INSTITUTE FOR GLOBAL PROSPERITY

Assessing the Impact of Artificial Intelligence on Sustainable Urban Development in the Global South: An Exploratory Study

NAME: Shreya Katwa

PROGRAMME: MSc Global Prosperity

MODULE: Dissertation (BGLP0005)

WORD COUNT: 15,180

IGP MSc COURSEWORK

DECLARATION OF OWNERSHIP AND COPYRIGHT FORM

1. DECLARATION OF OWNERSHIP

I confirm that I have read and understood the guidelines on plagiarism produced by IGP and UCL, that I understand the meaning of plagiarism as defined in those guidelines, and that I may be penalised for submitting work that has been plagiarised.

This piece of coursework must be submitted electronically through Turnitin on Moodle by the stipulated deadline. I understand that the coursework cannot be assessed unless it is submitted online and that penalties will be applied for late submissions as per UCL and IGP guidelines unless there is an approved case for Extenuating Circumstances or Reasonable Adjustments.

I declare that all material is entirely my own work except where explicitly, clearly and individually indicated and that all sources used in its preparation and all quotations are clearly cited using a recognised system for referencing and citation. Should this statement prove to be untrue, I recognise the right of the Board of Examiners to recommend disciplinary action in line with UCL regulations.

2. COPYRIGHT

The copyright of the coursework remains with me as its author. However, I understand that anonymised copies may be made available to future students for reference. Please, tick the box if you DO NOT want this report to be made available for teaching purposes.

Acknowledgements

I would like to thank my Mum, Dad, and brother for their warmth, wisdom, humour, love and unwavering support.

I would also like to thank my supervisor, Dr Hanna Baumann, for her support and expertise. I enjoyed the opportunity to work under the guidance of such a knowledgeable urban scholar and appreciate her constructive feedback.

I am also grateful for Dr Mara Torres Pinedo and Hadiqa Khan's advice and encouragement during this process.

Last but not least, this dissertation would not have been possible without the insights, enthusiasm and generosity of my research participants. I am humbled that they shared their time and expertise with me, and I look forward to seeing how they each shape the Fourth Industrial Revolution!

Table of Contents

Abstract

Characterised as the Fourth Industrial Revolution, AI is envisioned to reshape urban socio-technical interactions and drive solutions to the world's 'grand challenges.' Despite this foresight, there is an absence of qualitative studies that critically engage with the intersection between AI, sustainable development, cities, and the Global South. This represents an urgent research gap due to the synonymity of 'digitalisation-as-urbanisation' in the Global South, the acceleration of urban AI deployment, and the international pursuit of the SDGs. Through primary interviews with scholars and corporate AI technologists and secondary, case study research, this thesis thus addresses the question of AI's impact on *urban inclusion* and *urban environmental sustainability*. Based on primary, qualitative data analysis, this paper's thematic data map establishes the key determinants of AI's impact on sustainable urban development in the Global South as follows: Access, Representation, Privacy, Experimentation vs Regulation, Agency and Efficiency. These primary findings were then mobilised to analyse secondary case studies of urban AI deployment for security, urban planning, citizen services, and DRM across Global South cities (e.g. Johannesburg, Hyderabad, and Buenos Aires). In terms of *urban inclusion*, this paper concludes that AI in its current form risks the exacerbation of pre-existing social injustices due to data and infrastructural inequity and unethical surveillance practices that impacts urban service provision and spatial access. In terms of *urban environmental sustainability*, this paper argues that AI's capacity for innovative urban climate action will only be sustainable if its carbon and water footprint is proactively addressed and the digital divide is bridged.

Key words: AI, Global South, Smart Cities, Post-Smart Urbanism, Artificially Intelligent Cities, Sustainable Development.

List of Abbreviations

AI Artificial Intelligence

CSR Corporate Social Responsibility

DRM Disaster Risk Management

ESG Environmental, Social and Governance

FRT Facial Recognition Technology

HAIT Human-AI Teaming

ML Machine Learning

NCD Non-Communicable Diseases

NLP Natural Language Processing

SDG Sustainable Development Goals

UN United Nations

UNEP United Nations Environment Programme

XAI Explainable AI

List of Illustrations

Chapter 1: Introduction

1.1. Background and Rationale

"Once confined to the realm of science fiction and small-scale technological experiments, AI is now all around us in the shape of urban artificial intelligences."
(Cugurullo, et al., 2023, p. 1168)

If one were to consider the fact that artificial intelligence[1] (AI) only came into existence less than a century ago (Copeland, 2024), the advanced, quasi-science fiction capabilities of its technologies is truly remarkable. Characterised as the Fourth Industrial Revolution (Qiang, 2018), AI is envisioned to profoundly reshape the fabric of global society and redefine the relationship between humans and technology beyond previous waves of innovation. In fact, Mustafa Suleyman (2023), the co-founder of Google's DeepMind, has argued that AI is "different from previous waves of technology because of how it unleashes new powers and transforms existing power." This relationship between AI and power represents the crux of the technology's significance for 21st century society because it will arguably become a deeply agentic actor (Cugurullo, et al., 2023) if its place is not adequately interrogated on the cusp of this technological transition.

This challenge is particularly pertinent in the urban space, where the accelerated deployment of AI is most material (Cugurullo, et al., 2023). For example, urban AI manifests itself through the physical infrastructure required to operate its functions, such as automated vehicles, delivery robots and drone technology, as well as the outcomes of AI-generated, anticipatory urban planning mechanisms that determine construction and, thus, urban spatial distribution (Cugurullo, et al., 2023). Despite the experimental phase the technology finds itself in and subsequent regulatory ambiguity, scholars have argued that AI is dependent on the urban space to build its intelligence (Cugurullo, et al., 2023) and that cities thus represent a "decisive component in the future evolution of AI" (Palmini & Cugurullo, 2023, p. 6) due to their capacity to generate large amounts of data from dense populations, technologically advanced infrastructure, and the so-called "socio-technical assemblages of interactions" (Palmini & Cugurullo, 2023, p. 9) which take place in the urban space that lend themselves to a microcosmic status (Gulick, 1975).

This is particularly true in the context of the global pursuit of the United Nations Sustainable Development Goals (SDGs), for which AI is considered to enable almost 80% of all targets (Vinuesa, et al., 2020). Despite cities only covering 2% of the world's land surface, 80% of the world is expected to live in urban spaces by 2050, doubling global material consumption to around 89 billion tonnes and exacerbating their environmental impact (Venditti, 2022). In response to this prospect, AI technologies promise to enhance urban services such as air quality monitoring (Yigitcanlar & Cugurullo, 2020), the resilience of urban infrastructure (Yigitcanlar, Mehmood, & Corchado, 2021), waste management, public services, safety,

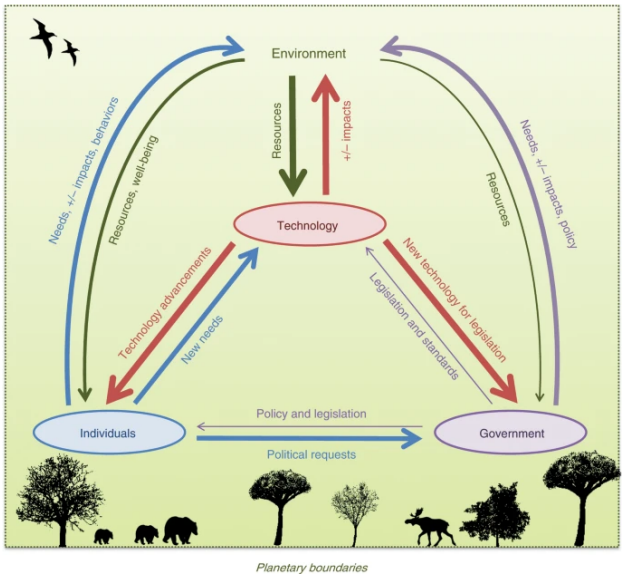
[1] The EU AI Act defines artificial intelligence (AI) as "a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments" (Gaudszun, Shin, & Mair, 2024). Despite the popularised use of the term 'AI' to categorise all machines that demonstrate these characteristics, the technologies that operate these systems are inherently plural in reality (Herath & Mittal, 2022). For example, Machine Learning (ML) is a form of AI that "enables software programs to grow increasingly effective at predicting outcomes without explicitly programming them to do so," robotics focuses "on the design/creation of robots involved in the automation of production-lines" (Herath & Mittal, 2022), and Deep Learning uses "multi-layered neural networks, called deep neural networks, to simulate the complex decision-making power of the human brain" (Holdsworth & Scapicchio, 2024).

natural resource management, disaster risk management, and the sustainable provision of food, water, and energy to urban populations (Herath & Mittal, 2022).

These services are increasingly sought by cities in the Global South[2] (Africa, Southeast Asia, Latin America, and the Caribbean) due to the disproportionate climate challenges the region faces (United Nations, 2019) and their rapid development that equates urbanisation with digitalisation (Datta, 2022). Despite this reality, there are limited empirical studies and regulatory interventions considering the socio-ecological impact of the 'coming wave' (Suleyman & Bhaskar, 2023) on sustainable urban development in the Global South. This is because of the "black box" nature of AI's development and deployment (Brevini, 2020) and the 'AI divide' between the Global North (Europe and North America) and Global South, caused by the technology's Euro-Americentric development and distribution (Yu, Rosenfeld, & Gupta, 2023), the wider global digital divide (Signé, 2023), algorithmic colonisation (Hao, 2020), and regionally disparate academic funding (Barcia, 2023).

This represents a concerning prospect to the prosperity of urban citizens in the Global South because AI is anticipated to profoundly transform society and the urban experience globally (Bibri, Krogstie, Kaboli, & Alahi, 2024). As indicated in Figure 1, this is because AI forms part of an intrinsically socio-technical system, impacting individuals, institutions and the planet synergistically and, thus, almost acting as an infrastructural extension of ourselves that will expand human capacities beyond the known. If academia neglects this field of study in the Global South, the Fourth Industrial Revolution runs the risk of leaving the region behind, posing a real threat to the exacerbation of the climate crisis and social inclusion, as well as global inequality more broadly (Yu, Rosenfeld, & Gupta, 2023).

Figure 1: "Interaction of AI and society." (Vinuesa, et al., 2020)



[2] Before engaging with the term Global South, it is important to recognise its limitations and contemporary contestation. In summary, critics argue that the term assumes the singularity of a geographical meta-category that ignores the complex cultural, economic, developmental, historical and geographical nuances of the so-called region (Patrick & Huggins, 2023). In contrast, proponents understand the term in relation to its non-Western geographies, shared colonial histories, subsequent neo-imperialism, differential trajectories of economic and social change, and conditions of inequality that directly alter conditions of life expectancy, living standards, and resource accessibility for its peoples (Dados & Connell, 2012). Whilst this author acknowledges the constraints of the term and encourages its reappraisal, this paper interprets the concept as Dados and Connell refer to it and, as such, will employ the term during this dissertation to reaffirm the distinctly non-Western focus of this study.

1.2. Aims and Objectives

This paper has been written in the context of the rapid urbanisation of the Global South, the 21st century digitalisation of the urban space (Datta, 2022), and the international pursuit of the SDGs (Vinuesa, et al., 2020). With this in mind, this dissertation aims to contribute to this urgent research gap through examining the impact of AI as a socio-technical system on sustainable urban development in the Global South.

In line with the scholarly need for multi-disciplinary perspectives regarding the emergence of AI (Manyika, Silberg, & Presten, 2019), the objective of this paper is to critically engage with the opportunities and challenges that AI poses to Global South cities through the lens of prosperity due to the current absence of rigorous studies dissecting the relationship between urban prosperity and AI.

This has been achieved through secondary research, primary, semi-structured interviews with academic researchers and corporate AI technologists, and the construction of a thematic map that establishes the key determinants of AI's impact on sustainable development in the urban Global South.

In contrast to the corporate domination of quantitative justifications for urban AI deployment, this paper offers a nuanced, qualitative perspective to the intersection between AI, sustainability, and urban development to encourage critical engagement with the urban implications of the Fourth Industrial Revolution and to progress discourse towards the promotion of a socio-ecologically symbiotic urban future.

It is important to note that this study is exploratory by nature. This is because of the early stage that AI's urban implementation finds itself in, particularly in the Global South. As such, this paper hopes to serve as a strong basis for further studies regarding the intersection between AI, sustainable urban development, and the Global South as the field evolves and applications mature.

1.3. Scope

In order to achieve the aims and objectives of this paper, this paper focuses its scope on the following primary research questions:

1) What is the potential impact of AI on urban inclusion?

AI systems are not objective entities (Yigitcanlar & Cugurullo, 2020). The semi-autonomous design of AI is ultimately the product of human intelligence since its operation is driven by algorithms informed by data collected from individuals with unconscious and conscious biases (Leverhulme Centre for the Future of Intelligence, 2024). This impacts the 'smart citizen' (Shelton & Lodato, 2019) because of AI's growing usage in sectors such as policing, government services, and surveillance (Mohamed, Png, & Isaac, 2020). In fact, IBM discovered that "over 180 human biases [affect] the decisions made by AI" (Truby, 2020, p. 952).

With this in mind, Yigitcanlar and Cugurullo (2020) have argued that algorithmic bias hosts significant constraints to the sustainable governance of urban life. These challenges include "making biased decisions including racial bias and discrimination, suppressing public voice/protests/rights, violating civil liberties, […] [and] creating cybersecurity concerns" (Yigitcanlar & Cugurullo, 2020, p. 10).

Given this concerning prospect for marginalised urban populations, this question seeks to examine the implications of algorithmic bias on urban social sustainability and spatial inclusion and to, thus, contribute to this urgent research gap (Bibri, Alexandre, Sharifi, & Krogstie, 2023).

2) What is the potential impact of AI on urban environmental sustainability?

AI is considered by global organisations, such as the United Nations Environment Programme (UNEP), as a key tool in the mitigation of the climate crisis in the urban space (United Nations, 2022). As such, leading technology corporations, such as Google and Microsoft, have made significant investments into 'AI for Good' initiatives that aim to advance the SDGs (Microsoft, 2024; Google, 2024). For example, AI technologies have been shown to unlock enormous potential for urban reforestation (Morfo, 2024), mapping biodiversity (Jones, Deparday, & Cowan, 2022), and disaster risk management (Matias, 2024).

Despite corporate commitments to 'AI for Good', technology companies have equally admitted that they may not be able to achieve their net zero targets due to the accelerated demand for AI solutions and the subsequent carbon emissions this generates (Milmo, Hern, & Ambrose, 2024).

Contrary to popular imagination of AI as intangible, this admission is inextricably linked to the technologies' materiality. In summary, AI systems are operated via physical data centres that require significant energy and water consumption to function (Crawford, 2024). In fact, studies have shown that data centre energy usage "[average] 200 TWh each year […], more than the national energy consumption of some populous countries such as Iran" (Brevini, 2020, p. 3). Moreover, before GPT-4 had completed its training, OpenAI consumed 6% of the West de Moines district's water in the USA, leading to a lawsuit by its residents (Criddle & Bryan, 2024).

In light of this paradox, this paper seeks to understand how AI can be harnessed to solve urban environmental challenges and to assess the extent to which its employment can be justified for sustainable urban development in the context of the Global South and its disproportionate regional climate challenges (United Nations, 2019), as well as the carbon and water footprint of AI technologies.

1.4. Structure

This paper is structured as follows. First, in the *Literature Review*, this author analyses corporate discourse and academic scholarship regarding AI ethics, environmental studies, decolonial theory, feminist literature and urban studies to identify research gaps and emphasise the need for Global South perspectives to be considered in AI discourse. Then, the *Research Design and Methodology* chapter indicates the rationale behind this study's qualitative research design, advocates the adequacy of semi-structured interviews to investigate this paper's primary research questions, justifies the line of questioning this author followed, and details how case studies were selected for analysis.

Afterwards, this paper indicates its *Findings* by critically engaging with the interviews conducted through inductive analysis, illustrating a thematic map in line with Braun and Clarke's (2006) methodology to reflect these outcomes and concretising theoretical

considerations through the examination of secondary case studies. Then, the *Discussion* draws from the Literature Review and findings from this study's primary interviews and secondary research of Global South urban AI applications to analyse this paper's primary research questions: 1) What is the potential impact of AI on urban inclusion? 2) What is the potential impact of AI on urban environmental sustainability? Finally, this study *concludes* with responses to this dissertation's principal research questions, acknowledges its limitations, and makes recommendations for further research.

Chapter 2: Literature Review

2.1. Corporate Discourse

From a corporate perspective, AI promises to accelerate the resolution of the world's wicked problems.

For example, Microsoft views AI as a "game-changer for our planet," investing $50 million in their AI for Earth initiative that seeks to democratise AI and scale its usage for climate, water, agriculture, and biodiversity (Smith, 2017). Google also lauds the technology's problem-solving capabilities, launching the 'AI for the Global Goals' initiative with a $25 million commitment to organisations seeking to advance the SDGs and helping recipients to meet their sustainability objectives "in a third of the time, at half of the cost" (Google, 2024). AI is also advocated by Meta as a means to increase efficiency, who argue that "making today's economy more efficient will be one of AI's most important environmental contributions" (Meta, 2022). Finally, OpenAI's Sam Altman views the technology's progress as "one of the biggest factors in improving people's quality of life" globally (Davalos, 2024).

If one were to consider the level of corporate investment in AI, the benefits it claims to yield, and the utopian lexicon employed by its developers, AI could be viewed as a quasi-science-fiction panacea to global challenges at first glance.

2.2. Scholarly Discourse

Despite corporate optimism, the reality of this technology's emergence has been met with much scepticism amongst scholars.

For example, AI ethicists warn of "the black-box algorithm and the problem of explainability, the lack of equal representation in training data and the resulting biases in AI models, […] the increase in facial and emotion recognition systems infringing on citizen's rights […] [and] the environmental impact of AI" (Wynsberghe, 2021, p. 213). In light of these alarming shortfalls, Van Wynsberghe argues that AI is a "social experiment conducted on society," advocating for the implementation of safeguards "protect people and the planet" (Wynsberghe, 2021, p. 217). Truby also expresses his wariness of Big Tech's accelerated development of AI technologies, asserting that "regulatory inertia has enabled Big Tech to experiment with, and commercialize, technologies without adherence to international principles or consideration of sustainable development" (Truby, 2020, p. 949).

As such, environmentalists are also conflicted regarding the true impact of AI. For example, on the one hand, the UNEP argues that AI is "central" to the management of the climate crisis, launching the AI-powered World Environment Situation Room (WESR) in 2022 to "inform near real-time analysis and future predictions on multiple factors, including CO2 atmospheric concentration, changes in glacier mass and sea level rise" (United Nations, 2022). On the other hand, academic researchers have asserted the climate risks posed by the extortionate energy and water consumption of AI data centres, arguing that AI "technology is as much a part of the climate problem as a solution" (Dora, 2024).

One may assume that AI for the purpose of sustainable development does not have an environmental impact, but this is not the case. For example, Natural Language Processing (NLP) can be used for purposes such as disaster risk management (Prior & Williamson, 2023) and the assessment of corporate alignment with the SDGs (Chen, Mussalli, Amel-Zadeh, & Weinberg, 2022). However, training one NLP model can generate up to 600,000 lb of carbon

emissions (Wynsberghe, 2021). As such, Van Wynsberghe has differentiated between 'AI for Sustainability' and 'Sustainable AI', advocating the latter as a "a movement to foster change in the entire lifecycle of AI products […] towards greater ecological integrity and social justice" (Wynsberghe, 2021, p. 213).

The notion of 'social justice' thus leads us to another challenge posed by AI: its neo-colonialist tendencies (Mohamed, Png, & Isaac, 2020). Whilst postcolonial studies may seem incongruous with AI discourse at first glance, scholars Mohamed, Png and Isaac (2020) understand the notion of AI's 'coloniality' in reference to power imbalances in AI design, development, deployment and policy discourse, structural dependencies between so-called developing and developed nations, inequitable access to AI's economic advantages, and unequal experiences of the technologies' risks.

Decolonial[3] theory has, thus, become an emerging reference in AI studies. For example, Dihal, Cave and Nwankwo (2024) have argued that the "systematic lack of diversity among AI developers and existing structural injustices are reflected in the technology, which in turn perpetuates those injustices." Moreover, Hao (2022) goes as far as to argue that "artificial intelligence is creating a new colonial world order." She asserts that "AI is repeating the patterns of colonial history" and parallels European colonialism's "violent capture of land, extraction of resources, and exploitation of people […] for the economic enrichment of the conquering country" with the AI industry's drive for profit and insatiable pursuit of data harvested from Global South citizen activities, movements, and bodies (Hao, 2022).

For example, in South African cities, the use of Facial Recognition Technology (FRT) is perceived to be "re-entrenching racial hierarchies and fuelling a digital apartheid" (Hao, 2022). In addition, ghost workers in Nairobi, have been paid as little as $1.46 an hour to filter data containing sexual abuse, hate speech, and violence to safeguard AI models predominantly used in the Global North and at the expense of the mental wellbeing of Global South workers (Rowe, 2023).

With this in mind, calls to 'Decolonise AI' have gained prominence amongst activists and Global South scholars (Mohamed, Png, & Isaac, 2020; Hao, 2022; Miller, 2022; Zimeta, 2023; Dihal, Cave & Nwanko, 2024). For example, Zimeta (2023) has asserted that "decolonizing AI is not just about undoing the harms of the colonial past, it is about learning from the harms of the past to make sure AI helps build a better future for everyone."

To achieve this, decolonial AI's leading scholar, DeepMind's Shakir Mohamed, has advocated the creation of a "critical technical practice of AI, […] reverse tutelage and reverse pedagogies, and the renewal of affective and political communities" (Mohamed, Png, & Isaac, 2020, p. 659), simultaneously asserting that the field must reorient its work "away from Western hubs like Silicon Valley and engage new voices, cultures, and ideas for guiding the technology's development" (Hao, 2020).

[3] Before dissecting decolonial theory's increasing prevalence in scholarly AI discourse, it is first important to recognise this term's controversial nature. As argued by Tuck and Yang (2012), the "metaphorisation" of decolonisation can be seen as problematic because "it makes possible a set of evasions, or "settler moves to innocence," that problematically attempt to reconcile settler guilt and complicity, and rescue settler futurity" (p. 1). Nonetheless, this author has decided to maintain the use of this term because of its present day synonymity with social justice and structural inequality and the characterisation of many Global South nations as former colonies, both of which are central to discussions of AI's urban impact.

The emergence of AI has also been a source of unease for feminist scholars due to its ability to propagate bias. For example, in a study conducted by Berkeley Haas Centre for Equity, Gender and Leadership, it was discovered that, across 133 AI systems, 44% exhibited gender bias (Smith & Rustagi, 2021). Arun argues that this bias stems from the fact that "the large-scale AI systems come from elite university labs and a few technology companies, […] [and are thus] "white, affluent, technically oriented and male" spaces" (Arun, 2020, p. 11).

Whilst a central factor to this challenge, this bias is not only due to the lack of diversity in the AI industry. As argued by Criado Perez (2019), systemic exclusion of women from research has led to biased datasets, datasets upon which AI algorithms are trained on. This deficit has the capacity to fundamentally reshape the female experience in the age of AI because gender-biased AI systems have already been shown to "lower the quality of service" for women, contribute to an "unfair allocation of resources, information, and opportunities," reinforce stereotypes, and even pose "detriments to physical safety [and] health hazards" (Smith & Rustagi, 2021).

In light of the ethical and environmental questions that AI poses, urban scholars express both concerns and hopes regarding AI's impact on the socio-ecological systems of cities. Within urban scholarship, the promises and pitfalls of AI for sustainable urban development are thus analysed through three major discourses: Urban AI, Smart Cities, and Artificially Intelligent Cities.

Urban AI has been defined as "any system that incorporates data derived from the urban environment, which is then processed by algorithms" (Popelka, Zertuche, & Beroche, 2023, p. 4), including autonomous cars, robots, City Brains and urban software agents (Cugurullo et al., 2023). Urban scholars who explore these applications argue that the development of AI is inextricably dependent on cities because they are the "primary locus of human societies, where intense and manifold human activities occur" (Cugurullo, et al., 2023, p. 1170) and thus have a superior capacity to consistently generate extensive data for AI systems to feed from. AI is, thus, characterised by its "urbanity" and seen as most material in the urban space (Cugurullo, et al., 2023). In fact, Cugurullo et al. (2023) go as far as to argue that "the autonomy of urban AIs means that, in AI urbanism, we will cede part of our decision-making power to machines" (p. 1170) and that it even has "the potential to create the autonomous city where human agency might be overshadowed by the agency of urban AI" (p. 1171).

This foresight leads us to the prospect of 'Artificially Intelligent Cities' that has gained interest amongst some scholars. For example, Cugurullo et al. (2023) argue that "the rise of a post-smart urbanism driven by AI has the potential to form autonomous cities that transcend, theoretically and empirically, traditional smart cities" (p. 1168).

The smart cities discourse first became prominent within the private sector in the early 2000s. As explained by Yigitcanlar and Cugurullo (2020), "the practice of smart urbanism has been made popular only in the 2000s with urban projects led by private companies like IBM and Cisco [62,63,64]. Since then, many major technology, construction, and consultancy companies, together with policymakers and city planners, have jumped onto the smart city bandwagon [65,66]" (p. 4). According to the 2023 IMD Smart City Index, the world now counts 141 smart cities, of which almost half are situated in the Global South (IMD, 2023).

Whilst the definition of smart cities is disputed, the European Commission defines the concept as "a place where traditional networks and services are made more efficient with the

use of digital solutions for the benefit of its inhabitants and business" (European Commission, 2024). Nonetheless, from a scholarly perspective, the emergence of smart cities and their techno-solutionist response to urban challenges has been met with scepticism, especially within the social sciences. For example, Hollands (2008) argues that the concept's "self-congratulatory" nature masks the risks of neo-liberal business-led urban development, the privatisation of the public space and gentrification that creates "inequalities of work, housing and neighbourhood, and extends to areas such as inequitable city space (Byrne, 1999) and entertainment provision (Chatterton and Hollands, 2003)" (p. 312).

The Artificially Intelligent City goes beyond the smart city because of the degree of autonomy that AI systems exhibit and their ubiquity that render them "deeply agentic despite their seeming immateriality," thus situating it in the realm of post-smart urbanism (Cugurullo, et al., 2023, p. 1170).

Nonetheless, given the present inexistence of holistically Artificially Intelligent Cities (Yigitcanlar & Cugurullo, 2020), there is currently not a uniform definition of the term. As such, definitions are everchanging, in line the field's struggle to assess AI's paradoxical impact on cities. This challenge can be best explained through the analysis of Yigitcanlar's academic output. In May 2020, Yigitcanlar and his colleagues put forward an optimistic definition of the foreseen phenomenon, describing the Artificially Intelligent City as:

- *"an urban locality functioning as a robust system of systems, and whose economic, societal, environmental, and governmental activities are based on sustainable practices driven by AI technologies, helping us achieve social good and other desired outcomes and futures for all humans and non-humans" (Yigitcanlar et al., 2020, p. 4).*

In contrast, Yigitcanlar, in collaboration with Cugurullo, shared a quasi-dystopian definition later the same year, describing them as:

- *"a city where algorithms are the dominant decision-makers and arbitrators of governance protocols—the rules and frameworks that enable humans and organizations to interact, from traffic lights to tax structures—and where humans might have limited say in the choices presented to them for any given interaction" (Yigitcanlar & Cugurullo, 2020, p.11).*

The contrast between these definitions is striking, but it represents the crux of scholarship and broader policymaking exercises in relation to AI's impact on sustainable urban development. There is no doubt that AI will reshape the urban space and that the emergence of its technologies will mark a turning point in urban behaviour, culture, and governance. Nonetheless, it is challenging to proactively plan for and predict the unknown, especially as AI technologies continue to rapidly evolve and surpass previous human conceptions of its capabilities.

2.3. Research Gaps

AI represents immense potential for socio-ecological prosperity in Global South cities. For example, it can make healthcare systems more efficient (Yu, Rosenfeld, & Gupta, 2023), support disaster risk management (Yigitcanlar et al., 2020) and facilitate urban planning (Graute, 2024). Despite this fact, there are no rigorous academic papers that analyse the intersection between AI and sustainable urban development in the Global South at present. This thesis argues that this is an urgent research gap because of the synonymity of

digitalisation with urbanisation in the Global South (Datta, 2022) and the so-called ‘AI divide’ that threatens to exacerbate global inequality (Yu, Rosenfeld, & Gupta, 2023) and reinforce hegemonic structures rooted in the colonial era (Mitra & Pansera, 2023).

In addition, Manyika et al. (2019) advocate “multi-disciplinary perspectives, including from ethicists, social scientists, and other humanities thinkers” in responding to the challenges posed by AI. Despite the importance of prosperity for ensuring the flourishing of people, cities, and ecosystems, there are currently no empirical studies on AI and prosperity. This is a concern because AI is envisioned to profoundly restructure urban society (Suleyman, 2023). If prosperity studies remains absent from discourse regarding AI on the cusp of this technological transition, it risks losing the opportunity to positively contribute to the responsible evolution of this revolution.

With this in mind, this paper thus seeks to harness the skills, theories, and practices learnt throughout this academic year to assess the significance of AI’s emergence on prosperity in the Global South from a qualitative perspective and, thus, contribute to this knowledge gap.

Chapter 3: Research Design and Methodology

3.1. Qualitative Research

This study used qualitative research to realise its objectives. This is due to the possibility that qualitative methods unlock for the explanation of "phenomena such as experiences, attitudes, and behaviours [that] can be difficult to accurately capture quantitatively," as well as the capacity of this approach "to expand and deepen understanding of data or results obtained from quantitative analysis" (Tenny, Brannan, & Brannan., 2022).

This paper argues that the analysis of AI data and perspectives from a qualitative viewpoint is imperative because it enables critical engagement, the humanisation of AI research, and, thus, serves to emphasise the inherently socio-technical nature of AI.

3.2. Interviews

In terms of primary research, this author conducted 5 semi-structured interviews with 3 academic researchers and 2 corporate AI technologists to gain an understanding of both public and private sector perspectives regarding the cross-demographic implications of this technology in the Global South. This is due to the possibility that semi-structured interviews hold for the detailed examination of more nuanced, context-specific AI impact.

3.2.1. Sampling

Since AI is still an emerging research field, this author deemed it necessary to sample its participants with intention to ensure the illumination of diverse perspectives. This author, thus, recruited participants through non-random, convenience and snowball sampling to ensure the suitability of interviewees and information-rich data collection that efficiently advances the objectives of this paper.

A total of 2 technologists and 10 scholars were reached out to. Interview requests for both technologists materialised, owing to the success of snowball sampling. In contrast, out of the 10 scholars contacted via convenience sampling, only 3 interviews took place. 5 scholars noted their interest in participating but were unable to do so due to the incompatibility of the project's timeline with periods of summer leave, and 1 responded with an automated email that indicated their absence too.

With this in mind, the sample includes participants with the following expertise. In order to both distinguish between samples and maintain the anonymity of participants, the corporate AI technologists and scholars are pseudonymised as follows:

Figure 2: Table of Participants (Figure by Author)

Pseudonym	Expertise
Corporate AI Technologist 1	AI and Sustainability, Policy
Corporate AI Technologist 2	Data Centres and AI
Scholar 1	AI in the Urban Space
Scholar 2	AI and Human Rights
Scholar 3	Digital Cities and Southern Urbanism

3.2.2. Line of Questioning

Each questionnaire was designed with the objective of gaining a more nuanced understanding of how AI is deployed in the urban space and the sustainability of its socio-ecological impact on the urban environment.

Questions for both samples converged in terms of the perception of the similarities and differences of urban AI impacts in the Global North and Global South, the notion of the 'AI Divide,' current applications of urban AI in the Global South, perspectives on current AI regulation, the question of data collection, and the hopes and concerns of participants in relation to the future of AI in the urban Global South (see Appendix A).

In terms of academic researchers, questions were asked regarding the role and perception of the academic in regulatory and policymaking exercises, as well as specific questions regarding each scholar's expertise.

In terms of corporate AI technologists, this researcher investigated specific questions regarding the criteria for the recommendation for urban AI solutions, as well as practices of urban governments and corporations when seeking AI tools for urban challenges.

3.2.3. Research Ethics

This research received ethical approval by the IGP's Local Research Committee at UCL.

In summary, each participant has been anonymised to ensure the protection of personal data and that their involvement in this project will not have broader implications for them, thus enabling open discussion. Anonymity has been enshrined by a Consent Form and Information Sheet, and research has been conducted with strict adherence to the high standard of ethical principles described in the ASA's 'Ethical Guidelines for Good Research Practice' (Association of Social Anthropologists of the UK, 2011).

3.3. Case Studies

Given the early stages of urban AI deployment and, thus, the exploratory nature of this study, this paper employs diverse, secondary case studies of specific AI tools currently mobilised in Global South cities to concretise theoretical considerations and, thus, strengthen academic foresight.

These case studies were selected according to the following methodology. First, key AI applications and, thus, areas of the technologies' potential urban impact were identified based on this study's primary interviews with academic and corporate experts. Then, such applications were coded on NVivo as follows: Urban Planning, Security, Citizen Services, and Disaster Risk Management. Finally, this author conducted secondary, academic research to analyse the impact of AI on the urban Global South, drawing on resources such as the GOUAI's Atlas of Urban AI (Urban AI, 2024) and the UN Habitat's 'AI & Cities' report (UN Habitat & Mila, 2022).

As a result, the following social and environmental applications and case studies have been selected for this paper:

- **Security:** Facial Recognition Technology (FRT) in Hyderabad, India (Amnesty International, 2021) and Johannesburg, South Africa (Hao & Swart, 2022).

- **Urban Planning:** Spatial Accessibility in Mexico City, Mexico (Global Observatory of Urban Artificial Intelligence, 2022), Reforestation in Rio de Janeiro, Brazil (Masterson, 2024), Tree Mapping in Dar es Salaam, Tanzania (Jones, Deparday, & Cowan, 2022) and City Brains in Chinese cities (Grobbink, Mulgan & Straub, 2024).
- **Citizen Services:** Smart Health in Khon Kaen, Thailand (UN Habitat & Mila, 2022) and Participatory Governance in Buenos Aires, Argentina (Global Observatory of Urban Artificial Intelligence, 2022).
- **Disaster Risk Management:** AI-powered Flood Forecasting in Patna, India (Matias, 2024).

3.4. Qualitative Data Analysis

This author first organised data extracted from interview transcripts on NVivo to identify patterns, define codes, and draw connections between responses within and beyond each sample through inductive and thematic analysis.

In line with Braun and Clarke's (2006) recommendations for thematic map construction, this author then followed the phases of thematic analysis below to achieve a rigorous thematic map that summarised this paper's findings from its primary research, illustrating the key determinants of the impact of AI on sustainable urban development in the Global South.

Figure 3: "Phases of thematic analysis." (Braun & Clarke, 2006)

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Finally, this paper drew on key case studies of urban AI applications discussed during each interview and interlaced them with the theoretical considerations deduced in the thematic data map, conducting diligent secondary research to unravel the complex opportunities and challenges AI poses to sustainable urban development in the Global South.

3.5. Research Output

A rigorous thematic map has been produced to identify the relationship between key topics that arose in interviews and, thus, establish the key determinants of the impact of AI on sustainable urban development in the Global South. This method has been chosen due to its proven efficiency in meticulous qualitative data analysis that facilitates the comprehension of complex, emerging, and interconnecting themes generated by interviews (Fearnley, 2022). In addition, this author believes that this map will prove a useful tool for urban stakeholders, such as policymakers, city governments and urban planners, to employ when determining the social and environmental suitability of the deployment of urban AI solutions.

Chapter 4: Findings

Summary of Findings

Whilst scholars were more sceptical, technologists were more optimistic regarding the impact of AI on sustainable urban development in the Global South, in line with the discourse analysed in Chapter 2. However, in contrast to the Literature Review, all participants critically engaged with the challenges and opportunities posed by AI in a more balanced and nuanced manner, unanimously evoking the idea of AI as a technological transition that will mark a turning point in digital and urban culture.

Despite discussions of AI and the Global South as collectives, all participants also emphasised the plurality of context and tool-specific nuances to AI's impact. In addition, both samples noted the early stage of AI development and deployment in the urban space and, thus, implicitly invoked the need for long-termist visions to mitigate potential challenges to urban development in the Global South without stifling innovation and the possibilities AI offers to tackle the SDGs.

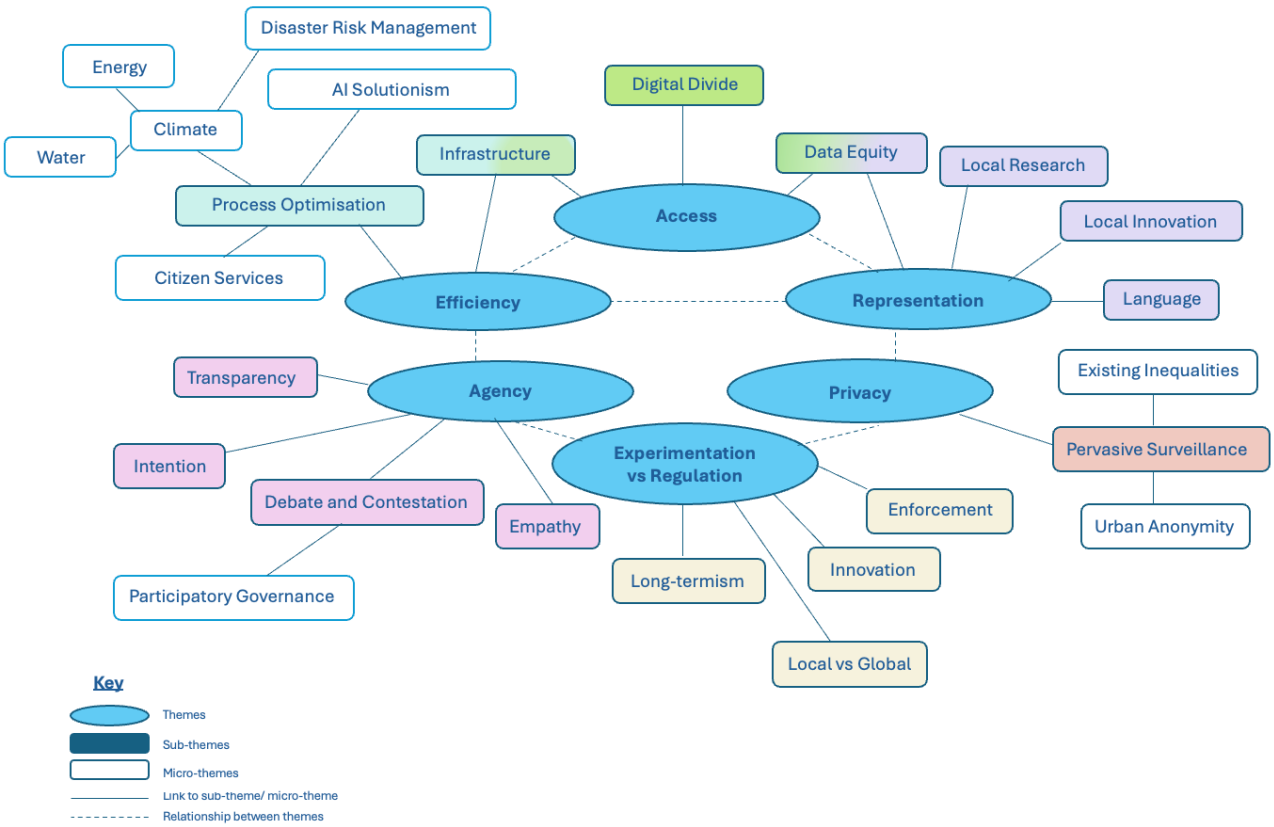
With this in mind, this section is structured as follows. First, this author reflects on the theoretical considerations brought to light during the primary interviews, presenting a thematic framework for urban stakeholders in the Global South to determine the impact of AI on sustainable urban development in their cities. Second, this author draws on the AI applications revealed in the interviews conducted and concretises these examples with secondary, urban Global South case studies, interlacing aforementioned theoretical considerations in each examination.

4.1. Key Determinants of the Impact of AI on Sustainable Urban Development in the Global South

4.1.1. Presentation of Results

The thematic map below synthesises the principal themes that emerged from the primary, semi-structured interviews conducted with AI technologists and academic researchers, encompassing the key determinants of the impact of AI on sustainable urban development in the Global South as the Fourth Industrial Revolution develops. Based on rigorous inductive analysis, these themes have been coded as follows: Efficiency, Access, Representation, Privacy, Experimentation vs Regulation, and Agency.

Figure 4: Key Determinants of the Impact of Artificial Intelligence on Sustainable Urban Development in the Global South: A Thematic Analysis. (Image by Author)



In summary, the notion of ***access*** refers to the question of which urban stakeholders can harness the benefits of AI in the context of the digital divide. Whilst both corporate AI technologists and Scholar 3 acknowledged AI's potential for urban challenge resolution, each participant emphasised that *access* to these are dependent on adequate digital infrastructural provision and equitable ***representation*** of urban demographics within the datasets upon which AI is trained.

In addition, the theme of *representation* was referred to regarding the possibility of the linguistic diversity of urban AI tools and, thus, enhanced digital inclusion in the age of AI. The localisation of AI research and innovation was also emphasised by participants to foster such representation, bridging not only urban inequality but also the 'AI divide' between the Global North and South more broadly. Nonetheless, it was emphasised that *representation* should not come at the cost of ***privacy*** regarding data collection. *Privacy* was also referred to in relation to AI-enabled surveillance, subsequent profiling, and thus human rights challenges in terms of anonymity, urban behaviour, and the democratic right to protest.

The conflict between ***experimentation*** and ***regulation*** was also evident within both samples. To elaborate, *experimentation* was deemed by Corporate AI Technologist 2 as means to facilitate urban innovation and unleash the full potential of AI tools for sustainable urban development in the Global South. In contrast, local and global *regulation* was prioritised by scholars as a means to ensure ethical oversight and maintain human ***agency*** long-term.

Given the semi-autonomy of AI and its self-learning capabilities, *agency* was emphasised by all participants as a means to remain in control of the 'coming wave'. For example, participants referred to transparent AI practice in relation to explainability, intentional urban decisions, opportunities for public debate and contestation, and the complementation of human qualities, such as empathy, with machine ***efficiency*** as means to drive sustainable urban development in the age of AI.

Finally, AI was lauded by technologists for its *efficiency* in terms of the optimisation of urban service provision and the sustainability of manufacturing processes. Nonetheless, *access* to such efficiency was deemed to be dependent on the quality of digital infrastructure and one's socio-economic status in the urban Global South.

With these determinants in mind, this section explores the above latent and semantic themes in reference to the expertise shared during each interview and represents how views differed and converged under each organising theme.

4.1.2. Theme 1: Efficiency

In terms of urban sustainability, corporate AI technologists advocated its usage for the optimisation and, thus, efficiency of both environmental and citizen services.

For example, Corporate AI Technologist 2 noted AI's potential for more efficient energy usage in technological manufacturing processes:

- *Beyond our own commitments around sustainability […] it is investing in projects where we can use AI to be more efficient and more effective, using it in applications and uses that provide either greater efficiency or productivity or purely manufacturing capabilities.*

In addition, Corporate AI Technologist 2 referred to the possibility of more efficient citizen service provision:

- *I think there's lots of opportunities. So, prosperity, healthcare, […] putting in new sources of organisation, economic development in new regions, healthcare services, really advancing climate science, renewable energy, really trying to find ways to drive efficiency and efficiency in terms of energy usage.*

Nonetheless, Scholar 3 alluded to the risks that AI's materiality poses to truly efficient energy consumption in the context of the energy crises in African cities:

- *Most African cities […] they already have an energy crisis. So you have this data centres that are pouring data in but the challenge is […] [their] energy footprint.*

Moreover, Scholar 1 remained sceptical of corporate AI discourse in relation to sustainability, arguing:

- *The majority of claims for AI in relation to sustainability are based on big hypotheses and/ or simulations along the lines of "if we develop this technology, then perhaps we'll be able to do this." Or "AI might be able to help us decrease emissions of different urban systems." Or "we have this simulation that shows us that if we do this*

then perhaps this will happen." So, they are very hypothetical in literature and I haven't seen any very strong piece of evidence that shows this has been done with AI and this has been positive. I haven't seen that so that's why I remain sceptical.

In contrast, corporate AI technologists expressed that the synonymity of AI with urban challenge solution is customer-led.

For example, Corporate AI Technologist 2 noted:

- *If you go back to the introduction of ChatGPT, the big pivot was everybody is trying to come with AI as the solution to their problem. Before that, the discussion was, how do we solve the problem? What sort of techniques can we use? Which may have been a lot of things. It could've been modelling and simulations, it could've been data analytics or AI, and that's probably been the biggest pivot in the last year and a half or so.*

This implicitly refers to an increasingly prevalent culture of pervasive AI solutionism that ignores the diversity of other technological - and even non-technological - support available to foster urban sustainability.

Similarly, Corporate AI Technologist 1 expressed:

- *Anyone adopting an AI solution I always ask, is that what you really need? I mean, first of all, I think, is that a real problem? And then, is AI the right solution to your problem or is there some easier way to do it? And, finally, do you have the right data? And that's why I talked about all these systems that are AI per se but if you don't have digital IDs or if you don't have people attached to a digital banking system then there's a lot of things you can't do.*

4.1.3. Theme 2: Access

The capacity of Global South cities to harness the positive opportunities that may arise from urban AI were found to be primarily dependent on access. Whilst this paper has noted the global 'AI divide' thus far, scholars and suppliers alike honed in on more local disparities in digital literacy, infrastructural capabilities, and data equity within urban populations.

For example, Corporate AI Technologist 1 noted the following:

- *Why is there such an asymmetry in access? It's nothing specific to AI - it's asymmetry in access to technology, it's asymmetry in access to resources, it's asymmetry in access to advanced education and science. All of these are longstanding capacity building things that are much broader than AI.*

In this quote, Corporate AI Technologist 1 refers to the socio-technical ecosystem in which AI resides. They emphasise that AI itself is not the driver of inequality, but rather pre-existing social injustice and digital divides that are directly affecting the capacity of Global South urban populations to access the potential advantages of AI for sustainable development.

The relationship between infrastructural access and inequality was emphasised within the academic sample too. For example, Scholar 3 highlighted this challenge in the African context:

- *It basically boils down to access. […] The penetration of the Internet in Africa is not equivalent to the Global North, even the cost of Internet access is actually very high. So this means, […] the ability to access resources that are AI-powered, is actually very low and it also impacts their ability to utilise the resource of AI.*

Here, Scholar 3 highlights the digital divide and asserts that access to AI-enabled sustainability solutions is primarily dependent on an infrastructural foundation that is currently not in place in many African cities.

Scholar 3 also reiterated the challenge of inequitable digital access:

- *A more alarming problem is […] the issue of equity because AI is not benefiting everyone directly, right? It may also benefit some segments of the group more than others, particularly those with access to the technologies.*

The notion of inequality was asserted by Scholar 1 too, who reiterated:

- *AI is already exacerbating pre-existing divides within the same city in terms of resources, in terms of income, in terms of gender, race […] literature is showing that AI is reproducing injustice and existing divides.*

In summary, these findings reveal that, whilst AI shows potential to enable benefits to the prosperity of urban citizens and environments, access to its advantages are not universal and are, thus, inextricably dependent on social progress in challenges such as bridging digital inequity.

4.1.4. Theme 3: Representation

The overarching theme of representation was explored by scholars and technologists under the following four sub-themes: Data Equity, Local Research, Local Innovation, and Language.

For example, Corporate AI Technologist 1 summarised the data and representation paradigm as follows:

- *One of the things we talk about is who's represented in datasets because if you're not represented in datasets, AI will never reflect you.*

Later on in the interview with Corporate AI Technologist 1, they paralleled the case of Jackson, Mississippi's Water Crisis in 2022, which left 150,000 residents of the city without water, with the conditions of some Global South populations, evoking the sub-theme of data equity and its impacts on disaster risk management in particular:

- *There is no data so AI is never going to help these people because AI doesn't even know they exist - there's no digital data. I mean, I know they exist because there are stories and interviews, but there is no digital footprint associated with these people so I think that's one of my biggest worries, it's ensuring that, whatever we build AI on and however we implement the outcomes that AI produces, we recognise that those digital access questions and digital representation questions and [are] proactively cognisant of that.*

In addition to data availability, participants also expressed a need for local innovation and research to ensure representative AI in the Global South. For example, Corporate AI Technologist 2 put forward the following question:

- *Local innovation […], that's a place where the South could particularly really benefit. In the Middle East - Saudi, Kuwait, the Emirates - they've done a fantastic job in creating the incentives and agenda around innovation. They have a lot of capital so it's a little bit different, but it's a question of - how do you create centres and zones of innovations?*

Moreover, the need for local innovation and particularly linguistic inclusion was echoed by Corporate AI Technologist 1, who asserted:

- *One of the challenges is having models that are in their native languages. I think, certainly, in India, there's Hindi models that people are investing heavily in. What's interesting is […] that in the Arab Emirates I think G42 and other entities are actually starting to look at African languages and see integrating African languages into their models as a way of extending their influence […] I think this is something that the Global South might want to be aware of, or might want to start to reckon with. It's, how do they start to build up kind of sovereign capacity so that they're not necessarily dependent on some countries?*

That being said, Scholar 3 acknowledged different priorities in urban challenges in the Global South as a key factor to disparities in research regarding smart cities:

- *When it comes to the critical issues that are happening in Africa, smart cities is not one of the top because there are […] more pressing issues that researchers and practitioners are busy with. You have a serious housing crisis, […] you still have issues of slums, the basics that actually, even when funding comes, it actually goes to those areas. So, when it comes to smart cities people say it's more of a 'middle-class thing' because it doesn't really consider the most critical issues. […] That's why you'll find more research on smart cities can happen in the Global North because it's one of the top priorities for each of the governments […] and when you compared that with African countries, it's also a difference where the smart cities agenda ranks.*

In summary, the question of representation evoked not only themes of social inclusion in the urban space but also the role of institutions in driving research and innovation to proactively address AI inequity.

4.1.5. Theme 4: Privacy

The theme of privacy was omnipresent throughout discussions with research participants, representing a point of tension for most participants when understanding AI in relation to sustainable urban development in the Global South.

For example, Scholar 2 reflected on their concerns regarding how AI-enabled surveillance infrastructure for the securitisation of the urban space may residually reshape urban behaviour, political participation, spatial dynamics, and the possibility of urban anonymity:

- *If urban spaces are constantly monitored, then I think that will have an impact of how they are used and […] that's not good for urban inclusion. I think a lot of the benefits of the urban space have been the ability to meet people anonymously, do different things and explore different areas but I think this totally erodes this possibility […] I think that's my big worry. The ability to be anonymous within a city is gone and that has really big impact not only on urban inclusion but also political participation or people's ability to develop their identity. I think that's potentially a really profound shift.*

Similarly, Scholar 1 also raised concerns about AI's impact on privacy and urban behaviour, as well as potential tensions that may arise from urban public-private partnerships:

- *AI is changing the way we are starting to understand privacy - which may not seem like a big deal today but in five, ten years this is going to really influence what we believe is private - in terms of behaviour and life - and what is not. Imagine the case in the near future [where] what happens inside our domestic spaces is still private but outside […] what happens in public spaces is in the domain of NEOM or Google, [for example].*

Moreover, Scholar 3 contrasted Global North and Global South urban governance frameworks regarding privacy rights, explaining:

- *You find that in the Global North […] they have very strong governance frameworks to govern the use of AI, the use of data, and privacy issues. But that's not the case […] with African governments. So you find that kind of variation and I think it has a very significant impact.*

Despite recognising privacy concerns in relation to data, both Scholar 1 and Corporate AI Technologist 2 acknowledged perspectives regarding the optimisation of urban services, implicitly acknowledging and dismantling Euro-Americentric notions of privacy.

For example, Scholar 1 stated:

- *That's not really an issue in China. Chinese citizens seem to be ok with that by and large. Of course, there are exceptions, but […] one of my PhD students is from China and he's ok with that. He really trusts the government and he doesn't mind sharing his information with the government via AI. For example, his point is that it has benefits, for example, in the health sector and even if the same information ends up in the government's server according to him the benefits outweigh the privacy issue and, again, I respect his position.*

Similarly, Corporate AI Technologist 2 noted:

- *Somewhere like Singapore where they have healthcare systems and they own the data […] the value of the service they can provide for citizens is really high […], in terms of care or even throughout the pandemic. So, there's new sources of value exchange and we need to be open to that.*

In contrast, Scholar 2 shared the following caveat regarding data collection in relation to privacy more broadly:

- *The question is, what data do you need to make a city run more sustainably? Now, you probably don't need personalised data. You need to be more intentional about what you collect and how you collect it.*

In summary, the theme of privacy in relation to AI echoed broader scholarly and popular conversations regarding the impact of digitally-enabled surveillance infrastructure on urban inclusion. The privacy and AI paradigm represents a double-edged sword in terms of urban social sustainability. On the one hand, AI can contribute to urban safety, as emphasised by Corporate AI Technologist 2, and urban service provision. On the other hand, access to the benefits of such security in the urban space is dependent on the way in which you are profiled by AI systems, thus representing the crux of urban surveillance in relation to bias and inequality.

4.1.6. Theme 5: Experimentation vs Regulation

The interviews revealed tension between experimentation and regulation.

On the one hand, scholars noted the need for the construction and enforcement of regulation to control AI's impact on urban spaces, manage public-private partnerships and, thus, ensure social inclusion. On the other hand, corporate AI technologists, whilst acknowledging the importance of regulation, emphasised the need for flexibility within its development in order to allow for experimentation and, thus, iterative policy construction, flexibility and unstifled innovation.

For example, Scholar 2 argued:

- *I think there needs to be a much more intentional approach to AI instead of it being an experiment and seeing what happens. I think, in a city, that's not a good idea. I think that's where a lot of the frameworks have settled at the moment, to allow experimentation.*

In addition, Scholar 1 expressed:

- *It should not just be about implementing regulation but about enforcing regulation.*

In the African context, Scholar 3 highlighted the challenge of unregulated innovation:

- *I think the kind of start-ups we have are not the kind of traditional companies that existed like the traditional banks or technology companies. We have a lot of start-ups that are booming because there's no framework of regulating the activities and you have a lot of innovation that you don't know how to regulate.*

In contrast, Corporate AI Technologist 2 recommended an iterative approach to policy construction that allows for flexibility, as well as the possibility of current laws to ensure the safe deployment of AI:

- *Enforce the laws we have is the first one and the second I think […] limit regulation to what I would say are mature areas that are clearly defined […] then the third is, when we do, regularly provide the flexibility to revisit this technology as technology*

evolves because it's very hard to anticipate in five or ten years what this will look like versus where we are today.

When referring to movements to pause AI, Scholar 1 emphasised the need for context, challenge and tool-specific regulation, arguing:

- *I don't believe that it will be a black and white situation - meaning yes to AI no to AI - it should be a more nuanced decision. It should be yes to some kinds of AI and no to some kinds of AI, depending on context and the specific local challenges that the city is experiencing.*

Similarly, Corporate AI Technologist 2 warned against extreme regulation, highlighting security implications as a potential consequence:

- *I think pausing it is a very naïve recommendation. First of all, if you pause it, the places where it will be used is in nefarious areas because the technology is already available so it'll just be used for nefarious and illegal activities. I think for security or governance, it's really important.*

4.1.7. Theme 6: Agency

Artificial intelligence is characterised by its capacity for automation and self-learning capabilities beyond human programming that render it agentic. In response to this capability, the notion of agency was highlighted by all three scholars. Whilst the tool itself may operate autonomously, it was concluded that AI's deployment and implementation in the urban space is ultimately human-led at present, allowing us agency to manage its outcomes in the Global South.

For example, Scholar 1 stated:

- *The good news is that, although AI operates autonomously, we humans are very much responsible for its development and deployment meaning that AI doesn't enter our cities unless policymakers decide that is going to be the case.*

As such, Scholar 1 recommended that AI should be limited for uses that require empathy-driven, ethical decision making, arguing:

- *We should limit the use of AI in domains where the choices that we make or the choices that AI will be making are very, very, very intense in terms of their ethical charge. For example, the choice of distributing mortgages, the choice of distributing health insurances, […] you can easily identify those kind of choices so, when ethics become very prominent, you should limit AI, if not entirely remove it. Similarly, in planning, deciding how we're going to redevelop a city, if we're going to develop more social housing or not or if we need more public infrastructure for cycling. Those choices that require more empathy with humans […] should be left to humans.*

In addition, Scholar 3 raised the latent theme of digital literacy as a means for agency and citizen-centric AI deployment, arguing:

- *Citizens themselves, they also have to know what they are getting into. […] How good are they as digital citizens? Do they know their rights to data and […] the right to*

participate? […] It can also be encouraged and promoted by having other actors who can facilitate community awareness. You may find citizen organisations that can actually propel that. So, I think it also comes in a little […] collective action among the authorities and the social society and sort of creating an awareness in terms of digital citizenship because it's something that is also a big challenge at the moment. Citizens, they may not know […] what they can do with the technologies, and they may not know their concept regarding data.

4.2. Key Applications of Artificial Intelligence for Urban Sustainability in the Global South

In summary, four key urban services were most commonly referred to by scholars and technologists as potential areas for AI's urban impact: Urban Planning, Citizen Services, Security, and Disaster Risk Management.

With this in mind, this section interweaves the principal urban AI applications illuminated in primary interviews with secondary, empirical case studies that demonstrate their social and environmental implications for cities in the Global South.

Given the early stage of AI implementation in the urban space, it is important to reiterate that some of these case studies (i.e. DRM in Patna, Reforestation in Rio de Janeiro, and Tree Mapping in Dar es Salaam) are *experimental* in essence. Nonetheless, given the aforementioned foresight that indicates the future proliferation of AI in the urban space (UN Habitat & Mila, 2022; Suleyman & Bhaskar, 2023; Cugurullo et al., 2023), each case has been examined with rigour to give an indicative sense of AI's impact on sustainable urban development in the Global South.

4.2.1. Urban Planning

In their interview, Scholar 3 referred to the potential AI offers to promote "evidence-based planning" and, thus, sustainable urban development in the Global South.

From an environmental perspective, this possibility can be best demonstrated by the use of AI to rewild the urban space in Rio de Janeiro, Brazil and Dar es Salaam, Tanzania.

For example, Rio de Janeiro suffers from decreasing biodiversity, extreme heatwaves, flooding, and landslides as a consequence of climate change (Morfo, 2024). In response to these challenges, a public-private partnership was formed between Rio de Janeiro's city council and the company Morfo to reforest Rio. Using forest engineering, computer vision, and drone technology, Morfo has been able to closely analyse soil and native plant species and safely disperse seed capsules 100 times faster than humans into 50 hectares a day of dangerous, inaccessible terrain for humans (Reuters, 2024).

The positive environmental implications of AI are not just confined to the Brazilian context. For example, in Dar es Salaam, deep learning algorithms have been applied to satellite imagery to map the city's trees, understand their health and distribution, and advocate the use of nature-based solutions to combat urban environmental challenges (Jones, Deparday, & Cowan, 2022). Through harnessing AI, the researchers also discovered that trees cover more than 20% of surface areas in wealthier neighbourhoods and only 0.5% of poorer areas, representing a direct challenge to environmental justice and, thus, highlighting challenges to urban inclusion for the city council to act on (Jones, Deparday, & Cowan, 2022).

If one were to consider the urgency of the climate crisis, its disproportionate impact on marginalised populations in the Global South (United Nations, 2019), and the productivity of AI-powered reforestation tools, these applications can be seen as *efficient* methods to foster environmental sustainability due to their speed of deployment, technical precision and detailed analysis, thus tying into the first organising theme of this paper's thematic data map. In addition, the mobilisation of human-AI teaming (HAIT) to realise the objectives of these projects indicates the possibility of human *agency* when using urban AI for environmental purposes. Nonetheless, it is important to note that *access* to equally advanced and *efficient* environmental advantages in other urban contexts is dependent on the quality of the datasets upon which climate AI is trained and, thus, data equity (Jones, Deparday, & Cowan, 2022).

From a social perspective, AI has the potential to be an effective planning tool in the urban Global South when accounting for spatial access in some contexts. For example, Project Sidewalk uses remote crowdsourcing and computer vision in Mexico City to examine the location, functionality, and condition of pavements to promote urban mobility and spatial accessibility for those with physical, cognitive and sensory needs. In addition, Project Sidewalk consciously decided to open their data and source code, facilitating the implementation of similar urban planning tools globally (Choi & Basat, 2022).

As with the environmental examples, this specific application of AI accelerates progress in social sustainability and, thus, unlocks the possibility of citizen-centric urban AI deployment. If one were to consider the thematic data map, the positive outcomes of this application are ensured by human *agency* and *representative* urban planning, encompassing the ethos of 'AI for Good'.

Nonetheless, this is not to say that all applications of AI for urban planning can be deemed uncontroversial.

For example, City Brains have been deployed at a large scale in collaboration with Alibaba across urban China as a means for anticipatory governance, operating as follows:

- "The ET City Brain system gathers large amounts of data (including logs, videos, and data stream) from sensors. These are then processed by algorithms in supercomputers and fed back into control centres around the city for administrators to act on—in some cases, automation means the system works without any human intervention at all." (Grobbink, Mulgan & Straub, 2024).

Figure 5: "100 feet view of the City Brain." (Zhang, et al., 2019)

In terms of applications, City Brains are used in 22 Chinese cities to realise the following urban tasks: traffic management, policing, and strategic planning (Zhang, et al., 2019). There is statistical evidence that City Brains can be *efficient*. For example, this mechanism is used

to detect accidents and autonomously modify traffic lights to ensure uninterrupted emergency responses in Chinese cities, improving ambulance arrival times by 49% (Grobbink, Mulgan & Straub, 2024). In addition, City Brains are used in response to environmental risks, reshaping traffic signals in anticipation of extreme weather events to enhance civic safety.

If one were to revisit the thematic data map, City Brains seem to enhance *efficiency* and *access* to optimised urban services, converting urban management from a reactive to proactive process. Nonetheless, within the Chinese context, its usage of sensors and Facial Recognition Technology may further contribute to mass surveillance in successive versions of the system (Andersen, 2020) and, thus, further compromise political freedom in the state, challenging urban privacy and anonymity.

As China seeks to export this tool to other cities in the Global South, such as Kuala Lumpur in Malaysia (Beall, 2018), it is thus important to also assess the impact of AI-powered anticipatory governance tools on sustainable urban development and critically question the transparency of urban AI deployed under the guise of *efficiency* in terms of human rights within more authoritarian political contexts.

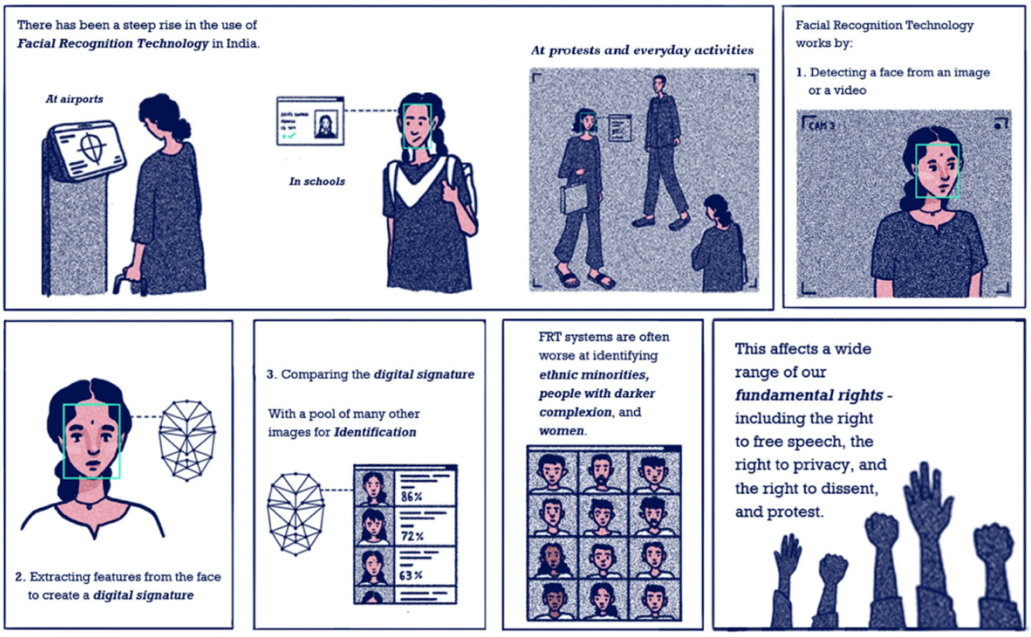
4.2.2. Security

Both Scholar 2 and Corporate AI Technologist 2 referred to the increased usage of AI for urban security, a key indicator for SDG 16 regarding 'Peace, Justice, and Strong Institutions'.

The most striking and mature case of AI deployment for urban safety is the use of Facial Recognition Technology (FRT) in surveillance technologies. In summary, FRT uses computer vision to detect faces, analyse facial geometry and expressions, and recognise matches in line with government-issued ID, social media profiles, police databases and publicly accessible resources such as newspapers (Amazon Web Services, 2024; Amnesty International, 2021).

Whilst the use of the technology is pervasive across the Global North and South, this paper has selected the following cities as case studies due to the polemical status of this application in each context: Hyderabad, India and Johannesburg, South Africa.

Figure 6: "Ban the Scan, Hyderabad." (Amnesty International, 2021)



With 600,000 cameras across the city and over 60% of the surface area of some neighbourhoods being covered by FRT-powered surveillance technology, Hyderabad has been referred to as one of the most surveilled cities in the world (Amnesty International, 2021). As detailed in the image above, produced for Amnesty's global 'Ban the Scan' human rights campaign, the use of FRT in Hyderabad is controversial due to empirical evidence of its contribution to discriminatory policing towards Muslims, Dalits, Adivasis, and Transgender communities, as well as those with darker complexions. Whilst the technology has only been shown to have 2% efficiency for the correct identification of crime perpetrators in some Indian cities (Amnesty International, 2021), its usage is becoming increasing prevalent across urban India for both predictive and reactive policing. This poses a direct threat to urban inclusion because it exacerbates the risk of unfounded profiling for marginalised demographics by the police, thus threatening spatial access, freedom from discrimination, and the democratic right to protest.

Similarly, in Johannesburg, AI surveillance is also growing in prominence. However, in contrast to the government-led FRT initiatives in India, residents of some Johannesburg neighbourhoods find themselves subject to entirely privatised AI-powered surveillance infrastructures (Hao & Swart, 2022), as indicated in the images below. The privatised nature of FRT deployment in the South African context renders this case even more problematic because of a lack of regulation that diminishes ethical oversight and corporate accountability (Provost, 2017), disproportionately compromising the rights of marginalised demographics, criminalising them under the guise of increased 'security', and thus limiting urban mobility and spatial inclusion.

Figure 7: "South Africa's private surveillance machine is fuelling a digital apartheid." (Hao & Swart, 2022)

For example, given FRT's algorithmic bias and its predominant deployment by residents of so-called "white enclaves" in Johannesburg, Black South Africans are disproportionately surveilled by these privatised infrastructures (Hao & Swart, 2022). As such, some critics, such as Hao and Swart (2022), even go as far as to argue that the impact of advanced AI surveillance mechanisms is reminiscent of the apartheid-era, asserting that:

- "In South Africa, where colonial legacies abound, the unfettered deployment of AI surveillance offers just one case study in how a technology that promised to bring societies into the future is threatening to send them back to the past."

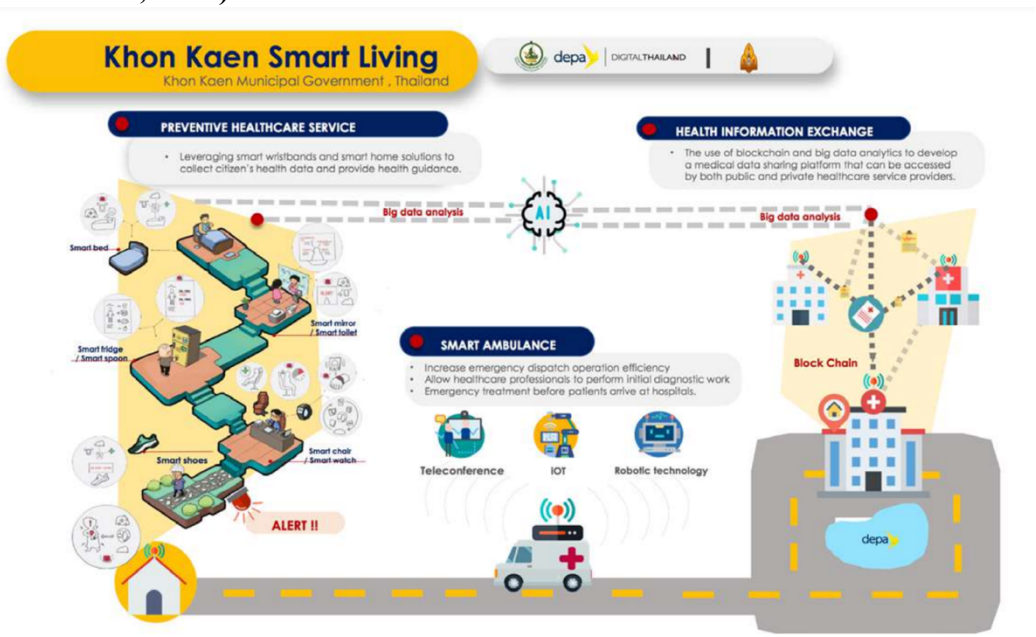
In summary, this application of AI represents a fundamental challenge to human rights in the urban space, compromising all six determinants of AI's impact deduced in this paper's thematic data map. For example, in terms of *privacy*, the emergence of FRT compromises the possibility of urban anonymity, political participation, and urban inclusion, evoking so-called "chilling effects of AI" referred to by Scholar 1, such as self-censorship and behavioural change (Penney, 2021).

4.2.3. Citizen Services

Corporate AI Technologist 2 referred to the potential AI unlocks for citizen service provision in the urban space. In the Global South, this application can be best exemplified through the integration of AI in healthcare, as also explored by Scholar 1.

For example, in the Thai city of Khon Kaen, AI is being used in collaboration with other technologies to improve the health of its elderly population, tackling non-communicable diseases (NCDs) such as diabetes and hypertension (Godoy, Hartmann, & Hanswillemenke, 2021). As demonstrated in the image below, the Khon Kaen Smart Health model harnesses technology to ensure preventative healthcare, *efficient* information exchange, and smart ambulances (UN Habitat & Mila, 2022), alleviating the pressure of urban population density to healthcare systems (WHO, 2021) and, thus, directly contributing to the achievement of SDG 3 regarding Good Health and Wellbeing.

Figure 8: "Khon Kaen Smart Living Initiative." (Godoy, Hartmann, & Hanswillemenke, 2021)



To achieve these objectives, IoT medical and non-medical devices are used to measure elderly health from home, health records are stored in a Health Information Exchange (HIE) system, and smart ambulances are equipped with tools for health monitoring. In addition, data gathered from IoT devices are analysed using AI to predict health outcomes and personalise medical recommendations regarding diet, sleep and physical activity to prevent and manage NCDs for elderly urban residents.

The outcomes of this case study have been positive so far due to the increased *agency* of elderly urban citizens regarding their health. For example, Khon Kaen citizens reduced their salt intake, increased their physical activity, and achieved lower levels of blood pressure and sugars. That being said, digital literacy has proven challenging for not only elderly citizens but also health professionals, posing a direct challenge to the determinant of *access.*

Moreover, in Buenos Aires, AI is being mobilised by the city government to provide an extensive range of urban services through the vessel of 'Boti', a chatbot designed to increase dialogue with its residents (OECD, 2023). The system works as follows. First, users have the option access information and support from an AI-powered chatbot on WhatsApp. If AI is unable to solve the query, users are then offered the possibility of speaking to a person. Boti can be used to *efficiently* act on concerns ranging from tree pruning, waste collection, urban gardening, and urban mobility to Covid-19 detection, social care, addiction and gender violence (OECD, 2023).

With 5 million conversations carried out monthly and a 90% average satisfaction rate (OECD, 2023), Boti shows great promise in proactively supporting sustainable urban development due to its promotion of participatory governance, deliberative democracy, and increased civic *agency* in shaping the spatial, environmental, and social future of Buenos Aires. Nonetheless, *access* to the advantages of AI-powered citizen services is, again, dependent on digital literacy, reiterating the notion of digital divides and asymmetry in digital competence referred to by Corporate AI Technologist 1.

4.2.4. Disaster Risk Management

In the Global South, cities are vulnerable to environmental disasters due rapid urbanisation and population density, unplanned and informal development, complex and unequal social dynamics, and the decline of ecosystems that once facilitated nature-based solutions (UNDRR, 2023).

In response to this challenge, AI seems to unlock immense opportunities for disaster risk management (DRM), as revealed by both Corporate AI Technologist 1 and Corporate AI Technologist 2. Nonetheless, it is important to note that perceived outcomes of IoT and HPC in this context are currently speculative (Yigitcanlar et al. 2020; Ghaffarian, Taghikhah, & Maier, 2023; Bari et al., 2023).

That being said, early outcomes of AI for disaster risk management seem promising. For example, machine learning is now used across South Asian cities for flood forecasting due to the success of Google's pilot in Patna, India, a city notorious for its propensity to flooding (Matias, 2024). In summary, Google's forecasting mechanism integrates historical precedent, terrain analyses, and river level readings from across the world to ensure localised, anticipatory readings and action up to seven days in advance of floods, including in regions that are data scarce and vulnerable. As a result, 65% of Patna's residents were able to take action to protect themselves in the lead up to floods during the pilot (Kahn, 2020). This

represents an enormous opportunity for sustainable urban development because it reduces uncertainty and, thus, enhances social resilience and ensures anticipatory protection of infrastructure (Curtis, Athas, & Machio, 2024).

Nonetheless, whilst this is impressive, one must question the reason 35% remained inactive. In their case study, Google alluded to the model's limited linguistic diversity as a reason for this gap, supporting Corporate AI Technologist 1's aforementioned notion of linguistic inclusion. In response to this challenge, the organisation is currently working on programming the system in 9 local languages, as well as visual communications (Kahn, 2020), to bridge challenges to inclusive AI outcomes for DRM. In addition, based on this paper's thematic map, one can also infer that this challenge may also be linked to reduced digital literacy and *access* amongst marginalised populations due to Google's use of phone alerts and digital systems for forecast notifications.

As AI tools are increasingly sought for other disasters in the urban context, such as earthquakes, wildfires, and hurricanes, it is thus not only important to ensure that mechanisms are robust and accurate but it is also vital to promote the citizen-centrism and *representativity* of AI tools to facilitate sustainable urban development, bridging digital divides and enhancing *access* to promote *agency* and *efficiency* in response to disasters. If not, AI-centred DRM strategies run the risk of exacerbating disparities in disaster preparedness, response, and recovery and, thus, reinforcing urban inequality.

Chapter 5: Discussion

In light of this study's findings, this paper now seeks to bring each determinant of AI's impact on sustainable urban development in the Global South and the case studies illuminated into conversation with the literature reviewed in Chapter 2, as well as broader theorisations within urban studies, to address this paper's research questions.

As indicated in the Literature Review, AI's capacity for ***efficiency*** is at the heart of corporate advocation for the employment of its technologies in the urban space. Similarly, Corporate AI Technologist 2 also referred to the technologies' "efficiency" and, thus, "productivity."

In correlation with such discourse, this paper's case studies demonstrate the early potential of AI for optimising urban services on a functional basis and, thus, facilitating urban governance. For example, AI holds the possibility to ensure faster responses to challenges faced by residents of Global South cities, as seen by the capabilities of AI for DRM, City Brains for improved ambulance responses, and 'Boti' for participatory governance. In addition, from an environmental perspective, AI unleashes potential for urban climate action beyond human capabilities, as demonstrated by the use of AI for reforestation in dangerous terrain in Rio de Janeiro and for proactive - rather than reactive - DRM in Patna. Given the rapid growth of Global South cities, the climate emergency, and, hence, increased pressure on urban services to support populations, the possibility AI unlocks for speed, productivity, and thus efficiency seems desirable in terms of urban development, at least at first glance.

Nonetheless, to assess the impact of the acceleration of urban processes on *sustainable* development, this paper thus deems it necessary to dissect the notion of urban efficiency more critically.

On further research, this author encountered Datta's (2021) conceptualisation of 'fast urbanism,' defined as the "management of speed and efficiency that is the cornerstone of new urban developments in a digital age" driven by the state-corporate-expert nexus and governed by digital infrastructure (Datta, 2021). Datta (2021) criticises such speed in the Global South context, arguing that "instant urbanism" and technology-led "quick fixes" are being "deployed faster than the social changes can keep up with," thus "destabilising the economy, society, and environment" and reinforcing social exclusion for the urban marginalised.

In terms of urban AI, the technologies' speed and efficiency is indeed desirable in terms of proactive climate action. Nonetheless, one cannot ignore the possibility of its carbon and water footprint to "destabilise" the environment. Whilst section 1.3. and Chapter 2 revealed scholarship that interrogated AI's climate impact in depth, there were no statistically-backed accounts of the true planetary consumption of the lifecycle of the specific AI tools analysed in this paper's case studies, especially in the context of AI start-ups. Given the disproportionate impact of climate change on the Global South (United Nations, 2019), the increasing consumption of cities as they grow in population, and the expansion of data centres into the urban Global South, the environmental applications of AI risk becoming merely symptomatic and, thus, inefficient in terms of sustainable urban development if the root causes of the environmental crisis are not addressed.

Similarly, technology-driven urban speed is unsustainable from a social standpoint. To put this into context, it is useful to refer back to Scholar 1's example of AI's usage for automating the distribution of mortgages and health insurances. Whilst AI certainly streamlines such

complex processes, speed risks the unfair allocation of urban resources based on gender and race due to the lack of ***representation*** in datasets and, thus, algorithmic bias, as similarly indicated by Criado Perez, Smith and Rustagi in the Literature Review. In addition, the use of AI risks the desensitisation of service provision, thus reiterating the need for the prioritisation of empathy-driven decision-making advocated by Scholar 1 and broader urban debates challenging "data-driven models that delegate critical, often ethical decisions to the machine" (Mattern, 2017). If AI is employed to automate the stratification of urban society in terms of service provision, the technology runs the risk of exacerbating pre-existing divides in Global South cities, reinforcing inequality, and thus compromising the achievement of SDG 5, regarding Gender Equality, and SDG 10 for Reduced Inequalities.

It is important not to forget that humans too hold bias and that the discriminatory practices carried out by AI are, thus, simply reproductions of pre-existing challenges to social justice in the urban space. Nonetheless, AI-driven injustice further complicates its deconstruction due to the complexity of attributing true accountability regarding AI outcomes, clouded transparency and explainability in decision-making processes, and the subconscious assumption of AI's impartiality in popular imagination given the inanimate nature of technology.

With this in mind, this thesis argues that increased efficiency in service provision from a top-down perspective does not equate to planet-centred, people-centred and, thus, sustainable AI application. Referring back to Datta's paper, urban efficiency is limited by the digital divide and the impact of inequitable infrastructural ***access*** in the Global South. As argued by Corporate AI Technologist 1, access to the advantages that AI offers for urban challenge resolution is entirely dependent on data equity, digital literacy, online connectivity, and linguistic representation in AI models. If these foundations are not in place in the Global South, the increasing digitalisation of urban services runs the risk of fragmenting society and service provision in terms of technological competence and, thus, exacerbating inequality and reducing civic agency in the age of AI.

Whilst the notion of access was not addressed in relation to AI in the literature reviewed, similar phenomena have been highlighted in wider urban scholarship regarding infrastructure. For example, in *Splintering Urbanism*, Graham and Marvin (2001) argue that, despite infrastructure acting as a mediator for urban "flow, movement and exchange," modern, digitalised cities hold "premium networked spaces" that reserves quality infrastructure to affluent socioeconomic groups for the interconnection of "powerful areas," marginalising the underprivileged in turn and, thus, fragmenting the urban space into "patchworks of unbundled networks" (p. 189).

As indicated by this paper's findings, inequitable digital infrastructural provision reduces the capacity for inclusive access to the more positive environmental applications of AI, such as for DRM, compromising the possibility of environmental justice. Moreover, disparate urban infrastructure risks the exacerbation of spatial exclusion and inequality and, thus, pre-existing social divides, as demonstrated by Johannesburg's privatised, AI-powered surveillance employed by the city's most affluent residents.

In addition, the pervasive nature of AI-driven urban surveillance and, thus, reduced ***privacy*** and anonymity in the urban space may lead to gradual behaviour change amongst citizens, echoing the arguments of Scholar 2. This represents a concern because it not only reduces the ease of urban engagement for marginalised populations on an emotional level but it also has

tangible systemic effects on other aspects of urban life in the Global South, such as inclusive political engagement and assembly. In academic discourse, the impact of AI-powered surveillance on urban behaviour has been analysed through the theorisation of so-called "chilling effects," defined as the impact of "individuals [modifying] their behaviour due to concerns about surveillance, and the potential consequences that may follow if their behaviour is observed" (Murray, 2024, p. 149). From a human rights perspective, these impacts may manifest themselves into self-censorship, restricted expression, and reduced political engagement (Murray, et al., 2023) in the urban Global South.

Despite the validity of these scholarly concerns, it is important to assess whether this impact is the direct consequence of the emergence of AI or the existing challenges of urban surveillance in more repressive political systems in the Global South. Whilst this paper's argument aligns more closely with the latter, AI does nonetheless further complicate existing urban surveillance challenges from a human rights perspective. This is due to FRT's propensity to gender and ethnic bias, subsequent inaccurate detection of perpetrators, usage for predictive policing, and thus exacerbation of urban inequality and spatial inclusion.

Given the early stage of AI deployment in the Global South and the polemical status of the technology's early outcomes, the tension between ***experimentation and regulation*** in the urban space was addressed by scholars and technologists alike.

In the academic discourse reviewed in Chapter 2, the notion of experimentation was analysed with similar criticality, thus correlating with this paper's findings. For example, Van Wynsberghe (2021) warned that AI is a "social experiment conducted on society" (p. 217). Moreover, urban scholars, such as Yigitcanlar (2023) and Cugurullo (2023), argued that the urban space is the locus of AI experimentation due to its extensive capacity to generate data.

In contrast to cautious academic discourse regarding AI experimentation, Corporate AI Technologist 2 associated experimentation with innovation, asserting that fixing regulation at such an early stage of AI deployment will limit the capacity of urban actors to test the full potential of AI tools. On further research, this paper discovered that the relationship between experimentation and the urban space is encapsulated in existing scholarly discourse too, with Evans (2016) characterising the so-called 'experimental city' as a "laboratory for field-testing new practices, or as a setting for experimental sites" (p. 429). To elaborate, Evans (2016) argues that:

- "this affinity between experimentation and urbanism reflects a longstanding, mutual relationship between science and the city (Evans, 2011). In relation to science, the city has served as both 'a site for' and 'an object of' experimentation" (p. 432).

With this in mind, experimentation is viewed as characteristically urban and desirable in terms of progress in combatting grand challenges such as the climate crisis. Nonetheless, it is important to critically engage with the sustainability of such experimentation in terms of AI and urban development in the Global South. For example, Torrens and Von Wirth (2021) warn against the 'projectification' of urban change processes by the private sector, arguing that it reinforces "short-termism and unambitious incrementalism" (p. 2) and the fragmentation of governance capacities.

Despite such criticism, this paper does concur with Corporate AI Technologist 2's argument regarding experimentation as innovation, especially in terms of the development of

environmental AI tools. Given the urgency of the climate crisis and its disproportionate impact on the Global South (United Nations, 2019), rapid action and innovation should be prioritised to tackle this emergency, as long as tools encompass the mechanisms of 'Sustainable AI' referred to by Van Wynesberghe in the Literature Review. In contrast, from a social perspective, this dissertation's argument aligns with Torrens and Von Wirth's more wary approach to urban experimentation.

With this in mind, this paper asserts that regulation should supersede experimentation in order to maintain human ***agency*** and the rights of urban residents in the age of AI. This is because, as revealed in the Literature Review, urban foresight predicts that "in AI urbanism, we will cede part of our decision-making power to machines" (Cugurullo, et al., 2023, p. 1170) and that it has "the potential to create the autonomous city where human agency might be overshadowed by the agency of urban AI" (Cugurullo, et al., 2023, p. 1171). In line with these projections, this study's scholarly sample also expressed concerns regarding human agency in the age of AI. Nonetheless, Scholar 1 and 2 equally emphasised that this possibility is not inevitable. For now, we humans are still very much in control of how we decide to shape the trajectory of AI's impact of sustainable urban development in the Global South.

Based on the Literature Review, case studies, and primary interviews conducted, this paper thus argues that the impact of AI is entirely dependent on one possibility: choice.

To elaborate, this author would like to cast the reader's mind back to Yigitcanlar's two paradoxical definitions of the Artificially Intelligent City. On the one hand, the scholar depicted a scenario where AI functions as the beating heart of the eco-city, driving sustainable development through accelerating progress in the resolution of economic, societal, and environmental challenges. On the other hand, the scholar proposed a much more dystopian vision of an AI-governed city, in which machines supersede human agency and dominate urban governance procedures.

Given the early phases of AI's development, deployment and regulation in the urban Global South, this author argues that each scenario is equally possible at this stage. As deduced by this paper's research output, the possibility of constructing an inclusive and sustainable urban future for the Global South in the age of AI is thus entirely dependent on how urban governments, AI developers, and policymakers choose to interact with the key determinants illustrated in Figure 4.

Chapter 6: Conclusion

6.1. Key Highlights

This thesis aimed to assess the impact of AI on sustainable urban development in the Global South through examining the following questions: 1) What is the potential impact of AI on urban inclusion? 2) What is the potential impact of AI on urban environmental sustainability? Having conducted primary, semi-structured interviews with scholars and corporate AI technologists, rigorously researched secondary case studies, and deduced the key determinants of AI's impact through the astute construction of a thematic map, this study responds to its principal research questions as follows.

First, in terms of *urban inclusion*, this paper concludes that AI in its current form risks the exacerbation of pre-existing social injustices and inequality in terms of urban service provision and spatial access in the Global South. Whilst the technology does indeed facilitate more efficient responses to the increasing demands of growing urban populations, access to such advantages is dependent on socio-economic status and digital connectivity. For marginalised populations, the current lack of explainability in AI's decision-making, the desensitisation of service provision through automation, and the algorithmic perpetuation of gender and ethnic bias renders the technology unsustainable from a social standpoint.

Second, in terms of *urban environmental sustainability*, AI unleashes extraordinary potential for innovative climate action and, thus, the positive resolution of the most complex environmental challenges facing the urban Global South, such as disasters and decreasing biodiversity. Nonetheless, this thesis concludes that the true sustainability of such innovations will be dependent on the proactivity of AI developers in creatively addressing the concerning carbon and water footprint of AI tools and the enforcement of stronger, planet-centred regulation by law and policymakers.

Given the early stages of AI development, AI deployment in the urban Global South, and, thus, the exploratory nature of this study, it is important to reiterate that the impacts outlined above are based on the *present* nature of the technology and its *current* urban applications. Empowered by the academic foresight contributed by this author and other experts, urban stakeholders, such as city governments, urban planners, businesses, AI developers and citizens, still have the agency to redirect the technologies' sustainable urban development trajectory in the Global South. With this in mind, this author strongly encourages city governments to critically engage with each determinant of this paper's thematic map (Access, Efficiency, Representation, Privacy, Experimentation vs Regulation, and Agency) when assessing the impact of the potential deployment of different AI tools on sustainable urban development in the Global South to ensure a socio-ecologically symbiotic future in the age of AI.

6.2. Limitations

Despite having conducted rigorous research to achieve this paper's outcomes, it is important to acknowledge the potential limitations of this study.

Firstly, there are no studies at present that explore the intersection between AI, sustainable development, cities, and the Global South. Whilst this author is pleased to have contributed to this urgent research gap, this does present a limitation from an academic perspective because this author was unable to validate results against previous findings and contextualise them in light of broader literature.

Secondly, the interview sample is not reflective of the diversity of the Global South. Whilst this author consciously endeavoured to illuminate different perspectives in the recruitment process, only one out of the five interview participants hails from the Global South and only one participant was a woman. This represents a limitation to this paper because it inhibits the true representativity of this study's sample, as well as the potential generalisability of this paper's outcomes. Methodologically speaking, this limitation may have arisen from the usage of convenience and snowball sampling. In retrospect, the employment of stratified sampling may have proven more effective in ensuring diversity.

Thirdly, in terms of positionality, this author is from the Global North. Whilst this author is of Global South heritage and was, thus, conscious of the importance of reflexivity, this, nonetheless, represents a limitation to this study because this author does not have direct experience of the nuances of urban challenges in the Global South.

Finally, this paper drew on diverse applications of AI across the Global South with a view to reorient discourse towards a distinctly non-Western perspective of the Fourth Industrial Revolution. Despite this justification, this author acknowledges the risk of reductionism posed by the implication of the Global South as a collective, as previously addressed in footnote 2.

6.3. Recommendations for Further Research

There are no studies at present that explore the intersection between AI, sustainable development, cities, and the Global South. As such, this paper contributes to this research gap within discourse regarding smart cities, post-smart urbanism, sustainable development, AI ethics, and urban AI, as well as prosperity studies.

With this in mind, this paper hopes to act as a springboard for future studies that critically engage with this important intersection on the cusp of the 'coming wave.' This thesis thus makes the following recommendations for future research.

Firstly, this author strongly recommends that a meticulous scenario planning exercise is conducted by large, diverse and transdisciplinary research teams across the Global South due to current uncertainty regarding the true implications of 'the coming wave' and the method's proven efficiency for medium-to-long term policymaking (Rhydderch, 2017). This is to ensure that robust foresight is available for urban stakeholders to mitigate the risks and harness the opportunities of the Fourth Industrial Revolution in terms of sustainable urban development.

Secondly, once applications mature and empirical evidence of AI's social and environmental implications are brought to light, this author recommends that this project is revisited in five years to test its hypotheses and draw informed conclusions.

Thirdly, this paper recommends that the questions this study poses are explored in a more contextually nuanced manner through the realisation of case studies in individual Global South cities in future research.

Finally, this author believes that popular and scholarly discussion of AI as a singular entity is too simplistic. As discovered in this paper, each AI tool will have a different relationship with sustainable urban development depending on its material composition, energy and water

consumption, level of autonomy, purpose and mode of application, as well as context-specific urban challenges. With this in mind, this paper strongly advocates that future research reorients discourse towards more detailed discussions regarding the implications of specific AI tools and their applications, rather than of AI as a collective.

Chapter 7: Bibliography

Amazon Web Services. (2024). *What is Facial Recognition?* Retrieved from Amazon Web Services: https://aws.amazon.com/what-is/facial-recognition/

Amnesty International. (2021). *BAN THE SCAN HYDERABAD*. Retrieved from Amnesty International: https://banthescan.amnesty.org/hyderabad/

Andersen, R. (2020, September). *THE PANOPTICON IS ALREADY HERE*. Retrieved from The Atlantic: https://www.theatlantic.com/magazine/archive/2020/09/china-ai-surveillance/614197/

Antonelli, A. (2022, March 24). *Harnessing the power of artificial intelligence for conservation*. Retrieved from Royal Botanic Gardens Kew: https://www.kew.org/read-and-watch/artificial-intelligence-conservation

Arun, C. (2020). AI and the Global South: Designing for Other Worlds. *Ethics of AI*, 588-606.

Association of Social Anthropologists of the UK. (2011). *Ethical Guidelines for Good Research Practice*. Retrieved from ASA: https://www.theasa.org/ethics/guidelines.shtml

Barcia, M. (2023, November 27). *The Global North should share its research funds with the Global South*. Retrieved from Times Higher Education: https://www.timeshighereducation.com/blog/global-north-should-share-its-research-funds-global-south

Bari, L. F., Ahmed, I., Ahamed, R., Zihan, T. A., Sharmin, S., Pranto, A. H., & Islam, M. R. (2023). Potential Use of Artificial Intelligence (AI) in Disaster Risk and Emergency Health Management: A Critical Appraisal on Environmental Health. *Environmental Health Insights*.

Bibri, S. E., Alexandre, A., Sharifi, A., & Krogstie, J. (2023). Environmentally sustainable smart cities and their converging AI, IoT, and big data technologies and solutions: an integrated approach to an extensive literature review. *Energy Informatics*.

Bibri, S. E., Krogstie, J., Kaboli, A., & Alahi, A. (2024). Smarter eco-cities and their leading-edge artificial intelligence of things solutions for environmental sustainability: A comprehensive systematic review. *Environmental Science and Ecotechnology*.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 77-101.

Brevini, B. (2020). Black boxes, not green: Mythologizing artificial intelligence and omitting the environment. *Big Data & Society*.

Carter, T. R., & Rovere, E. L. (2018). Developing and Applying Scenarios. *IPCC*.

Chen, M., Mussalli, G., Amel-Zadeh, A., & Weinberg, M. O. (2022). NLP for SDGs: Measuring Corporate Alignment with the Sustainable Development Goals. *The Journal of Impact and ESG Investing*, 61-81.

Choi, N., & Basat, G. (2022, April 13). *Accessible sidewalks for inclusive cities*. Retrieved from World Bank : https://blogs.worldbank.org/en/sustainablecities/accessible-sidewalks-inclusive-cities

Clutton-Brock, P., Rolnick, D., Donti, P. L., Kaack, L. H., Maharaj, T., Luccioni, A. (., . . . Hodes, C. (2021). *CLIMATE CHANGE AND AI: Recommendations for Government Action.* Paris: Global Partnership on AI.

Copeland, B. (2024, June 14). *artificial intelligence*. Retrieved from Britannica: https://www.britannica.com/technology/artificial-intelligence

Crawford, K. (2024, February 20). *Generative AI's environmental costs are soaring — and mostly secret*. Retrieved from Nature: https://www.nature.com/articles/d41586-024-00478-x#ref-CR1

Criddle, C., & Bryan, K. (2024, February 25). *AI boom sparks concern over Big Tech's water consumption*. Retrieved from Financial Times: https://www.ft.com/content/6544119e-a511-4cfa-9243-13b8cf855c13

Cugurullo, F., Caprotti, F., Cook, M., Karvonen, A., McGuirk, P., & Marvin, S. (2023). The rise of AI urbanism in post-smart cities: A critical commentary on urban artificial intelligence. *Urban Studies*, 1168-1182.

Curtis, T., Athas, T., & Machio, P. (2024, June 25). *AI-led science innovation protects communities hit by climate change* . Retrieved from University of Oxford: https://www.ox.ac.uk/news/2024-06-25-ai-led-science-innovation-protects-communities-hit-climate-change#:~:text=Accurate%20early%20warnings%20are%20a,weather%20events%20before%20they%20occur.

Da Costa, K. (2024, August 7). *AI in healthcare: what are the risks for the NHS?* Retrieved from BBC News: https://www.bbc.co.uk/news/articles/c6233x9k4dlo

Dados, N., & Connell, R. (2012). The Global South. *American Sociological Association*, 12-13.

Datta, A. (2022). The digitalising state: Governing digitalisation-as-urbanisation in the global south. *Progress in Human Geography*, 141-159.

Datta, A. (2021, February 2). *Fast Urbanism: Between Speed, Time and Urban Futures*. Retrieved from Transient: Spaces & Societies : https://www.transient-spaces.org/blog-fast-urbanism-between-speed-time-and-urban-futures/

Davalos, J. (2024, March 4). *OpenAI signs open letter to build AI responsibly just days after Elon Musk sued the company for putting profit ahead of people*. Retrieved from Fortune: https://fortune.com/2024/03/04/openai-signs-open-letter-ai-salesforce-sam-altman-elon-musk/

Dora, S. (2024, February 16). *AI has a large and growing carbon footprint, but there are potential solutions on the horizon*. Retrieved from The Conversation: https://theconversation.com/ai-has-a-large-and-growing-carbon-footprint-but-there-are-potential-solutions-on-the-horizon-223488

European Commission. (2024). *Smart cities*. Retrieved from European Commission: https://commission.europa.eu/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en

Evans, J. (2016). Trials and Tribulations: Problematizing the City through/as Urban Experimentation. *Geography Compass*, 429-443.

Fearnley, C. J. (2022). Mind mapping in qualitative data analysis: Managing interview data in interdisciplinary and multi-sited research projects. *Geo: Geography and Environment*.

Gaudszun, T., Shin, J., & Mair, D. (2024, May 21). *AI Watch: Global regulatory tracker - European Union*. Retrieved from White & Case: https://www.whitecase.com/insight-our-thinking/ai-watch-global-regulatory-tracker-european-union

Ghaffarian, S., Taghikhah, F. R., & Maier, H. R. (2023). Explainable artificial intelligence in disaster risk management: Achievements and prospective futures. *International Journal of Disaster Risk Reduction*, 1-22.

Global Observatory of Urban Artificial Intelligence. (2022). *Mexico City*. Retrieved from Atlas of Urban AI: https://gouai.cidob.org/atlas/

Godoy, F. V., Hartmann, N., & Hanswillemenke, J. (2021, August). *APEC Case Study: Best Practices of Smart Cities in the Digital Age.* Retrieved from Asia-Pacific Economic Cooperation: https://www.apec.org/publications/2021/08/best-practices-of-smart-cities-in-the-digital-age

Google. (2024). *Applying AI to make a difference in the lives of those who need it most*. Retrieved from Google: https://ai.google/responsibility/social-good/#:~:text=Our%20Purpose,focus%20on%20positive%20social%20impact.
Google. (2024). *Let's build a better, more sustainable future for all*. Retrieved from Google: AI for the Global Goals: https://globalgoals.withgoogle.com/globalgoals/
Graham, S., & Marvin, S. (2001). *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition.* Milton Park: Routledge.
Granular.ai. (2024). *Adaptive Earth Intelligence*. Retrieved from Granular.ai: https://www.granular.ai
Graute, U. (2024). *AI in urban planning: risks and opportunities*. Retrieved from Academy of Social Sciences: https://acss.org.uk/publications/ai-in-urban-planning-risks-and-opportunities/
Grobbink, E., Mulgan, G., & Straub, V. (2024). *The global race is on to build 'City Brains'*. Retrieved from Nesta: https://www.nesta.org.uk/feature/ten-predictions-2019/the-global-race-is-on-to-build-city-brains/
Gulick, J. (1975). The City as Microcosm of Society. *Urban Anthropology*, 5-15.
Ham, B. (2021, April 23). *'DeepShake' predicts earthquake shaking intensity with AI*. Retrieved from Stanford: Doerr School of Sustainability: https://sustainability.stanford.edu/news/deepshake-predicts-earthquake-shaking-intensity-ai
Hao, K. (2020, July 31). *The problems AI has today go back centuries*. Retrieved from MIT Technology Review: https://www.technologyreview.com/2020/07/31/1005824/decolonial-ai-for-everyone/
Hao, K. (2022, April 19). *Artificial intelligence is creating a new colonial world order*. Retrieved from MIT Technology Review: https://www.technologyreview.com/2022/04/19/1049592/artificial-intelligence-colonialism/?utm_source=google&utm_medium=search&utm_campaign=acq_UKBLOW&utm_content=DSATOPICS&gad_source=1&gclid=Cj0KCQjw4MSzBhC8ARIsAPFOuyVC4_bgdL1nkjgBDGRC55GxV_HszyfOpR0_Q4x03
Hao, K., & Swart, H. (2022, April 19). *South Africa's private surveillance machine is fueling a digital apartheid*. Retrieved from MIT Technology Review: https://www.technologyreview.com/2022/04/19/1049996/south-africa-ai-surveillance-digital-apartheid/
Herath, H., & Mittal, M. (2022). Adoption of artificial intelligence in smart cities: A comprehensive review. *International Journal of Information Management Data Insights*, 1-21.
Holdsworth, J., & Scapicchio, M. (2024, June 17). *What is deep learning?* Retrieved from IBM: https://www.ibm.com/topics/deep-learning
Hollands, R. G. (2008). Will the real smart city please stand up? *Analysis of Urban Change, Theory, Action*, 303-320.
IBM. (2024). *What is explainable AI?* Retrieved from IBM: https://www.ibm.com/topics/explainable-ai
IMD. (2023). *IMD Smart City Index Report 2023.* Retrieved from IMD: https://imd.cld.bz/IMD-Smart-City-Index-Report-20231/6/
Jones, N., Deparday, V., & Cowan, N. M. (2022, May 18). *Mapping Dar es Salaam's trees through artificial intelligence*. Retrieved from World Bank: https://blogs.worldbank.org/en/digital-development/mapping-dar-es-salaams-trees-through-artificial-intelligence

Kahn, J. (2020, September 1). *Google bolsters its A.I.-enabled flood alerts for India and Bangladesh*. Retrieved from Fortune: https://fortune.com/2020/09/01/google-ai-flood-alerts-india-bangladesh/

Knott, E., Rao, A. H., Summers, K., & Teeger, C. (2022). Interviews in the social sciences. *Nature Reviews Methods Primers* .

Lange, M. d. (2019). The Right to the Smart City. In M. d. Lange, *The Right to the Datafied City: Interfacing the Urban Data Commons* (pp. 71-83). Bradford: Emerald Publishing Limited.

Leverhulme Centre for the Future of Intelligence. (2024). *Decolonising AI*. Retrieved from Leverhulme Centre for the Future of Intelligence: http://lcfi.ac.uk/projects/ai-narratives-and-justice/decolonising-ai/

Maanen, G. v., Ducuing, C., & Fia, T. (2024). Data Commons. *Internet Policy Review*.

Manyika, J., Silberg, J., & Presten, B. (2019, October 25). *What Do We Do About the Biases in AI?* Retrieved from Harvard Business Review: https://hbr.org/2019/10/what-do-we-do-about-the-biases-in-ai

Masterson, V. (2024, February 12). *9 ways AI is helping tackle climate change*. Retrieved from World Economic Forum: https://www.weforum.org/agenda/2024/02/ai-combat-climate-change/

Matias, Y. (2024, March 20). *How we are using AI for reliable flood forecasting at a global scale*. Retrieved from Google: https://blog.google/technology/ai/google-ai-global-flood-forecasting/

Matsiko, A., & Nelson, B. J. (2023). Robotics and AI in the Global South. *Robots and Society*.

Mattern, S. (2017, February). *A City Is Not a Computer*. Retrieved from Places Journal: https://placesjournal.org/article/a-city-is-not-a-computer/?cn-reloaded=1

Meta. (2022, April 18). *How AI is helping address the climate crisis*. Retrieved from Meta: https://ai.meta.com/blog/how-ai-is-helping-address-the-climate-crisis/

Microsoft. (2024). *AI For Good Lab*. Retrieved from Microsoft: https://www.microsoft.com/en-us/research/group/ai-for-good-research-lab/

Miller, K. (2022, March 21). *The Movement to Decolonize AI: Centering Dignity Over Dependency*. Retrieved from Stanford University: https://hai.stanford.edu/news/movement-decolonize-ai-centering-dignity-over-dependency

Milmo, D., Hern, A., & Ambrose, J. (2024, July 4). *Can the climate survive the insatiable energy demands of the AI arms race?* Retrieved from The Guardian: https://www.theguardian.com/business/article/2024/jul/04/can-the-climate-survive-the-insatiable-energy-demands-of-the-ai-arms-race

Mitra, S., & Pansera, M. (2023). Techno-solutionism and Neocolonial Narratives in ICT (and other engineering) Curriculum: Extended Abstract. *Universidade de Vigo*.

Mohamed, S., Png, M.-T., & Isaac, W. (2020). Decolonial Theory as Sociotechnical Foresight in Artificial Intelligence. *Philosophy & Technology*, 659-684.

Moore, H. L., & Mintchev, N. (2021, April). *What is prosperity?* Retrieved from UCL Discovery: https://discovery.ucl.ac.uk/id/eprint/10126424/7/Moore_WP_What%20is%20Prosperity_DOI.pdf

Morfo. (2024, July). *BRAZIL: RIO DE JANEIRO*. Retrieved from Morfo: https://www.morfo.rest/en/case-study/bresil-rio-de-janeiro

Mulgan, G., Grobbink, E., & Straub, V. (2019). *The global race is on to build 'City Brains'*. Retrieved from Nesta: https://www.nesta.org.uk/feature/ten-predictions-2019/the-global-race-is-on-to-build-city-brains/

Murray, D. (2024). Facial recognition and the end of human rights as we know them? *Netherlands Quarterly of Human Rights*.

Murray, D., Fussey, P., Hove, K., Wakabi, W., Kimumwe, P., Saki, O., & Stevens, A. (2023). The Chilling Effects of Surveillance and Human Rights: Insights from Qualitative Research in Uganda and Zimbabwe. *Journal of Human Rights Practice*, 397-412.

Nsoesie, E. O. (2024, May 7). *Using AI to Decolonize Health Care in Africa*. Retrieved from Think Global Health: https://www.thinkglobalhealth.org/article/using-ai-decolonize-health-care-africa

OECD. (2023, November 16). *Boti, the City's Whatsapp!* Retrieved from Observatory of Public Sector Innovation: https://oecd-opsi.org/innovations/boti-the-citys-whatsapp/

Palmini, O., & Cugurullo, F. (2023). Charting AI urbanism: conceptual sources and spatial implications of urban artificial intelligence. *Discover Artificial Intelligence*.

Patrick, S., & Huggins, A. (2023, August 15). *The Term "Global South" Is Surging. It Should Be Retired.* Retrieved from Carnegie Endowment for Global Peace: https://carnegieendowment.org/posts/2023/08/the-term-global-south-is-surging-it-should-be-retired?lang=en

Perez, C. C. (2019). *Invisible Women: Exposing Data Bias in a World Designed for Men.* London: Vintage.

Popelka, S., Zertuche, L. N., & Beroche, H. (2023). *URBAN AI GUIDE.* Retrieved from Urban AI (Parisian Think Tank): https://urbanai.fr/wp-content/uploads/2023/03/Urban-AI-Guide-2023-V2.pdf

Prior, H., & Williamson, A. J. (2023, May 3). *Revolutionising disaster response*. Retrieved from Deloitte: https://www.deloitte.com/nz/en/services/consulting/blogs/revolutionising-disaster-response.html

Qiang, Y. (2018, June 25). *The Fourth Revolution*. Retrieved from UNESCO: https://courier.unesco.org/en/articles/fourth-revolution

Reuters. (2024, January 12). *In Brazil, drones take flight in Rio in high-tech reforestation push*. Retrieved from Reuters: https://www.reuters.com/world/americas/brazil-drones-take-flight-rio-high-tech-reforestation-push-2024-01-12/

Rhydderch, A. (2017). Scenario Building: The 2x2 Matrix Technique. *Futuribles*.

Rowe, N. (2023, August 2). *'It's destroyed me completely': Kenyan moderators decry toll of training of AI models*. Retrieved from The Guardian: https://www.theguardian.com/technology/2023/aug/02/ai-chatbot-training-human-toll-content-moderator-meta-openai

Shelton, T., & Lodato, T. (2019). Actually existing smart citizens. *Analysis of Urban Change, Theory, Action*, 35-52.

Signé, L. (2023, July 5). *Fixing the global digital divide and digital access gap*. Retrieved from Brookings: https://www.brookings.edu/articles/fixing-the-global-digital-divide-and-digital-access-gap/

Smith, B. (2017). *AI for Earth: a gamechanger for our planet*. Retrieved from The Guardian: https://www.theguardian.com/advertiser-content/microsoft-ai-for-earth/microsoft-ai-research

Smith, G., & Rustagi, I. (2021, March 31). *When Good Algorithms Go Sexist: Why and How to Advance AI Gender Equity*. Retrieved from Stanford Social Innovation Review: https://ssir.org/articles/entry/when_good_algorithms_go_sexist_why_and_how_to_advance_ai_gender_equity

Sophie, B., Alina, T., Ontrup, G., Gilles, B., Peifer, C., & Kluge, A. (2023). Defining human-AI teaming the human-centered way: a scoping review and network analysis. *Frontiers in Artificial Intelligence*.

Stonier, J., & Woodman, L. (2024, January 11). *Why data equity plays a crucial role in establishing trust in the tech era*. Retrieved from World Economic Forum: https://www.weforum.org/agenda/2024/01/data-equity-trust/

Stratfor. (2015, January 8). *Scenario Planning and Strategic Forecasting*. Retrieved from Forbes: https://www.forbes.com/sites/stratfor/2015/01/08/scenario-planning-and-strategic-forecasting/?sh=2a6c966e411a

Suleyman, M. (2023, September 1). *How the AI Revolution Will Reshape the World*. Retrieved from TIME: https://time.com/6310115/ai-revolution-reshape-the-world/

Suleyman, M., & Bhaskar, M. (2023). *The Coming Wave.* London: The Bodley Head.

Ta, R., & Lee, N. T. (2023, October 24). *How language gaps constrain generative AI development*. Retrieved from Brookings: https://www.brookings.edu/articles/how-language-gaps-constrain-generative-ai-development/

Tenny, S., Brannan, J. M., & Brannan., G. D. (2022). Qualitative Study. *StatPearls*.

Torrens, J., & Wirth, T. V. (2021). Experimentation or projectification of urban change? A critical appraisal and three steps forward. *Urban Transformations*.

Truby, J. (2020). Governing Artificial Intelligence to benefit the UN Sustainable Development Goals. *Sustainable Development*, 946-959.

Tuck, E., & Yang, K. W. (2012). Decolonization is not a metaphor. *Decolonization: Indigeneity, Education & Society*, 1-40.

UNDRR. (2023). *Urban Resilience*. Retrieved from United Nations Office for Disaster Risk Reduction: https://www.undrr.org/urban-resilience

UN Habitat & Mila. (2022). *AI & Cities: Risks, Applications and Governance.* Retrieved from UN Habitat: https://unhabitat.org/ai-cities-risks-applications-and-governance

United Nations. (2016). *City Prosperity Initiative*. Retrieved from UN Habitat: https://unhabitat.org/knowledge/city-prosperity-initiative

United Nations. (2019, October 8). *Unprecedented Impacts of Climate Change Disproportionately Burdening Developing Countries, Delegate Stresses, as Second Committee Concludes General Debate*. Retrieved from United Nations: Meetings Coverage and Press Releases: https://press.un.org/en/2019/gaef3516.doc.htm

United Nations. (2022, November 7). *How artificial intelligence is helping tackle environmental challenges*. Retrieved from UN Environment Programme: https://www.unep.org/news-and-stories/story/how-artificial-intelligence-helping-tackle-environmental-challenges

United Nations. (2024). *Data Collection and Disaggregation for Indigenous Peoples*. Retrieved from United Nations: Department of Economic and Social Affairs: https://www.un.org/development/desa/indigenouspeoples/mandated-areas1/data-and-indicators.html

Venditti, B. (2022, April 26). *This chart shows the impact rising urbanization will have on the world*. Retrieved from World Economic Forum: https://www.weforum.org/agenda/2022/04/global-urbanization-material-consumption/

Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., . . . Nerini, F. F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications*.

Walter, M., Kukutai, T., Carroll, S. R., & Rodriguez-Lonebear, D. (2020). *Indigenous Data Sovereignty and Policy.* London: Routledge.

Wynsberghe, A. v. (2021). Sustainable AI: AI for sustainability and the sustainability of AI. *AI and Ethics*, 213-218.

Yigitcanlar, T., & Cugurullo, F. (2020). The Sustainability of Artificial Intelligence: An Urbanistic Viewpoint from the Lens of Smart and Sustainable Cities. *Sustainability*.

Yigitcanlar, T., Butler, L., Windle, E., Desouza, K. C., Mehmood, R., & Corchado, J. M. (2020). Can Building "Artificially Intelligent Cities" Safeguard Humanity from Natural Disasters, Pandemics, and Other Catastrophes? An Urban Scholar's Perspective. *Sensors (Basel)*.
Yigitcanlar, T., Butler, L., Windle, E., Desouza, K. C., Mehmood, R., & Corchado, J. M. (2020). Can Building "Artificially Intelligent Cities" Safeguard Humanity from Natural Disasters, Pandemics, and Other Catastrophes? An Urban Scholar's Perspective. *Sensors (Basel)*.
Yigitcanlar, T., Mehmood, R., & Corchado, J. M. (2021). Green Artificial Intelligence: Towards an Efficient, Sustainable and Equitable Technology for Smart Cities and Futures. *Sustainability*.

Yu, D., Rosenfeld, H., & Gupta, A. (2023, January 16). *The 'AI divide' between the Global North and the Global South*. Retrieved from World Economic Forum: https://www.weforum.org/agenda/2023/01/davos23-ai-divide-global-north-global-south/

Zhang, J., Hua, X.-S., Huang, J., Shen, X., Chen, J., Zhou, Q., . . . Zhao, Y. (2019). City brain: practice of large-scale artificial intelligence in the real world. *IET Smart Cities*, 28-37. Retrieved from The Inst.

Zimeta, M. (2023, October 3). *Why AI must be decolonized to fulfill its true potential*. Retrieved from Chatham House: https://www.chathamhouse.org/publications/the-world-today/2023-10/why-ai-must-be-decolonized-fulfill-its-true-potential

Chapter 8: Appendix

Appendix A: Interview Questions

This author based her semi-structured interviews on the following questions:

Corporate AI Technologists

1) When did you begin to work in AI?
2) Why did you decide to work in this sector?
3) What criteria do you follow when recommending urban AI solutions to clients?
4) Do you work internationally? If so, do you see a difference in the AI-powered urban solutions sought by clients in the Global North (Europe, North America, Australia, and New Zealand) and the Global South (Africa, Southeast Asia, Latin America, and the Caribbean)?
5) Do you have examples of specific case studies where AI has been used positively or negatively for urban sustainability in the Global South?
6) What feedback do you get from clients who have employed AI solutions to tackle urban challenges?
7) ESG and CSR are trending subjects in the private sector. Do you integrate these principles into your work? If so, how?
8) Are you aware of the distinction between 'Sustainable AI' and 'AI for Sustainability'?
9) Do you have any hopes or concerns for the future of AI? How do you think these can be harnessed or mitigated?
10) What is your perspective on current AI regulation? Do you think it'll serve to advance or hinder societal, economic, and environmental progress?

Scholars

1) When did you begin to research AI in relation to the urban space/ sustainable development?
2) Why did you decide to focus on this sector in your research?
3) How do you think AI will shape the 'smart city'?
4) Do you think that there will be a difference between the impact of AI on sustainable urban development in the Global South and Global North?
5) Do you have examples of specific case studies where AI has been used positively or negatively for urban sustainability in the Global South?
6) To what extent do you believe there to be cohesion between academic research of AI, corporate AI practice, and governmental and intergovernmental regulation?
7) How do you think the role of the academic is perceived by those with regulatory and developmental agency?
8) Do you have any hopes or concerns for the future of AI in Global South cities? How do you think these can be harnessed or mitigated?
9) What is your perspective on current AI regulation? Do you think it'll serve to advance or hinder societal, economic, and environmental progress?

Appendix B: Policy Recommendations

The principal objective of this study was to analyse the opportunities and challenges that AI poses to cities in the Global South in terms of sustainable development. Nonetheless, in response to the issues highlighted in this dissertation, Appendix B supplements this paper with progressive policy recommendations for interested urban stakeholders, such as city governments, urban planners, AI developers, policymakers and businesses, to consider to both mitigate risks and promote positive AI innovation moving forward.

Efficiency

IBM (2024) defines Explainable AI (XAI) as "a set of processes and methods that allows human users to comprehend and trust the results and output created by machine learning algorithms" through enabling users to retrace how AI tools reach their decisions. To boost the efficiency of AI for urban service provision, this paper recommends that AI developers strengthen the explainability of models deployed in the urban space in order to ensure the accuracy and fairness of decisions made and thus demystify the "black box" nature of AI tools for urban residents, referred to by Brevini in the Literature Review. In doing so, city governments in the Global South will be able to promote critical engagement with decisions made by AI through logical – and empathetic – reasoning, contemplate algorithmic bias, and carefully evaluate responses generated in order to ensure the sustainability of outcomes.

In terms of the environment, AI developers must also continue to optimise manufacturing and operating processes throughout the AI lifecycle in order to reduce the energy and water footprint of AI models and data centres, as advocated by Corporate AI Technologist 2. Energy and water are finite resources, so the economical use of such natural assets, as well as the promotion of renewables, will ensure the true sustainability of AI-driven climate solutions.

Access

As indicated by Corporate AI Technologist 1, inclusive access to the advantages of urban AI is dependent on digital literacy and robust online connectivity. In order to bridge the digital divide and ensure 'AI readiness' in the urban Global South, city governments must therefore subsidise access to technological devices for marginalised groups, instate digital infrastructure to promote connectivity, and provide free digital skills training that integrates AI education in pursuit of SDG 4 for Quality Education.

Moreover, companies must also diversify the linguistic competence of models used for DRM in the urban Global South in order to ensure inclusive access to the efficiency of forecasting models in preparing civic disaster responses.

Representation

In order to promote the representativity of AI, it is important to ensure data equity, as advocated by Corporate AI Technologist 1. In line with recommendations by the World Economic Forum, human-centred AI design must be encouraged to facilitate an iterative and discursive approach to urban challenge resolution and, thus, gather sufficient data and social information to inform AI outputs (Stonier & Woodman, 2024). This paper also advocates public and private subsidisation of local AI innovation to promote linguistic inclusion and context-specific challenge resolution, as supported by Corporate AI Technologist 1.

Privacy

Whilst more representative data is necessary to ensure inclusive access to AI's environmental advantages, researchers must take an ethical, consent-first, trust-based and participatory approach to ensure privacy and agency when collecting such information in protected areas. For example, in the context of data collection in indigenous territories, the United Nations recommends that such populations should not only be fully-consenting in data collection but also must determine the indicators used to measure social needs and the environment, have access to all data that implicates the management of their lands, and have the agency to fully, actively, and meaningfully participate in all stages of data collection, including the analytical and implementation phase (United Nations, 2024).

In addition, in terms of FRT, there is empirical evidence that the technology disproportionately impacts marginalised groups and, thus, exacerbates urban inequality (Amnesty International, 2021; Hao & Swart, 2022). In terms of predictive policing, this paper recommends that FRT in its current form is banned for now to halt algorithmic policing and to ensure an ethical, human-rights based approach to urban security.

Experimentation vs Regulation

The strength of regulation required to foster urban inclusion is dependent on the geographical context and tools considered. Nonetheless, from a social perspective, this paper recommends stricter regulation of AI's social applications, such as FRT and mortgage distribution, in order to foster a human rights-based approach that safeguards urban residents from the misuse of AI and to increase trust in its use in urban governance.

Moreover, whilst urban climate innovation and, thus, experimentation should be encouraged, regulators must seek to enhance the transparency of the lifecycle of urban AI. For example, corporations that develop AI should be regulatorily required to not only express environmental commitments but also produce an empirically-informed report on their websites and to the UN Global Compact each year that accurately detail the precise environmental impact of both AI production and application. AI practices must also decarbonise by 2030, in line with the deadline for the achievement of the UN SDGs.

Agency

From a governance perspective, this paper advocates a Human-AI Teaming (HAIT) approach to ensure human oversight in urban service provision. In summary, HAIT refers to the practice of complementing both the efficiency and speed of AI's complex processing and analytical capabilities and the human capacity for emotional intelligence, critical thinking, and social awareness (Berretta et al., 2023) to ensure robust decision-making practices and maintain human agency in the age of AI.

In addition, this paper encourages the proliferation of data commons, defined as "communities that collectively and sustainably govern data and their relationships" to bridge data inequity (Maanen, Ducuing, & Fia, 2024, p. 2). For example, indigenous activists across the world have advocated such commons in data sovereignty movements to bridge data gaps, increase agency, and, thus, decolonise datasets (Walter, Kukutai, Carroll, & Rodriguez-Lonebear, 2020). Given the so-called 'datafication' of the urban space, data used to inform urban decisions must become a shared resource in order to increase civic ownership and

agency in the urban space and, thus, enhance inclusive governance practices (de Lange, 2019).