusive and Accessible Urban Development (DIAUD)

The suggested themes of a people-centric inclusive smart city from the respondents from three case studies, including 26 global thematic experts are tabulated below in Table 34:

Table 34 Summary of themes of a people-centric inclusive smart city from London, Bengaluru, Kampala and international thematic experts (Source: Author)

London	Bengaluru	Kampala	Global thematic experts
☞ User group approach	☞ Knowledge education and skill for all	☞ Participation of vulnerable and marginalised populations is very important	☞ Local innovations
☞ Citizen engagement throughout the project life cycle	☞ 24/7 delivery services and everywhere	☞ Participation of youth in decision making	☞ Transparency
☞ Testing small and local pilot projects and then replicate and scale up	☞ Safe, secure and accessible city	☞ Giving people(users) control over their own data- So that technology companies cannot misuse the same	☞ Delivery of essential services
☞ Sharing information	☞ Access to cheap transport and communication	☞ Making technology invisible	☞ Sustainability
☞ Establishing trust through data security and privacy	☞ Access to hygiene, health, quality education and portable water	☞ Good governance	☞ Participatory methods
☞ IT infrastructure like Wi-Fi available to all at affordable cost	☞ A smart city should be affordable for all, a smart city should be accessible for all, a small city should be accountable to all	☞ Building the link between social economic development to climate change adaptation and mitigation	☞ Public service delivery
☞ Every household should have a laptop and Internet connection	☞ The increased role of civil society organisations	☞ Inclusion of gender and social economic equality	☞ Good governance
☞ Right to a decent and happy life	☞ Required resources and capacity of institutions	☞ Issue of disability – need inclusive city planning	☞ Integration block by block
			☞ Focus on vulnerable and disadvantaged populations
			☞ Digital infrastructure
			☞ Smart governance
			☞ Smart transport

<ul style="list-style-type: none"> ☞ Hybrid model-alliance between public and private ☞ Focus on inclusion, safety, accessibility ☞ Long-term vision and collaborative approach ☞ New financial models for attracting private sector ☞ Co-creation through active participation of citizens ☞ Technology should aim at benefit of all ☞ Use the power of data ☞ Innovation should focus on last mile inclusions ☞ Equal quality of service to everyone ☞ Equal respect for all individuals in society irrespective of their background ☞ A mix of digital and non-digital people engagement ☞ The disabled person led transformation leadership ☞ Considering the city as an interactive and dynamic system ☞ Educating political leadership and government ☞ Systems thinking 	<p>(funds and people). No good intent can survive if there is a lack of capacity</p> <ul style="list-style-type: none"> ☞ Gender equality ☞ Integrated and participative inclusion planning ☞ Reducing digital divide ☞ More emphasis on social infrastructure ☞ Decentralised and participatory planning process beyond lip service; for example, participatory budgeting is a good method of decentralised planning ☞ Transparency and accountability ☞ Involving all stakeholders including vulnerable and disadvantage populations ☞ Leadership positions for vulnerable and disadvantaged populations ☞ Quality of life indicators for the well-being of all sections of the population ☞ Efficient service delivery of basic services ☞ Climate change and environmental sustainability ☞ Effective local government regulating ☞ Physical and digitally access ability for all ☞ Helpline access to honourable populations ☞ Feedback oriented planning system 	<ul style="list-style-type: none"> ☞ Infrastructure development ☞ Shifting administrative offices and businesses to outside Kampala – Decongest city – Develop other areas ☞ Clean city – garbage collection and distribution ☞ Smart city should recognise urban environment as social ecological entity ☞ Language translation for refugees ☞ Cheap and easy access to Internet ☞ Inclusion of all the groups in public consultation ☞ Technology for participation – cross – sourcing of inputs ☞ Technology for decentralised solution – platform for allowing to create own solution ☞ Democratising & quality access to utilities ☞ Inclusive and smart transport and mobility ☞ Strong policies for protection of vulnerable and marginalised populations like street kids, commercial sex workers and so on ☞ Improved services to people and less pollution ☞ Focus on community and customer centric ☞ Holistic and integrated – cross disciplinary approach ☞ Hyper localisation of plans, projects and programs ☞ Improve upward mobility of vulnerable and marginalised populations 	<ul style="list-style-type: none"> ☞ Co-creation ☞ Improved public awareness ☞ Citizens centric planning ☞ Sustainability focus ☞ Natural and local solutions ☞ Open spaces and clean air ☞ Access to water ☞ Communication – even if things are going wrong ☞ Bottom-up approach to engage citizens ☞ Make it compulsory for everyone to collaborate ☞ Pilot at a small scale and then ☞ Policies are inclusive looking at problems not pushing technical solutions ☞ Open data ☞ Free public wi-fi ☞ Last-mile connectivity
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Three case studies and 26 global expert interviewees identified multiple themes of a people-centric, inclusive smart city in line with the literature findings. The combination of themes and features from the literature review and case study investigations, including interviews with 26 global thematic experts, are summarised in Table 35 below:

Table 35 Identified themes and features of a people-centric inclusive smart city (Source: Author)

Themes and features of a people-centric, inclusive smart city

- Long-term vision
- Systems thinking
- Rights-based approach
- Integrated methods & multi-stakeholder collaboration
- Citizen centric planning
- Vulnerable people-led transformation and leadership
- Capacity building of local government
- Digital literacy for all citizens
- Hybrid participatory approach (digital and non-digital)
- Leadership and political will for inclusion
- Citizen participation (project life cycle approach)
- Transparency and accountability (Open data)
- Sustainable and future proof planning (Climate change and environmental focus)
- Focus on natural and local solutions
- Co-creation through citizens participation
- Cultural and behavioural change towards inclusion and equality
- New business and financial models for inclusion
- Strong civil society
- Digital rights to everyone
- Efficient service delivery of basic services
- The rule of law and good governance
- Elimination of corruption
- Social infrastructure
- Elimination of poverty
- Inclusive spatial planning & interdisciplinary approach to city planning
- Universal Internet access as a basic service
- Standardisation of smart city technologies from human factors
- National policies and decentralised implementation on inclusion
- Identification of vulnerable populations and strong policies for their protection and development
- Data privacy and security
- Citizens access to legislative transparency scrutiny and accountability
- Citizens access to policymaking and budget decisions
- Assistive technologies (Customised, user-friendly digital tools and applications)
- Basic amenities for a decent living
- Universal accessibility
- Safety and secure urban environment
- Dedicated team on inclusion in the municipality
- Gender equality
- The accessible multi-modal transport system
- Multiple language translation
- Affordable living
- Women safety
- Culture, history & heritage conservation
- Mixed land use pattern
- Public education
- Accessible and affordable healthcare
- Minimum wages
- Universal access to services
- Democracy & local elections
- Multi-level and decentralised governance (Local Governance)
- Community & women empowerment

- Mainstreaming of vulnerable population
- More from less for more
- Climate resilience and sustainability

8.3.1 Public consultation and the role of citizens in designing people-centred inclusive smart cities

The literature (Peña-López, I 2020; UN-Habitat 2020; UNDESA 2018b; Ferronato and Ruecker 2018; Bolívar and Muñoz 2018; Viale Pereira et al.,2017; Berntzen and Johannessen 2016; Vrabie, C. and Tirziu, A 2016; UN SDG 2015; Sovacool 2014; Perera et al.,2014; Harrison et al., 2012; Schaffers et al.,2011; Sæbø, Rose and Flak 2008; OECD 2001) in Chapter II highlights the need and prerequisite for citizen participation in public policy and inclusive smart city development. It is argued that smart city planning should start with people (Hollands 2008) where effective citizen participation accommodates changing needs of citizens and ultimately leads to the realisation of the strategic vision of a smart city (Castelnuovo et al., 2015).

Existing literature on citizen participation in smart city initiatives often relies on eight rungs of Arnstein's ladder of citizen participation (1969). They include manipulation(people participation in advisory boards as rubber stamps); therapy (pseudo-participatory programs highlighting citizens as problems, not the policies); informing(one-way flow of information); consultation(seeking opinions); placation(token participation with limited influence); partnerships(redistribution of power through negotiation); delegated power(some degree of control in management and decision-making including funding); citizen control(citizens govern a program or an institution). Where the first two (manipulation and therapy) are considered non-participation mode, the next three (informing, consultation and placation) are considered for token participation, and the last three (partnership, delegation and citizen control) represent citizen power.

All three case studies and 26 global thematic experts criticised the present top-down approach of current smart city models and confirmed the need for widespread public consultation in smart city planning. This study suggests that the vision of an inclusive smart city can be achieved only through effective citizen engagement. The findings show that the right mode of citizen engagement would strengthen the democratic process and help build more sustainable and liveable societies. Many participants, however, raised concerns about the mode of engagement by the city government and suggested increased participation with full control of

citizens and their engagement spread throughout the project life cycle. The review of smart city initiatives points to top-down strategies often undertaken without understanding the people's needs (Musakwa and Mokoena 2017). The lack of studies on e-participation in smart city development leads to several open-ended questions (Bolívar, M.P.R. and Muñoz, L.A 2018).

Almost all three case study participants stated that public consultations are often a misnomer, and a lot needs to be done by the government. Many participants believed that citizen participation remains a farce unless the government is serious about citizen engagement and deliberate attempts are made. Many times, there is no project funds allocated for citizen engagement. Wider people consultations are missing in all government processes and projects; hence, the same is true with smart city projects. The average citizens quite often are unaware of smart cities and digital innovations. One interviewee said, "*the smart city concept is alien to the common man.*" One rare input of an interviewee was to encourage more religion-based communication to help establish better community participation.

The London case illustrated the flow of a lot of one-way information from the government to citizens, but to what extent citizen-led decisions influence government actions is unknown. One interviewee in London stated that citizen engagement is often outsourced to a third party and completed as ticking a box item. In the case of Bengaluru, except for election purposes and the role of residential associations in civic matters, the direct participation of citizens in local affairs is minimal. On a few occasions, the citizens of Bengaluru led protests that differed from the decisions of the local government. However, this is not a regular feature. In the case of Kampala, the development agenda is strictly top-down, with the least participation of citizens. One interviewee from Kampala suggested that many public consultations seemingly happen through political leaders, but to what extent they are taken seriously is not known.

Co-creation is considered one of the best methods of citizen engagement by many participants, where community-led local innovations can deliver better and long-lasting results. Few interviewees suggested that the government should not try to solve problems for the whole city in one go. It is suggested to develop pilot initiatives through co-creation methods that can be implemented on a small scale and after assessing the impact implemented on a large scale. This gives room for experimentation and trying different solutions to solve the problems. One interviewee suggested that every part of the city has different characteristics, and no one solution may fit different regions; hence the tailor-made consultative approach is good.

The participation of citizens in the project governance is considered the best approach of engagement by many interviewees. One interviewee suggested the use of both top-down and bottom-up approaches to citizen participation. All the participants across the case studies and others mentioned that technology is useful in reaching out to many people and multiple stakeholders. In terms of tools, many participants suggested the use of both digital and non-digital tools. All the participants identified digital literacy as a major concern in many cities, and much of the affected population is vulnerable people. It is suggested that the city governments should focus on the digital literacy of all citizen groups leaving no one behind, and then only they can participate and contribute meaningfully to smart city planning and development. As a cautious approach, few participants suggested using both digital and non-digital tools for citizen engagement.

To address these challenges and develop the right citizen engagement strategy, the key elements of citizen participation are identified, and a theoretical framework is developed based on the literature review in Chapter II. The key elements of the citizen engagement strategy are detailed in Table 36 below:

Table 36 Key elements of citizen engagement strategy identified by literature survey (Source: Author)

Key elements identified	Literature evidence
Enhancing digital literacy skills	Capdevila and Zarlenga., (2015); Pateman (2012)
Enabling digital eco-system for e-participation	Lember et al., (2019); Ferronato and Ruecker (2018); Dobrovnik et al., (2018); Anand et al., (2018); Viale Pereira et al., (2017); Praharaj et al., (2017); Díaz-Díaz & Pérez-González (2016); Kitchin (2014); Berntzen and Karamagioli (2010); Boulianne, S (2009); Sæbø, Rose, & Flak (2008); Polat, R.K (2005)
Citizen participation in the project lifecycle	Preston et al., (2020); Simonofski et al., (2017); Perera, et al, (2014); Schaffers et al., (2011)
Inclusive tools to cover vulnerable population	Amann, J. and Sleigh, J (2021); Mulvale, et al., (2021); Berntzen et.al., (2009)
Involvement of community through local grassroots organisations and networks & committees	Preston, S et al., (2020); Cardullo and Kitchin (2019a); Granier, Kudo, and Scholl (2016); Berntzen and Johannessen (2016); Sadoway (2012)
Co-creation to stimulate citizen participation and develop sustainable social innovations	Preston, S et al., (2020); Osborne et al., (2018); Fujitsu (2017); Castelnovo et al., (2015); Pestoff, V (2014); European Commission (2009); Bovaird, T (2007)

Renewed policy, governance mechanisms and implementation approach for inclusive citizen participation	Peña-López, I (2020); Kapoor et al., (2020); Przybilovicz et al., (2020); Ferronato and Ruecker (2018); Musakwa and Mokoena (2017); URBACT, I.C (2015); Bekkers et al., (2013)
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The three case studies were analysed using this theoretical citizen engagement strategy and found to validate the seven key elements as essential criteria for effective citizen participation. All the 45 interviewees in London, Bengaluru and Kampala, shared the view that only through empowered citizens the public engagement becomes useful and meaningful. Such empowered smart citizens being at the centre of the implementation of the smart city be then able to identify priorities, benefits, strategies and goals for the smart city development (Albino et al., 2015; Nam, T. and Pardo, T.A 2011). However, digital literacy is found to be a huge challenge across the three case studies, and the study inferred that the city governments have identified this challenge and initiated a few programs to address this gap, but still, a lot needs to be done. Particular focus and deliberate actions are needed to increase the digital skills of the vulnerable population identified in this study. Among the three case studies, London has shown some lead by customised digital courses for vulnerable people.

Technology is an effective tool and a great enabler for establishing the right communication network and reaching out to a wider audience within less time and cost. All three case studies indicated the use of technology for citizen participation. The findings show that by using online methods, the government can better meet the citizens' needs and requirements and create a more efficient bottom-up development inviting all the actors in the process of decision-making, that can be considered a smart city (Vrabie, C. and Tirziu, A 2016). London's most popular and frequently used digital tools include social media such as Twitter and Facebook, SMS, newsletter, and other civic platforms (like Talk London etc.). In the case of Bengaluru, apart from social media, SMS and government websites (like www.mygov.in) were extensively used. In the case of Smart Kampala, the technology tools used included social media, radio, and SMS. However, the challenge across the three case studies was digital connectivity and data affordability, particularly for vulnerable citizens. This situation often led to limited and ineffective participation of citizens.

The technology eco-system for citizen participation in smart cities, such as a web portal, automatic call centre, and an electronic payment system (Vrabie, C. and Tirziu, A 2016), are available in all three case studies. In the case of London, the Local Government Digital Service

Standard was introduced in 2016. These common standards help the city to share and better serve citizens across organisational boundaries and platforms (Mayor of London 2020). In this project lot of thrust is given to digital connectivity, public wi-fi and mobile network. In the case of Bengaluru, the availability of a dedicated portal, digital connectivity with a range of broadband options, public wi-fi in select locations and increased mobile connectivity were identified as the basic eco-system for the participation of citizens. In the case of Kampala, Internet broadband and mobile connectivity is set in place as a required eco-system. However, across all three case studies, coverage of citywide digital connectivity, data availability, security and privacy, and trust in online services are still considered a challenge.

Citizen engagement in the project management life cycle from end to end is one of the critical elements for successfully designing people-centric solutions. All the interviewees in the three case studies emphasised the importance of involving people right from the project's ideation through planning, execution and closure. However, none of the three case studies has any specific guidelines on the methods and timelines of engagement of citizens. The analysis of citizen participation in terms of Arnstein's ladder of citizen participation across the three case studies indicates that for the case of Bengaluru and Kampala, citizen participation is considered at the level of tokenism (manipulation, therapy and informing), while for the London case, the participation level is a little high and additionally includes consultation. The other four groups of placation partnership, delegation and citizen control representing citizen power are missing in all three case studies.

The use of digital and non-digital tools and two-way communication is considered essential, particularly for the inclusion of vulnerable populations. All the interviewees in the three case studies mentioned the need for using non-digital tools and digital tools to include all categories of people, particularly those excluded from digital systems. In the case of London, the practice of using digital and non-digital methods is found to be satisfactory. In contrast, in the case of Bengaluru and Kampala, the participation tools are not exhaustive, giving limited options to the citizens. Moreover, in all the circumstances, the communication most frequently is one way from top to bottom, while in the case of London, there is limited use of two-way communication. One of the key challenges in all the issues is to reach the targeted population of vulnerable populations and lack tailor-made consultative approaches to include these categories. In the case of migrants and refugees, language barriers remain unaddressed in all three case studies. Several interviewees across three points shared that only a few people

participate in town hall meetings and face-to-face meetings, and often the vulnerable populations shy away from active participation.

In terms of skilful facilitation, partnership and delegation, none of the three case studies has any well-defined policy. While citizen participation is recognised as a prerequisite for designing and developing the smart city, none of the three cities framed any guidelines and methods. The case studies illustrate that pressure group tactics often force citizen-centric decisions in city planning and development. In terms of participation of the community and grassroots organisations, the neighbourhood committees in London and the residential associations in Bengaluru are well mature and contribute a lot towards the planning and development of the city. In the case of Kampala, several NGOs working at the grassroots level are providing public consultative support to the city administration.

Co-creation is the most acceptable user-led innovation. All three case studies found the popular co-creation method of living labs with public, private, and academic partnerships. London leads several research and innovation centres and is considered one of the leading hubs of social innovation. Citizen Space is a digital platform that is a joint initiative of the UK government for the democratic involvement of citizens. Bengaluru, the leading startup hub of India and Asia, provides a conducive environment for innovations and new businesses. There are 10,083 tech startups in Bangalore, with Ola (An app-based platform offering ride-hailing services), Swiggy (An online platform for food ordering and delivery), and Sharechat (A provider of vernacular-based social media platform) being the most successful. Kampala also boasts several citizen innovation hubs in partnership with KCCA. One of the challenges with existing co-creation living labs is that they do not focus much on the needs and requirements of vulnerable populations. In all three cases, the participation of the vulnerable population in co-creation is nil.

Citizen participation needs renewed policy and governance mechanisms, including institutional capacity and preparedness. One of the crucial factors is budget support for citizen engagement which is missing in many project plans across the three case studies. The policies must address the challenges of the legal and regulatory framework, social and technological barriers like the digital divide, political context, and stakeholders' expectations. All three case studies do not indicate a holistic approach and lack a fully designed mechanism and system.

8.4 Recommendations for designing people-centric, inclusive smart city

The research confirmed the existence of the problem of exclusion and inequality in contemporary cities and identified the affected category of vulnerable populations through a literature review and the case study findings. The findings show that the smart cities approach and digital technologies have the potential to enhance the inclusion of these populations subject to specific recommendations. As discussed in the literature review in Chapter II, the strategic vision sets an organisation's aim and desired outcome (Ilesanmi, O.A 2011; Wilson, I 1992). However, the strategic vision is a high-level plan and long-term goal setting the agenda for desired change which further needs the support of an operational plan with implementation details (Cowley, M. and Domb, E 2012). Frameworks are strategic planning tools that set out an integrated design vision for the desired future development of urban places. They translate the broad aims of Municipal Strategic Statements (MSS) and planning schemes to practical urban design action at the local level.

Inspired by the findings of this study, the inclusive smart city can be defined as:

"The city by optimal use of smart applications and digital innovations ensures equal accessibility and affordability for everyone; promotes sustainable growth and equity and creates opportunities for all; and where everyone, regardless of their gender, age, race, ethnicity, religion, class including persons with disabilities, migrants and refugees are empowered to fully participate in the social, economic, cultural and political opportunities without any physical and mental barriers thus leading a decent, dignified and respectable life".
(Source: Author).

Therefore, to provide a holistic and comprehensive approach this research suggests a two-level recommendations at governance and operational levels. The governance level recommendation is aimed at the high-level strategic vision of a city government, and the operational level covers the implementation action plan. Both are required to tackle the challenges of exclusion and inequality in contemporary cities. The prescription includes both strategic and operational level components. The first component at the strategic level sets the vision for inclusion by identifying the vulnerable population, their day-to-day challenges in city life and the required action areas to mitigate the challenges. This integrated inclusion vision developed using concentric circles is named by the researcher 'The Wheel of inclusion and equality' and

discussed in the next section at 8.4.1. The second component of operational level recommendation includes an - 'Inclusive Smart City Framework' with a set of guidelines as strategies, governance methods, and policy innovations, including citizen engagement strategy and performance indicators discussed further in section 8.4.2.

Together, the two prescriptions, at strategic and operational levels, help design a people-centric, inclusive smart city. The vision at the strategic level, or 'The Wheel of inclusion and equality framework, emphasises the intent combined with integration and holistic planning. The operational level recommendations aim at people-centricity. The two-level approach is suitable for managing the complex urban inclusion issue as it involves multiple actors and stakeholders, posing different challenges and diverse implications. Further, as discussed in the case study findings, one of the severe drawbacks of the current approach to inclusion in smart cities is its disintegrated approach and working in silos with a narrow focus. These recommendations are expected to overcome this gap.

On the other hand, as these research findings imply, the increasing use of digital technologies in smart cities has tremendous potential for greater collaboration, integration and a unified approach to tackling urban challenges. Therefore, it is suggested that the combination of strategic and operational level strategies will help achieve the desired outcome of designing a people-centric, inclusive smart city. At the operational level, the critical aspect of people-centricity is focused on emphasising that citizen participation is the best method by which a people-centric, inclusive smart city can be achieved. Further, the operational level prescriptions will ensure the participation of vulnerable populations in designing people-centric, inclusive smart cities, which is the critical requirement of this study.

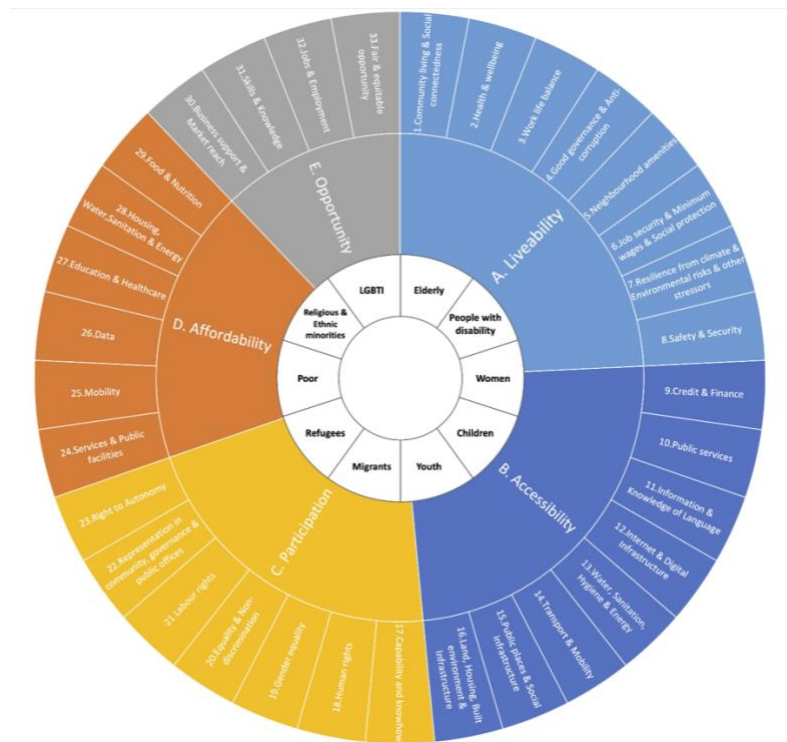
8.4.1 Integrated inclusion agenda in a smart city: The wheel of inclusion and equality

Drawing on the literature review and investigation of case studies, the integrated city inclusion plan sets the overarching vision for developing inclusive smart cities. The three main actors for inclusive vision -the vulnerable population, the five key challenges and the 33 action areas are combined and represented in concentric circles. The use of circles in design provides a better representation of relationships combined with a message of unity, integration and wholeness (Browne, C.G 1950). In this design, the inner circle represents the vulnerable population, the

middle circle represents the five identified challenges, and the outer circle represents the 33 action areas.

This integrated city inclusion plan called 'The Wheel of inclusion and equality' by the researcher and shown in Figure 44 below gives a vision/roadmap for local authorities and city governments to identify the five key challenges and 33 action areas for inclusion of vulnerable and marginalised populations such as the elderly, people with disabilities, children, women, poor, youth, migrants & refugees, indigenous population, religious minorities, ethnic or caste groups, LGBTI community.

Figure 44 Integrated inclusion agenda in a smart city: The wheel of inclusion and equality (Developed by Researcher)



This integrated inclusion agenda is not a prescriptive tool but a broad agenda and vision for inclusive city development as the high-level strategic vision of a city government at a governance level. It identifies and highlights the needs and requirements of the excluded population, who are the focus group of this research study and who are voiceless and marginalised in the current smart city planning and development.

8.4.2 Inclusive Smart City Framework

The research confirmed the existence of the problem of exclusion and inequality in contemporary cities and identified the affected category of vulnerable populations through a literature review and the case study findings. The findings show that the smart cities approach and digital technologies have the potential to enhance the inclusion of these populations subject to specific recommendations. This research aims to suggest key recommendations for designing a people-centric, inclusive smart city using an integrated framework revolving broadly around the three research questions, which are mirrored in the following five layers:

Layer 1: The individuals and groups of the population excluded and marginalised from smart city development projects

Layer 2: The specific challenges of exclusion and inequality faced by these vulnerable populations in city life


Layer 3: The key elements of a people-centric, inclusive smart city strategy

Layer 4: The applications domains of technology contributing to inclusion and equality

Layer 5: The performance indicators of people-centric, inclusive smart city

The framework with five layers is shown in Figure 45 below and is further outlined and summarised based on the themes of literature evidence and investigation of case studies, including findings from 26 global thematic experts.

Figure 45 Inclusive smart city framework (Source: Developed by author)



Layer 5 Measuring Outcome	33 Inclusive Smart City Performance Indicators				
Layer 4 Technology Enablers	22 Application Domains of Technology				
Layer 3 People-Centric Planning	People-Centric Smart City				
	A	15 Strategies	21 Governance Methods	10 Policy Innovations	
	B	Citizen Engagement Strategy			
Layer 2 Areas of Intervention	Challenges				
	Accessibility	Affordability	Opportunity	Participation	Liveability
Layer 1 Target Population	Vulnerable Groups				
	Elderly	People with disabilities	Women	Children	Youth
	Poor	Migrants	Refugees	Ethnic and Religious minority groups	LGBTI community

Layer 1: Excluded and marginalised individuals and groups from smart city development projects

The excluded populations identified as the vulnerable population in this study include the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, ethnic and religious minority groups, and the LGBTI community.

Layer 2: The specific challenges of exclusion and inequality faced by these vulnerable populations in city life

The multiple challenges faced by these vulnerable populations are broadly grouped into five main challenges accessibility, affordability, opportunities, participation and liveability.

Layer 3: The key elements of a people-centric, inclusive smart city strategy

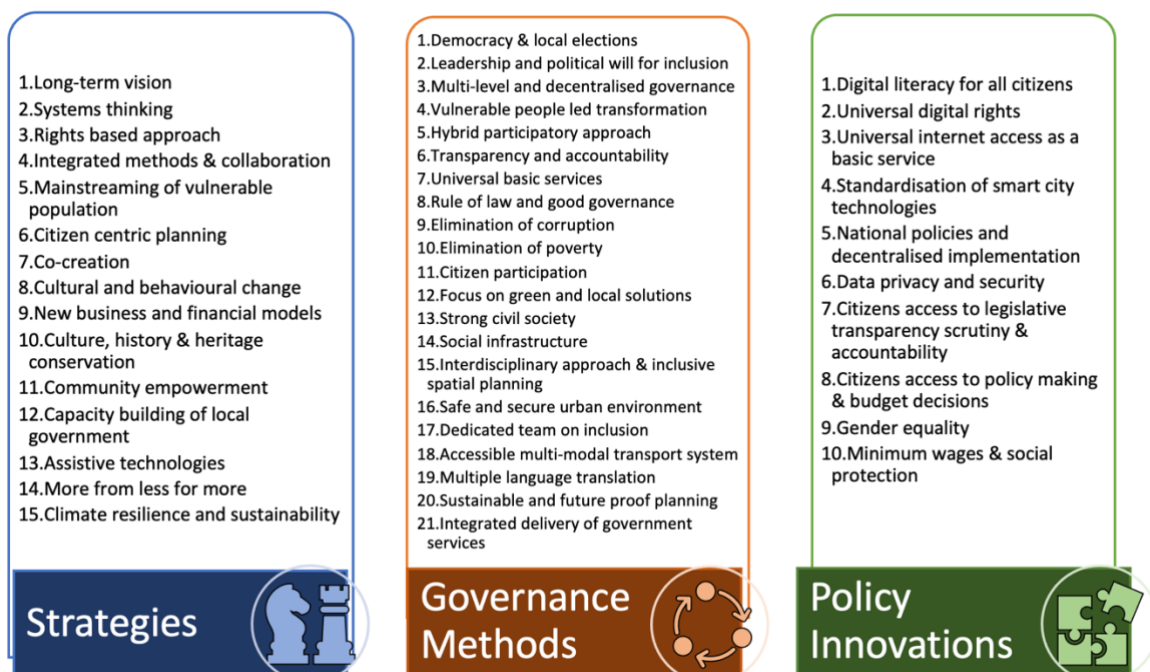
As discussed in the literature review in Chapter II, the strategic vision sets an organisation's aim and desired outcome (Ilesanmi, O.A 2011; Wilson, I 1992). However, the strategic vision is a high-level plan and long-term goal setting the agenda for desired change which further needs the support of an operational plan with implementation details (Cowley, M. and Domb,

E 2012). Therefore, as a holistic approach for comprehensive coverage, this research suggests a two-pronged approach in terms of A) Strategy, Governance and Policy principles for designing the people-centred inclusive smart cities and B) Citizen engagement strategy for people-centric inclusive smart city

A) Strategy, Governance and Policy principles for designing a people-centred inclusive smart city

The strategies are consciously planned courses of action to deal with a situation (Mintzberg, H 1987), such as exclusion and inequality in cities. The governance methods focus on participation, transparency, legitimacy, efficiency, effectiveness, and accountability, including reforms, process reengineering, and public and private partnerships (Bundschuh-Rieseneder, F.F 2008). Policy innovations aim to tackle the root causes and lead a transformative change (Díaz S. et al., 2019). The strategies, governance methods and policy innovations are proposed as an integrated framework to tackle exclusion and inequality in smart city planning and development. Layer 3 developed by the researcher, is shown in Figure 46 below:

Figure 46 Summary of strategy, governance and policy principles for designing a people-centred inclusive smart city (Source: Developed by Author)



The summary of strategies for designing people-centred inclusive smart city are elaborated in Table 37 below:

Table 37 Suggested strategies for designing people-centred inclusive smart city (Source: Author)

Strategies for designing people-centred inclusive smart city	
Long-term vision	It is an essential feature for sustainable development and hence forms the first strategy. The smart city should have a long-term vision and approach to tackle a complex challenge like urban inclusion. Long-term vision provides a pathway to a whole-of-society transformation and helps support present needs and those of future generations in a balanced manner (OECD). Further urban inclusion is a complex phenomenon that needs integration, assimilation, and change absorption by multiple actors; therefore, it needs a long-term vision and strategy.
Systems thinking	It gives smart cities that a holistic approach and focuses on how a city's constituent parts interrelate and how they work and influence over time and within the context of larger city systems.
Human rights-based approach (HRBA),	It is one of the six guiding principles of the United Nations Sustainable Development Cooperation Framework. It is a conceptual framework for the process of human development that requires upholding and maintaining the five human rights principles—equality, participation, non-discrimination, accountability and empowerment and legality (UN SDG 2015). It aims to address the inequalities and discriminatory practices that impede development progress and result in people being left behind.
Integrated methods & multi-stakeholder collaboration	As the inclusion challenges are interconnected, an integrated approach implies managing trade-offs and maximising synergies across targets. A system view with integrated support for all excluded and vulnerable populations helps design holistic solutions. Moreover, collaborative work between four prominent actors in the innovation system: science, policy, industry, and society (quadruple helix innovation framework) allow more sustainable and appropriate solutions to tackle the challenges of urban inclusion. Specifically, this study identified the lack of collaboration between urban planners and smart city planning teams as a serious gap in current practice that needs to be addressed through a deliberate attempt.
Mainstreaming of vulnerable population	Identifying and mainstreaming vulnerable populations and then assessing and designing specific and targeted programmes and projects to fulfil their needs and requirements. Identification of socio-economic factors and demographic characteristics, including physical and digital vulnerability, helps profile vulnerable groups like the disabled, youth, women, minorities, refugees, elderly, and others. Identifying and including these groups in the mainstream activities and adopting the train, prepare, and drive strategy will enhance the inclusion of these vulnerable populations.
Citizen-centric planning	It aims to involve all key stakeholders, particularly the vulnerable populations, in decision-making and aim for development that provides equal opportunities for all, leaving no one behind. Participatory planning should be an organic process that is tentative, flexible, and adaptive to local conditions. It is a change from the bottom up with a focus on the development of citizens and the local organisations.

Co-creation	Co-creation and collaborative innovation where citizens are involved in designing public services, including concept plans, solutions, products and services, together with experts and other stakeholders such as customers and suppliers. Different methods for citizen co-creation include online contests and competitions, E-petitions, mobile apps, innovation jams, prototyping tools, virtual design, participatory design workshops, open-source databases, and online citizen communities (Nambisan, S. and Nambisan, P 2013).
Cultural and behavioural change	Cultural and behavioural change towards inclusion and equality using change management strategy through advocacy, social mobilisation, and social change communication.
New business and financial models	This is one of the essential strategies as inclusion is not an attractive agenda for businesses and commercial organisations. Hence, the city government must drive new business models to establish a business case for inclusion and attract the private sector.
Culture, history & heritage conservation	As each city is unique and has local culture, history and heritage, which should be preserved and propagated in the smart city agenda. This is one of the important principles to establish identity and belongingness between people and place. The local culture, history and heritage educate visitors on local customs, traditions, and practices, thus enabling a better understanding of different cultures leading to social cohesion, increased tolerance and unity.
Community empowerment	It aims to impart digital skills and make citizens more confident, inclusive, organised, cooperative and influential. Any government exploring digital transformation agenda needs to consider its population's level of digital skills. The digital divide decreases access to information technologies, particularly the Internet, and is a considerable barrier to the active participation of the vulnerable population. Further, the lack of digital skills makes them more vulnerable to online scams such as phishing and identity theft in the digital age. Digital literacy can help close the digital divide and increase their access to and use of digital solutions and applications.
Capacity building of local government	As often, the local government is poorly equipped to innovate and deliver change; hence local government capacity building includes skills to design strategic inclusive development plans and tools.
Assistive technologies	These are customised, user-friendly digital tools and applications that are to be used by individuals with disabilities to perform functions that might otherwise be difficult or impossible. They include mobility devices such as walkers and wheelchairs and hardware, software, and peripherals that assist people with disabilities in accessing computers or other information technologies.
More from less for more	The fourteenth strategy includes more from less for more which suggests more performance by using fewer resources for more people. This strategy is particularly suitable for developing countries where the demand pressure is more with a limited supply of resources.
Climate resilience and sustainability	It refers to the adaptive capacity of a system to absorb, adapt, reorganise, and evolve out of any external stresses caused due to climate change. As a result, the system can anticipate, prepare and respond to the increasing climate impacts. The vulnerable populations are at more risk due to climate change and environmental degradation. Therefore, relevant strategies should be drawn based on declarations of 2021 -United Nations Climate Change Conference (COP26) alongside the Paris Agreement and UN

	Framework Convention on Climate Change recommendations. This strategy, combined with inclusive governance and integrated planning, addresses risk, and contributes towards sustainable outcomes.
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The summary of governance methods for designing a people-centred inclusive smart city is elaborated in Table 38 below:

Table 38 Suggested Governance methods for designing a people-centred inclusive smart city (Source: Author)

Governance methods for designing people-centred inclusive smart city	
Democracy and local elections	This method ensures the active involvement of people in local governance where the people have the power to elect their representatives and run the government.
Leadership and political will	As leadership and political systems drive decision-making on how resources are used and assets are developed to target inclusive outcomes. Political will drives the required intent, and therefore leadership forms the foundation of an inclusive vision into reality.
Multi-level decentralised governance	The city governments should be empowered through appropriate legislation and delegated with all required functions and powers for the effective delivery of services to all the citizens.
Vulnerable people-led transformation and leadership	Where the vulnerable people identified through this research should have a representation on smart city boards and governance institutions so that they have a decisive role in smart city development that suits their requirements. The representation of identified vulnerable people from diverse sections can be through select committees and subgroups developing smart city plans and projects.
Hybrid participatory approach	A hybrid participatory approach uses digital and non-digital tools for effective and comprehensive citizen participation. Digital tools lower the cost of communication but may not be accessible to everyone, particularly vulnerable populations. Hence the use of non-digital and conventional methods of citizen engagement, like face-to-face meetings, will substantiate digital tools for wider coverage and reach. It is not either/or, but it is and use of both digital tools and non-digital tools simultaneously.
Transparency and accountability	Where open data gives greater transparency and integrity with the possibility to track and monitor public money. Open data combined with community monitoring increases transparency and accountability of public services and governance. Transparency measures authorities' performance and serves to achieve accountability, which means that authorities can be held responsible for their actions.
Universal basic services	Aims to transform the way services are designed, controlled, and delivered, focusing on access to essential services like water, sanitation, and hygiene (WASH), electricity and the Internet, including services like education, healthcare and mobility, is essential for the inclusion of vulnerable populations.
Rule of law and good governance	To enforce the law equally with independent adjudication and in consistency with international human rights principles. The seven characteristics of 'good governance' identified by UN-Habitat (2010) include sustainability, equity or inclusiveness, efficiency, subsidiarity, transparency and accountability, security and civic engagement.

Elimination of corruption	Through strong enforcement, reforms in public financial management, promotions of transparency and access to information, empowering citizens and curbing money laundering.
Eliminating poverty	This is a global challenge affecting millions of people in cities. The national and city governments need the right policies, funding, and integrated approach to tackling this problem.
Citizen participation throughout the project life cycle	This method suggests the involvement of citizens in the project management life cycle right from the initiation phase, planning phase, execution phase and project closure phase. The city government should also allocate a separate budget for citizen participation planning and implementation.
Green and local solutions	It includes a focus on area-based, and citizen-led green and local solutions that will have multiple benefits in terms of cost savings, economic prosperity, quality of life, efficiency gains and reduced environmental impact.
Strong civil society	It gives a voice to the vulnerable and most marginalised citizens. They foster participation, enhance cohesion, enable informed decision-making, raise voices, and hold the government accountable. They can be a powerful agent for change.
Social infrastructure	It includes education, healthcare, youth, community, recreation, faith, sports, and emergency facilities, including transport, which should be designed with universal accessibility and affordability.
Interdisciplinary approach to city planning and inclusive spatial planning	As an interdisciplinary approach in urban vision, resource management, design, and construction approaches that enable viewing the city's highly complex system from a fresh and holistic perspective. The built environment should incorporate universal design principles so that everyone can access it regardless of age, size, ability, or disability. Inclusive spatial planning should create decent spaces and public amenities for all people.
Safe and secure urban environment	To control crime and violence and prioritise of women's and children's safety.
Dedicated team for inclusion in the municipality	creating a separate unit or department with a dedicated team of officials exclusively working on the inclusion of vulnerable populations.
Multi-modal transport system	A roadway, railway, airway, and waterway to produce an integrated travel solution. Multi-modal transport system design should focus on cost, time, reliability, security, and capability. This enables easy, convenient, and efficient mobility of residents leading to a better travel experience in a city.
Multiple language translation	The city being cosmopolitan with a mix of people speaking different languages should have multiple language translation services, particularly at public service locations.
Sustainable and future proof planning	It aims at climate change mitigation and environmental focus. Sustainable planning needs a balance between the economy, society, and the environment and resilient thinking can help future-proof cities design cities to absorb and minimise shocks and stress of future events.
Integrated delivery of government services	Integrated delivery of government services through designated service centres or kiosks will benefit vulnerable populations who may not have sufficient access to personal digital aids. This facility will also benefit people who lack digital skills and need to depend on others.

The summary of policy innovations for designing people-centred inclusive smart city are elaborated in Table 39 below:

Table 39 Suggested Policy innovations for designing a people-centred inclusive smart city (Source: Author)

Policy innovations for designing people-centred inclusive smart city	
Digital literacy for all citizens	Digital literacy is an essential skill in the current digital age. Hence all people, particularly the vulnerable population, should be trained in the use of digital services. This policy innovation should work in tandem with the eleventh strategy discussed here. As inferred from the literature review in Chapter II, the primary digital skills to be imparted may include data privacy, navigating forms and applications, setting up and using email, identifying trustworthy sources of information online and using word processing solutions. A digitally literate person must understand the basics of digital devices, use digital devices to access, create and share information, carry out cashless transactions using digital financial tools, access government services and use other citizen-centric services online
Universal digital rights	This supplements the first policy and aims to allow people to use, access, create, and publish digital media and access and use electronic devices such as computers, mobile phones, and other communications networks.
Universal Internet access	Internet access is a basic service available to all categories of populations. The Internet allows people to participate in the digital world; on the other hand, the Internet divide' creates unequal Internet access affecting many essential aspects of modern life, including education, healthcare, and employment. During the current coronavirus crisis, the digital divide proves the Internet should be a public utility that is easily available, accessible, and affordable.
Standardisation of smart city technologies	To include human factors to assess citizen-related issues and address citizen needs as users of standards rather than participants. The technology standards should cover "Five" 'A's of Technology- which include: Access, Ability, Awareness, Affordability and Availability (Roberts' 2017).
National policies and decentralised implementation on inclusion	A national policy should support a shared vision for the inclusion of vulnerable populations with budget support and required funds to the smart city. The common policies and standards at the national level shall foster collaboration and coordination at the national and international level and provide infrastructure support and promote best practices and technology partnerships with global corporates.
Data privacy and security	To assure citizens' digital rights with proper regulation of the private sector. The government shall own data that can be classified as public data accessible to everyone, paid data for business and innovation purposes and private data that remains confidential. Further include technical measures like multilayer protection and authentication, compartmentalisation where each device remains autonomous within the network even though connected to wider digital infrastructure with auto-updates for security and auto-install of security patches.

Citizens access to legislative transparency, scrutiny, and accountability	Where all citizens should have the proper access to participate and question the legislative authority that makes law for the city.
Citizens access to policymaking and budget decisions	The representation of all sections of society, particularly the vulnerable population, should be ensured by allocating the required quota of representation in proportion to their populations. The concept of community participatory budgeting shall be adopted with more representation from vulnerable populations.
Gender equality and women's empowerment	To ensure gender equality and women empowerment as a fundamental human right. This will ensure equal rights and opportunities for women, including equal pay, thus laying a strong foundation for a peaceful, prosperous, and sustainable society. Women's empowerment should be achieved through literacy, education, and leadership with the increased role of women in decision-making and governance
Minimum wages, social protection, and financial inclusion	The national and city government shall develop the required policies and take steps to create sufficient social housing, employment, minimum wages, affordable education, and healthcare, including gender equality and women's safety. All necessary steps are required for the financial inclusion of vulnerable populations, and wherever possible use of digital means will increase the spread, reach, and transparency of financial inclusion methods.

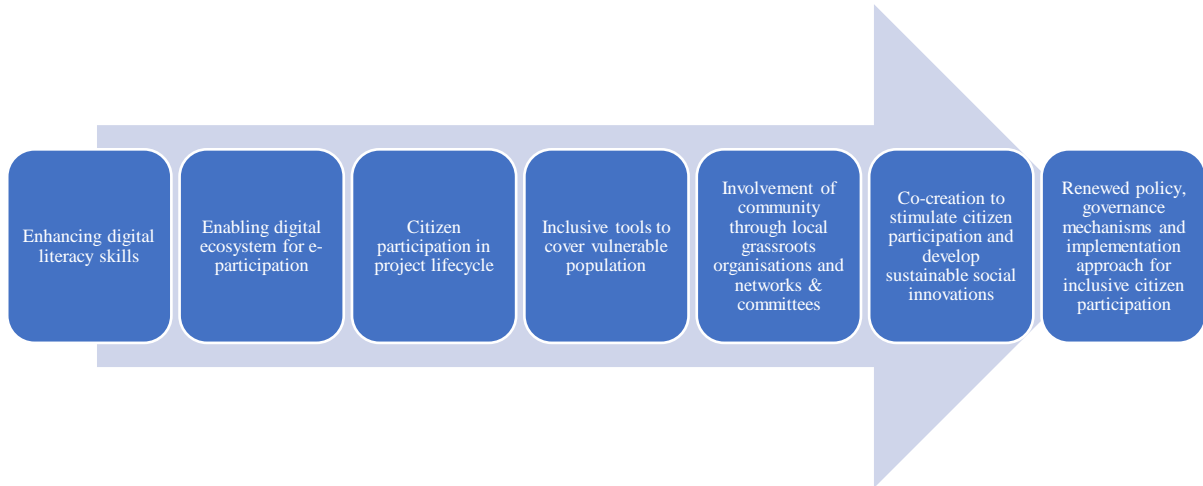
B. Citizen engagement strategy for people-centric inclusive smart city

The seven key elements of the citizen engagement strategy developed as a theoretical framework from the literature review, further confirmed by three case study investigations and discussed here.

The city engagement strategy is a two-way interactive tool between the citizens and the city government. It gives the citizens stake and ownership in the city development process where all citizens enjoy the outcomes, leaving no one behind. It will bring greater transparency, accountability, and inclusion by enhancing the overall management of public finances. Citizens will experience belongingness and many tangible benefits when they have a say in their neighbourhood development planning. Furthermore, this strategy will ensure the participation of vulnerable populations in designing people-centric, inclusive smart cities, which is the critical requirement of this study.

The literature and the case study investigations identified seven critical elements of a citizen engagement strategy which are shown in Figure 47 below:

Figure 47 Key aspects of citizen engagement strategy (Developed by Researcher)



This tool developed by the researcher as a theoretical framework using literature and then investigated and confirmed by the three case study findings is crucial in the current mode of urban development using smart city models. On the one side, technology is creating immense potential to collaborate and cooperate. There is a gap in the digital divide and required processes for the involvement of all citizens. Particularly the vulnerable people who are marginalised and pushed away in the smart city development process. This tool acts as a deliberate strategy to include vulnerable populations to access and address their needs, leading to inclusive development. However, the first and foremost requirement is identifying vulnerable and marginalised people.

Level 4: Application domains of technology (for equality and inclusion)

The research findings imply that the increasing use of digital technologies in smart cities has tremendous potential for greater collaboration, integration and a unified approach to tackling urban challenges.

The application domains of technology that can potentially contribute toward the equality and inclusion of vulnerable populations are summarised in Table 40 below:

Table 40 Suggested application domains of technology that contribute towards equality and inclusion of vulnerable populations (Source: Author)

Application domains of technology (for equality and inclusion)	
Access to information	Digitizing information makes it easier to preserve, access, and share. Accessible information increases the transparency and accountability of any entity. Digital information can be created quickly and at a much cheaper cost. Open data policy and practice allows anyone to use, reuse, distribute or share the data with others without technical, financial or legal restrictions.
Access to the Internet	The Internet has become one of the most fundamental and vital infrastructures around the world. The Internet should be made available to all residents through public wi-fi and ensure <i>web accessibility</i> to make websites usable for all visitors, including those with disabilities, impairments, and limitations.
Access to digital infrastructure	The digital divide prevents societies from harnessing the full benefits of digital technologies. Access to network connections, to devices and to software and applications at an affordable cost will ensure equal participation of all residents. As one example, the cost of smartphones affects their utility, particularly among vulnerable groups and populations. Ethiopia has partnered with Chinese manufacturers for the local assembly of smartphones to reduce costs. More widely in Africa, MTN launched a low-cost smartphone costing just \$20, while in India, Jio had managed to drive costs as low as \$9. Some countries, such as Costa Rica and Malaysia, are even allowing Universal Service Funds to be used to subsidize the purchase of smartphones for disadvantaged groups, as opposed to the more traditional practice of subsidizing network rollout by operators (World Bank 2021).
Universal access to services	Technology is constantly evolving to remove barriers that emerge due to a person's social characteristics, geographic location, and physical or sensory abilities. It is a great equalizer that can dramatically improve the quality of a person's life through the click of a mouse button. If appropriately planned, technology can enhance access to city services and be available in multiple formats 24X7 without any time limitations.
Affordable data	Modern data infrastructure including affordable and reliable network solutions and right equipments will ensure equitable access to Internet services and data. For example, the establishment of Internet Exchange Points (IXPs), which allow domestic data traffic to be exchanged locally, without the need for the data to travel vast distances to reach overseas IXPs, incurring significant costs and time delays in the process. Overall, countries relying on the overseas exchange of data have fixed data charges that are 35 times as high as those with full modern data infrastructure and mobile data charges that are seven times as high (World Bank 2021). After digital literacy, affordability is considered the second largest barrier to uptake of online services.
Digital literacy	Digital literacy allows users to find, use & create information online in a productive and useful manner. Basic knowledge on the use of technology is an essential requirement to use technology safely, and it helps users avoid its dangers particularly being cheated by online frauds.
Digital skills	Lack of digital skills in the 21st-century economy is considered tech poverty. The people who lack access to technology, training, skills and experiences needed to thrive in the current digital age are considered to be in tech poverty. This problem has no borders and impacts everyone from developed and developing economies, rural and urban communities, young kids and adult professionals.
Assistive technologies	Assistive technologies promote the health and well-being of needy individuals. It enables people to live independent, dignified and productive lives and actively participate in education, the labour market and civic life. It reduces the need for formal and long-term healthcare and other support services. For elders, it helps reduce isolation and supports other individuals to participate fully in work and education.
Security and surveillance	Digital technology is playing a critical role in preventing and fighting crime more efficiently and effectively. It has the potential to transform the way public safety is delivered in our

	communities. For example, CCTV surveillance in cities enhances women's and children safety, detects and deters criminal activities, records traffic infractions, etc.
Citizen engagement platform	Actively engaged citizens can play a critical role in making public institutions more accountable, transparent, and responsive to development challenges. Citizen engagement platform connects public agencies with their citizens to share important information, solicit feedback, and provide transparency and accountability in decision-making and operations. Online citizen engagement platforms provide users with the convenience of reach and availability from multiple locations and round the clock.
Participatory budgeting	Participatory budgeting allows citizens to have a say in how and what for budget is allocated and utilised. Increasing use of digital technologies and platforms, social media, mobile apps etc., offers immense opportunities for engaging with the people and their active participation in budget-related decisions.
Financial inclusion	Digital financial inclusion involves the deployment of cost-effective digital solutions to reach the financially excluded and vulnerable populations. The operating cost of providing financial inclusion and the charges levied on the users are important dimensions of the process of financial inclusion where technology can play an important role in reducing the operating cost of providing financial services, particularly in rural and unbanked areas.
Jobs	Technology fuels economic growth and improves living standards, including opening up new avenues to better kinds of work. It can contribute to higher-quality products or services, enhance customer satisfaction and the user experience, and reduce waste while improving productivity for higher profit margins.
Education /Skills	Educational technology increases collaboration and communication with 24/7 access to educational resources and personalised learning opportunities, including improving teacher productivity and efficiency.
Urban Planning and Evidence-Based Decision Making	Use of technology in urban planning increases the efficiency of advanced and helps decision-makers make right decisions at the right time.
Accountability	Technology increases communication channels and brings transparency and accountability to public life.
Transparency	Technology increases communication channels and brings transparency and accountability to public life.
Public Wi-Fi	Public Wi-Fi networks provide easy and accessible Internet and data to the community.
Integrated Information Network	The integrated information system brings together multiple datasets and allows to construct and explore complex solutions in an integrated way. It provides the advantage of one secure location with real-time data, better communication, reduced risk of errors and greater productivity.
Integration Of Service Delivery	Integrated services delivery offers significant benefits, including optimising end-to-end service delivery, improving customer experience and controlling and reducing costs.
Open Government	Open government enhances accountability and public participation, resulting in more informed, better government policies, practices, and decisions and more responsive, innovative, and effective governance and services.
Mobile technologies	Mobile technologies offer higher efficiency and better quality, and flexibility of service to customers. It increases accessibility and network. It can potentially support the social inclusion and self-determination of people with physical and intellectual disabilities.

Layer 5: The performance indicators of people-centric inclusive smart city

The success of achieving specific targets of an inclusive smart city can be measured using performance indicators. They help formulate goals and support measuring achievements while implementing the plan. The vulnerable population defined for this study include- the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, and ethnic and

religious minority groups, including the indigenous population and the LGBTI community. The dimension-wise inclusive smart city performance indicators are listed in Table 41 below:

Table 41 Suggested performance indicators for the inclusive smart city (Source: Author)

Dimension	Indicators
Accessibility	% of vulnerable population having access to land, housing, built environment and infrastructure
	% of vulnerable population having access to public places and social infrastructure
	% of vulnerable population having access to transport and mobility
	% of vulnerable population having access to water, sanitation, hygiene and energy
	% of vulnerable population having access to the Internet and digital infrastructure
	% of vulnerable population having access to information (language barriers)
	% of vulnerable population having access to services (including emergency services)
	% of vulnerable population having access to credit and finance
Affordability	% of vulnerable population who can afford adequate food and nutrition
	% of vulnerable population who can afford housing, water, energy and sanitation, including land and other essential assets
	% of vulnerable population who can afford education and healthcare
	% of vulnerable population who can afford sufficient data
	% of vulnerable population who can afford mobility
	% of vulnerable population who can afford services and public facilities
Opportunity	% of vulnerable population who do not have fair and equitable opportunity
	% of vulnerable population who do not have jobs
	% of vulnerable population who lack essential skills and knowledge
	% of vulnerable population who lack business support and market reach
Participation	% of vulnerable population satisfied with their right to autonomy
	% of vulnerable population having representation and participation in community, governance and public offices
	% of vulnerable population satisfied with labour rights
	% of vulnerable population satisfied with equality and non-discrimination
	% of population satisfied with gender equality
	% of vulnerable population satisfied with human rights
	% of vulnerable population satisfied with capability and know-how
Liveability	% of vulnerable population satisfied with safety and security (crime and violence prevention)
	% of vulnerable population satisfied with efforts towards resilience from climate and environmental risks and other stressors
	% of vulnerable population satisfied with job security and minimum wages and social protection
	% of vulnerable population satisfied with local or neighbourhood amenities
	% of vulnerable population satisfied with governance and anti-corruption
	% of vulnerable population satisfied with work-life balance
	% of vulnerable population satisfied with health and wellbeing
	% of vulnerable population satisfied with community living & social connectedness

8.5 Chapter Summary

This research confirmed the evidence of the problem of exclusions and inequality in contemporary cities. The various categories of the vulnerable population identified by gender, age, race, religion, class, and persons with disabilities are marginalised and neglected in the current smart city development models. The key challenges relating to inclusion are identified as -accessibility, affordability, opportunity, participation and liveability. The three case studies, including 26 global thematic experts, reiterated the use of technology to enhance the inclusion of vulnerable populations across the identified five challenges. Hence, the smart city model with the right strategy of an integrated and inclusive approach combined with an appropriate citizen engagement plan seemingly has the potential to contribute to designing a people-centric, inclusive smart city.

Even though still at the periphery of inclusion, the three cases show certain good practices worth emulation by other cities. For example, the London case study highlighted certain best practices such as data-driven evidence-based policymaking, digital literacy for citizens, centralised policy and decentralised implementation, a separate department for inclusions, multiple language services (To make life easier for London's diverse communities all touch screen ticket machines with 17 languages at all Tube stations) including Braille, Large Print, Easy Read and audio descriptive content, subsidised travel for elderly, children and disabled, targeted technology solutions through open challenges. The Bengaluru case presented substantial evidence of social innovations led by civil society organisations that are sustainable and worth replicating in many other cities. The other good practices enhancing inclusion are the 74th constitutional amendment act empowering urban local bodies, integrated citizen service centres, the ward committees monitoring local development at the ward level, DBT and community-led budget. In the case of Kampala, mobile phone-based transactions contribute to the financial inclusion of vulnerable populations. The Social Tenure Domain Model (STDM) is another excellent example where people are involved in local land administration.

Finally, concluding research findings, this chapter suggests a particular set of recommendations helpful in designing people-centric, inclusive smart cities. The researcher suggests two recommendations for developing a people-centric, inclusive smart city. The first recommendation is at the strategic level, where an integrated inclusion agenda setting the vision for an inclusive smart city is suggested for a city government at the governance level. The three

main actors for inclusion -the vulnerable population, the five key challenges and the 33 action areas are combined and represented in concentric circles. It helps in identifying the needs and requirements of the excluded population, who are the focus group of this research study and who are voiceless and marginalised in the current smart city planning and development. The second recommendation at the operation level is an inclusion framework to implement inclusion agenda. The integrated framework for inclusive smart city planning consists of five layers, as indicated below:

Layer 1: The individuals and groups of the population excluded and marginalised from smart city development projects

Layer 2: The specific challenges of exclusion and inequality faced by these vulnerable populations in city life (five challenges)

Layer 3: The key elements of a people-centric, inclusive smart city strategy(15 strategies,21 governance methods,10 policy innovations along with renewed citizen engagement strategy)

Layer 4: The applications domains of technology contributing to inclusion and equality(22 application domains of technology are identified that has potential to enhance inclusion and equality)

Layer 5: The performance indicators of people-centric inclusive smart city(33 performance indicators are recommended for measuring the city performance in achieving inclusion particularly for the vulnerable populations identified in this research)

This research suggests implementing these two recommendations for designing people-centric, inclusive smart cities.

Chapter IX

9 Conclusion

This final chapter concludes earlier findings and analysis and further discusses the research contribution, including research evaluation and scope for future study.

9.1 The main conclusions of the research topics

This thesis sets four research objectives to explore designing people-centred, inclusive smart cities. It investigated three diverse case studies by conducting semi-structured interviews with 45 participants and 26 global thematic experts from different parts of the world. The four research objectives broadly cover the challenges of inequality and exclusion in smart cities; identification of the categories of excluded and vulnerable populations; assessing the priority of their inclusion in smart city planning, including the impact of digital technologies; and finally, identification of the key pointers to design people-centred inclusive smart city is further dealt through following three research questions mentioned below:

1. Who are the individuals and groups of the population excluded and marginalised from smart city development projects? What are their experiences of different forms of exclusion?
2. Is urban inclusion a priority in current smart city planning? What is the impact of digital technologies being extensively used in smart cities? Do they have the potential to enhance vulnerable populations' inclusion and equity? If so, how?
3. What are the key features of a people-centric and inclusive smart city, and how to design the same?

The above three research questions are formed from seven research questions by grouping interrelated themes. The first research question identified the excluded population's major categories: the elderly, people with disabilities, women, children, youth, poor, migrants, refugees, ethnic and religious minority groups, and the LGBTI community. These population categories are identified through the literature review and confirmed by the case study investigations and interviews with global thematic experts worldwide.

To clearly understand the complex phenomenon of urban exclusion and inclusion, the key challenges experienced by vulnerable populations are grouped into five themes accessibility,

affordability, opportunity, participation and liveability. These challenges are further analysed by highlighting the relevant literature and then elaborating on the suggested action areas. The detailed analysis of these five challenges led to identifying 33 action areas required to include vulnerable populations. The literature identified eight action areas under the accessibility challenge, six action areas under the affordability challenge, four action areas under the opportunity challenge, seven action areas under participation and eight action areas under liveability challenges. The three case studies and 26 thematic experts confirmed the five challenges and the suggested 33 action areas.

The analysis of the second research question concluded that digital technologies have the capability and can be an effective tool for inclusion; however, it further revealed that technology is only a means, and its use and application depend on the priority and interests of the city administration. Regarding inclusion as a priority in smart cities, it is concluded that the inclusion of vulnerable populations is not a priority in the current smart city planning. All three case studies and 26 global thematic experts have confirmed this view and further substantiated and identified the key challenges that must be tackled to enhance the inclusion of vulnerable populations in smart city planning. The application domains of technology contributing to improving equality and inclusion include access to information, access to the Internet, access to digital infrastructure, universal access to services, affordable data, digital literacy, digital skills, assistive technologies, security and surveillance, citizen engagement platform, participatory budgeting, financial inclusion, jobs, education /skills, urban planning and evidence-based decision making, accountability, transparency, public Wi-Fi, integrated information network, integration of service delivery, open government and mobile technologies.

The third research question analysed the key features of people-centric inclusive smart cities through extensive literature review and case study investigations and identified specific evidence-based strategies, governance methods and policy recommendations. It further added renewed citizen engagement strategy to enhance the inclusion of vulnerable populations.

The final recommendations include an integrated inclusion agenda for smart cities. The researcher proposed ‘The Wheel of inclusion and equality’ as the high-level strategic vision of a city government at a governance level in Section 8.4.1 in Chapter VIII. It discusses the three main actors for inclusive vision -the vulnerable population, the five key challenges, and the 33

action areas- combined and represented in concentric circles. The inner circle represents the identified vulnerable population, the middle circle represents the five identified challenges of these vulnerable populations, and the outer circle represents the 33 action areas required to address the inclusion of these populations.

Again, at the operational level, an action plan is recommended as an ‘Inclusive Smart City Framework’ with a set of strategies, governance methods and policy recommendations. The framework consists of 15 strategies,²¹ governance methods and ten policy innovations, as detailed in section 8.4.2 in Chapter VIII. The suggested 15 strategies include: long-term vision, systems thinking, rights-based approach, integrated methods & collaboration, mainstreaming of the vulnerable population, citizen-centric planning, co-creation, cultural & behavioural change, new business & financial models, culture, history & heritage conservation, community empowerment, capacity building of local government, assistive technologies, more from less for more and climate resilience and sustainability.

The suggested 21 governance methods include: democracy & local elections, leadership and political will for inclusion, multi-level and decentralised governance, vulnerable people-led transformation & leadership, hybrid participatory approach, transparency and accountability, essential universal services, the rule of law and good governance, elimination of corruption, elimination of poverty, citizen participation, focus on green and local solutions, strong civil society, social infrastructure, interdisciplinary approach & inclusive spatial planning, safe and secure urban environment, dedicated team on inclusion in the municipality, accessible multi-modal transport system and multiple language translation, sustainable and future proof planning and integrated delivery of government services.

The suggested ten policy innovations include: digital literacy for all citizens, universal digital rights, universal Internet access as an essential service, standardisation of smart city technologies, national policies and decentralised implementation, data privacy and security, citizens' access to legislative transparency scrutiny and accountability, citizens access to policymaking & budget decisions, gender equality and minimum wages & social protection.

In addition, the theoretical framework with seven critical elements of citizen participation first developed using literature review, which is further examined and analysed through the case studies of London, Bengaluru, and Kampala; is recommended as an effective citizen

engagement strategy for the inclusion of vulnerable populations in smart city planning. The seven critical elements of citizen participation suggested at the operational level are first discussed in Chapter II and later in Chapter VIII in section 8.4.3, include: enhancing digital literacy skills, enabling a digital ecosystem for e-participation, citizen participation in a project lifecycle, inclusive tools to cover vulnerable population, involvement of community through local grassroots organisations and networks and committees, co-creation to stimulate citizen participation and develop sustainable social innovations and renewed policy, governance mechanisms and implementation approach for inclusive citizen participation.

Finally, the performance indicators for an inclusive smart city are identified to measure the achievements across the key dimensions of accessibility, affordability, opportunity, participation and liveability, which constitute specific targets to mitigate the challenges of inclusion of vulnerable populations.

The above findings of the three research questions fulfil the requirements of the research objectives and provide substantial conclusions and recommendations that can be drawn to promote urban inclusion in future smart cities.

9.2 Summary of contributions to knowledge

This thesis has explained and analysed the interplay between urban inclusion and smart city planning. The main aim of the thesis is to explore how to design a people-centric, inclusive smart city and suggest possible methods to enhance the inclusion of vulnerable populations who are marginalised and left behind. This thesis first investigates the challenges of urban inclusion in an integrated manner. So far, most studies focus on one excluded group or one challenge of inclusion. Based on the literature used in this study, no researcher has previously dealt with this complex phenomenon in an integrated manner.

Urban inclusion takes the central stage because today, more than 50 per cent of the population lives in cities, with an estimation of 70 per cent living in cities by 2050. Apart from being economic hubs, the cities should contribute to sustainable development and provide opportunities for everyone, leaving no one behind. Further, it is argued that inclusion is a social challenge, and technology as a means has immense potential to address this gap in contemporary societies. With this new perspective on urban inclusion, this thesis joins recent

discussions alongside several researchers exploring the impact of smart cities on urban sustainability and, more particularly, urban inclusion.

The specific outcomes of this study include enriching the literature on urban inclusion by identifying the most excluded populations in contemporary cities, their day-to-day challenges, and the contribution of ICT toward the inclusion of vulnerable populations. The theoretical contribution of this thesis is the integrated city inclusion agenda named by the researcher as ‘The Wheel of inclusion and equality’., mapping the vulnerable populations to their challenges and then identifying the key barriers as action areas. It contributes to sustainable urban development, smart cities, and urban inclusion theories. As a theoretical contribution, this inclusion agenda is relevant to multiple stakeholders like academicians, researchers, policymakers, practitioners, the private sector, civil society organisations, and international organisations working and aspiring for sustainable and inclusive urban growth.

This thesis has important implications for policymakers and practitioners too. The inclusive smart city framework with suggested strategies, governance methods and policy innovations can be used as practical guidance and an effective approach for designing inclusive practices in contemporary cities. Additionally, the citizen engagement strategy suggests practical methods of public consultations, which will enhance two-way communications between the city governments and the citizens, further leading to meaningful and effective collaboration between them. Furthermore, the identified application domains of technology can potentially contribute to enhanced equality and inclusion of vulnerable populations. Finally, the specified performance indicators for inclusive smart cities measure progress and achievement of inclusion goals in smart city planning.

Therefore, this thesis offers theoretical and empirical contributions to research and practice knowledge, opening discussions on urban inclusion as an essential attribute of sustainable development and its interplay with the emerging urban development paradigm of the smart city. Furthermore, other cities can easily replicate the approaches and tools analysed in this thesis. The results are based on data analysis and the research findings from three diverse case studies and 26 global thematic experts worldwide.

Thus, the research findings are expected to enhance inclusion and design people-centric and inclusive smart cities, which are essential building blocks for sustainable urban development.

Furthermore, this research further carries implications for urban policy and governance systems- identifying and exploring opportunities for new, innovative, holistic, and sustainable city development models on the co-creation method focusing on the inclusion of vulnerable populations.

9.3 Evaluation, limitations and future research

This research dealt with the complex phenomenon of urban inclusion, its different manifestations in terms of the affected population, and their challenges, among others, through an exhaustive literature review and three case studies, including global perspectives. From a comparative case study perspective, the case selection strategy has satisfied a combination of techniques such as being diverse, varied, influential, pathway, similar and different and further acts as a broad representative sample of the existing global models of smart cities. Accordingly, the three selected cities are high-income, middle-income, and low-income countries. They further represent the advanced smart city model (London), emerging smart city model (Bengaluru) and aspiring smart city model (Kampala), narrating the use and orientation of ICT and levels of progress achieved in improving the quality of life and aspirations of the public and the vulnerable populations, in particular.

The methodology for the case studies provided sufficient data for analysis of the issues and challenges of urban inclusion and the smart city development practice. The study involves a literature review of the existing research and policy landscape, exploring evidence from multiple data sources, including rigorous document analysis, followed by a qualitative study of three case studies (London, Bengaluru, and Kampala), providing an enriching spatial comparison with additional inputs from global thematic experts. To increase the qualitative research credibility and validity, semi-structured interviews were conducted with relevant stakeholders from the case study locations and other global regions.

The sample size of 45 participants from case studies and sampling criteria for identifying possible participants from vulnerable groups added tremendous value in directly getting first-hand information from the affected people. Further addition of 26 global thematic experts brought diverse international perspectives making this study relevant for global clients.

The main limitation of this research is that the interviews were conducted online due to the then-prevailing conditions of the epidemic. Enough efforts were made to include as many respondents as possible from the affected groups. However, in-person interviews would have been more detailed and engaging, with scope for in-depth discussion and gathering of detailed data. Also, there is a possibility that these groups may not be accessible online. Therefore, to get a complete and clear picture, future studies may include in-person interviews with the marginalised and affected groups facing exclusion and inequality. The most common limitation of a case study is said to be that it lacks scientific rigour, and based on a study of a limited population, the findings cannot be generalised to the wider population. The multiple and comparative case study approaches combined with international perspectives adopted in this research addressed this issue to a greater extent. However, this limitation can be overcome with country-specific, region-specific and maybe city-specific inclusion studies that situate the problem in local settings with the potential for finding local solutions. At the same time, the findings of this study may provide an understanding for the need and urgency of an inclusive smart city development and suggest the basic and essential guidelines and an integrated framework to address the specific challenges identified in this study which may lay a foundation to build further new knowledge and theories in the domain of inclusion and equality.

This research included all categories of excluded and disadvantaged people and groups identified as vulnerable populations; however, there may be other categories of excluded populations in smart cities that need consideration in future studies. Similarly, the five challenges and 33 gap/action areas identified in this research are the most common and generic experiences of the identified vulnerable population. The same may further be amended and contextualised to local conditions and different city development models. Also, the different forms of exclusion, such as social, political, economic, cultural, physical, financial and digital forms and dimensions, is another area of research, which can further be studied through both horizontal or vertical methods or in-depth analysis of one dimension in the context of smart city developments.

The other limitation of this thesis is in terms of understanding how the other constraints of smart city development, such as lack of funding, affect the planning for the inclusion of vulnerable populations, which is a different research gap in itself. The effects of climate change on inequality and vulnerability is another possible dimension for future research. Furthermore, in future research, the levels of exclusions of different categories of vulnerable populations in

terms of most excluded and least excluded vulnerable groups can be identified and given priority. The other area is to rate and rank the technologies used in smart cities in terms of their contributions toward inclusion. The research can focus on identifying and rating the technology solutions vis-à-vis their contribution to inclusion and equality. During this study, some participants expressed that mobile technologies contribute more towards inclusion than other smart projects like digital IDs, which may cause exclusion.

9.4 Chapter Summary

This chapter contributed to the conclusion of the thesis through conceptual, theoretical and empirical contributions to knowledge about the dimensions, challenges and relationships of the inclusion of vulnerable populations in smart city planning and development. This study is relevant to understanding the need and urgency of an inclusive smart city development approach and building cities worldwide, where exclusion issues are similar in different settings with minor variations in nature, form, characteristics and scale.

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11 Appendix 1: Interview questionnaire

Case Study- Interview Topic Guide

PhD Research Topic: “*Designing people-centred inclusive smart cities: Exploring integrated inclusion approaches and citizen engagement strategies through case studies of London, Bengaluru, and Kampala*”

(Interview carried out by Prakash Kamtam, PhD Research Scholar @University of Hertfordshire, College Lane Campus, Hatfield, Herts, UK, Postcode: AL10 9AB; Email Id: p.kamtam@herts.ac.uk / pkamtam@gmail.com)

Participant Information Sheet

This research aims to investigate the challenge of urban inclusion in contemporary cities and explore the potential contribution (if any) of the digital technologies in achieving improved - accessibility, affordability, opportunity, participation and liveability of the vulnerable and disadvantaged population (like- elderly, people with disabilities, women, children, youth, poor, migrants, refugees and other minority/ethnic and religious groups); who are often neglected and excluded from mainstream development.

The following broad research objectives are set for this study:

1. To identify the challenge of inequality and exclusion in contemporary societies
2. To explore the different categories of vulnerable and disadvantaged group(s) often excluded from urban planning and the city development projects and highlight their specific challenges in city life
3. To assess the priority of inclusion of vulnerable and disadvantaged population in smart city planning
4. To assess the impact of digital technologies and explore their potential contribution (if any) in enhancing inclusion and equity of vulnerable and disadvantaged population living in smart cities
5. To conclude key pointers that allow creating a comprehensive, enhanced and successful people-centric and inclusive smart city plans

This study aims to contribute to the body of knowledge in the areas of sustainable urban development, urban inclusion, smart cities and citizen participation and is relevant for both academics and practitioners. The research study involves document analysis of 30 lead smart cities from 30 countries (across 6 continents of the world) along with comparative case studies of -London, Bengaluru, and Kampala (one smart city each from high, medium and low-income country respectively).

This interview is intended for relevant stakeholders from the case study locations and include informants from diverse backgrounds like- public officials, international agencies, tech firm's/business groups, INGOs, NGO/CBOs, Academia and Experts, local residents etc. This will be a face to face virtual open ended and semi-structured interview (between 30-45 minutes) with each informant separately. The broad topics for discussion are detailed below for reference.

This project has been ethically approved by the University of Hertfordshire's Ethics Review Procedure, as administered by the HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA, School of Life and Medical Sciences, University of Hertfordshire; vide approval Protocol number: LMS/PGR/UH/04085 dated 05/03/2020. Your participation in this research study is optional. During this study, no personal information will be collected. If you do decide to take part, you can still withdraw at any time without any negative consequences. Any information provided during the study will be anonymised to ensure confidentiality. This research data will be held by the Researcher for up to 5 years following PhD study and used for further research and professional purpose. The University of Hertfordshire will act as the Data Controller in accordance with the ‘*data protection principles*’ of Data Protection Act 2018, UK.

You have been chosen for participation in this study based on your knowledge of urban sustainability, urban inclusion, and smart cities or as an important stakeholder in chosen smart city. If you would like further information about the research, please contact:

Prakash Kamtam (Researcher)

E: p.kamtam@herts.ac.uk

Assoc Prof. Susan Parham (Research Supervisor)

E: s.parham@herts.ac.uk

INTERVIEW DISCUSSION TOPICS

A. The nature and challenges of urban exclusion/inclusion in contemporary cities

- i. Challenges of **inequality and exclusion** in contemporary societies is affecting global sustainable development-What do you understand by urban exclusion? Is it a global challenge?
- ii. The different forms of **urban inclusion** are - social inclusion, economic inclusion, physical inclusion & digital inclusion **if any?**
- iii. The **category of vulnerable and disadvantaged population** neglected from city planning/development- *Elderly, People with Disabilities, Children, Women, Poor, Youth, Migrants/Refugees, Indigenous population, Religious minorities, Ethnic or caste groups, Lesbian/ Gay/ Bisexual and Transgender (LGBT) community* - **who else?**
- iv. Problems/critical **challenges** faced by them? -*Accessibility, Affordability, Opportunity, Participation and Liveability* **what else?**
- v. Elements necessary for creating an **inclusive and equal society**- *Human rights-based approach, Good Governance, Effective leadership, Participatory planning, Freedom & the rule of law, Transparency & Accountability, Equality in the distribution of wealth/resources, Universal access to public services/ information/infrastructure/facilities, Participation in civic/social/economic and political activities, Existence of a healthy civil society, Social justice* **what else?**

B. The priority of inclusion of vulnerable and disadvantaged population in smart city planning/development

- i. What is your **vision** of smart city? Is it a desired model, thrust upon or no other better choice? In your opinion smart city is good, bad, or neither. Is it the right choice of city development? **Why?**
- ii. Does the smart city model have the potential to **enhance inclusion** in contemporary cities?
- iii. Is **inclusion** a priority in smart cities? Does your smart city vision/ leadership consider inclusion of **all sections/categories** of people? If not, why? In your opinion who are most benefited and who are most neglected sections?
- iv. Any **specific** smart city projects in your city benefit vulnerable and disadvantaged population? Does your smart city provide separate budget for these projects/programmes?
- v. What is the role & interest of **private sector (tech companies)** towards inclusion of vulnerable and disadvantaged population in smart city development? What are the challenges to motivate them?

C. The contribution of digital technologies in enhancing inclusion and equity of vulnerable and disadvantaged population living in smart cities

- i. The **benefits** of using technology- *resource efficiency, 24X7 access, security and surveillance, evidence-based policymaking, social cohesion, participation & opportunity, improved access, quality of life, elimination of inequality, elimination of social, economic and physical exclusion* **Do you agree?**
- ii. Today technology does not meet the needs of all people, it **unfairly impacts** one group at the expense of the other! What is your experience?
- iii. How digital technologies can play **important role** in inclusion of vulnerable and disadvantaged population/group(s) living in cities? Examples (or) **Does it foster exclusion?**

- iv. What **digital infrastructure** is required/essential for inclusion of vulnerable and disadvantaged population? Like Internet, wi-fi, assistive technology etc
- v. Is **human centred design** (HCD) of technology solutions the key for inclusion? – to understand the user needs and context of use etc or **What other solutions you suggest?**

D. The key terms and elements on which urban inclusion can be achieved using digital technologies

- i. The smart city innovation(s) today spends **too much** time focusing on management and technology challenges and not enough time thinking about people? What is your opinion of this?
- ii. What are the challenges /**impediments** in achieving people-centered inclusive city development?
- iii. What kind of smart city **approach(s)** can address the challenge of inclusion of (vulnerable and disadvantaged population) more efficiently and effectively and why?
- iv. Modes of **public consultation** (digital & non-digital tools) in smart cities-Esp... How the needs and requirements of the vulnerable and disadvantaged population identified and gathered in a smart city?
- v. The issue of **data security** and **data privacy**-Who will own the technologies, data and decision-making processes within the smart city? **Are you worried about this? Any solution?**

E. The design/ specifications of people-centric and inclusive smart city

- i. “Citizen participation should involve **true co-design**, which invites co-creation across the entire project lifecycle not just for mere ideas, opinions, suggestions and feedback”. How do you think this can be achieved?
- ii. In addition to digital technologies what **other factors** in city governance/administration can contribute to effective inclusion of vulnerable and disadvantaged population?
- iii. How to build an inclusion driven (focusing on vulnerable & disadvantaged population) sustainable **business model** on smart city ecosystem? **Any innovative ideas?**
- iv. Which of the following **approach** is better suited for designing people-centric and inclusive smart city? And why? (1) Indicators based approach (2) Inclusive Smart City Toolkit (3) Inclusive Smart City Framework/model (4) Guidelines/Checklist/Recommendations **Any other approach?**
- v. What is your **definition** of people-centric and inclusive smart city? Can you suggest the key themes (**at least three**) for the same?

F. For Local Residents or Affected groups

- i. **Are you more positive or negative about the future of your smart city** (Yes/No)
- ii. Use of digital technology in smart cities changes my life for the better (Yes/No)
- iii. I feel like I belong to this city and I can voice my opinion without fear of negative consequences (Yes/No)
- iv. **I feel included and respected within the city growth and development. Perspectives like mine are included in decision making and city development planning** (Yes/No)
- v. My city provides timely and accurate communication to all citizens about policies, projects and programmes (Yes/No)
- vi. **The city's policies and procedures discourage discrimination and exclusion** (Yes/No)
- vii. I see strong leadership support of the city's value of diversity and inclusion. **People of all cultures and backgrounds are respected and valued here.** (Yes/No)
- viii. I am comfortable talking about my background and cultural experiences with other groups and city dwellers. **Racial, ethnic, and gender-based ill-treatment is not tolerated by this city administration** (Yes/No)

- ix. **This city provides an environment for the free and open expression of ideas, opinions and beliefs.** (Yes/No)
- x. **I believe this city will take appropriate action in response to incidents of discrimination.** If I had a concern about harassment or discrimination, I know where and how to report that concern. (Yes/No)

Thank you for your valuable time, please feel free to share any additional information relating to inclusion and participation of vulnerable and disadvantaged sections/groups in your smart city at pkamtam@gmail.com or p.kamtam@herts.ac.uk.

12 Appendix 2: Interview Recruitment request

LinkedIn message / Email Script for Recruitment

Dear _____,

Season's Greetings! I hope you are doing well during these turbulent times!

My name is Prakash Kamtam, and I am a PhD Research Scholar at the University of Hertfordshire, UK. My research study is on- *'Designing people-centred inclusive smart cities: Exploring integrated inclusion approaches and citizen engagement strategies through case studies of London, Bengaluru, and Kampala'*. I am exploring how the use of digital technologies in smart city projects can advance equity and inclusion of most vulnerable, neglected and disadvantaged groups like elderly, persons with disability, women, children, youth, poor, migrants and refugees etc thus enabling their increased access, opportunity, participation and livability.

As part of this study, I intend to do case study research of three diverse smart city locations- London (UK), Bengaluru (India) and Kampala (Uganda). I would like your participation in this case study and spare 30-45 minutes of your valuable time for open ended and semi -structured interview/discussion. I am seeking your experience specifically to understand the nature, scope and challenge of urban exclusion/inclusion vis-à-vis smart city development model and what smart governance and ICT tools /digital innovations have contributed to enhance inclusion and equity of vulnerable and disadvantaged population?

If you are willing to participate, we may have a Zoom, Teams or Skype meeting. Your participation is voluntary, and you can withdraw from the process at any time. You will remain anonymous, and no personal details will be collected.

If you agree to the interview, I can share the relevant information on your email and we can schedule an appointment, a date and time that is mutually convenient.

Please advise if you are you interested to participate.

I thank you for your time and consideration.

Best Regards,
Prakash Kamtam
London



HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA
ETHICS APPROVAL NOTIFICATION

TO Prakash Kantam
CC Dr Susan Parham
FROM Dr Simon Trainis, Health, Science, Engineering & Technology ECDA Chair
DATE 05/03/2020

Protocol number: LMS/PGR/UH/04085
Title of study: "Designing Inclusive Smart cities: Enhancing urban Inclusion by use of smart applications and Innovations"

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

no additional workers named.

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Permissions: Any necessary permissions for the use of premises/location and accessing participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid:

From: 05/03/2020

To: 31/10/2022

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties.

Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.

Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.

Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

14 Appendix 4: Definitions of smart city

	Organisation	Category	Definition	Keywords
1.	Crust (2021)	Private sector	“A smart city is a regional area that uses electronic and technology-based infrastructure such as information and communication technology (ICT) to collect real-time data and insights, provide certain important services, and solve city problems”.	ICT, data, services, To solve city problems
2.	BusinessTech, South Africa (2021)	Civil society/ Think tank	“A smart city is a city where opportunity, amenity, safety, resilience, inclusivity and prosperity are imperatives, and innovation across financing, design, construction, operations and governance is embraced by all stakeholders to achieve these imperatives”.	Opportunity, amenity, safety, resilience, inclusivity, Prosperity, innovation
3.	United Cities and Local Governments (UCLG)-2019	International Organisation	“A city can be considered as “smart” when investments in human and social capital and communication technologies and infrastructures actively foster sustainable economic development and a high quality of life, with wise resource management exercised through an open and excellent government”.	Human capital, social capital, Communication technologies, infrastructure, sustainable economic development, quality of life, resource management, open government
4.	Simonofski et al (2019)	Academic	“Smart cities integrate ICT to solve urban challenges and improve quality of life of their citizens”.	Urban challenges, Quality of life
5.	Caragliu and Del Bo (2019)	Academic	“Smart city projects foster urban innovation as they create opportunity for interaction of municipal and regional authorities with multi-dimensional corporations”.	Urban innovation, multi-dimensional interaction
6.	OECD (2018)	International Organisation	“Initiatives or approaches that effectively leverage digitalisation to boost citizen well-being and deliver more efficient, sustainable, and inclusive urban services and environments as part of a collaborative, multi-stakeholder process”.	Digitalisation, well-being, efficient, sustainable, inclusive, environment, collaborative, multi-stakeholder
7.	McKinsey (2018)	Private sector	“Smart cities put data and digital technology to work to make better decisions and improve the quality of life”.	Data, digital technology, better decisions, quality of life
8.	Lauriault et al (2018)	Academic	“An open smart city -where residents, civil society, academics, private sector, and public officials collaboratively mobilize data and	Collaboration, data, technologies, economic development, social

			technologies when warranted in an ethical, accountable and transparent way in order to govern the city as a fair, viable and liveable commons and balance economic development, social progress and environmental responsibility”.	progress and environmental responsibility
9.	Shen et al., (2018)	Academic	“A smart city is considered as a technology-based solution to mitigate urban diseases like social inequality, energy shortage, traffic congestion, pollution, lack or shortage of public service and so on”.	Technology, social inequality, energy shortage, traffic congestion, pollution, lack or shortage of public service
10.	Silva et al (2018)		“The 4 pillars of smart city include- institutional infrastructure, physical infrastructure, social infrastructure, economic infrastructure. The generic characteristics of smart city include- sustainability (infrastructure and governance, Energy and climate change, pollution and waste, social, economic and health), smartness (economical, social and environmental), quality of life (financial and emotional well-being), urbanisation (technical, infrastructure, governance, economy)”.	infrastructure and governance, energy and climate change, pollution and waste, social, economic and health, financial and emotional well-being, economical, social and environmental
11.	Juniper Research (2017)	Research	“A smart city is characterised by the integration of technology into a strategic approach to sustainability, citizen well-being and economic development”.	Technology, strategic approach, sustainability, well-being, economic development
12.	Inter-American Development Bank (2016)	International Organisation	“An innovative city that uses ICT and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, and environmental aspects”.	ICT, improve quality of life, efficiency of operation and services, competitiveness, economic, Social and environmental needs
13.	Mohanty et al., (2016)	Academic	“A smart city is a place where traditional networks and services are made more flexible, efficient, and sustainable with the use of information, digital, and telecommunication technologies to improve the city's operations for the benefit of its inhabitants”.	Networks, services, flexible, efficient, sustainable, technology, city operations, inhabitants
14.	Joshi et al (2016)	Academic	“The six pillars of smart cities are: (1) Social, (2) Management, (3) Economy, (4) Legal, (5) Technology and (6) Sustainability”.	Social, Management, Economy, Legal, Technology and Sustainability

15.	United Nations (2016)	International organisation	“A smart city approach makes use of opportunities from digitalisation, clean energy and technologies, as well as innovative transport technologies, thus providing options for inhabitants to make more environmentally friendly choices and boost sustainable economic growth and enabling cities to improve their service delivery”.	Digitalisation, clean energy, transport, environment, sustainable economic growth, improve service delivery
16.	World Bank (2015)	International organisation	“A city that cultivates a better relationship between citizens and governments - leveraged by available technology. They rely on feedback from citizens to help improve service delivery and creating mechanisms to gather this information”.	Technology, citizen focus, improve service delivery, gather information
17.	Deloitte (2015)	Private sector	“A city is smart when investments in (i) human and social capital, (ii) traditional infrastructure and (iii) disruptive technologies fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance”.	Human and social capital, infrastructure, disruptive Technology, sustainable economic growth, quality of life, natural resources, participatory governance
18.	Letaifa (2015)	Academic	“The global driver for smart cities is to balance social development and economic growth and to improve healthcare, energy use, education, transportation and services into a well-articulated system vision. ..smart technologies are expected to transform cities public and private services by integration of real-time communication and information by identifying and addressing citizens needs thus enhancing liveability”.	social development, economic growth, improve healthcare, energy, education, transportation and services, integration of real-time communication, liveability
19.	Manville, C.,et al., (2014)	Academic	“A smart city is a place where the traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses”.	Digital and telecommunication technologies, efficient, benefit of inhabitants and businesses
20.	Hitachi (2014)	Private sector	“Hitachi's vision for the smart sustainable city seeks to achieve concern for the global environment and lifestyle safety and convenience through the coordination of infrastructure. Smart Sustainable Cities realized through the coordination of infrastructures consist of two infrastructure layers that	Coordinated infrastructure, lifestyle safety, lifestyle convenience, urban infrastructure, IT

			support consumers' lifestyles together with the urban management infrastructure that links these together using information technology (IT)".	
21.	Schneider Electric (2014)	Private sector	"Five (5) steps to make a city smart: 1. Vision: setting the goal and the roadmap to get there; 2. Solutions: bringing in the technology to improve the efficiency of the urban systems; 3. Integration: combining information and operations for overall city efficiency; 4. Innovation: building each city's specific business model; 5. Collaboration: driving collaboration between global players and local stakeholders".	Urban systems, efficiency, technology, integration, innovation, efficiency.
22.	Fujitsu (2014)	Private sector	"Smart cities: Innovative urban developments that leverage ICT for the management of natural energy consumption at the community level and other technologies to balance environmental stewardship with comfortable living".	Innovation, urban, ICT, energy, community, technology, environment, living.
23.	Kramers et al., (2014)	Academic	"Five successful factors for a smart city:(i) broadband connectivity, (ii) knowledge workforce, (iii) digital inclusion, (iv) innovation, (v) marketing, (vi) advocacy".	ICT, education, technology, digital inclusion, innovation, business, communication.
24.	Marsal-Llacuna, M.L., (2015)	Academic	"The Smart Cities initiative seeks to improve urban performance by using data, information and IT to provide more efficient services to citizens to monitor and optimize existing infrastructure, to increase collaboration between economic actors and to encourage innovative business models in both public and private sectors".	Urban, ICT, innovation, people, economy, business, public, information, management, services.
25.	China Communication Standards Association (2014)	Civil society/ Think tank	"A smart city is a city that employs ICT infrastructures by sensing, transmitting and utilizing information in order to fulfil information sharing and service collaboration, further improve citizens' livelihood standards and their quality of life, increase urban operation efficiency and public service level, enhance the quality of economic development and industry competitive ability, and realize the scientific and sustainable development of the city".	ICT, infrastructure, information, collaboration, quality of life, citizens living standards, urban efficiency, economy, competitive, scientific, sustainable.

26.	Meijer et al. (2013)	Academic	"We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance".	ICT, high quality of life, natural resource management, participatory governance, transport infrastructure, communication infrastructure, economic growth, sustainability.
27.	Woods et al. (2013)	Academic	"Smart city is characterized by the integration of technology into a strategic approach to sustainability, citizen well-being, and economic development. Smart city projects span several industry and operational silos: energy, water, transportation, buildings management, and government services. Most importantly, the smart city concept promotes new integrated approaches to city operations, leading to innovation in cross-functional technologies and solutions".	Technology, well-being, economic development, energy, water, transportation, buildings, government, innovation, technology.
28.	Schaffers et al. (2012a)	Academic	"A smart city is referred to as the safe, secure, environmentally green, and efficient urban centre of the future with advanced infrastructures such as sensors, electronics, and networks to stimulate sustainable economic growth and a high quality of life".	Safe, secure, environment, green, efficient, urban, future, infrastructure, sensor, electronics, networks, sustainability, economy, quality of life
29.	Chourabi <i>et al.</i> (2012a)	Academic	"A "smart city" is a city well performing in a forward-looking way in the six characteristics (smart economy, smart people, smart governance, smart mobility, smart environment, smart living) built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens".	Citizens, economy, people, governance, mobility, environment, living
30.	Shanghai Pudong Smart city development research Institute (SPSCDRI, 2012)	Research	"The five dimensions for Chinese smart cities (2012) include- smart infrastructure, economy development, public governance and services, education and social safety".	smart infrastructure, economy development, public governance and services, education and social safety
31.	Smart Cities Council (2012)	Civil society/ Think tank	"A smart city gathers data from devices and sensors embedded in its roadways, power grids, buildings and other assets. It shares that data via a smart communications system that is	Data, technology, digital services

			typically a combination of wired and wireless. It then uses smart software to create valuable information and digitally enhanced services”.	
32.	Lazaroiu and Roscia (2012)	Academic	“The thematic orientation of smart city projects include environment, energy, government, people, planning, living, mobility with common feature among these projects as integrated approach to urban planning with focus ICT”.	environment, energy, government, people, planning, living, mobility, ICT
33.	ARUP (2011)	Private sector	“A "smart sustainable city" is one in which the seams and structures of the various urban systems are made clear, simple, responsive and even malleable via contemporary technology and design. Citizens are not only engaged and informed in the relationship between their activities, their neighbourhoods, and the wider urban ecosystems, but are actively encouraged to see the city itself as something they can collectively tune in, such that it is efficient, interactive, engaging, adaptive and flexible, as opposed to the inflexible, mono-functional and monolithic structures of many 20th century cities”.	Urban system optimization, technology and design, informed citizens, citizen contribution, efficiency, interactive, adaptive, flexible.
34.	Cohen, Boyd (2011)	Academic	“Smart sustainable cities use information and communication technologies (ICT) to be more intelligent and efficient in the use of resources, resulting in cost and energy savings, improved service delivery and quality of life, and reduced environmental footprint – all supporting innovation and the low-carbon economy”.	ICT, cost efficiency, energy efficiency, energy savings, quality of life, environment, improved service delivery, innovation, low carbon economy.
35.	Komninos et al., (2008)	Academic	“The smart city model include four dimensions- skills, knowledge, space and innovation”.	skills, knowledge, space and innovation
36.	International Telecommunication Union (ITU)	International organisation	“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects”.	ICT, innovation, quality of life, efficiency of urban operation and services, competitiveness, economic, social and environmental aspects

37.	UNECE and ITU	International organisation	“A smart sustainable city is an innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects”.	ICT, innovation, quality of life, efficiency of urban operation and services, competitiveness, economic, social and environmental, cultural aspects
38.	British Standards Institute (BSI)	International organisation	“The effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens”.	physical, digital and human systems, built environment, sustainability, prosperity, inclusion
39.	ICLEI Local Governments for Sustainability	International organisation	“Smart Cities are the ones that look at the big picture, using resource efficiency and technological progress as well as taking overall urban governance into account to achieve a wider vision of sustainable cities and communities”.	Resource efficiency, technology, sustainability, urban governance, sustainable communities
40.	Japan	Government	“A sustainable city or region incorporating ICT and other new technologies to solve various challenges it faces and manages itself (planning, development, management and operation) for its overall optimisation”.	ICT, planning, development, management and operation, optimisation
41.	Australia	Government	“Smart cities are those which leverage innovative technologies to 'enhance [the] quality and performance of urban services, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens”.	Technology, quality and performance of urban service, reduce cost, resource optimisation, engage with citizens
42.	Spain	Government	“The Smart City concept is a holistic approach to cities that uses ICT to improve inhabitants' quality of life and accessibility and ensures consistently improving sustainable economic, social and environmental development. It enables cross-cutting interaction between citizens and cities, and real-time, quality-efficient and cost-effective adaptation to their needs, providing open data and solutions and services geared towards citizens as people”.	Holistic approach, innovation, ICT, quality of life, accessibility, sustainable economic, social and environmental development, citizen interaction, open data
43.	China	Government	“A new concept and model which utilises the next generation of information technology, such as the	Technology, IoT cloud computing, big data,

			Internet of Things. (IoTs), cloud computing, big data, to promote smart urban planning, construction, management and services for cities”.	smart urban planning, construction, management and services
44.	India	Government	“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”.	Improve lives, digital and information technologies, urban planning, public-private partnerships, and policy change, people first
45.	Malaysia	Government	“A city that uses ICT and technology and innovation advances to address urban issues including to improve the quality of life, promote economic growth, develop sustainable and safe environment and encourage efficient urban management practices”.	ICT, innovation, address urban issues, quality of life, promote economic growth, develop sustainable and safe environment, efficient urban management
46.	Amsterdam	Government	“A 'smart city' encourages innovation and sustainability in social and technological infrastructures. The aim of the Amsterdam Smart City initiative is sustainable economic growth, efficient use of natural resources and a high quality of life”.	Innovation, Sustainability, social and technological infrastructures, sustainable economic growth, efficient use of natural resources, and quality of life.
47.	Toronto	Government	“A smart city improves access to the information and data a city needs to help it become an economically, socially and environmentally connected community. The City's goal is to ensure that people are included and easily connected – not divided – in this digital city”.	Information, data, economically, socially and environmentally connected community, people are included and easily connected
48.	Johannesburg	Government	“The City of Joburg is a smart city that makes decisions and governs through technologically enhanced engagement with its citizens who have universal access to services and information, where socioeconomic development and efficient service delivery is at its core”.	Technology, citizen Engagement, universal access to services and information, socioeconomic development, efficient service delivery
49.	Manchester Digital Development agency	Government	“A ‘smart city’ means ‘smart citizens’ – where citizens have all the information, they need to make informed choices about their lifestyle, work and travel options”.	citizens have all the information, to make informed choices about their lifestyle, work and travel options

50.	IBM	Private sector	“One that makes optimal use of all the interconnected information available today to better understand and control its operations and optimise the use of limited resources”.	interconnected information, control operations, resource optimisation
51.	Cisco	Private sector	“Smart cities are those that adopt “scalable solutions that take advantage of ICT to increase efficiencies, reduce costs, and enhance quality of life”.	Take advantage of ICT, increase efficiencies, reduce costs, and enhance quality of life
52.	Digi.city	Civil society/ Think tank	“Smart Cities use connected technology and data to (1) improve the efficiency of city service delivery (2) enhance quality of life for all (3) increase equity and prosperity for residents and businesses”.	Technology, improve service delivery, enhance quality of life, increase equity and prosperity for residents and businesses
53.	KPMG	Private sector	“Smart means useful and data-driven- It has to deliver a benefit to the citizens of a city. Whether it drives better quality of life, economic efficiency, better health outcomes — there has to be a societal benefit. ... The operators in a smart city will collect data, curate it and use it for their decision-making”.	Data driven decision making, societal benefit
54.	PwC	Private sector	“Bringing new technologies and reimagining the future of our urban spaces to ensure tomorrow’s cities work for everyone”.	Technology, cities work for everyone
55.	TWI (independent research and technology organisation)	Research	“A smart city uses information and communication technology (ICT) to improve operational efficiency, share information with the public and provide a better quality of government service and citizen welfare”.	ICT, operational efficiency, share information with the public, improve quality of government services, improve citizen welfare
56.	IoT Agenda	Research	“A smart city is a municipality that uses information and communication technologies (ICT) to increase operational efficiency, share information with the public and improve both the quality of government services and citizen welfare”.	ICT, operational efficiency, share information with the public, improve quality of government services, improve citizen welfare
57.	Consultancy.lat	Civil society/ Think tank	“A smart city can be defined as a hyperconnected urban area which utilizes innovation and technology to become more liveable. Through an integrated information network, cities can efficiently manage resources, helping them to become more	hyperconnected urban area, innovation, technology, liveability, integrated information network, efficiently manage resources, sustainable urban planning

			sustainable while aiding urban planning”.	
58.	Institute of Electrical and Electronics Engineers (IEEE)	Civil society/ Think tank	“A smart city brings together technology, government and society to enable the following characteristics: smart cities, a smart economy, smart mobility, a smart environment, smart people, smart living, smart governance”.	brings together technology, government and society, smart economy, smart mobility, a smart environment, smart people, smart living, smart governance
59.	Frost & Sullivan	Private sector	“We identified eight key aspects that define a smart city: smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen”.	smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen.
60.	THALES	Research	“A smart city is a framework, predominantly composed of Information and Communication Technologies (ICT), to develop, deploy, and promote sustainable development practices to address growing urbanization challenges”.	ICT, sustainable development, address urbanization challenges.

15 Appendix 5: List of 110 Cities Selected under India Smart City Mission

(Source: Press Information Bureau, Government of India, Ministry of Urban Development)

Name of State/UT	Names of Selected Cities
Andaman & Nicobar Islands	1. Port Blair
Andhra Pradesh	1. Vishakhapatnam
	2. Tirupati
	3. Kakinada
	4. Amaravati
Arunachal Pradesh	1. Pasighat
Assam	1. Guwahati
Bihar	1. Muzaffarpur
	2. Bhagalpur
	3. Biharsharif
	4. Patna
Chandigarh	1. Chandigarh
Chhattisgarh	1. Raipur
	2. Bilaspur
	3. Naya Raipur
Daman & Diu	1. Diu
Dadra & Nagar Haveli	1. Silvassa
Delhi	1. New Delhi Municipal Council
Goa	1. Panaji
Gujarat	1. Gandhinagar
	2. Ahmedabad
	3. Surat
	4. Vadodara
	5. Rajkot
	6. Dahod
Haryana	1. Karnal
	2. Faridabad
Himachal Pradesh	1. Dharamshala
	2. Shimla
Jammu and Kashmir	1. Srinagar
	2. Jammu
Jharkhand	1. Ranchi
Karnataka	1. Mangaluru
	2. Belagavi
	3. Shivamogga
	4. Hubballi-Dharwad

	5. Tumakuru
	6. Davanegere
	7. Bengaluru
Kerala	1. Kochi
	2. Trivendrum
Lakshadweep	1. Kavaratti
Madhya Pradesh	1. Bhopal
	2. Indore
	3. Jabalpur
	4. Gwalior
	5. Sagar
	6. Satna
	7. Ujjain
Maharashtra	1. Navi Mumbai
	2. Nashik
	3. Thane
	4. Greater Mumbai
	5. Amravati
	6. Solapur
	7. Nagpur
	8. Kalyan-Dombivali
	9. Aurangabad
	10. Pune
	11. Pimpri chinchwad
Manipur	1. Imphal
Meghalaya	1. Shillong
Mizoram	1. Aizawl
Nagaland	1. Kohima
Odisha	1. Bhubaneshwar
	2. Raurkela
Puducherry	1. Oulgaret
	2. Puducherry
Punjab	1. Ludhiana
	2. Jalandhar
	3. Amritsar
Rajasthan	1. Jaipur
	2. Udaipur
	3. Kota
	4. Ajmer

Sikkim	1. Namchi
	2. Gangtok
Tamil Nadu	1. Tiruchirapalli
	2. Tirunelveli
	3. Dindigul,
	4. Thanjavur,
	5. Tiruppur,
	6. Salem,
	7. Vellore,
	8. Coimbatore,
	9. Madurai,
	10. Erode,
	11. Thoothukudi
	12. Chennai
Telangana	1. Greater Hyderabad
	2. Greater Warangal
	3. Karimnagar
Tripura	1. Agartala
Uttar Pradesh	1. Moradabad
	2. Aligarh
	3. Saharanpur
	4. Bareilly
	5. Jhansi
	6. Kanpur
	7. Allahabad
	8. Lucknow
	9. Varanasi
	10. Ghaziabad
	11. Agra
	12. Rampur
Uttarakhand	1. Dehradun
West Bengal	1. New Town Kolkata
	2. Bidhannagar
	3. Durgapur
	4. Haldia