THE POTENTIAL OF THE SMART CITY
IN THE PERIPHERIES OF BENGALURU, INDIA

On the inclusivity of infrastructures
for marginalised groups

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August 2020

"[...] It follows that the **'ideal city'** must be considered as 'a place of equal access, mutuality, freedom and fulfilment of potential. . . The city, more specifically its social and institutional set-up, must give us, all of us, the space and time to become something else, the right and opportunity to experiment, to enable lines of flight, to forge solidarities' (Amin et. al. 2000, 26, original emphasis). This involves major political issues such as reconstructing the balance between the State, the market and civil society, the need to nurture more democratic ways of economically organising, resisting the replacement of discourses of citizenship with those of consumerism, and connecting local and urban strategies with global practices and debates surrounding international economic governance, in an age of what Richard Falk (1999) calls 'predatory globalisation'."

- A passage on the 'ideal city' in the book "Splintering Urbanism" (2002, 419) by Graham and Marvin.

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**A thesis for the completion
of Utrecht University's MSc program
'International Development Studies'**

7th of August 2020

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Acknowledgements

Abstract:

The potential of the smart city in the peripheries of Bengaluru, India: on the inclusivity of infrastructures for marginalised groups

As smart city development steadily gains more and more traction among urban policy makers throughout the Global South, many scholars warn for its negative consequences on access to infrastructure, democratic citizenship practices and the position of marginalized groups. This thesis contributes to this body of literature, but takes on a different starting point, as it analyses the potential for inclusive smart cities in the urban peripheries of Bengaluru. Bengaluru is one of the hundred participating cities in India's Smart City Mission.

Through quantitative and qualitative socio-spatial analyses on Bengaluru's infrastructures in its peripheries, along with an actor analysis of the involved governance actors, I have developed a model of the infrastructural configuration for one of Bengaluru's peripheral regions. Furthermore, this thesis entails a discourse analysis of state, market and civil society actors, on their agendas and practices regarding smart cities, urbanisation and inclusivity. Together, these methodological approaches provide an understanding on the potential of smart city development in respect to the context of the urban peripheries.

As Bengaluru's infrastructure is under pressure through massive urbanisation, market and civil society actors take on institutionalised and hybridised functions in the governance of infrastructure. I argue that these processes will only be intensified and utilised by Bengaluru's smart city projects, which may have both positive and negative consequences on the infrastructural access of marginalised groups. How these projects will turn out, is dependent on the State's normative and ethical considerations and policy decisions. In an effort of critical pragmatism, this thesis provides five instructive pathways for policy makers to ensure inclusive smart city practices, that can prevent or alleviate the marginalisation of infrastructural access.

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List of Acronyms

ABD	Area-Based Development
ABID.e	Agenda for Bengaluru Infrastructure and Development Task Force
B.Pac	Bangalore Political Action Committee
BBMP	Bruhat Bengaluru Mahangara Palike (ULB)
BDA	Bangalore Development Authority
BESCOM	Bangalore Electricity Supply Company
BMPC	Bangalore Metropolitan Planning Committee
BMRC	Bengaluru Metro Rail Corporation Limited
BMRDA	Bangalore Metropolitan Region Development Authority
BMTC	Bangalore Metropolitan Transport Corporation
BWSSB	Bangalore Water Supply and Sewerage Board
CAG	Citizen Action Group
CCTV	Closed-Circuit Television
CSR	Corporate Sustainable Responsibility
GIS	Geographical Information System
GoI	Government of India
HLRN	Housing and Land Rights Network
ICT	Information Communication Technology
IoT	Internet of Things
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LVC	Land-Value Capture
MoHUA	Ministry of Housing and Urban Affairs (formerly MoUD)
MoUD	Ministry of Urban Development
NGO	Non-Governmental Organisation
NWO	Netherlands Organisation for Scientific Research
O&M	Operation and Management
PG	Paying-Guest accommodation
PMAY	Pradhan Mantri Away Yojona (Housing for All program)
PPCP	Public-Private Community Partnerships
PPP	Public-Private Partnerships
RWA	Resident Welfare Association
SC	Smart City
SCM	(India's) Smart City Mission
SEZ	Special Economic Zone
SPV	Special Purpose Vehicle
ULB	Urban Local Body

Introduction

On 25 June 2020, the national government of India launched the Smart City Mission, by the initiative of Prime Minister Narendra Modi. The Smart City mission (SCM), currently in progress, envisions to revamp the infrastructure of 100 Indian cities, by the means of implementing 'smart technology' (Hoelscher 2016, 29). There are multiple motives why a State would embark on such endeavour. For example, the implementation of smart city development can spur economic growth, enhance the standard of living, provide solutions for large scale urbanisation, which all could contribute to the improvement of ill-performing infrastructures (Datta 2015a; Hoelscher 2016, 29; Madakam & Ramaswamy 2015).

Although many governments around the world are showing interest in smart cities and with the steady expansion of the smart city industry, much unawareness persists on what smart cities can and cannot do within certain contexts. This unawareness can be categorized in four distinct issues. First, there is no consensus on a conceptual definition of smart cities in either scientific or policy communities (Kitchin 2015). This leads to further differentiated conceptualisations, which might create wrong expectations of the smart city. Second, smart city technologies are developed, implemented and quite often governed in a neoliberal fashion by private companies. This leads to privatisation and weakening of the State's control over infrastructures, and consequently, less possibility of the State to ensure inclusivity for marginally disadvantaged groups. Third, the introduction of smart cities applications in citizens' neighbourhoods transforms the relation between the State and its citizenry. By means of implementing smart sensors and its subsequent possibilities of big data collection and surveillance, smart city applications can increase the state's possibilities for policing as well as provide data to develop suitable policy that would improve the standard of living of its citizens. Lastly, even though large-scale urbanisation is the most-prominently mentioned reason for undertaking the Smart City Mission, it seems unclear how, and under which conditions, smart city projects can be used inclusively where urbanisation is the greatest; the urban peripheries.

In this light, it would become fruitful to search for an understanding on the inclusivity of the smart city in the context of peripheries, regarding the potential benefits and implications for its citizens – particular for those who are often excluded from well-functioning infrastructure. In peripheries, access to infrastructures is often fragmented, privatised and governed by a multitude of actors (Graham & Marvin 2002; Coutard & Rutherford 2015). Nevertheless, scholars like Holston (1991), Caldeira (2016) and Bhan (2019) describe how many

peripheries in cities in the Global South are characterised by 'autoconstruction', in which citizens take housing and, to a lesser extent, infrastructural governance into their own hands. In such neighbourhoods, a myriad of actors facilitates, maintain and govern infrastructures, with mixed results in regard to the functionality and inclusivity of marginalised groups.

As smart city applications should primarily be seen as enhancements to existing infrastructure, we can analyse how this technology could affect the inclusivity of infrastructures for marginalised population groups. I have analysed how the relations between state-, market- and citizen actors affect the inclusivity of infrastructures.

In order to set out these dynamics in the context of the Smart City Mission, I have conducted qualitative ethnographic fieldwork in Bengaluru. Of the 90 of the 100 cities selected by mid-2017, Bengaluru was chosen to participate in the SCM. Bengaluru is the 16th largest city in the world, and, because of its flourishing IT-sector, also known as 'India's Silicon Valley'. Nevertheless, the city is affected by large-scale urbanization and a poorly functioning infrastructure, which causes challenges to facilitate inhabitants that are facing poverty. Within this context, Bengaluru makes an excellent case to explore the relationship between the potential of smart cities to improve the State's infrastructure governance, and the potential to enhance the inclusivity of infrastructure for the marginalised population.

This thesis addresses at least three knowledge gaps in regard of smart cities, signalled by various scholars (Kitchin 2014; idem. 2015; Glasmeier 2015; DeFalco et al. 2019). First, smart cities are (still) often seen as a one-size-fits-all products, that can easily be replicated and reproduced in other cities. Rob Kitchin (2014, 3) argues against this perception, and suggests conducting research on smart cities in variegated local and cultural contexts. In doing so, the researcher should consider the particular histories, cultural dimensions and political economies that constitute the contextual background in which smart cities are implemented. By conducting ethnographic fieldwork in Bengaluru, I made an effort towards capturing these aspects – aspects that constitute the conditions and potentiality for smart city applications in the urban periphery.[2]

Second, Glasmeier (2015, 11) and Kitchin (2014, 4-6) call for collaborative research projects with smart city actors, to create an understanding of what smart technology can and cannot do; researchers should establish a multi-perspective understanding on the conditions for inclusive smart cities. I have aimed to do so by setting out the perspectives of the State, market actors and civil society.

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[2] The fieldwork period took place in February and March 2020, but was intended to run till the half of May. However, the period in the field was shortened because of the Covid-19 crisis. The data collection has continued at a distance till the beginning of June 2020.

Third and foremost, the majority of smart city projects have been primarily focussed on the city-core, most often not scaling the development to the peripheries. This resulted in limited contributions of academic literature to knowledge on the effects of smart city technology applied in such environments, despite that smart city projects are slowly occurring more frequent in peripheral areas (De Falco et al. 2018). As such, this thesis aims to contribute to this knowledge gap, whilst attempting to provide practical utility for Bengaluru's smart city development. By early signalling the challenges, conditions and limitations of smart cities in the urban peripheries, the inclusivity of marginalised groups can be better taken into account once smart city projects would expand towards the peripheral areas of Bengaluru.

This thesis is divided in six chapters. Respectively, the first chapter details a theoretical framework on the conceptualisation, risks and limitations of smart cities, concluded with problem statement. Included are a conceptual framework on the inclusivity of infrastructures in the Global South, and a contextual framework on infrastructures and smart cities in India and Bengaluru. The second chapter set outs the research design and methodology.

What follows are three empirical chapters. Chapter 3 and 4 describe the contextual backdrop for which this thesis seeks the potential for smart cities: Bengaluru's urban peripheries. In chapter 3 I set out the socio-spatial outcomes of urbanisation that contribute to the deficiency in state infrastructure, that in turn is mitigated by infrastructure facilities provided by the market – that is, for those who can afford it. Next, chapter 4 aims to explain why marginalisation in infrastructure access occurs, through a mapping exercise of the relations between citizens and infrastructural governance actors – the State, market players and civil society groups.

Chapter 5 analyses the perspectives and agendas on smart city development. Here I seek how various involved actors – the national government, Bengaluru's state actors, smart technology providers and civil society actors conceptualise smart cities. In other words, how these actors imagine the purposes of smart cities. This is supplemented by an analysis on how these actors perceive smart cities to be inclusive, in particular in relation to citizen participation. Next, I set out how smart cities are planned to be implemented in Bengaluru, through an analysis of the deployed strategies for the financialisation of the projects, which further elucidates the agenda of the smart city projects.

Chapter 6, the discussion, places chapter 5 in juxtaposition with chapters 3 and 4. Practices on infrastructural governance and marginalisation of infrastructural access are compared to the perceptions and agendas on smart cities. By making this parallel, I will provide five potential pathways that are instructive in assuring more inclusive smart cities.

Research Frameworks, Design and Methodology

1. Theoretical, conceptual and contextual framework

1.1 Research problem: on the theory and practices of smart cities

Over the past 15 years, scholars, governmental institutions, businesses and media have become increasingly interested in the broad concept of 'Smart Cities', resulting in the development of wide range of ICT applications that can be applied to urban infrastructures. Simply put, smart city applications have on the one hand the potential to stimulate economic development, and on the other hand the potential to enhance the urban management of infrastructures. Nevertheless, in practice the concept lacks a coherent definition, as it is differently understood and used by a myriad of actors. Hence, geographer Rob Kitchin (2015, 1) proposes to understand smart cities by (at least) two different perspectives.

First, from an *economic perspective*, a smart city refers to a city with an "economy increasingly driven by technologically inspired innovation, creativity and entrepreneurship, enacted by 'smart people'". Policies that foster the development of smart technologies and the investment in smart infrastructures can attract businesses and jobs, as it increases the productivity and competitiveness of the city (Cariaglu et al. 2009 in Kitchin 2015, 1).

Second, from a *governance perspective,* a smart city refers to a city that uses ICT applications which collect real-time big data on infrastructures to monitor its operation and use (Townsend 2013). This creates possibilities to improve management and regulation of infrastructures. More specifically, smart city applications enable governance actors to exert more control over infrastructures, which in turn enhances the state's capacity for facilitation. Examples of smart city applications are provided in Table I.

Table I: Examples of smart city applications and their purposes for the governance of infrastructure[3]

	Purpose	Infrastructural problem	Measure
1	*Measurement and regulation of resources*	Water shortages, electricity outages	Big data collection displaying spatial use, smart grids for regulation
2	*Signal and resolve capacity issues*	Congested traffic	Road sensors, smart traffic lights
3	*Enhance population enforcement*	High crime rate	Algorithmic automated CCTV, facial recognition
4	*Call for maintenance activities*	Inefficient garbage collection	Smart dustbins that signal when needs to be emptied

[3] The examples are based on a convergence of sources e.g. Bengaluru's Smart City proposal (2017), India Smart City Readiness Guide (Smart City Council, 2016), Kitchin 2014; Lee 2020; Meijer 2016).

Central to the governance perspective, smart city applications are understood to be a source of 'big data', which has been described as collected data that is "huge in volume, high in velocity, diverse in variety, exhaustive in scope, and flexible in extending its reach and scale" (Kitchin 2014, 3).[4] Collected big data, often centralised and analysed in control rooms, can be used to enhance the capacity and quality of infrastructures.

However, the concept of smart cities has entered the public sphere – and is therefore simultaneously used by scholars, media, politicians, businesses and citizens. As a result, the concept is often more freely used for any ICT-related development. For example, in certain cities in India, even the installation of digital boards in elementary schools ,or the assembling of solar panels are considered smart city development. Although these elements can enhance the quantity and quality of infrastructure deliveries, it does not focus on the causes of infrastructural problems as it does not enhance the infrastructure's governance practices.

There are various motives for implementing smart city applications, but so are the consequences. Aside from the augmentation of cities' economic performance and improvements in the efficiency of infrastructures, smart cities can alter the relations between the State[5] and citizens (Cardullo et al. 2019). From a state point-of-view, Smart cities offer opportunities to exert more governmental control over the urban population, creating the risk of technocratic rather than democratic governance (Hill 2012; Haque 2012 in Kitchin 2014, 9). From a citizen point-of-view, an expanded and improved infrastructure could benefit citizens greatly – e.g. consistent flow and quality of water. Additionally, collected big data could also be used in their interest. For example, by GPS-tracking the location of buses, a mobile app could show the user the remaining time till bus arrives, regardless of traffic.[6] Furthermore, if States share these data, it could potentially increase the transparency of the government. Thus, smart cities can be transformative, which may both enhance or hinder the livelihood of the urban dweller.

Risks and limitations of smart cities

In academic circles, there is a growing body of critical literature on the negative consequences of smart cities, purposed to explain the risk and limitations of smart city technology. In particular, authors warn for a limited efficiency, the narrowing of democratic governance, and the socio-political and socio-economic consequences for citizens, especially for marginalised populations.

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[4] Big data can be collected in three ways: first, *directed data*, referring manually collecting data on large scale, such as at immigration passport control at airports; Second, *automated data*, referring to the collection of data by a device or system, such as scanners, sensors, machine-to-machine interactions, or by clickstream data when using social media or webpages; and finally, *volunteered data*, inferring to as gifted data by individuals, for example by posting on social media, or by providing feedback on infrastructural improvements (possibly by use of a mobile app) (Kitchin 2014b, 4).

[5] Throughout this thesis, 'State' is capitalized whenever referred to as a conceptual entity, encompassing all state actors, institutions, actions and discourses. This differentiates 'the State as entity' from 'the state government', which is a specific governance tier between India's national government and the Bengaluru's city government, the BBMP.

[6] Bengaluru is implementing this application in Spring 2020.

For example, Glasmeier and Christopherson (2015) argue that smart city technology may indeed measure infrastructure and guide decision-making in urban planning and management, but that it does not solve the problems 'that lie at the heart of improving the quality of life' (6). Utilising Smart city technology can indeed alleviate traffic congestion, but does not directly improve the marginalised positionality of India's poor. These scholars argue that smart city projects are mostly upgrades rather than true innovations (8). Likewise, Kitchin (2014, 9), Meijer (2016, 647) and Hoelscher (2016) argue that smart city data fails to take into account the wider effects of culture, politics, policy, governance and capital that shape city life.

Next, Allam (2018) argues that businesses have vested interests in pushing for market-led technological solutions, which results in deregulation and privatisation of infrastructure. Further neo-liberalising the market for infrastructure delivery could negatively impact the State's influence to ensure inclusivity for its marginalised population. However, in spite of this, both businesses and governance actors brand smart cities as inclusive and citizen participatory. Business would do so to maximise the output of their products, whilst States to foster political support through highly visual narratives of progress and leadership (Allam 2018, 124). Datta (2015b) argued that this is the case in India, where its Smart Cities Mission aimed to foster a sense of 'technocratic nationalism'.[7] According to Datta, this ideology got a lot of traction among the middle-class population.

Furthermore, in this framing of smart cities, Smart city technologies are often characterised as pragmatic, non-ideological and inclusive, with the belief that data measured by technology is inherently neutral and objective (Kitchin 2015, 2; 2014, 8). Kitchin questions this by arguing that what data is generated is the product of "choices and constraints, shaped by a system of thought, technical know-how, public and political opinion, ethical considerations, the regulatory environment, and funding and resourcing" (2014, 9). Instead, the State governs the city by a solutionist rationality through "information and analytic systems [that] promotes a technocratic mode of urban governance, which presumes that all aspects of a city can be measured and monitored and treated as technical problems [...]" (Kitchin 2014, 9; Mattern 2013; Morozov 2013).

In conclusion, various authors argue how smart city development furthers the neoliberal discourse and creates an overdependency on technology, leading to technocratic governance. In turn, this may have adverse effects for democratic practices and inclusivity of infrastructure facilitation for marginalised groups.

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[7] This concept refers to the ideology in which patriotism is linked to 'the belief in the power of technology' (50). to my perception, 'technocratic nationalism' has much similarities to James Scott's conceptualisation of 'high modernism': "a strong, muscle-bound version of the self-confidence about scientific and technical progress, the expansion of production, the growing satisfaction of human needs, the mastery of (human) nature and above all, the rational design of social order commensurate with the scientific understanding of natural law. Originated in the West, as a by-product of unprecedented progress in science and industry" (4).

The theoretical research gap

The literature review above demonstrates a commonality among the discussed authors: all make calls for a critical analysis of the context, in which smart city development takes place, and the consequences the projects might have for the respective urban population. To establish inclusive smart cities, one should recognise the local context of those it tries to include, distinguish what implementations potentially work in these circumstances, and customise its design and policy on Smart Cities (Kitchin 2015, 4).

Another commonality in this body of literature is the generally pessimistic and dystopic argumentation on the character and consequences of Smart Cities. Although I do not intend to dispute the findings of these authors per se, I argue that smart city projects can be beneficial for the expansion and improvement of infrastructure deliveries for citizens in a marginalised position. Rather than expanding the list of limitations and dangers of smart cities, I argue it is more constructive to take a more pragmatic approach, given the enthusiastic participation of various governments, market actors and citizens that feeds the smart city discourse. The technological possibilities are likely to expand rather than disappear, regardless of the protests and warnings in academic literature. Therefore, I argue we should create an understanding of *the conditions under which smart cities <u>can</u> be inclusive for marginalised groups*. In other words, I argue scholars should analyse the potential for inclusive smart cities.

Based on this line of thought, I have analysed the positionality of those least included in infrastructure facilitation – marginalised groups – in the city zones where research on smart cities has been practiced the least – the urban periphery (DeFalco et. al 2019). Taking in consideration that smart city development augments the efficiency of legacy infrastructure[8], and is thus not an all-encompassing replacement of such (Glasmeier and Christopherson 2015, 8) this thesis takes on a conceptual focus on the governance of peripheral infrastructure.

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[8] Legacy infrastructure refers to already in place infrastructure, such as water facilities, roads, etcetera.

1.2 Conceptual operationalisation: inclusive facilitation and governance of infrastructures in urban peripheries

What follows is a brief theoretical discussion and conceptual operationalisation on the definitions, concepts and theories that indicate the governance configurations of peripheral infrastructures. It will be concluded with a simple conceptual model.

Infrastructures, inclusivity, and urban peripheries

Infrastructure is generally loosely conceptualised as a set of structures, or 'systems' related to government duties, or alternatively, facilitated by market actors. Here a distinction can be made between technical and social infrastructure systems. Neuman (2006) technical infrastructure systems are attributed to the following infrastructures: water and sewage systems; transportation systems of people and goods (e.g. railways, public transport, roads, airports); energy systems (electricity, gas); waste systems; telecommunication (e.g. television, internet). The following sectors are understood as 'social infrastructure systems': public education (e.g. schools, universities, libraries); public health (e.g. hospitals, vaccination centres); culture and recreation (e.g. museums, parks); public security (police, fire brigade, military). In the conceptualisation of smart cities by Bengaluru's governance actors – discussed in section 5.1 – smart cities have the potential to enhance both technical and social infrastructure systems.

Unpacking inclusivity of infrastructures for marginalised groups

Over the last decades, 'inclusivity' has taken a prominent position in the evaluation of urban (development) policy. The concept gained popularity in Europe in the seventies and eighties, shifting the focus of policy from poverty alleviation towards social inclusion (Rawal 2008).

Inclusivity is most commonly defined in dualistic terms of social inclusion and exclusion, whereas both concepts are considered two sides of the same coin. Social exclusion is often defined as "the process through which individuals or groups are wholly or partially excluded from full participation in the society within which they live", whereas social inclusion refers to not being excluded from participation. Thus, in this context, inclusive policy would capture the effort to include those who are excluded (Rawal 2008, 164).

Table II: Four proxies indicating social exclusion (Aasland and FlØtten 2001)	
1	*Exclusion from formal citizenship rights*
2	*Exclusion from the labour/infrastructure market[a]*
3	*Exclusion from participation in civil society*
4	*Exclusion from social arenas*

[a]: In the conceptualisation of Aasland and FlØtten, the second proxy refers to exclusion from the labour market, here adapted for exclusion of infrastructural access.

Social exclusion and can be operationalized by four proxies (Aasland and Fløtten 2001), displayed in Table II. Hence, if inclusivity is defined as the capacity of being included in the four proxies, inclusive infrastructures would refer to a wide-spread availability to utilise infrastructure and equal benefits of infrastructural improvements, regardless of class, income or socio-political background (e.g. caste, religion). With this definition of inclusivity, 'Marginalised groups' refer to those who are excluded from access to equal-quality infrastructure, and excluded from participation in the decision-making process on infrastructural policies, (by civil society or 'social arenas'[9]) because of socio-political or socio-economic characteristics of the respective group.[10]

Social exclusion, and thus the concept of inclusivity, obtains much of its conceptual power by having a multi-faceted character, rather than just considering financial poverty. Nevertheless, one should be wary of the concepts' dualistic nature, as it might lead to simplifying complex relationships that cause and enable inclusion and exclusion. It suggests a "unitary notion of power in which the included are powerful and excluded are powerless, rather than one in which power is dispersed, contingent and unstable (Rawal 2008, 170). Furthermore, being included is not always necessarily positive; being included in a group consistent of exploitative and violent relationship, may not be desirable (170).[11] Thus, we should understand inclusivity in terms of the subjects' perceptions and aspirations, and is therefore also dependent on cultural, political and individual context.

Urban peripheries

'Urban peripheries' is an inherently contested concept (De Falco et. al 2018). One the one hand, the periphery can be understood as a spatially localized region – For example, James Holston (1991) simply defines it as 'the hinterlands' through its geospatial location, whereas Caldeira defines the urban periphery through characteristics and processes. She argues that the periphery "does not simply refer to a spatial location in the city – its margins – [...], but rather [to] the crucial role of residents in the production of space, and how as a mode of urbanization it unfolds slowly, transversally in relation to official logics, and amidst political contestations" (2017, 2). Although these processes and characteristics can indeed be found in the city core as well, the access and availability of infrastructure in the city margins is more fragmented and less inclusive as a result of a diverse rapidly growing population (see chapter 3). Although I agree with the calls to stop perceiving the urban periphery as the exclusive urban region that harbours urban issues, I believe we should acknowledge that areas distant from the city core can have vastly different issues that are less or not present (anymore) in the centre. Hence, in order to avoid misunderstandings, *I refer to urban peripheries in a geographical spatial lens*, ergo, the area 'outside the city core', whilst acknowledging the variety of social and physical characteristics that can be found in both core and peripheral areas.[12]

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[9] 'Social arena', refers to both places and processes of political contestation.

[10] Given that the research is not conducted in European context, it is worthwhile to not take the concept at face-value, acknowledging potential cultural differences in the conceptualisation of inclusivity.

[11] Furthermore, dualist discourses can themselves be structures of control which deserve to be questioned and decentred (Rawal 2008, 170).

[12] Hence, I propose to differently name processes that apply to the whole city differently, and not relate that to the concept of urban periphery.

Causes of infrastructural social exclusion – A conceptual model for infrastructural supply

Having defined infrastructure, inclusivity and urban peripheries, I will turn to theorising the possible causes of infrastructural exclusion, through a conceptual model for infrastructural configurations. This model can be used to analyse the inclusivity of governance practices of three infrastructure facilitative actor groups: the State, the market and civil society. A theoretical foundation will be built based on the works 'Splintering Urbanism' by Graham and Marvin (2002) and 'Beyond the Networked City' by Coutard and Rutherford (2015).

Graham and Marvin describe how infrastructural configurations of cities[13] have been historically understood and ideologically envisioned in the global North. Infrastructure networks are usually imagined to "deliver broadly similar, essential, services to (virtually) everyone at similar cost across cities and regions, most often on a monopolistic basis" (2002, 8). As such, infrastructure networks are deemed to integrate urban spaces and contribute to the city's cohesion, by means of state actor regulation, in the name of public interest (8). By centralising the facilitation of infrastructure networks by the State, its construction and maintenance can benefit from economies of scale, absence of competition over demand for resources, and political solidarity to provide a well-working infrastructure. In this scenario, infrastructures are thus configured in extensive overarching networks – an infrastructural configuration dubbed as 'the networked city' (Coutard & Rutherford 2015, 4). Graham and Marvin describe this infrastructural configuration as 'the modern infrastructural ideal' (2002, 35), understood as a powerful ideology that shaped infrastructural policy in the west (8), which to some extent is also practiced in former colonial territories (Coutard & Rutherford 2015, 4).

Both works argue that the modernist infrastructural ideal is challenged. Graham and Marvin describe that in an internationalising capitalist world, specialised, privatised and customised networks have emerged that fragment the prior taken-for-granted equal access to infrastructures (2002, 9). Urban fragmentation might occur when, for example, highways with unaffordable tolls arise, gated communities arrange infrastructural packages superior to that outside their territory, or when water sanitation is only provided to more affluent neighbourhoods (2002, 2-5). The use of infrastructures is thus changed from a 'public good' to a 'club good' (Acemoglu 2016, 251), excluding those not able to afford it.

Similarly, Coutard and Rutherford (2015) argue that in cities in the Global South, the 'modernist infrastructural ideal' is most often dysfunctional or absent. Instead, they describe the incremental changes in infrastructure systems, that entail a shift from homogeneity to diversity in infrastructural practices, technologies, standards, flows and service suppliers. As such, infrastructural facilities have become commercialised and individualised, rather than collective; from a 'one-size fits all' to 'tailor-made customised infrastructures' facilitated by market actors (2008, 7).

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[13] Referring to 'organisation' of relations between the various involved actors on both the demand and supply of infrastructures.

Thus, infrastructure is not only fragmentedly facilitated by the State, but privatised by the market, leading to a wide array of options to which citizens individualistically can call upon, dependent on financial capacities and location within the city. Hence, infrastructural access is not unilaterally inclusive, but fragmented and dependent on class, income, and underlying political economy of acquiring infrastructures.

Civil society as third governance actor

In response, citizens can organise themselves in civil society groups as a third actor group that governs infrastructure, for the sake of compensating the voids left by the State and the market. As I shall demonstrate in chapter 4, can citizens collaborate with one another through civil society, by accumulating financial capital collectively to purchase marketised infrastructure and services. However, citizens do not only depend on state or market facilities. Caldeira (2017) argues:

> "Many cities around the world have been largely constructed by their residents, who build not only their own houses, but also frequently their neighbourhoods. [...] Throughout the process, they interact with the State, [...] their actions typically escaping the framing of official planning. They operate inside capitalist markets of land, credit, and consumption, but usually in special niches bypassed by the dominant logics of formal real estate, finance, and commodity circulation. In the process of house/city building, many make themselves into citizens and political agents, become fluent in rights talk, and claim the cities as their own" (Caldeira 2017, 1).

Caldeira refers to this mode of self-sufficiency as 'autoconstruction', that addresses the agency of urban dwellers. She argues that residents "are agents of urbanization, not simply consumers of spaces developed and regulated by others" (2017, 3). Residents construct their housing by means of improvisation, constant imagination of what their house should look like and improve housing step-by-step over time. As such, one could track the development of such neighbourhoods from unused land to potentially a fully equipped well-functioning neighbourhood through civil society practices. This process is happening in many parts of the Global South, including in Indian cities (Holston 1991, 447; Caldeira 2017, 1; Bhan 2019). Although originally developed to address alternative modes of housing, it also sheds light on neighbourhoods characterised by 'informal' non-state forms of infrastructural governance by civil society groups, to what I refer to as 'autoconstructed infrastructure'.

Infrastructural supply in the Global South

The three forms of providers, the state, market and civil society, can be depicted in a model (see figure 1 below).[14] Together, these actors form and configure the infrastructural configurations, in which the inclusivity of these infrastructural options are decisive for the access of marginalised groups to infrastructure. Chapter 3 and 4 will elaborate on this.[15]

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[14] Own model, based on empirical findings discussed in chapter 3 and 4.

[15] I want to emphasise that these broad categories of governance actors are not mutually exclusive; there are a myriad of variations, hybrids and forms of cooperation possible between these actors, which will be highlighted in

Figure 1: A model for infrastructural supply in the Global South

State ◄──────── Market ──────────► Civil society

Networked state infrastructure

Personal marketized infrastructure

Collective marketized infrastructure

Autoconstructed infrastructure

Infrastructural supply for citizens

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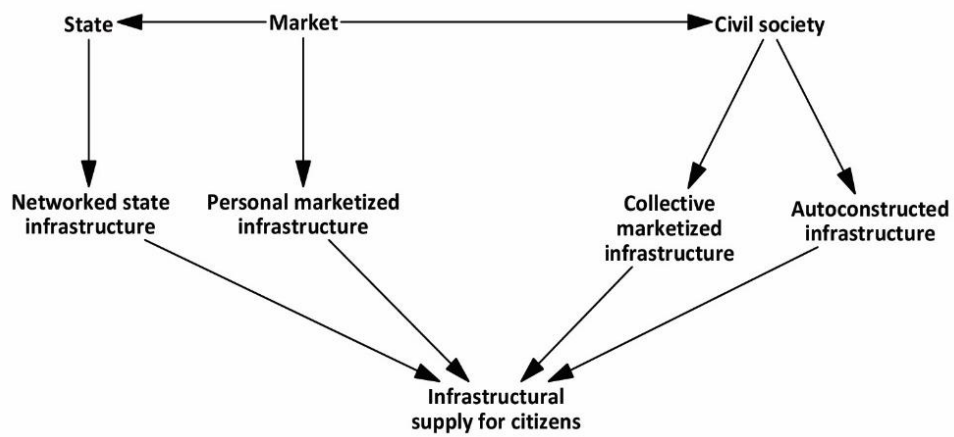
the results section. Furthermore, the three providers – State, market, civil society – should be seen in relation to one another on a continuum of state control. The less the infrastructure is institutionalised by the State, the less the influence the State is thought to have over the operation of it, and thus the sphere of influence in which infrastructural policies can enhance the inclusivity of marginalised groups.

1.3 Contextual framework: Smart Cities and Infrastructure in India

With the understanding that infrastructural facilities are not egalitarian and uniformly distributed by the State, how do unserved and underserved Indians gain access to basic infrastructures? And what is the stance of the State towards the trend of diverting from the modernist infrastructural ideal?

State and market infrastructure facilitation in India

Hoelscher (2016) describes how the Indian State has set out many large-scale urban projects and policies[16] to improve urban governance and basic infrastructure services. However, the success of urban policies "has been linked in part with India's urban informality, [as] urban governance and basic services are often organized and provided through informal mechanisms" (30). Informal economies provide a living for the majority urban dwellers, and civil society groups are utilised to gain rights, tenure and access to service delivery. In spite of this, informality is at odds with state practices, as it hinders initiatives of infrastructural improvement in terms of planning, construction and land tenure (2016, 30). This hinders the efforts to provide inclusive infrastructure for marginalised groups.

This argument can be substantiated by linking the disconnection between state and the cities' informal sphere. First, India has been characterised by transforming to liberal market economies (Bhan 2019; Watson 2009, 2268). Here, the State takes a neoliberal approach towards infrastructure, creating space for the market to fill this gap. It opens up for a myriad of infrastructure providers and customised and fragmented infrastructures. This has taken place partly in cooperation with the State, by means of public-private partnerships (PPPs)[17], but also by completely privatised means, on the initiative of commercial businesses. In case of the latter, the State only has limited to no power to improve infrastructural inclusion of marginalised groups.

Second, India's the middle- and upper-class citizens have increasingly more voice in civil society, and are in desire for modernised urban spaces (Bhan 2009). Places of 'urban informality' are framed as impediment of growth, hindering modernisation reforms and gentrification efforts. This has led to 'bypass urbanisation', with gated enclaves and planned peripheral towns (Bhattacharya & Sanyal 2011, 41)..

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[16] For example, the megacity scheme and the national urban renewal mission (JNNURM).
[17] Likewise, India's Smart City Mission makes use of public-private partnerships to finance the respective projects.

India's Smart City Mission in India and Karnataka

With the electoral victory of the political party BJP, and the instalment of the current Prime Minister Narendra Modi, Smart Cities have become a high priority topic in urban development. In June 2015, PM Modi launched the 'Smart City Mission (SCM)', that aims to develop 100 smart cities, either by greenfield development – new neighbourhoods on unbuild plots – or by retrofitting or redeveloping parts of existing cities – also known as area-based development (ABD).[18] Additionally, cities are instructed to develop a 'pan-city project' to improve an infrastructural sector for the whole city. Cities eager to participate could sign up by filing a proposal, of which a selection was made based on four different selection rounds. Bengaluru was selected in the third round, in June 2017.

Five years later, many cities have made considerable progress, though cities in Karnataka selected for the Smart City Missions are lagging behind – in particular Bengaluru. Although Bengaluru entered SCM just 2,5 year ago, it was plagued by delays due to "administrative reasons, political dismal, and a lack of coordination between governmental departments", a newspaper reported.[19] As such, none of the SCM projects in Bengaluru were finished mid-2020. As portrayed in Table III below, most projects in Bengaluru were in October 2019 still in the planning phase (DPR).

Table III: Status of smart city projects in Karnataka as of October 2019
(Government of Karnataka 2019[20])

city	total projects	completed	ongoing	tendered	DPR
Belagavi	84	14	47	10	11
Davangere	69	14	41	8	6
Hubballi-Dharwad	57	6	24	19	8
Mangaluru	40	2	17	6	15
Shivamogga	52	2	27	11	6
Tumakuru	118	25	46	25	12
Bengaluru	7	0	2	1	4

[18] Source: *Smart City Mission Statement & Guidelines*, Ministry of Urban Development, GoI. June 2015.
[19] Source: Times of India. *Bengaluru lags in smart city implementation.* October 25, 2019, accessed on November 30th 2019. https://timesofindia.indiatimes.com/city/bengaluru/bengaluru-lags-in-smart-city-implementation/
[20] Source: Times of India. *Bengaluru lags in smart city implementation.* October 25, 2019, accessed November 30, 2019. https://timesofindia.indiatimes.com/city/bengaluru/bengaluru-lags -in-smart-city-implementation/ articleshow/71749676.cms.

Figure 2: *Participating smart cities in India and Karnataka.*

[21] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018]. Housing and Land Rights network, New Delhi, 2018.

The Smart City Proposal of Bengaluru

Bengaluru's Smart City proposal exists out of two parts: an area-based approach, focused on Bengaluru's inner centre, and a pan-city approach, aims to improve city-wide infrastructure (governance). The process of formulation of the Smart City Proposal included an "evaluation and documentation of the city, consultation with elected representatives, urban planners and sector experts, citizen participation through online/offline channels and consultation with vendors and suppliers for smart components and innovations".[22]

In regard of Bengaluru, the area-based development (ABD) focuses on the inner-city centre. This area has been selected with the rationale that the city centre "belongs to and is used by everyone".[23] The ABD projects detailed in the proposal entail:

> a) The revitalisation of the historic centre by redeveloping certain roads;
> b) Redeveloping parks, markets and lake areas;
> c) Retrofitting a general hospital;
> d) Slum redevelopment of one neighbourhood (cancelled);
> e) Redeveloping three transport hubs.

The pan-city project entails multiple 'citizen-centric e-governance projects and services':

> a) The enhancement of governmental efficiency by improving finances, policing, crime mitigation, tax collection.
> b) Better integration between different governmental departments by overarching online platforms.
> c) More information and data available for citizens, and more possibilities to provide feedback, grievances and complaints to the city government (thus, participation).
> d) Improving better information and accessibility to public transport (A mobility card for multiple modes of transport).

See appendix I and II for a more detailed overview of Bengaluru's proposed smart city projects.

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[22] Ibid.

[23] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.

Bengaluru as choice of research location

Taking the urban context and content of the smart city plans in consideration, I believe Bengaluru has been a well-suited research location.

First, the rapid urbanization and expansion of Bengaluru's city boundaries makes and the improvement in infrastructural governance very relevant for the State to be able to manage. As the pan-city projects of the smart city proposal are primarily focused on the improvement of governance, I concluded that aforementioned is high-ranked on BBMP's agenda. As inclusivity is highly dependent on infrastructural governance, Bengaluru makes an interesting case study.

Second, in the context of urbanization and population growth, Bengaluru has become a scene with many infrastructural issues, in which the inclusivity of marginalised groups is not guaranteed. These issues would be less straining and therefore less observable in smaller-sized cities, and thus less suitable for an explorative research on the potentiality of smart city applications.

Third, given the multiplicity of state institutions involved in the provision of infrastructures, in addition to the scale of marketised and autoconstructed infrastructures to be found in the peripheries metropolis, Bengaluru makes an excellent case to assess the potentiality of smart city development to improve the governance on multi-actor infrastructural configurations.

A limitation of selecting Bengaluru as case study is the current state of implementation of the city's smart city proposal – no projects were completed during the research period. Nevertheless, as this research project focuses on the *potentiality* of smart cities, this was not problematic. Moreover, as many of the projects are currently (august 2020) still under design, it will be more in the interest of state stakeholders than when they would be finished, and time has passed to conduct a meaningful evaluation.

2. Methodology

2.1 Research questions[24]

Main research question

How can smart city applications be functional and inclusive in Bengaluru's urban peripheries, given the city's forms of governance and infrastructural configuration(s)?

Sub research questions

1. *What challenges arise in facilitating inclusive infrastructure, considering the forms of governance and infrastructural configurations in Bengaluru's urban peripheries?*

    1.1 How does marginalisation of infrastructural access take place in Bengaluru's urban peripheries?

    1.2 How does the State facilitate infrastructures in urban peripheries?

    1.3 What is the market contribution to facilitating infrastructures in urban peripheries?

    1.4 How do civil society groups and related stakeholders negotiate access and inclusivity to infrastructures?

2. *How do the State, market actors and civil society actors define and perceive the smart city mission vis-a-vis the facilitation of inclusive infrastructure to marginalised groups in the urban periphery?*

3. *What are the conditions and possibilities for smart city development to provide inclusive infrastructure, in respect to the challenges of facilitating and governing infrastructures in Bengaluru's urban peripheries?*

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[24] The research questions of this thesis – displayed above – originate from the research proposal, but have been adapted and reformulated throughout the research period, to further the analytical depth and scope of the project.

2.2 Research design & methodology

This thesis constitutes the final product of a research project of nine-and-half months, that ran from November 2019 to August 2020. This research is individually conducted and self-financed by the author, but has been integrated as a side project of the NWO-funded research "Inclusive Cities through Equitable access Mobility Infrastructures for India and Bangladesh". This latter is conducted under the leadership of the author's supervisor Professor Ajay Bailey. The period of data collection included an on-site fieldwork period of six weeks, where I was hosted by Institute for Social and Economic Change (ISEC) and established a cooperation with the NGO Sensing Local, whose staff aided me greatly with providing access to the research location. Additionally, I have conducted two-and-half months of data collection at a distance.

As this research aims to explore the potential of smart cities, and thus the conditions of this potential in a particular social context, this research has been primarily explorative and inductive. Prior to data collection I performed a literature review, that provided a preliminary conceptual model and a set of 'sensitising concepts' – e.g. concepts with limited operationalisation in terms of indicators – which over time have become more definitive), based on the empirical findings I encountered (Boeije 2009, 23).

On the ontology and epistemology of this research

Jenifer Mason (2007) addresses the ontological nature of social research as the researcher's position or perspective of how one sees 'the very nature and essence of things in the social world' (14), which underpins the fundamental social reality of the phenomena and entities the researcher aims to investigate. Instead of positioning myself at beginning of this project in a particular school of thought, I have inductively come to understand the ontological nature of the social practices and processes I encountered during the data collection and analysis. That is, a post-structuralist adaptation of Pierre Bourdieu's constructivist critique on structuralism (Flecha et. al 2001) and Sherry Ortner's practice theory (Rouse 2007). I agree with the premise of structures in the sense of Bourdieu's 'constructivist structuralism', in which one recognises the existence of structures, but argue that they are socially constructed rather than existing on itself. At first, we have the ability to decide on our actions, but in the repetition of practices we lose control over them and become increasingly structuralised (Rouse 2007).

In the conclusion of section 1.1 I posed that the social researchers' critique on smart cities is vested in negative impacts of macro-structures related to neoliberalist and high-modernist discourses, that smart cities substantialise and aggravate, rather than alleviate. Discursively, governance actors have the perception of having lost control over urbanisation, migration or infrastructural governance, for which smart cities then become a 'new practice' in an almost desperate attempt to regain this control, by means of the high-modernist doxa of scientific solutionism (Mattern 2013; Scott 1998). Smart Cities then relate to Chris Philo (1992) and James Scott (1998), who argue that in times of modernity 'space' is made readable through science and technology, and in turn transformed into 'disciplinary spaces' that limit the autonomy and agency of the citizen (Peet and Hartwick 2015, 233).

To a greater degree I agree with these premises, but argue that instead of only setting out the limitations and dangers of smart cities, one should analyse the acts of autonomy and agency that challenges the structures, that create change over time. I have done so by adopting the 'practice theory', a school of thought popularised in the eighties among sociologists and anthropologists. In practice theory, researchers seek out the norms, rules and tacit knowledge in respect of observable practices and structural context. Researched phenomena, 'practices', extend in range from "the most mundane aspects of everyday life to highly structured activities in institutional settings" and are thus localised in both macro- and micro processes, as well observable in both material objects and constructed interpretations (Rouse 2007, 639). Whilst adopting this lens, I seek out the macro- and micro-practices that undermine social exclusion of marginalised groups, *but also* those that mitigate exclusionary outcomes and further social inclusion. As such, it allows for the recognition of agency and contestations amongst citizens vis-à-vis macro structures embedded in governance and smart city practices.

Adopting this approach for smart city practices, provides thus a more pragmatic, optimistic perception of smart technology – It allows for positive societal change, seeking out the potential to transform smart city practices towards more inclusive ones, rather than dismissing its utility to improve social inclusion. As such, this research aimed to provide a meaningful addition to the body of literature. More concretely, this thesis analyses the 'practices' of infrastructure deliveries and their governance, urban planning, smart city planning in relation to marginalisation and urbanisation in the periphery. In respective order of the empirical chapters, I have sought for material and physical outcomes that demonstrate the inclusivity infrastructure; the actor relations underpinning urban and infrastructural governance; and the perceptions and agendas of the smart city discourse, practised through language, policy plans, recommendations and critique, in the context of Bengaluru.

On the positionality of researcher vis-à-vis inequality and marginalisation

Firstly, the author has an academic background in anthropology, development studies, political science and economics. As such, the used concepts and theoretical argumentations in this thesis a derive from a wide variety of disciplines.

Moreover, for a postgraduate student to do international research symbolises a position of privilege. Besides being able to afford a plane ticket and easily obtain a visa, the student writes his thesis about the marginalisation of infrastructure in his respective country, whilst having complete access to top-quality infrastructure. It demands the question how the researcher positions himself vis-à-vis poverty and inequality.

From an anthropological angle, I generally practice cultural relativism; cultural, but also material differences such as poor housing or infrastructure, should in the first place not be understood in terms of 'morally wrong', 'bad management', 'backwards' or 'underdeveloped' in relation to the circumstances of my own. I tend to adhere a normatively neutral position and attempt to interpret the practices based on local accounts and perceptions of involved actors, also called an emic perspective (Kottak 2015, 46), rather than interpret phenomena by my own (culturally) normative values. As such, I do not attempt to provide the 'objective, factual truth', but rather demonstrate how smart cities are taking place in the social context of Bengaluru's peripheries, based on the practices, relations and perspectives of those involved.

Nevertheless, in regard of inequality, cultural relativist arguments, e.g. 'it is normal in Indian cities' are too simple,, as it does not clarify on the intention *why* one researches marginalisation. Of course, I am fully aware that (some) inequality is an inevitable aspect of social life, which renders an objective to eradicate inequality rather pointless. Notwithstanding, marginalisation of infrastructural access refers to explicit and implicit exclusion of basic infrastructure deemed as minimal necessity for a healthy and acceptable living circumstances. What standard this should be set by, is beyond the scope of my research, and up to respective citizens and governance actors to debate on.

As such, I have not taken on an activist critical-emancipatory research approach, but rather aim to pose questions that invite the reader to (re)think on the perceptions on poverty and inequality. As a result, besides setting out the empirical findings, this thesis also discusses the normative justifications of marginalisation the involved actors make, or could make, and in turn, the possible impacts that smart cities might have on these practices.

Data collection and research methodology

A great variety of research methods have been utilised for this research; each method, its rationale, case selections, and limitations are discussed below in order of occurrence in this thesis. Most qualitative data sources have been coded and analysed in NVivo software.[25]

Reflection on research data collection in the light of the COVID-19 pandemic

On the research progress of this project of nine-and-half months, a research proposal had been made, including a literature review, theoretical framework and research design, between early November and the end of January. These months were supposed to be followed up by a four-month period of data collection on location, in Bengaluru. This research design included on-site ethnographic methods including participant observation, unstructured and semi-structured interviews amongst Smart City officials, State actors, civil society actors and (marginalised) citizens living Bengaluru's peripheries.

However, this fieldwork timespan was drastically shortened as a result of the pandemic outbreak of COVID-19, for which I returned to the Netherlands after six weeks of data-collection. Consequentially, the planned research methodology had to be drastically changed to continue data-collection from a distance. The topic and research objective stayed the same – simply put, to create an understanding of the potential of inclusive smart cities in urban peripheries.

The research period in Bengaluru, however short, provided rich detailed accounts of various issues surrounding infrastructures, the peripheries, and smart cities. This provided many leads on in-depth explanations of marginalisation, but were at first too difficult to validate on fieldwork data alone, due to the early stage of the data collection. As a result, I have continued the data collection by using methods suitable for distanced data collection, from April till June 2020. including descriptive

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[25] At first by inductive coding, which constitute the larger part of codes, later by axial coding or deductive grouping of codes (Boeije 2009, 108).

quantitative analysis[26], GIS analysis, discourse (document) analysis and two online interviews, whilst processing the data collected during fieldwork.

Consequentially, a large range of methods have been used, which, at first glance, might occur odd to the reader. As a result of dividing the attention over multiple collection methods, this thesis presents less in-depth ethnographic accounts than originally hoped for – aiming for a 'thick description', in the words of Clifford Geertz (1973). However, by carefully triangulating the methods, I argue that the validity of the research findings displayed in this thesis are well assured. For the readers reference to the context in which data is collected, all data collection activities referred to in this thesis are attributed with an item ID. See appendix III for this overview.

Research ethics

The ethical considerations taken in account largely concern the protection of the identity of research participants. As such, all names and obvious ways to identify the participant have been omitted in this thesis. The participants are referred to by a descriptive title and Item ID designated to the field notes I made during participation. All participants, in way or another active in the civil society of Bengaluru, were fully aware of my research intentions and consented with participation. This includes thus to the notes made of respective conservations and interviews, and the presence of their perspectives they shared in this thesis. More ethical considerations regarding the particular methods are discussed below.

Spatial quantitative and qualitative data analysis

Firstly, I have conducted a quantitative deductive analysis based on open-source demographic-, tax- and socio-economic- data of Bengaluru's 198 wards (N=198), which has been projected by GIS mapping. This quantitative analysis has validated the applicational value of the theory and literary contextual accounts of the Global South to Bengaluru's peripheries. As open data sources only provide raw data, many additional calculations were made in order to be informative – e.g. by normalising data to population and area size, or calculating averages that demonstrate differences based on location.[27] Here, wards have been selected as research units, as it is the smallest governmental entity. Data on wards is the most localised data available, which allows to observe differences within city regions.

The quantitative findings have been further validated and illustrated by a qualitative case study analysis of a peripheral ward (number 85, Doddanekundi). The analysis is based on ward maps created by the NGO 'Sensing Local', during their project 'Reimagining Doddanekundi'.[28] Furthermore, three fieldwork days were spent in the ward, where I made observations and photos in the ward, and conducted one ad hoc informal interview with a civil society member.[29] In combination, these maps (e.g. housing, land use) locate the made observations and photographs an

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[26] As reliable governance and infrastructure data is not easily accessible, or available at all, a more advanced analysis was discouraged by the supervisor and peers.

[27] The calculations were made in Excel in order to preserve the data for future use and validity checks.

[28] Source: *Imagining Local Futures*. Sensing Local. https://sensinglocal.wixsite.com/doddanekkundifutures/blog accessed June 1, 2020.

[29] Source: II3, Resident Welfare Association member in Doddanekundi, interview with author.

demonstrate the social exclusionary processes of urbanisation, fragmentation and economic development in the periphery.

The choice of Doddanekundi as case study was derived from a preliminary quantitative analysis on the characteristics of peripheral wards (N=27). Doddanekundi has a strong presence of economic development, whilst simultaneously having a relatively large low-income population (45%), along with a large presence of middle- and upper-class condominiums and gated communities. These indicators suggested the presence of splintered urbanism, infrastructural fragmentation and bypass urbanism, which are issues that would problematise the inclusivity of future smart city development in sort like peripheries. As Doddanekundi is thus chosen on its outstanding rather than average characteristics, the case study has some limitations in regard of generalisability; However, as literature, quantitative data, interviews and field visits to other wards demonstrate we can comfortably assume that the forms of exclusion occurring in Doddanekundi happen in other peripheral wards as well, although perhaps less intensively.

Triangulating both quantitative and qualitative spatial methods provided an empirically and physically observable reality of the marginalisation in infrastructural facilities. This creates a canvas of infrastructure 'practices' through which infrastructural governance, attempts for infrastructural improvement, and the inclusivity of smart cities can be related and understood.

Actor-mapping: interviews and participant observation

Next, an 'actor-map' has been established, which sets out the relations between involved governance actors – state- , market- , civil society-actors and (marginalised) citizens – to signify the processes related to the four proxies of infrastructural marginalisation (Table II, section 1.2). For this purpose I have conducted the interviews and (participant) observation(s) as data collection methods.

First, eight interviews have been conducted with participants active in civil society, whom have varying positions and expertise vis-à-vis infrastructures. Six interviews were conducted unstructured, meaning, interviews where the participant has most control over the content of the conversation. One of these can be seen as 'walking interview', in which data is collected 'on the move'.[30] Additionally, two semi-structured interviews were conducted with prepared questions (Boeije 2009, 62), and two interviews have been conducted digitally, after my return from the field. All interviews were conducted on the location preferred by the participant and took between thirty and ninety minutes. The interviews have been worked out in detailed notes, which in turn has been coded and analysed in NVivo.[31] For participants who shared sensitive information, the notes have been shared with them to re-verify their consent for participation.

Next, during the various 'field expeditions' in various wards, I have made observations that demonstrated the relations and characteristics of governance practices. These observations have been captured in jot notes, which were as soon as possible converted in detailed extended field notes, and later inductively and deductively coded in NVivo (DeWalt and DeWalt 2010, 165). Photographs

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[30] Doing so generated data derived from the physical landscape in relation to governance practices (Evans 2011, 849).
[31] As most interviews were primarily purposed to build a relationship/rapport in the first weeks of the fieldwork, I decided not to record these interviews, with the expectation to do semi-structured interviews in a later stadia of data collection. Again, the covid-19 pandemic limited this possibility.

were made of some observations, where I avoided capturing recognisable faces as much as realistically possible.

Furthermore, observations have been made whilst participating in six events with state or civil society actors.[32] These activities that provided data on the position and relations of state- and civil society actors – e.g. an activist meeting, development summit or conference with government speakers. These notes have been analysed similar to 'field expedition' observations. Through participant observation one can place statements of interviews in perspective and establish rapport with relevant actors (DeWalt & DeWalt 2010, 140). During these events I carefully considered whether or not to declare my presence as researcher. Only with large public events (e.g. more than hundred people) I omitted of doing so, though presenting myself as researcher whenever in conversation.

Given the curbed time spent in Bengaluru, one actor group is better represented in the data collection then the other. Specifically, civil society actors are the best covered group, as participants during interviews and as part of the social reality during observations. Civil society groups to be included in this research were 'selected' based on their affinity to infrastructures and data, smart cities, or their active presence in the case study ward Doddanekundi. These civil society groups thus have not a specific focus on marginalised groups, e.g. NGOs. Civil society groups with such focus have been included in the discourse analysis in chapter 5.

State actors' perspectives were captured during the researcher's participation at events, observations in the field in comparison to the accounts on state actors by civil society actors. Additionally, the literature review and the discourse analysis of chapter five further validated these findings. A limitation here is the fact that, with exception of two interviews with ward committee members, no state actors were interviewed.

Similarly, practices of market actors and marginalised citizens have been researched by means of observation and accounts of civil society and state actors. In regard of market actors, this was a deliberate decision to limit the scope of the research. Marginalised groups have not been accounted for in person, primarily because of the time constraints (covid-19), further hindered by language constraints of the researcher. The position of marginalised groups has been accounted for by observations and a literature review on marginalisation in Indian metropoles. Although I perceive this as the most significant limitation, I believe that the positionality and relations of marginalised groups vis-à-vis other actors are sufficiently captured for the purposes of this research.

Discourse (document) analysis on the perceptions and agendas of smart cities

Lastly, a discourse analysis have been established, that sets out the dialectic conceptualisations, perceptions, and agendas of the 'inclusive smart city' of India's smart city mission (SCM), market actors selling smart technology, Karnataka State and BBMP state actors, Bengaluru's civil society actors, and a national NGO that represents the interests of marginalised groups (Housing and Land Rights Network (HLRN; see table IV below). `

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[32] During two research activities I was in the company of two PhD students working at ISEC

Table IV: Discourse analysis - Four smart city perspectives and their sources

Perspective	Actors	(Document) sources
National perspective	- Ministry of Urban Development (MoHUA) - Smart City Mission (SCM)	- Smart City Guidelines[33] - Smart City Success stories[34]
City (State) Perspective	- Karnataka State and the BBMP	- Bengaluru Smart City Proposal[35]
Market perspective	- Smart City Council (leading corporate interest group)	- Smart City India Readiness Guide[36]
Civil society perspective	- NGO Housing and Land Rights Network (HLRN) - CAG/NGO B.Pac and C.Smart - Various individuals active in Bengaluru's civil society	- Report 'Smart Cities for Whom?[37] - B.Pac Smart City recommendations[38] - Interviews

As table IV demonstrates, various actors have been taken into consideration through the analysis of documents. Most documents were retrieved from "Smartnet", the open library of the Ministry of Housing and Urban Affairs. This library is meant as a platform of learning for smart city officials. A pre-selection was made of 30 documents, of which five of six documents noted above have been analysed. Furthermore, five of the eight interviews with civil society members, that shared their perspective on smart cities, have been included in the analysis. These sources have been multiple times carefully read, analysed, and coded in NVivo. Furthermore, key findings had been placed in a table to enable cross-perspective comparisons (Appendix V).

The documents are selected based on their intrinsic importance and the importance of the actor who produced it. The SCM Guidelines is here an obvious choice, as it is the primary document with instructions for cities who want to participate. Also the choice for Bengaluru's Smart City proposal is self-evident, as it portrays the perceptions and intentional uses of smart city development. Initially, I received access to interview Bengaluru's smart city officials. However, as the staff was fully occupied in remedying the Covid-19 pandemic. As such, this opportunity could not have been pursued; an analysis of the proposal was the best alternative.

The 'India Readiness Guide' is written by 'the Smart City Council', a conglomerate of technology providers, which sets out the purposes and options for smart city development. This sets out the technological possibilities of Smart Cities, and the way market actors frame the technology for profit (Allam 2018, 124). The report 'Smart Cities for whom?' is a production of the NGO 'HLRN', which is the only source in the Smartnet Database that focuses primarily on marginalised groups.

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[33] Source: *Smart City Mission Statement & Guidelines*, Ministry of Urban Development, GoI, June 2015.

[34] Source: *India Smart Cities: Success Stories from Mission Cities.* Ministry of Urban Development, GoI, 2017.

[35] source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.

[36] Source: *Smart Cities India Readiness Guide.* Smart City Council, 2016.

[37] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018]. Housing and Land Rights network, New Delhi, 2018.

[38] Source: *Smart City Namma Bengaluru: Powered by Technology – Suggestions to BBMP By B.Pac and C.Smart.* B.Pac. Bpac.in, July 2016. B.Pac, http://bpac.in/wp-content/uploads/2016/07/Namma-Bengaluru-Smart-Cities-suggestions-June-28.pdf accessed June 4, 2020

Kitchin (2015) stipulated how the existing literature comes short in ethnographic accounts and interviews with those actively engaged with the technology, governance, and implementation of smart cities, as most literature base their arguments on document analysis (e.g. Hoelscher 2016; Datta 2018). Although because of the pandemic this research has not been able to perform such interviews with state and market actors, it does account for their governance relations that underpin the smart city projects. For example, the interviewed civil society members (e.g. urban planners, a data archivist, ward committee members) have shared many insights that set out the ethnographic complexity at hand.

Emperical Findings
on Infrastructure
in Bengaluru's Peripheries

3. Urban peripheries of Bengaluru: a socio-spatial city analysis

Bengaluru, a city of millions, underwent massive urbanisation over the last decades. Urban growth, caused by economic development and related migration, has led to rapidly expanding peripheries. As the peripheral population is growing, the demand for basic infrastructure such as waste management, water and sewerage – is increasing. However, this increased demand has not been met with increased state capacity to facilitate these services. The urban peripheral population has varied success in attaining access to infrastructures by appealing to the State, the market or civil society. As I will demonstrate in this and next chapter, the infrastructural options for households are dependent on the socio-economic position of the groups in question.

In this chapter, I aim to demonstrate how the socio-economic positionality vis-à-vis deficiencies in state infrastructure deliveries are interrelated, by analysing the causes and consequences of urbanisation in the periphery. This has been done by means of quantitative and qualitative socio-spatial analysis.[39] As such, this chapter describes the characteristics of urban peripheries and points out the infrastructural demand that the State, the market and civil society need to meet in order to facilitate inclusive infrastructures. This chapter thus provides the contextual setting in which the potential of smart cities will be analysed.

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[39] E.g. a quantitative descriptive analysis, GIS-mapping, a geotagged photo essay in relation to housing, explorative field days, a walking interview, interviews.

3.1 Urbanisation and social inequality in urban peripheries

Over the last decades, the population of Bengaluru has grown excessively. The population of Bengaluru Metropolitan region[40] was counted at 8.52 million inhabitants in the national decadal census of 2011.[41,42] The population marked a 65 percent growth in 2011 compared to the 2001 census (see table V), whereas the projections of 2020 have estimated the city's population at 12.34 million inhabitants, marking a 45 percent growth compared to 2011.[43]

Table V: Trajectory of urbanization in Bengaluru (1981-2011[a]

Indicators	1981	1991	2001	2011
Total population (million)	2.9	4.13	5.69	8.52
Total area (km²)	365.65	445.91	531.00	709.10
Decadal growth of population (%)[b]	76	41.36	37.69	52.49
Average annual growth rate[b]	5.8	3.52	3.25	n/a
Density of population (per km²)	7991	9263	10710	12017

[a]: Census data of 1981 till 2001 retrieved from the article Pellisery et al. (2016), 2011 Census data retrieved from BBMP ward data. Secondary sources used due to the difficulty of acquiring direct census data.
[b]: Decadal and average annual growth refers to the growth in respect to the ten years before the indicated year; (1971-1981, 1981-1991, 1991-2001 and 2001-2011).
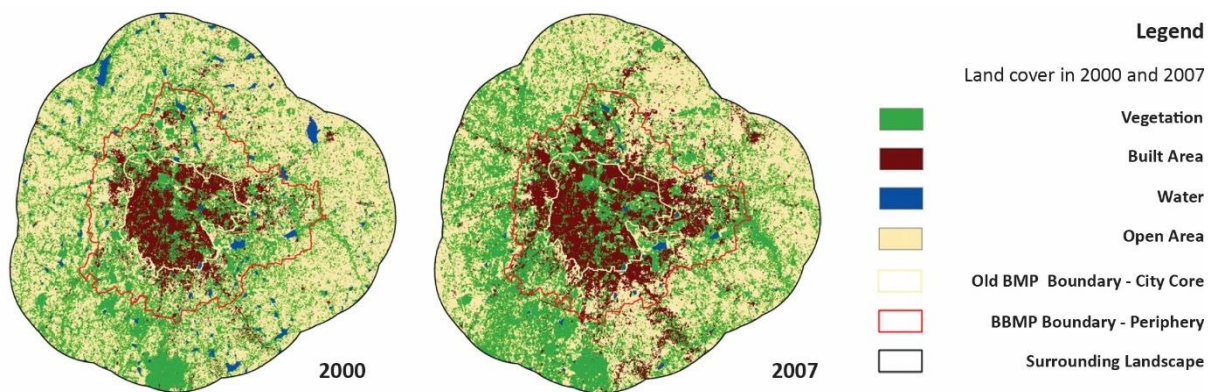
Map 1: Land cover in different zones of Bengaluru for 2000 and 2007

Source: Nagendra et al. 2012
Landscape and Urban Planning 105, 400– 406

Legend
Land cover in 2000 and 2007
Vegetation
Built Area
Water
Open Area
Old BMP Boundary - City Core
BBMP Boundary - Periphery
Surrounding Landscape

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[40] This includes the city core and urban agglomeration, the region which is governed by the Municipal Corporation (BBMP).
[41] Source: *India Census 2011*. GoI. https://www.census2011.co.in/census/metropolitan/388-Bengaluru.html. Accessed January 25, 2020.
[42] Bengaluru ranks as the third most populous city of India and sixteenth most populous city in the world.
[43] Source: *Bengaluru Population 2020*. World Population Review [UN World Urbanization Prospects].
http://worldpopulationreview.com/world-cities/Bengaluru-population. Accessed January 25, 2020.

Map 2: Percentual population growth wards Bengaluru 2001-2011

Legend

Percentual decadal population growth per ward from 2001 till 2011

- 23,9 % -	< 0 %
0 % -	< 50 %
50 % -	< 100 %
100 % -	< 150 %
150 % -	< 200 %
200 % -	< 250 %
250 % -	< 315 %

Source: BBMP ward data
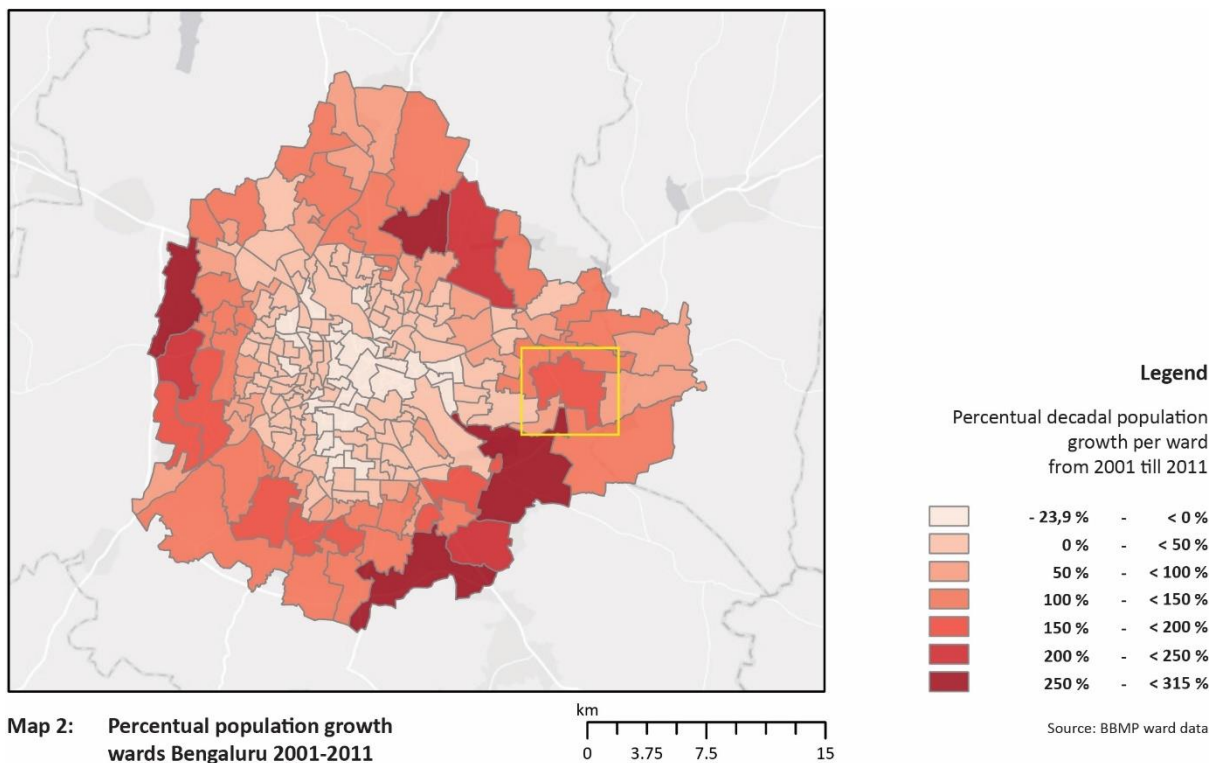
The maps (1; 2) and tables (V; VI, Appendix IV) demonstrate that most urbanisation occurred in the periphery, resulting in the expansion of the city fringes. The differences in population between 2001 and 2011 show that in some of the wards in the city core a small decrease occurred, with up to 50 percent growth in most other core wards. Comparatively most peripheral wards had a growth rate between 100 and 200 percent. This peripheral urbanisation can be explained by two interrelated factors; economic development and migration.

Economic development and migration

Bengaluru's urban growth is often ascribed to its economic development, most prominently to its booming IT sector,[44] additionally by the textile-, automobile-, machinery-, aviation-, space-, defence-, and biotechnology-based industries (Sudhira et. al. 2007, 384-385). Most economic (industrial) development takes place in the urban peripheries (Nagendra et. al 2012, 401), as peripheries provide attractive locations with low land prices. Furthermore, peripheries have more purchasable space for large manufacturing sites, and often have better access to export facilities (Webster 2014, 318).

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[44] Thirty percent of India's IT workforce is located in Bengaluru.

To gain insight in the spatial distribution of economic development, one could appropriate property tax collection data as a proxy. Additionally, property tax constitutes the primary tax income of the BBMP,[45] and demonstrates each ward's financial significance for the government.[46] Three observations are made.

First, with the core-periphery distinction in consideration,[47] we see that the distribution of property tax between the core and the periphery is almost even, suggesting the economic importance of the periphery for the city's economy. Though Bengaluru's peripheral zones are almost 300km² larger than the inner zones, with 175.000 more tax-paying properties (table VI, Appendix IV), the similar amount of tax collection can be explained by a lower population density and still available non-build-up plots in outer fringes of the city. Second, large variations in economic development can be found within the periphery as well (map 3 and 4). These differences can be often be explained by the presence or absence of Special Economic Zones (SEZ), which attract companies with foreign investment. The majority of these SEZs are located in wards with a higher tax income.[48] Third, a comparison of map 2 with map 3 and 4 demonstrates that a high tax collection – indicating the presence of economic development – seems to correlate with a high population growth within these respective wards.[49] Thus, these findings seem to validate Nagendra's claim (2012) that much of the economic development is occurring in the periphery, and can be seen as a primary cause of urbanisation.

The presence of these economic activities comes with increasing job opportunities for all economic classes, which leads to urbanisation through (labour) migration (Webster 2014). As an Indian newspaper reported in response to the 2011 census data, 50,6% of the urban population are migrants.[50,51] With limited (affordable) housing possibilities in the core and extreme commute times throughout Bengaluru, most migrants, regardless of class, favour housing nearby their work. Thus, incoming migrants contribute to peripheral population growth through economic development.

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[45] The importance of property tax income for the BBMP is also observable in the smart city proposal.
[46] A high property tax collection per ward can indicate a high floor area ratio (FAR) which indicates high-rising buildings and large industrial compounds. These aspects are drivers for high tax collection. These properties signify an economically prosperous area (efficient tax paid area/total area) and/or signifying a strong urban governance capacity.
[47] In this section, the core is defined as inner BBMP zones (West, East, and South), and the periphery defined as outer BBMP zones.
[48] E.g. the wards of Whitefield, Doddanekundi, Marathahalli, Bellanduru, Thissandra.
[49] With exception to the western periphery. In the last years, urbanisation seems less extensive here. Most urban growth happens in the north and east.
[50] Migration in this news source is defined as individuals not coming from Bengaluru. 64% of the migrants comes from the same state (Karnataka), and 2.5 million migrant came from other states, for work, marriage, business. Most migrants are thus internal migrants.
[51] Source: Times of India. *Bengaluru's Migrants cross 50% of the city's population.* August 4, 2019. https://timesofindia.indiatimes.com/city/bengaluru/bengalurus-migrants-cross-50-of-the-citys-population/articleshow/70518536.cms. Accessed June 5, 2020.

Legend

Percentual contribution of total property
tax collection per ward
vis-à-vis total collection (198 wards)
financial year 2018-2019

0.0 %	- < 0.5 %
0.5 %	- < 2.0 %
2.0 %	- < 4.0 %
4.0 %	- < 6.0 %

Percentual contribution of total property tax
collection per km² of particular ward vis-à-vis
total collection, financial year 18-19)

0.00 %	- < 0,05 %
0.05 %	- < 0.10 %
0.10 %	- < 0.20 %
0.20 %	- < 0.30 %
0.30 %	- < 0.41 %

Center and periphery distinction
Bengaluru

City core (inner BBMP zones)
Peripheries (outer BBMP zones)

Map 3: Bengaluru, property tax collection of individual
peripheral wards and their percentual per km²
contribution to total collection
(financial year 2018-2019)

km
0   3.75   7.5   15

Legend

Average property tax collection
per square km for each peripheral ward
in millions of rupees (₹) , (f. year 2018-2019)

2.5	- <7.5
7.5	- <12,5
12.5	- < 25.0
25.0	- < 37.5
37.5	- < 80.0

Average property tax collection
per property for each peripheral ward
(f. year 2018-2019)

3.500 ₹	- <10.000 ₹
10.000 ₹	- <20.000 ₹
20.000 ₹	- <30.000 ₹
30.000 ₹	- <60.000 ₹

Center and periphery distinction
Bengaluru

City core (inner BBMP zones)
Peripheries (outer BBMP zones)
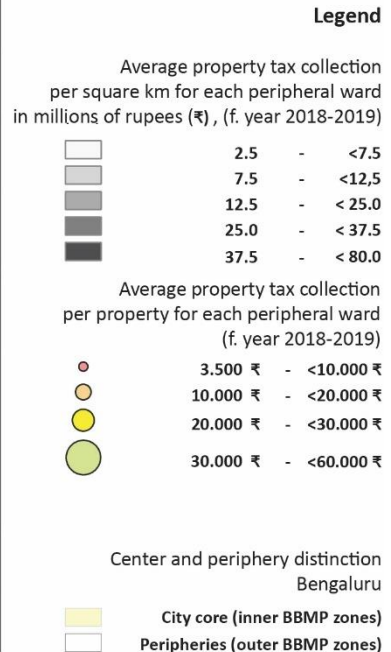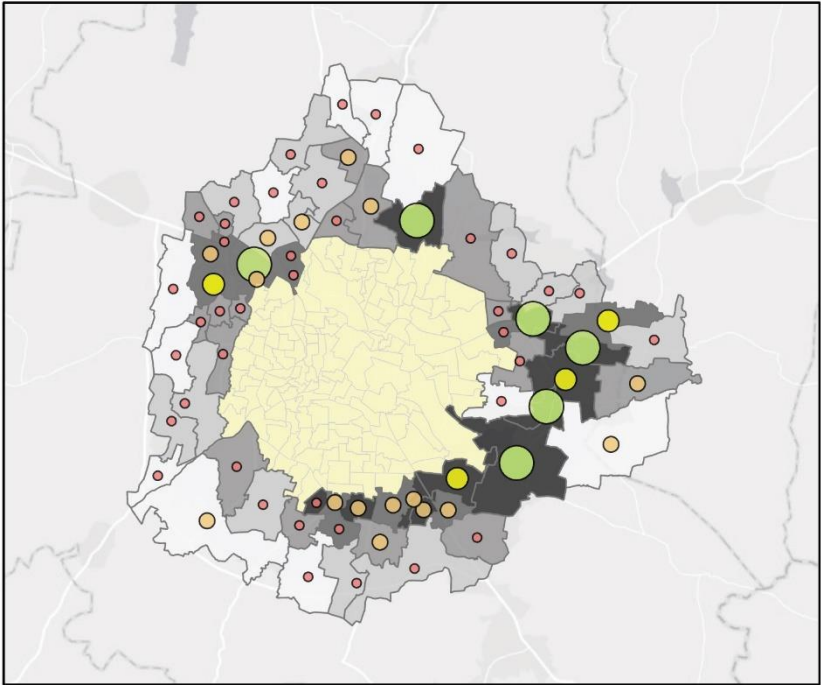
Map 4: BBMP property tax for peripheral wards in
financial year 2018-2019,
1) avg. tax per km², 2) avg. tax per property

km
0   3.75   7.5   15

Legend

Combined percentage of low income HHs and slum HHs over total HHs in each ward, excluding large appartment HHs (>50 units). designated colours for center and urban periphery wards (2017)
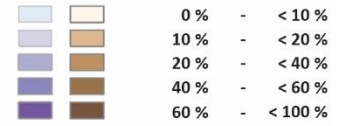
		0 %	-	< 10 %
		10 %	-	< 20 %
		20 %	-	< 40 %
		40 %	-	< 60 %
		60 %	-	< 100 %
				no recorded data

HH distribution of low income HHs vis à vis slum HHs in urban peripheries (2017)

slums HHs

low income (non-slum) HHs

Data source: BBMP Microplans (2017)
https://opencity.in/pages/latest
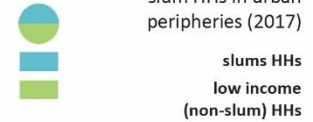
Map 5: Presence of low income and slum households (HHs) vis à vis total HH income distribution in wards (2017)

km
0   3.75   7.5   15
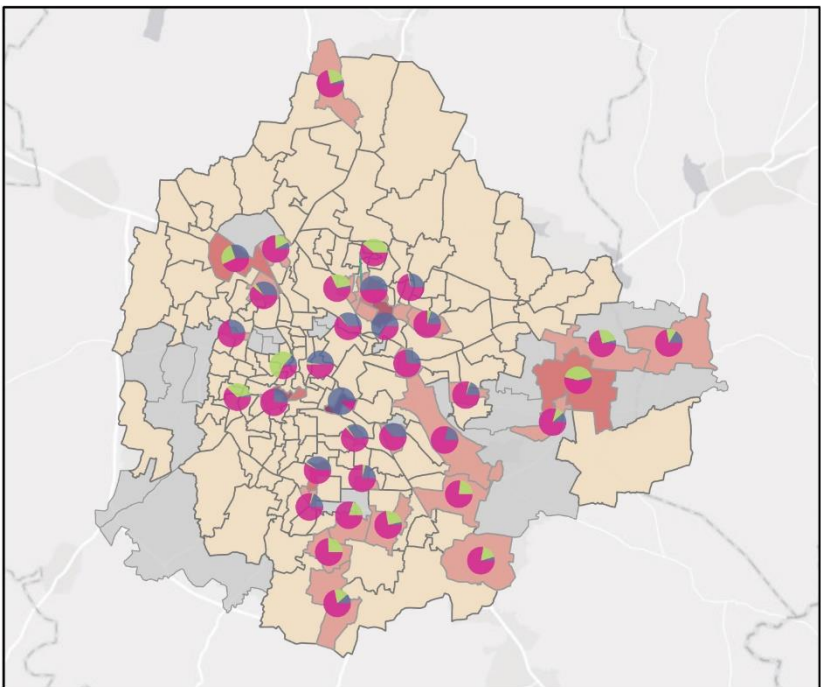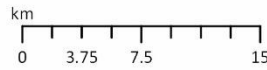
Legend

Percentage of non-regular housing (slums+ large appartments)

		0.0 %	-	< 20.0 %
		20.0 %	-	< 40.0 %
		40.0 %	-	< 60.0 %
		60.0 %	-	< 80.0 %
		80.0 %	-	< 100.0 %
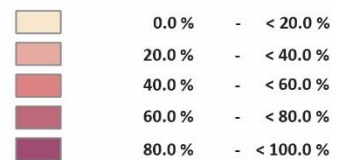
Distribution of housing types in percentages per ward (when non-regular housing is > 20%)

Slums

Large Appartments
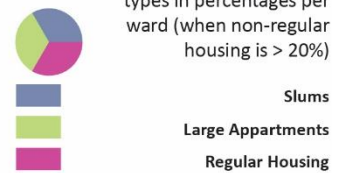
Regular Housing

No data reported/available

Data source: BBMP microplans (2017)
https://opencity.in/pages/latest

Map 6: Housing types per ward in Bengaluru: regular housing, large appartments (>50 units), slums (2017)

km
0   3.75   7.5   15

45
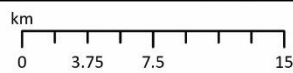
Housing and income: poverty conditions in the periphery[52]

Regardless of Bengaluru's economic significance and generally high average per capita income, a considerable part of the population is in impoverished housing conditions. The census of 2011 detailed that 8,39% of inhabitants of Bengaluru are living in 'slums'.[53] With regard to income, the data in map 5 demonstrates three important findings. First, in nearly all wards can poverty be found, regardless of the distance between a ward and the city centre.[54] Second, slums were reported in almost all wards. Third, the periphery has a more heterogeneous socio-economic population, which suggests that wards within the core have more segregation between itself more homogenous wards, and that wards in the periphery have more socio-economic segregation within – likely in closer vicinity to one another.[55]

Furthermore, based on a typology of housing types per household (see map 6)[56][57], three additional observations can be made. First, the smaller wards in the city core have a high percentage of slum households, further substantiating the argument of a relative socio-economic homogeneity of wards in the core. Next, many of the south and south-eastern wards are characterised by a high prevalence of large apartment buildings. This likely signifies a relatively large presence of gated communities and higher income households, that live in close proximity to a substantial poor population (comparing map 5 and 6). Lastly, in turn, this also demonstrates a more heterogenous income distribution in peripheral wards, which is an indication for possible segregation, bypass urbanisation and splintered urbanism (Graham and Marvin 2002).

Deficiencies in infrastructure

As a consequence of peripheral urbanisation, governmental agencies are facing challenges in catering to the city's demand for basic infrastructures (Sudhira et al. 2007, 380, 387; Shaw 2016, 73). Issues occur with drinking water, sewerage, electricity,[58] waste management,[59] traffic congestion, air, water[60] and lake pollution, and a diminishing of green spaces (Sudhira et al. 2007, 383; Nagendra et al 2012). Moreover, whereas the state infrastructure network of tap water and sewerage has almost a complete coverage in the core, the periphery is characterised by fragmented access and presence of state infrastructure (see map 7 and 8).

---

[52] Based on ward data collected by their respective BBMP ward staff units, I have compiled, analysed and mapped the household income and housing data of Bengaluru's wards - if not with major limitations. This data provides us the spatial distribution of poverty, which can debunk some of the typical misconceptions about urban peripheries.
[53] Source: *India Census 2011*. GoI. https://www.census2011.co.in/census/metropolitan/388-Bengaluru.html. Accessed January 25, 2020.
[54] Only 10 wards reported lower than 10% slum or low-income households.
[55] Possibly explained by smaller sized wards.
[56] Household typology: 'Regular housing' HHs, slums HHs, and large apartment HHs (>50 units per property).
[57] On the map below are all wards with more than 20% of slums and/or large apartments contributed with a pie chart with the distribution of the household typology.
[58] Good cover but frequent outages, especially during rain.
[59] Public garbage dumping, low waste segregation.
[60] Deccan Herald. *Poison in your tap: Sip faecal flow, metal mix.* 30-11-2019.
https://www.deccanherald.com/city/bengaluru-infrastructure/poison-in-your-tap-sip-faecal-flow-metal-mix-781128.html. Accessed January 25, 2020.

As such, the increased demand as a consequence of urbanisation, without the state capacity to meet this demand, has led to infrastructural deficiencies – in particular, though not only, in Bengaluru's peripheries. As next section will demonstrate the partial absence of state facilities causes variated outcomes in infrastructural access, which is depending on the socio-economic background.

Legend

Percentage Household Sewerage Connections
- 66.3% total coverage

	7.6	-	< 30.0
	30.0	-	< 50.0
	50.0	-	< 70.0
	70.0	-	< 90.0
	90.0	-	< 99.0

Source: BBWSB (Karnataka State)
in Smart City Proposal Bengaluru Annexures 2017,
City Profile, page 5

Legend

Percentage Household Tapwater Connections
- 39% overall coverage

	14.7	-	< 30.0
	30.0	-	< 50.0
	50.0	-	< 70.0
	70.0	-	< 90.0
	90.0	-	< 98.0
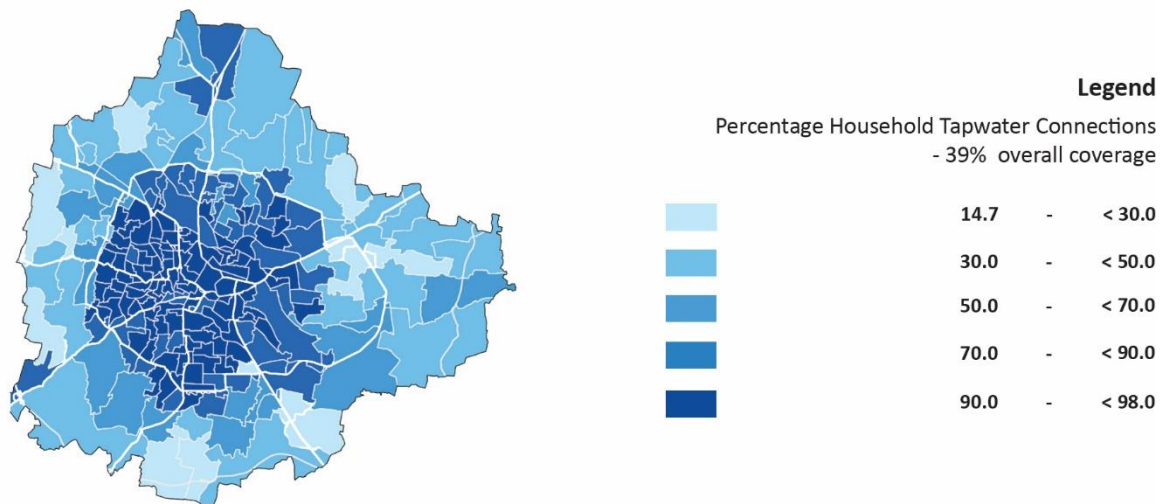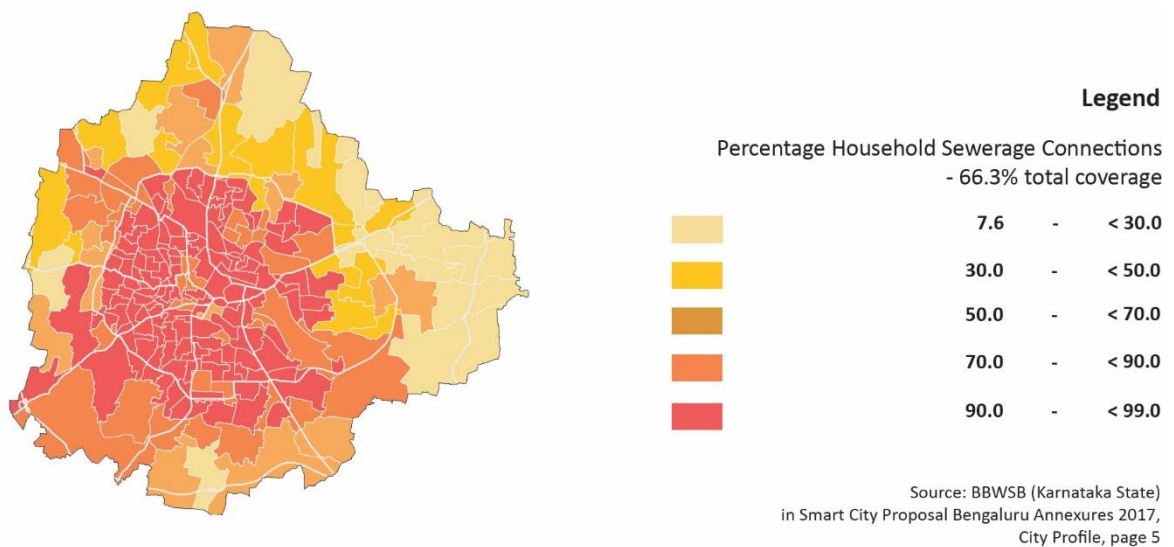
Map 7 and 8: Percental household coverage sewerage and water tap connections, Bengaluru 2017

Source: BBWSB (Karnataka State)
in Smart City Proposal Bengaluru Annexures 2017,
City Profile, page 5

3.2 Case study: urbanisation and infrastructural deficiencies in the peripheral ward 'Doddanekundi'

Map 9:   Landuse of Doddanekundi ward
          (nr. 85), 2020

0.5   1 km

Legend

Residential
Commercial
Water Bodies
Parks and Open Spaces
Public
Defence
Industry

Source: Sensing Local (2020)
https://sensinglocal.wixsite.com/
doddanekkundifutures/basemapforlanduse
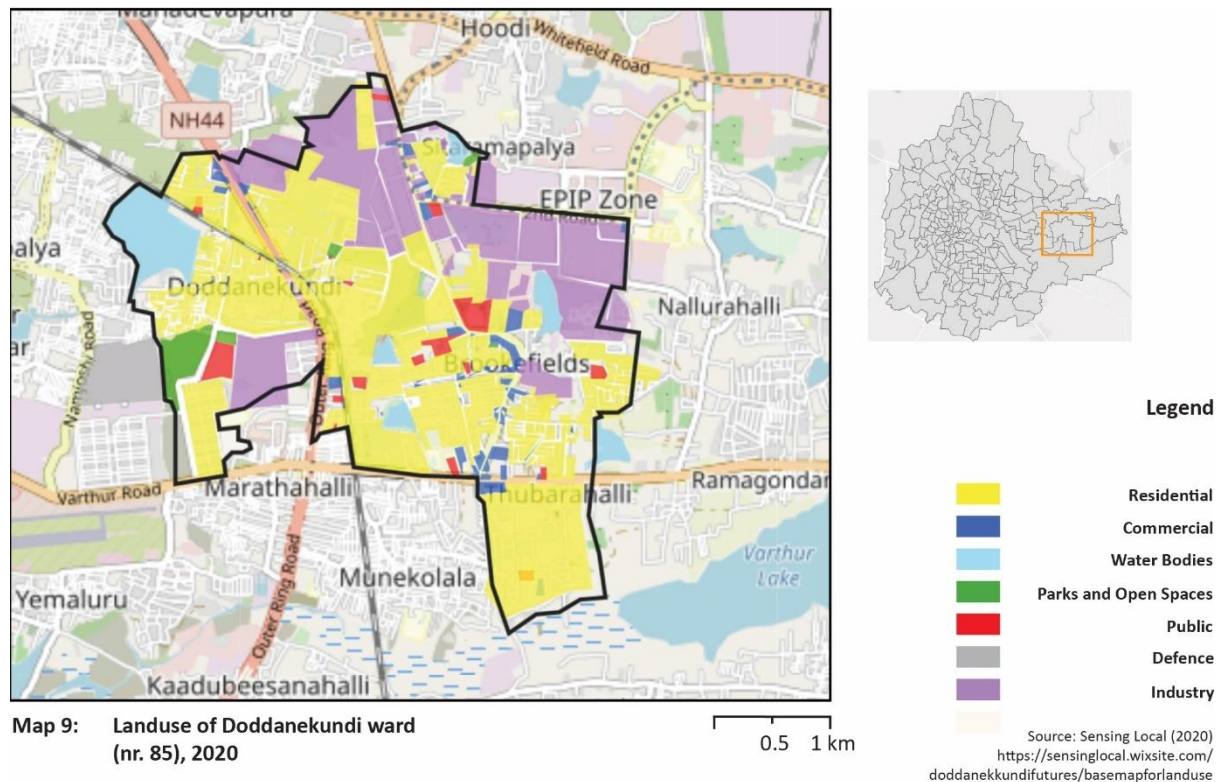
As demonstrated above, the demography of peripheries is made up of a socio-economically heterogeneous population, as a result of urbanisation. Consequentially, inhabitants of peripheries have varying outcomes in housing and infrastructure facilities, where groups with a weak socio-economic background have only limited access to basic infrastructures.

These arguments are illustrated in a case study of an eastern peripheral ward in Bengaluru, named Doddanekundi.[61] This ward has known much economic development over the last decades through the arrival of many *Fortune 500* businesses. Here, companies such as Dell, Boeing, Huawei and Amazon have either offices or manufacturing sites located.[62] The economic development brought many job opportunities for differing socio-economic backgrounds, which resulted in multiple types of urban layouts (see map 10).

---

[61] That is, the ward Doddanekundi before the new delimitation of ward boundaries most probably happening in the second half of 2020 or 2021. The delimitation displayed has been in place since 2009 after the expansion of the BMP into the founding of the BBMP.

[62] Quantitative data on Doddanekundi is displayed in Table VIII, Appendix IV.
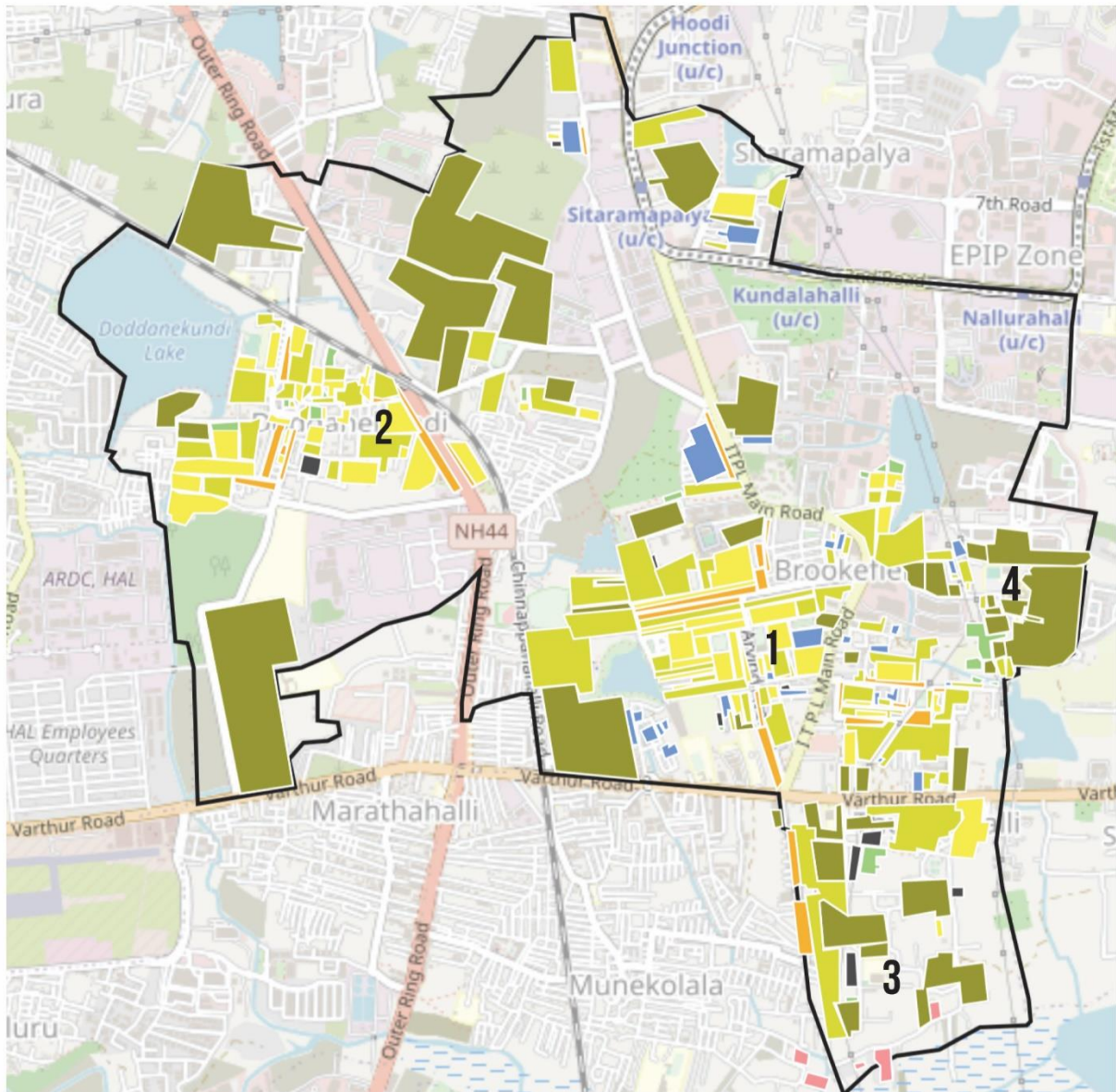
Map 10:   Housing in Doddanekundi (April 2020)

1 (Semi-)planned layouts
2 Enveloped urban village
3 Gated communities
4 Larger slum area

Legend

Independent houses

Low rise apartments

Apartments and gated communities

Residence cum commercial housing

PG ('paying guest', temp. rented housing)

Labour housing

Slum

Under construction

A heterogenous population, varied housing and fragmented infrastructure deliveries

Middle- and upper-class housing

First, the arrival of migrants working at the multinational companies resulted in a rapid growth in middle-class neighbourhoods (mark 1, map 10) and large condominiums and gated communities (mark 3 and 4, map 10).[63] This form of residential growth can be understood by a combination of manufacture-driven and amenity-driven peri-urbanisation, for a large part through an emigrating urban middle- and upper class (Webster 2014).

Envelopment of villages

Not all housing in Doddanekundi is a result of increased industrial activity. For example, Doddanekundi village (mark 2, map 10), has been enveloped by newer areas. Such villages, with a relatively older population and with households that have a long history of living in the area, have seen their vicinity change for better or worse. Zacharias,[64] an elderly man and resident welfare association (RWA) member, who has resided in the village for over 35 years, expressed some of the tensions that came along with the nearby economic development. While he is content with the increased job opportunities, he dislikes the pollution and increasing water shortages that came along with that.[65]

Within the village, change is observable as well; there is ongoing construction, presumably to facilitate incoming migrants in the area. Figure 3 below shows an about-to-be apartment building to capitalise on the housing demand in the area. Furthermore, the socio-economic background of village inhabitants varies; lower-income households live in the direct vicinity of middle-class households (see figure 4).[66]

Figure 3 (left):   Small apartment building under construction in Doddanekundi village.
Figure 4 (right):   Social (private) housing in Doddanekundi village.

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[63] Source: SI7, Ward Committee Member. May 19, 2020. Digital interview with author.
[64] Pseudonym
[65] Source: II3, Zacharias, Resident Welfare Association Member in Doddanekundi, February 27, 2020. (walking) interview with author.
[66] Ibid.

Migration, PGs and labour camps

Whereas slum dwellers on mark 3 can be understood as more permanent inhabitants, the ward has a large 'floating population' as well. The ward has many 'PG's',[67] which are privately rented rooms, floors, or complete houses which the owners rent out, primarily to migrants. Moreover, with ongoing large development projects, many construction workers live in labour housing camps for a long period of time (mark 4 map 10, figure 5). The poor living conditions – e.g. no direct source of water and bad sanitation facilities – can be contributed to a lack of social housing,[68] Furthermore, also the limited state regulation and initiatives to expand the infrastructural cover causes limited access for these labour migrants.

Figure 5: Labour housing camps, construction workers living in poverty, marginal conditions.

Infrastructure in the absence of state facilities – market deliveries

In case of Doddanekundi, the State has not been able to create and manage a 'networked city-infrastructure' by the 'modernist ideal' (Coutard & Rutherford 2015; Graham & Marvin 2002). State infrastructure is only partially able to suffice in the infrastructural demand and does so in a fragmented fashion. As a result, market providers aim to compensate the untended demand, but do not service each income group to the same extent. I will name three examples.

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[67] 'PGs' refer to 'paying guest accommodations'.
[68] Source: "Swot Analysis" *Imagining Local Futures*. Sensing Local. https://sensinglocal.wixsite.com/doddanekkundifutures/swot-analysis. Accessed June 1, 2020.

First, with minimal affordable social housing present in the ward – neither constructed by the State or the market – the lowest socio-economic strata of the population are dependent on housing in slums and labour camps, in which sanitation facilities for basic hygiene are often minimally present. Second, with the State servicing less than 50 per cent in tap water, most inhabitants on water from borewells. However, most access to ground water has depleted through over usage.[69] As such, many households are currently serviced by private water tanker companies, which are considerably more expensive than tap water (see figure 6). In comparison, gated communities and middle-class neighbourhoods are less dependent on state infrastructure. For example, thirdly, those with financial capital can purchase back-up generators that compensate the adverse effects of frequent outages.

Figure 6: Water tankers in Doddanekundi village (mark 2 on map 10, but present everywhere in the ward).

Conclusively, the financial capital of households available for market deliveries has a decisive impact on their respective infrastructure outcomes. Here, marginalised groups without the financial capacity are thus reliant on state infrastructure, whilst this demand is not met by the State agencies. Two forms of infrastructural exclusion occur. First, by the geospatial disparity between core and periphery. Where citizens living in the city core are serviced regardless of socio-economic background, the periphery is characterised by the absence of an extensive networked state infrastructure. Second, citizens' differentiated access to basic infrastructure is dependent on one's financial capital to acquire marketised infrastructure, causing marginalised groups to be excluded from individually purchased market infrastructures (social exclusion proxy 2; Aasland and Fløtten 2001).

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[69] Source: II3, Resident Welfare Association member in Doddanekundi. February 27, 2020. Walking interview with author.

4. Infrastructural Governance: a multi-perspective actor-analysis

Taking the disparity of infrastructural access between marginalised groups and middle- and upper-class residents in consideration, this chapter aims to explain how this has come to be through the governance of the State, market and civil society. In doing so, I have created an overview of the practices and relations of involved the actors, that underpin the perceptions and outcomes of smart city projects.

The purpose of this chapter is threefold. Firstly, section 4.1 will elaborate on the political processes among state actors that hinders state capacity, and thus contributes to an explanation why the State has a limited capacity to provide (inclusive) infrastructure. Next, taking the limited state capacity in consideration, section 4.2 focuses on the forms of governance that are practiced by civil society, that aim to compensate the middle- and upper-class needs that would otherwise be left untended. Also discussed are how these governance practices of civil society actors are not inclusive for marginalised groups in terms out infrastructural outcomes, aggravating the fragmentation and disparity with more affluent citizens. The chapter concludes by bringing all sections together in an actor map, displaying the relations between the state, market and civil society, whilst indicating which processes relate to the four proxies of exclusion (table II, section 1.2).

Legend

Actors	Controlling function	Planning jurisdiction	Facilitative jurisdiction

Government of India (electoral/bureaucratic)

- Controlling the state governments
- National security, immigration, foreign affairs, finance
- National development plans (e.g. Smart City Mission)

Karnataka state government (electoral/bureaucratic)

- Departments (e.g. dep. of urban development)
  - Infrastructure planning (finance allocation, initiating plans)
  - Social and economic policy implementation, public order
- Planning parastatal agencies (BDA, BMRDA)
  - Urban development planning, spatial planning
- Facilitative parastatal agencies (e.g. BESCOM, BWSSB, BMTC, BMRC)
  - Facilitation and O&M of water, sewerage, electricity, public transport infra
- State parliament (electoral)
  - Controlling state departments, Parastatal agencies, ruling government, and BBMP

Urban Local Body (ULB) (BBMP)

- BBMP departments (bureaucratic)
  - Infrastructure planning waste management, roads, street lighting
  - Ward staff
    - Ward-level facilitation and O&M waste management, Roads, street lighting
- Ward corporators BBMP parliament (electoral)
  - Ward Committee Members (active in civil society)
    - Ward planning
    - Controlling BBMP/parastatal agencies, appealing for infra improvement, grievance adressal
  - Controlling BBMP departments, ward staff, appealing to parastatal agencies

Figure 7: Actor map of state actors related to the governance of infrastructure in Bengaluru, and their functions *(own model)*

4.1 Explaining the infrastructural deficiency: State actor-analysis

In order to get a better understanding of the actors that are influential for the state of Bengaluru's infrastructure, I will briefly discuss the decentralised organisational structure of the governmental tiers: the national government, the state government, city government and ward governance actors. The structure is illustrated in figure 7 on the left.

This descriptive overview is followed up by an examination of four problems that inhibit the state capacity to provide inclusive infrastructure. These issues have consequences for the implementation and operationalisation of smart cities. At the same time, these problems may be alleviated through smart city projects, and thus expand the State's infrastructural capacity.

Organisational structure of State actors

When India gained its independency from British colonial rule, the nation-state had become a democratic federal republic with a parliamentary system, consisting of a strong national government with subordinate state governments. Until 1992, the national government had the responsibility over national security, immigration, foreign affairs and national finance, whereas state governments had jurisdiction over economic and social planning, public order, and infrastructures such as water, electricity and public transport (Shaw 2017, 59). This division of duties changed in 1992 with the 74th Constitution Amendment Act which aimed for further decentralisation, granting recognition to urban local governments (ULBs).[70] Since then, the state government and the BBMP government – the ULB of Bengaluru – share custody over the facilitation and planning of infrastructures (see figure 7). Whereas the BBMP departments facilitate and plan infrastructure regarding waste management, roads and street lighting, the state government has jurisdiction over other infrastructures like water, electricity and public transport (Shaw 2017, 60; Sudhira 2007, 387).

Bureaucratic state actors

Whereas a part of the policy making and resource allocation is executed by Karnataka State's departments, a significant amount of its policy and infrastructure duties are executed by 'parastatal agencies'. These are companies, agencies or organizations that exist in separation of the state government, but are still supervised by the latter (see table IX).[71] Whereas some parastatal agencies focus on the facilitation of a particular infrastructure (e.g. BESCOM, BWSSB), others focus on city-wide planning and land-use allocation (BDA, BMRDA).

Infrastructural planning by the BBMP is executed by its respective departments, which simultaneously steer smaller departments and units, that in turn manage the 'ward staff teams'. The ward staff – e.g. health inspectors, street sweepers, etc. – execute the facilitation, operation and management on the most local scale, in Bengaluru's wards.

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[70] ULB refers to 'Urban Local Bodies', the city government.
[71] See table VII below for are range of agencies involved in urban planning, policy and infrastructural provisions, as of 2007 (original table in Sudhira 2007, 387).

TABLE IX   Selection of State organisations concerning infrastructure in Bengaluru

(Sudhira 2007, 387)

Organisations	*Functional areas (scope of work)*
Greater Bengaluru City Corporation (ULB) [Bruhat Bengaluru Mahanagara Palike (BBMP)]	Urban local body responsible for overall delivery of services – roads and road maintenance including asphalting, pavements and street lighting; solid waste management, education and health in all wards, storm water drains, construction of few Ring roads, flyovers and grade separators.
Bengaluru Development Authority (BDA)	Land use zoning, planning and regulation within Bengaluru Metropolitan Area; Construction of few Ring roads, flyovers and grade separators. Some neighbourhoods are planned by the BDA.
Bengaluru Metropolitan Region Development Authority (BMRDA)	Planning, coordinating and supervising the proper and orderly development of the areas within the Bengaluru Metropolitan Region, which comprises Bengaluru urban district and parts of Bengaluru rural district. BDA's boundary is a subset of BMRDA's boundary.
Bengaluru Water Supply and Sewerage Board (BWSSB)	Drinking water – pumping and distribution, sewerage collection, water and wastewater treatment and disposal
Bengaluru Metropolitan Transport Corporation (BMTC)	Public transport system – bus-based
Bengaluru Metro Rail Corporation Ltd. (BMRC – Namma Metro)	Public transport system – rail-based
Bengaluru Electricity Supply Company (BESCOM)	Responsible for power distribution

Electoral state actors

Electoral state actors, such as the Karnataka state- and BBMP parliaments ought to have a controlling function over the bureaucratic actors, keeping them in check whilst representing the interests of Bengaluru's citizens. Whereas citizens may have difficulty to approach bureaucratic state actors– e.g. through red tape and a 'come back tomorrow' rhetoric[72] – electoral state actors create access to the infrastructural governance, in particular for marginalised groups (Chakrabarti 2007; Harriss 2005).

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[72] Source: SI7, ward committee member. May 19, 2020. Digital interview with author.

On the most decentralised level, ward corporators represent the residents of their respective ward in the BBMP parliament, and fulfil a controlling function over the activities of the BBMP departments and ward staff. The ward corporator is aided in this function by the through him/her selected nine ward committee members, who are generally very active in civil society. Committee members are often selected based on their expertise on a certain kind of infrastructure, or because of their social position in certain neighbourhoods that enact them to be a local representative.[73] Ward committees ought to analyse public works done in the ward, but are also supposed to create a local development plan, and decide on budget allocation for infrastructural improvements. Furthermore, ward committees ought to hold monthly public meetings, where the residents of the ward can raise grievances and are supposed to participate in the decision-making process.[74]

State deficiencies in infrastructure: issues over decentralisation and cooperation

Based on the description above, it becomes clear that the functions of planning, facilitating and controlling of a state actor affects the practices of other actors across the governmental tiers. For example, if a state government department develops an infrastructural plan, this would likely be executed by a parastatal agency, would impact the plans of the BBMP departments, affect the operations of ward staff and ought to be controlled by the ward corporators and their committees. This results in a complex hierarchy, power play and tensions over decentralised authority among the different actors. These aspects hinder the State capacity for the facilitation of (inclusive) state infrastructure, as it is impeded by a troubled cross-actor cooperation and coordination. I will discuss four underlying problems.

First, the government structure creates *a dependency of decentralised actors on higher tier actors*, rather than having the autonomy to execute their functions independently. For example, The BBMP has a bounded financial capacity as a result of limited tax income.[75] Collected taxes do not cover the BBMP's costs, which creates a dependency on financial transfers from the state government (Shaw 2017, 70). As a result, the BBMP has a curbed autonomy, as the Karnataka state government has taken on a critical supervising position. In turn, this created tensions between the two government tiers. For example, Karnataka's principal secretary of urban development,[76] expressed his frustrations during a conference in Bengaluru: "Some organisations need to be done in a very professional manner, we cannot let the ULB do that", he argued.[77,78] Similarly, little executive power is granted to ward committees, who receive little support by the BBMP or state government.[79] The committees

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[73] Idem.
[74] Source: *Ward as Unit of Change. Study observing 22 Ward Committee Meetings.* Sensing Local Foundation. October 30, 2019.
[75] The BBMP only levies taxes on property, advertisement, animals, and certain professions.
[76] Anjum Parwez.
[77] Source: E7, IASSI conference, ISEC Institute, February 27, 2020. Participant observation by the author.
[78]See also the interview with Karnataka Principal Secretary of Urban Development Anjum Parwez. Source: Elets News Network. *Ready to take Smart Cities to the next Level: Anjum Parwez.* https://egov.eletsonline.com/2020/02/ready-take-smart-cities-the-next-level-anjum-parwez/. Accessed June 9, 2020.
[79] Source: SI6, urban planner, February 25, 2020. Semi-structured interview with author.

have a minimal free-to-spend financial capital to implement initiatives, do not receive specific training in planning or technical knowledge, nor have easy access to data or information necessary for proper urban planning.[80,81] As such, ward committee members have the responsibility over governance duties beyond what can be realistically expected.

Second, the state capacity is hindered by *an inhibited intergovernmental bureaucratic cooperation in urban planning.* Many actors have the authority to plan – parastatal planning agencies, BBMP and Karnataka state departments, and ward committees (see figure 7). This results in overlapping jurisdictions that acquire in-depth cross-actor cooperation and coordination across the different tiers to avoid contravening development plans. Furthermore, as ward committees are not supported enough, actual planning is not done (yet) by ward committees – most committees focus on the addressing of grievances rather than actual planning.[82] A ward committee member of the Doddanekundi ward explained that they "haven't reached there yet, to do planning and financing", but rather fulfil a controlling function, overseeing the plans made by the BBMP and Karnataka state government.[83]

Third, *electoral state actors are limited in their controlling function to steer and correct bureaucratic actors.* As parastatal agencies operate primarily independently, the state parliament does not control these organisations directly. Moreover, the BBMP parliament, made-up of ward corporators, have even more difficulty controlling parastatal agencies, as these are not under supervision of state government, and thus not within the jurisdiction of the BBMP. Simultaneously, ward committees, ought to observe and control the local ward activities of the parastatal agencies, as well as those of the BBMP departments, which is thus impeded by their disempowered position vis-à-vis the other state actors.

Fourth, the state capacity is *impeded by the limited availability of quality data*. Through the limited state capacity and inter-actor cooperation data – e.g. tax collection-, socio-economic- and demographic data – is often unreliable, undetailed, outdated, limitedly available and not shared across state actors (Sharma 2018; Appendix IV, case study I&II).[84] In the appendix (IV) I provide two detailed case studies that illustrate these data issues. "There is no technological innovation, no dashboard, and a complete lack of data", a ward committee member argued (case study II).[85]

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[80] Sources: Source: II2, data archivist. February 26, 2020. Interview with author.
SI6, Urban Planner. February 25, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author.
II8, ward committee member. May 21, 2020. Digital interview with author.
[81] Source: *Ward as Unit of Change. Study observing 22 Ward Committee Meetings.* Sensing Local Foundation. October 30, 2019.
[82] Source: *Ward as Unit of Change. Study observing 22 Ward Committee Meetings.* Sensing Local Foundation. October 30, 2019.
[83] Sources: SI7, ward committee member. May 19, 2020. Digital interview with author.
II8, ward committee member. May 21, 2020. Digital interview with author.
[84] Sources: Smart City Challenge Round 3: Smart City Proposal Bengaluru. Ministry of Urban Development, GoI, 2017.
SI7, ward committee member. May 19, 2020. Digital interview with author.
Citizen Matters, Bengaluru. *Delimitation will not solve Mahadevapura's traffic, infrastructure woes.* March 7, 2020. https://bengaluru.citizenmatters.in/bbmp-ward-delimitation-notification-unscientific-mahadevapura-infrastructure-services-43301. Accessed May 24, 2020.
[85] Sources: SI6, Urban Planner. February 25, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author.

Urban governance challenged – 'Smart' e-governance as solution?

With data availability and state actor cooperation impeded, Bengaluru's State officials have taken interest in the use of (smart) technology. The digitisation of governance enables state actors to trace each other's actions, which can result in better attuned policy plans. This sparked interest has taken form in various e-governance platforms deployed by the various state-actors (see table XI, appendix IV), as well through the participation in the Smart City Mission. It is not surprising that many over pan-city projects included in the proposal relate to digitisation and e-governance that ought to alleviate the four problems noted above. For example, project 5a (see appendix II) entails a governance-to-governance platform to be used by all parastatal agencies and departments of the BBMP.[86]

In theory, if the problems set out in this section can indeed be alleviated by smart technology, state actors should have more capacity to meet the infrastructural demand and enlarge the coverage of basic infrastructure in the urban peripheries. Nevertheless, these potential improvements through technological innovation do not address the political or normative stances of involved state actors. However, in a scenario in which the organisational and political complications among state actors are alleviated, and thus the state *ought to be capable* to meet the infrastructural demands, citizens, organised through civil society or represented by elected representatives, could potentially hold state actors accountable for their infrastructural policy decisions.

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[86] Source: Smart City Challenge Round 3: Smart City Proposal Bengaluru. Ministry of Urban Development, GoI, 2017.

Neoliberalise infrastructure - finance state infrastructure (PPP)

State

Market

Hybridise governance - agenda-setting by market actors

Facilitate platform for direct CS participation in policy making
-
Appeal for state infra by bureaucratic cooperation

Cooperate - finance Civil society projects (CSR)

Demand - supply marketised collective infra

Institutionalise civil society in bureaucratic duties
-
bureaucratic representation at the State by civil society groups

Civil society

Electoral representation, protect interests and rights of voters
-
elect representatives, agenda-setting by electoral control

Citizen representation at bureaucratic state actors
-
citizen participation in CS

Supply collective & autoconstructed infra
-
citizen participation

Supply - demand state infrastructure

Demand - supply marketised personal infra

Citizens

Marginalisation in infra. access

Legend

— 'Facilitating' practices

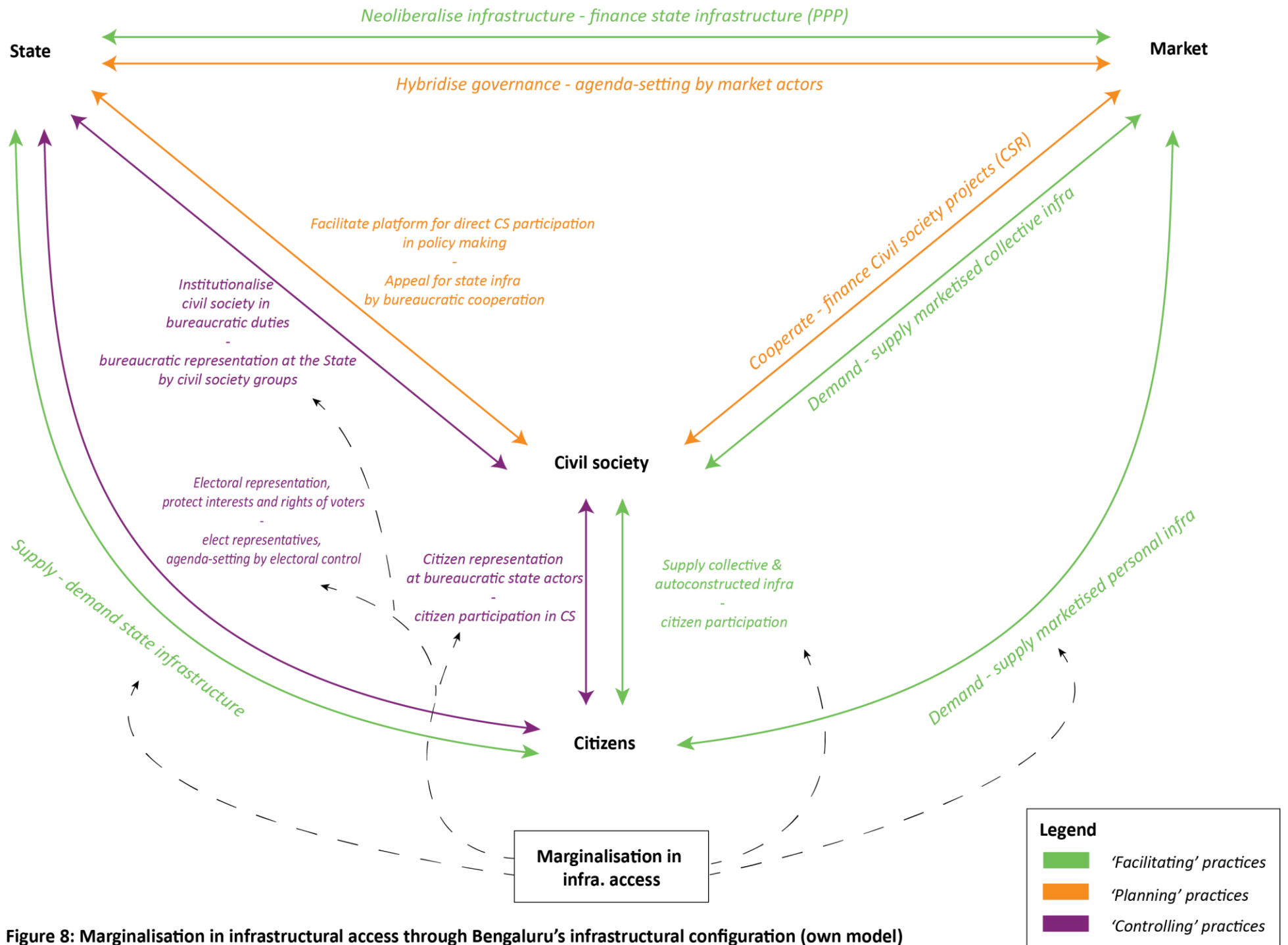— 'Planning' practices

— 'Controlling' practices

Figure 8: Marginalisation in infrastructural access through Bengaluru's infrastructural configuration (own model)

4.2 Hybridised governance and the semi-institutionalisation of civil society: coping practices of middle- and upper-class citizens

In the absence of an extensive state infrastructure network, a neoliberal, hybridised infrastructural governance configuration (Graham 2002; Coutard & Rutherford 2015) has taken shape in Bengaluru's peripheries. In addition to just the State, market- and civil society actors take on governing functions to assure access and facilitate infrastructure. These practices have been illustrated in the model on the left (figure 8), that will be explained throughout this section. This analysis is purposed to indicate in which practices the marginalisation of infrastructural access takes place. By doing so, we can understand how smart city technology can alleviate or aggravate these forms of marginalisation.

Financial capital and political power

"Urban planning is not curated", explained a Bengaluru urban planner, when I asked how development projects usually come off the ground. Much of the planning is done 'informally' through various actors, she argued.[87] In other words, where improvements of infrastructure occur is dependent on a) who has financial capital to purchase or auto-construct, and b) who has the political power to set the agenda of state infrastructure.

In section 3.2, I concluded that the gap between the infrastructural demand in the peripheries and supply by the State can be compensated by market supply, resulting in infrastructural access for citizens with sufficient financial capital. Market actors play an additional role as well; they can fund infrastructural improvements by State initiatives through public-private partnerships (PPPs). Through PPPs, market actors can seize business opportunities as a result of the state's neoliberal governance discourse. Furthermore, market actors can finance civil society groups by Corporate Sustainable Responsibility (CSR) contributions (see figure 9, appendix IV).

In addition to financial capital, political influence, or political power, is a second decisive factor in the decision-making and allocation process of infrastructural improvement. During the interviews I conducted, two ward committee members logically explained how the BBMP and parastatal agencies have limited financial funds for infrastructural improvements or repairs. They argued that, in addition to the importance of location,[88] the allocation of repairs or improvements made by the State is dependent on civil society members with the political power to set the agenda.[89] As such, citizens form civil society groups to unite their interests and appeal for scarce state infrastructure, whilst simultaneously pooling financial resources to auto-constructively self-facilitate infrastructure.

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[87] Source: II4. Urban planner. March 9, 2020. Interview with author.
[88] E.g. if the location near important landmarks or road arteries.
[89] Sources: SI6, Urban Planner. February 25, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author.

A typology on civil society groups

Bengaluru's civil society groups concerned with infrastructural governance can be characterised by a typology (see table X). The first type is what I call 'citizen action groups' (CAGs), that have characteristics of both between interest groups and activist groups, and sometimes have the legal form of an NGO. CAGs are concerned over issues related to infrastructural governance and focus on the whole city, or large parts of it. The second type are 'residential welfare associations' (RWAs), a common term for localised groups that are concerned with the infrastructure and well-being of the particular neighbourhood its members live in. What I call 'citizen initiatives' constitute the third type. Citizen initiatives generally focus on one particular issue, such as lake rejuvenation projects, or groups that volunteer to fix road potholes.

Table X: Typology of civil society groups concerned with infrastructural governance

	Single/multiple issue(s)	*City(part)/locality*	*Function*	*Examples*
Citizen Action Groups (CAGs)	Multiple	City(part)	- Controlling - Agenda-setting (planning)	CIVIC, B.PAC, CfB, Whitefield Rising, IT for Change
Resident Welfare Associations (RWAs)	Multiple	Locality (neighbourhood)	- Controlling - Agenda-setting (planning) - Self-facilitation	To be found in hundreds of neighbourhoods throughout Indian cities
Citizen initiatives	Single	Locality, city part	- Controlling - Agenda-setting (planning) - Self-facilitation	Lake rejuvenation projects, city waste clean-up initiatives, pothole fixing groups

Noteworthy, most civil society members have a middle-class background, by which the marginalised population is underrepresented in civil society groups (Kamath 2009; Smitha 2010; Idiculla 2017).[90] If financial capital and political power are the decisive factors for infrastructural improvements, it can be reasoned that upper- and middle-class households will have easier access to better infrastructure than marginalised groups, particularly when organised in civil society groups. Logically speaking, it can be presumed that marginalised groups lack at least one of these factors, in particular when not organised.

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[90] Source: SI7, ward committee member. May 19, 2020. Digital interview with author.

Marginalised groups do also organise amongst themselves, as they for example do through slum dweller organisations, that cooperate with NGOs that take special interest in them (Appadurai 2001). Alternatively, they also organise through community representatives (Harriss 2005). Regardless, the middle-class organisations trump organised marginalised groups in agenda-setting, power to control the State, as well as having more financial capital to purchase collectivised market infrastructure. As such, organised groups still find themselves in a marginal position vis-à-vis middle-class civil society groups.

Bureaucratic state actors, e.g. state- and BBMP departments, generally recognise, value and support the practices of middle-class civil society groups.[91] Whereas civil society groups interact with the State to harness political power and influence the outcomes of infrastructure delivery, the research findings discussed below demonstrate how state actors cultivate two contradicting processes that impact the position of civil society groups. First, through the practice of *hybrid governance*, civil society groups are encouraged to reduce citizens' reliance and dependence on state infrastructure by auto-constructively setting up their own infrastructure operations and maintenance. Second, civil society groups are *institutionalised* by the State's facilitating role for a) having a controlling position towards the various state actors, and b) giving ample opportunities to influence agenda-setting and policy decisions by means of citizen participation. The institutionalisation of civil society causes these groups to be cooperative and to be 'labouring' for the State. Through both hybridisation and institutionalisation of civil society marginal groups may be excluded from infrastructural access.

Civil society as hybrid governance actor – exclusion from citizen participation

In the void left by the State's insufficient infrastructure facilitation, civil society groups organise themselves *to further self-reliance and independence from state (infrastructure)* (Smitha 2010). Where the State and market do not facilitate, or when this is less practical or affordable, civil society groups facilitate infrastructure for themselves or their neighbours – a process what can be linked to the concept of 'autoconstruction' (Caldeira 2017).

RWA activities include making small repairs – e.g. fixing streetlight switches or small water leakages – or improving or renewing infrastructure themselves, often in interaction with the market. For example, an RWA in Doddanekundi pooled financial capital of the residents to collectively purchase a water tower for the neighbourhood. This improved the water availability, through which residents were not dependent anymore on expensive marketised water tankers, and did not need to await potential infrastructural improvement of the State (see figure 10).

Figure 10: Collectively purchased water tower

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[91] This becomes apparent in the communication by the State. For example, Bengaluru's smart city proposal notes that one of the strengths of the city is the active presence of civil society: "[Bengaluru has] hundreds of active citizen groups [and] resident welfare associations [...] actively involved in civic welfare that champion socio-economic and civic causes in the city."[91] Furthermore, the state applauds active citizens, as civil society groups "[...] provide forums for people to voice their concerns and participate in civic discussions,". Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.

In relation to the territorial character of RWAs, urban fragmentation can be aggravated through the relative absence of marginal groups participating in the practices of RWAs. For example, if a slum is just outside the self-defined territorial delimitation of an RWA, it can be presumed unlikely that the RWA extends its infrastructural maintenance services within the slum.[92] If marginalised citizens may not feel welcome to participate, the slum is likely to not be included by the services of the respective RWA.

Furthermore, next to RWAs, citizen initiatives operate as hybridised governance actors by improving particular infrastructures. An often-occurring example are the various lake redevelopment projects, which aim to clean up a polluted lake and create a surrounding park-pathway.[93] These projects are often financially supported by market actors, as part of the CSR contributions. Other practices that occur are organised garbage clean-up runs, or even initiatives that fix potholes is roads.[94]

Although the hybridised governance practices of Citizen Initiatives take place in relative autonomy of the State, they do not occur in an isolated fashion. For example, at a lake rejuvenation project a slum had encroached one side of the lake, to the dismay of the respective citizen initiative. In line with Hoelscher (2016), the position of the citizen initiative corresponds to the middle-class aversion of 'places of urban informality', as hindrance for modernisation and gentrification efforts (Bhattacharya 2011, 41). The initiative awaited upon the removal of the slum by the BBMP, rather than enabling the participation of the slum dwellers in the project. Here the redevelopment of the lake is beneficial for the water quality of the lake, and improved a large part of the lakeside, but endangered the already minimal housing conditions of the slum dwellers.

As such, through the skewed participation of middle-class citizens in hybridised civil society practices, marginalised groups can (implicitly) be excluded from participation and the benefits of CS activities, that can lead to adverse effects for their livelihoods (proxy 3, Aasland & Fløtten 2001).

On a side note, the rationale of the BBMP, illustrated by the words of Chatterjee (2004, 136), is understandable: "if squatters were given any kind of legitimacy by government authorities in their illegal occupation of public or private lands, then the entire structure of legally held property would be threatened" (in Chakrabarti 2008, 99).

Institutionalisation of civil society groups

In the cooperative relationship between civil society and the State, civil society groups interact with (bureaucratic) state actors for two purposes, where the groups are institutionalised by encapsulating practices of state actors.

First, civil society groups interact with state actors to have a *controlling function over the State*. Doing so, civil society actors monitor and scrutinise the planning and execution of tasks related to infrastructure. CAGs can challenge development plans, e.g. by protesting against the

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[92] Given the poor state of the respective living conditions.

[93] Source: E4, visit at a lake rejuvenation project in Bengaluru's periphery. 20 February, 2020. Observation and informal conversations by the author.

[94] Bangalore Mirror. *Bengalureans come together to fill potholes.* October 7, 2019. https://bangaloremirror.indiatimes.com/bangalore/civic/bengalureans-come-together-to-fill-potholes/articleshow/71470015.cms Accessed June 20, 2020.

construction of a highway-flyover,[95] or make demands for more transparent and accountable governance, further citizen participation,[96] and open data access to ensure the capacity of civil society to have a controlling position.[97] State actors are generally cooperative in this aspect. For example, high ranking state officials can join activist meetings to explain and discuss the current policy plans.[98] Furthermore, the State attempts to make more government data available – although being limited to do so because of the state's data deficiency.[99] In response, CAGs sometimes undertake data projects themselves to demonstrate the issues occurring in governance and infrastructure facilitation.[100]

Second, CAGs mobilise political power *to influence agenda-setting.* Influential CAGS do so by raising the attention of Karnataka government or BBMP by publishing (media) reports[101] and participating in debates and discussion groups with state actors.[102] Moreover, some CAGs are involved in the development of the BBMP's policy vision by participating in 'expert groups' - e.g. Bengaluru Blueprint Group, ABID.e and BMPC. These groups, consisting of high-ranking state officials, market leaders and civil society leaders, have a lot of influence in the infrastructure development plans (Idiculla 2017). Most relevant, the Bengaluru Blueprint group has been highly influential for Bengaluru's smart city proposal.[103]

Similarly, RWAs also practice agenda-setting by raising issues and suggesting improvements to the ward committee or the ward corporator, that in turn can attempt to take contact with the respective departments or parastatal agencies. Furthermore, RWAs control the State in its infrastructural maintenance activities, e.g. in waste collection, street cleaning, street lighting and water facilities. This way, RWAs appeal to be serviced within the limited coverage of state infrastructure. Illustratively, a RWA member explained that when the BMP staff fail to do their work (properly), he would contact the responsible person, praise this person for his good work, and politely ask to do the job again, sometimes with a small incentive (e.g. 50 rupees[104]). Furthermore, state actors appreciate citizen input on where attention is necessary, and further enable grievance addressal by setting up e-governance platforms (see appendix IV, table XI).

As such, both CAGS and RWAs can have a 'critical' position as well as a cooperative position towards state actors. Civil society groups involved in infrastructure do not seem to pose hostile opposition. In the light of the State's data deficiency, civil society is mobilised to signify the most urgent issues

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[95] The CAG 'Citizens for Bengaluru' successfully challenged the plan, which was considered too expensive and would have adverse effects for the neighbourhood.
[96] Source: E2, activist meeting with various civil society groups on transparency and accountability in governance. February 18, 2020. Participant observation by the author.
[97] Ibid.
[98] Ibid.
[99] Karnataka State disperses open data through the Mahita Kanaja portal. Source: http://mahitikanaja.karnataka.gov.in/Department. Accessed on June 9, 2020.
[100] E.g. Sensing local, IT for Change, CfB, CIVIC. For example, together with the NGO 'IT for Change', youngsters in a badly connected neighbourhood collected data on its transportation needs, pressuring the BMTC to create better mobility access. Source: E6, pitch and discussion group meeting on the use of urban space. February 20, 2020. Participant observation by the author.
[101] Most often on the website Citizen Matters.
[102] Source: E8, Bengaluru Development Summit. February 29, 2020. Participant observation by author.
[103] Source: Smart City Challenge Round 3: Smart City Proposal Bengaluru. Ministry of Urban Development, GoI, 2017.
[104] Equal to € 0,58 as of July 17, 2020.

that need the attention of the state actors. The responsibility for agenda-setting and controlling the bureaucratic state actors, a task usually performed by elected representatives in Karnataka state- and BBMP parliament, is thus partially delegated to civil society actors. Therefore, it can be argued that civil society groups are institutionalised in the process of their interactions with bureaucratic state actors.[105]

Exclusion of social arenas

The institutionalisation of civil society groups is especially troublesome for the position of marginal groups, as various literature sources indicate that Indian metro-urban poor mobilise local electoral governance as primary strategy to attain infrastructural improvement (Chakrabarti 2008; Benjamin 2008; Idiculla 2017; Harriss 2005). For example, as Chakrabarti argues for Delhi:

> "The key distinction between the urban poor and the middle class' access to the State is that the middle class uses bureaucratic and judicial channels as opposed to formal electoral politics (Harriss 2005). This is partly because the middle class has better knowledge of the law and access to resources, but also because middle-class housing and occupations are more often 'formal' and 'legal' and become the basis for representation when outnumbered by the more politically active poor[106] (Mazzarella 2006).

By the institutionalisation of middle-class civil society groups, the State provides a bureaucratic platform for citizen participation, only accessible through civil society. Thus, civil society fulfils a role of bureaucratic representation, in parallel to the electoral representatives.[107] Problematically, civil society groups are thought to primarily focus on middle-class interests, in desire for modernised urban spaces (Bhan 2009 in Hoelscher 2016, 31). As such, as middle-class interests do not strike with those of the urban poor, civil society's role of bureaucratic representation becomes meaningless for marginalised groups. Hence, as urban poor and marginalised groups do not have access to this form of governance, they are excluded from this so-called 'social arena' (proxy 4; Aasland and Fløtten 2001).

Moreover, the institutionalisation of civil societies effectively secures more political power over agenda-setting through bureaucratic governance through 'influential expert groups' (Idiculla 2017). This limits the effectiveness of electoral governance through elected representatives. The institutionalisation of civil society reduces the already limited political power of marginalised groups.

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[105] Two additional supportive examples can be provided. Ward committee members combine their regular jobs with an important governance function for which they not receive a salary, whilst often coming from an active position in civil society groups. As such, it can be argued that ward committee members are examples of how the BBMP has recruited citizens to voluntarily fulfil governing functions. Likewise, the Karnataka state government instructed RWAs during the Covid-19 pandemic to screen residents for heightened body temperature upon entering their neighbourhoods, install CCTV cameras to monitor physical distancing, and ensure that residents stay within their house (figure 11, Appendix V). Here, RWA members fulfil a policing function, and are thus institutionalised as governance actors. Furthermore, Karnataka state set up a voluntary force of 'Corona Warriors', with hundreds of local volunteers to spread correct information provided by the various state actors to prevent miscommunication and fake news. Source: *Mobilising state and citizens against COVID-19: lessons from Karnataka.* World Economic Forum. May 13. 2020.

[106] This is reflected in Delhi's voter turnout rates in the order of 35–40 per cent in middle-class areas as opposed to more than 80 per cent in poorer neighbourhoods and slums.

[107] This phenomenon strongly relates to the concept of 'political society' see Chatterjee (2004).

Conclusion: marginalisation of infrastructural access

In conclusion, where the State does not facilitate citizens in basic infrastructures – the peripheries – or does little maintenance to ensure the quality of infrastructure, civil society groups can appeal for state infrastructure, setting the agenda. State actors, are very open to cooperate with civil society, as the alleviate the responsibilities traditionally meant for the state. The State facilitates here a platform for direct participation in urban (infrastructural) policy making. These practices institutionalise civil society as an infrastructural governance actor. Simultaneously, civil society can purchase or cooperate with market actors for infrastructure facility. Civil society groups can participate in hybrid governance, compensating for the absence of acceptable facilities by State and market, by self-facilitating 'autoconstructed infrastructure'.

I argue that these governance practices are highly influential and underpin the perceptions, ideas, agendas and actions related to Bengaluru's smart city development. Thus, as 'the smart city' in itself is not an isolated entity but engages and adapts legacy infrastructure (Glasmeier and Christopherson 2015), the potentiality and inclusivity of smart city development is dependent on the socio-spatial dimensions of the periphery and infrastructural configuration between governance actors. In respect to the latter, I refer back to the model in figure 8.

Emperical Findings

on Bengaluru's

Smart City Development

5. Envisioning smart city projects: a discourse analysis

Having analysed the context of infrastructural challenges in urban peripheries, this chapter follows up on the calls of Glasmeier (2015, 11) and Kitchin (2014, 4-6) to analyse the perspectives among different smart city actors, in order to understand the different multiple perceptions and agendas on the conditions for inclusive smart cities – in the context of India, Bangalore and its urban peripheries.

As such, in this chapter I will discuss four different perspectives – a national, market, city and civil society perspective – in three broad thematic sections. First, I will discuss the perceived definitions, associations, purposes and agendas of smart cities by state-, market- and civil society actors. In the second section the perceptions on inclusivity and participation (of marginalised groups) are scrutinised, whereas in the third section I will set out how these actors envision the implementation process of smart cities, e.g. on their scale, scope and forms of governance.

Noteworthy, this evaluation is not necessarily a critique on the current practices. The analysis is based on the implementation detailed in the proposal, and not the actual implementation currently under further detailing, tender or implementation by the involved actors. As such, this analysis is intended to be useful for both current implementations of smart city projects, as well instructive for any future smart city development.

5.1 Perceptions on the purposes of smart city projects

all sources of the four perspectives – the national-, city- market- and civil society perspective – depict in their problem statement urbanisation as the challenge that smart cities are ought to overcome, but have different perceptions on the most important consequences of urbanisation that needs to be overcome.

On the necessity of the Smart City Mission: perceptions on urbanisation

"Cities are the engine of growth for the economy", reads the first sentence of the national SCM guidelines document, suggesting a city-focused economic perspective on Smart Cities (Kitchin 2015). However, the guidelines also indicate the objective of the mission to "promote cities that provide core infrastructure and give decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart Solutions'. The national SCM perceives urbanisation as a threat for the city's economic development, Smart city development in believed to mitigate this threat through improved infrastructures and governance practices.[108]

Comparatively, Bengaluru's Smart City proposal underwrites the stresses caused by urbanisation, but perceives the problem differently. It argues:

> "Bengaluru is one of the fastest growing cities in the country. This rapid growth has strained the existing city's infrastructure, unchecked urban sprawl creating [a] disconnect with [the] historic identity and city assets lying in neglect".[109]

This emphasis on the degradation of the city's identity is a recurring theme in the proposal, with a stronger focus on problems surrounding the liveability of Bengaluru than on strains on economic development.[110]

Nevertheless, what is missing in the guidelines and the proposal, is explicit notification of the position of marginalised groups in relation to urbanisation, as discussed in previous chapters. This sharply contrasts with the problem statement of HLRN's report 'Smart Cities for Whom?'. The report argues that cities are becoming increasingly exclusionary, where "state- and non-state actors are contributing to the growing segregation, ghettoization, invisibilisation and peripherialisation of the poor",[111] and beliefs that the Smart City Mission contributes to these phenomena. It describes the 'dominant urbanisation paradigm adhered by state and policy actors' as one in which urbanisation is seen as inevitable, which has led to a symptomatic rather than durable approach to mitigate the pressures of urbanisation – creating "a rise of forced evictions, homelessness, inequality and impoverishment".[112,113]

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[108] Thus, embracing both the economic and governance perspective on smart cities.
[109] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru,* page 16. Ministry of Urban Development, GoI, 2017.
[110] Although the economic strains of urbanization are mentioned rather explicitly in the strategic focus on page 14-15, the city's 'strategic focus and blueprint'.
[111] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018], page iv. Housing and Land Rights network, New Delhi, 2018.
[112] HLRN argues State actors should focus on the rural-urban linkages to prevent urbanisation in the first place.
[113] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018], page iv. Housing and Land Rights network, New Delhi, 2018.

Definitions and associations regarding smart cities

These variating perspectives on urbanisation suggest that the discussed actors have different expectations on the purposes of smart city projects, and with that define and associate smart cities distinctively. As Kitchin (2015) points out, there is an absence of a cross-actor agreed upon definition for Smart Cities. Where the market perspective and academics emphasise big data, 'smart censors' and the 'Internet of Things' (IoT), the national and city state actors in India define smart cities rather loosely. With a broader development approach, 'smart' is perceived as an ideological focus, with big data only being a part of what is understood as 'smart technology'.

When analysing the SCM guidelines, it becomes clear a lexicon is used in which 'smart' is rather undefined and freely used as an adjective, e.g. by terms as 'smart solutions', and 'creating smart people', to create 'comprehensive development' "by adding layers of smartness".[114] This underlines the open interpretation on Smart Cities. In fact, the SCM have encouraged participating cities to come up with their own definition of smart cities, arguing that smart city applications should fit the city-specific needs that are derived by citizen participation in the planning phase.[115]

I argue this stance has both benefits and hindrances. Indeed, a decentralised area-, city- and citizen-centric conceptualisation of smart cities is something scholars (e.g. Kitchin 2015; Glasmeier 2015), market actors[116] and civil society[117] have called upon – and should thus cherished, as it makes the SCM a national undertaking one-of-its-kind. As an interviewed urban planner put it, the SCM is the first national project with this much citizen participation in its design.[118] As various civil society groups argue, citizen participation can potentially assure inclusive development, as it will not be solely focussed on the benefits of state actors and their business partners, but based on the voices of civil society.

On the other hand, as the SCM moves the responsibility of conceptualising smart cities to the cities participating, at least two critical remarks can be made. Firstly, an ambiguous large-scale State plan with an incoherent objective carries the risk of being misused and abused by corrupt parties, as one interviewed urban planner argued.[119] Second, by formulating the smart city proposals based on (active) citizen participation, one runs the risk that the interests of middle- and upper class skews the benefits of projects away from marginalised groups, who are, as I have demonstrated, not well represented by civil society (Hoelscher 2016, Idiculla 2017). As argued in section 4.2, those with financial capacity and the power of agenda-setting to 'plan the city', can aggravate the disparity and exclusionary practices to marginalised groups.

This might well be the case in regard of Bengaluru's proposal, were also a well-defined, straight-forward conceptualisation of a smart city is absent. The proposal depicts a smart city slogan -"[A] Smart City is built by Smart Communities" –, emphasising citizen participation in governance and

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[114] Source: *Smart City Mission Statement & Guidelines*. Ministry of Urban Development, GoI, June 2015.
[115] Idem.
[116] Source: *Smart Cities India Readiness Guide.* Smart City Council, 2016.
[117] Sources: II1, urban planner. February 25, 2020. Interview with author.
II4. Urban planner. March 9, 2020. Interview with author.
[118] Source: II4. Urban planner. March 9, 2020. Interview with author.
[119] Source: II1, urban planner. February 25, 2020. Interview with author.

infrastructure management. Furthermore, the proposal entails a city vision[120] on which the selection of Bengaluru's smart city projects was based - with the objectives to increase mobility, safety and security in the city, improve urban health, and revitalise Bengaluru's city identity. Interestingly however, this city vision was a largely influenced by the Bengaluru Blueprint, a document that was formulated before – and in separation of – the establishment of the Smart City Mission. The document was written by the similarly named highly influential expert group,[121] which was primarily constituted by elite- and middle-class civil society groups, market leaders and high-ranking politicians and administrators (see section 4.2). Although citizen participation projects should be cherished, it is thus highly likely that, partly because of the prominent governance position of market and civil society, marginalised groups had a marginal position in the formulation of the smart city proposal.

Furthermore, two critical cumulative arguments can be made. First, as the proposal's set objectives were based upon a document that was established *before* Bengaluru's participation in the Smart City Mission, and not *because* of the participation, I argue that the proposal is based on the perceived issues of politically influential actors, and not *on the possibilities of smart city technology to resolve the issues caused by urbanisation*. I will further elaborate on this in the next paragraph. Second, as the smart city proposal is not necessarily based on currently available smart technology, but rather on the aspirations of highly influential actors, the conceptualisation of the smart city becomes a *politicised, modernist interpretation of a city* – a city that embodies the characteristics to be deemed modern by middle- and upper class citizens (Hoelscher 2016), rather than one that focuses on overcoming the issues of its legacy infrastructure. This thus contradicts with the needs of marginalised groups, who would benefit the most by simply upgrading water, electricity, and sanitation facilities.

Technology as defining factor of the Smart City?

Various participants and document sources argued that Bengaluru's smart city plans focus on the wrong priorities, and do not utilise the available technology.[122,123] If a more technological approach to smart cities might lead to better outcomes, it becomes worthwhile to understand how smart technology providers define smart technology in comparison to the SCM and Bengaluru's smart city actors.

The most prominent market group, the Smart City Council, a conglomerate of smart technology providers, defines Smart cities quite different than the SCM Guidelines and Bengaluru's proposal. In the 'India Smart City Readiness guide' the council defines 'the smart city' as a city that "uses information and communications technology (ICT) to enhance its liveability, workability and

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[120] The SCM proposal instructions ask to define 'overall aspirations and goals for the city' over the next 5-10 years. For Bengaluru, the key aspects of this vision are increased mobility, safety and security, improved health and improving the city's identity. Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.
[121] Bengaluru Blueprint Group
[122] Sources: II1, urban planner. February 25, 2020. Interview with author.
II4. Urban planner. March 9, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author.
[123] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018]. Housing and Land Rights network, New Delhi, 2018.

sustainability."[124] The document goes into length demonstrating the possibilities of sensors, IoT, and the analysis of collected big data. The group argues that the data can create 'real-time situational awareness', can 'perfect operations [...] to optimise complex [infrastructure] systems' and predict infrastructural capacity failures in the future.[125]

In comparison, the SCM Guidelines and Bengaluru's proposal do not explicitly mention any terminology on big data or IoT, which suggests its relative absence. In the SCM guidelines, the technology components are rather vaguely conceptualised as 'smart solutions'; the SCM provided examples that participating cities could use as inspiration (see figure 12 below). Of course, IoT and big data applications can be incorporated in these examples, but are not seen as a requirement by the SCM. This may create the suggestion that the SCM is one more national project focussing on urban development, rather than one that maximises the use of available technology.

Figure 12: Suggestions for smart city projects, provided by the Smart City Mission (Smart City Mission Statement and Guidelines, MoUD, GoI, June 2015).

Bengaluru has taken up few of the 'smart solutions' in their proposal, for example, the development of smart parking, citizen-enabled security policing and CCTV monitoring, but also here is an absence of aforementioned 'smart technology' – e.g. big data, real-time tracking, IoT, as defined above by both the smart city council and academia (e.g. Kitchin 2014).

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[124] Source: *Smart Cities India Readiness Guide,* page 7. Smart City Council, 2016.
[125] Idem. page 8.

Instead, much of the resources are planned for the redevelopment of roads, lakes and markets, which will be attributed with 'smart technology trinkets', such as e-toilets or solar panels (see appendix I). Projects that make use of such technology, will most likely only mitigate the symptoms of problems for which it is purposed, various research participants argued.[126,127] For example, the 'smart dustbin' gives a signal when the bin is full, to be directly tended to by a garbage collector. Although useful to ensure temporary cleanliness of certain areas, it does not help solving the issue of the tremendous uncontrolled waste production. As such, it is likely that the smart city projects, set up to in response to urbanisation pressures, provide symptomatic relieve rather than tackling the structural causes of the issues.

Instead, various projects that track, locate and predict waste production have suggested[128] and undertaken[129] by various civil society actors. These projects could, in particular with the use of IoT, big data and real-time technology be most helpful and necessary to redevelop the legacy infrastructure in order to withstand the growing pressures of urbanisation. Indeed, the use of smart technology could be used alleviate the aforementioned data deficiency on the use of infrastructure; something that is not incorporated in the current proposal, but which could have much potential for future Smart City plans.

Based on the analysis of the documents, I agree with the abovementioned argument, which has been made by HLRN, urban planners, a data expert, and a government official. Nevertheless, three nuances can be made.

First, the analysed sources tell something about the overall design of the SCM and Bengaluru's original submitted proposal. This implicates that the argument cannot be generalised to all participating cities. As one of the urban planners explained, various other cities have incorporated IoT- or big data technology in their Smart City proposals.

Second, in the similar line, current and future projects undertaken in Bengaluru might differ from the submitted proposal. A prominent example of this is how Bengaluru's Smart City SPV has contributed to the establishment of the city's 'Corona War Room'. By implementing a dashboard which makes use of GIS-technology, most patients and available resources were mapped that were deemed necessary to tackle the Covid-19 virus. However this further validates the argument made by above. For example, one research participant argued:

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[126] Sources: II1, urban planner. February 25, 2020. Interview with author.
II2, data archivist. February 26, 2020. Interview with author.
II4. Urban planner. March 9, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author
[127] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018]. Housing and Land Rights network, New Delhi, 2018.
[128] Source: *Smart City Namma Bengaluru: Powered by Technology – Suggestions to BBMP By B.Pac and C.Smart.* B.Pac. Bpac.in, July 2016. B.Pac, http://bpac.in/wp-content/uploads/2016/07/Namma-Bengaluru-Smart-Cities-suggestions-June-28.pdf. Accessed June 4, 2020.
[129] E.g. by Sensing Local and ward committee member (SI7).

"With Covid-19, BBMP is doing massive data collection, tracking patients, allocating resources […]. That technology should be implemented for infrastructures as well. The technological capability is there.''[130]

Third, coming from the anthropological discipline, I believe it is necessary to practice a mild form of cultural relativism. I believe that the loose conceptualisations of 'Smart Cities' by the SCM and Bengaluru are not wrong in a normative manner; it can be respected that the SCM is by many popularly perceived as a broadly oriented urban modernisation practice. However, consequently, we should also understand the ramifications of such approach for all involved actors, including for marginalised groups.

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[130] Source: SI7, ward committee member. May 19, 2020. Digital interview with author.

5.2 Perceptions on the inclusivity of smart cities

Even though smart cities are framed as inclusive by technology providers and state actors, various critical scholars argued that in practice, this inclusivity can be disputed given the perceptions and agendas on smart city development (see section 1.1; Kitchin 2015; Lee et al. 2020; Allam 2018). In this light, I argued above that the conceptualisations of the smart city is a politicised, modernist interpretation of a utopian city. Thus, it becomes worthwhile to analyse *how* inclusivity itself is conceptualised, or deliberately framed, in the SCM's design detailed in its guidelines, and in is redefined and utilised in Bengaluru's smart city proposal.

Here, I argue that inclusivity is defined as the 'right to benefit', in which for all strata of the population *some* benefits are included, whereas the existing forms of social and infrastructural exclusion are not taken in account.

Inclusivity as the right to benefit

In the guidelines, inclusivity is articulated as followed:

> "[The] application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services. Comprehensive development in this way will improve quality of life, create employment and enhance incomes for all, especially the poor and the disadvantaged, leading to inclusive Cities."[131]

This perception of inclusivity suggests that the SCM perceives inclusivity in a way that all citizens will benefit from Smart City Projects, in which marginalised groups are not excluded from opting to the new smart city services, nor excluded from the benefits that derive from increased economic activity. However, this does not consider that middle- and upper-class generally have better access to infrastructures, and have better opportunities to capitalise urban development in the first place. While in its formality marginalised groups are not excluded from accessing the benefits of smart city projects, no measures or specifications are detailed on how existing inequality, segregation and marginalisation might hinder equal access to the infrastructure, nor does the proposal details how these forms of inequalities should be alleviated. Consequently, the SCM might risk deepening urban segregation. I will give two examples in which this rationale towards inclusivity comes forth.

First, marginalised groups are predicted to benefit through the attraction of economic development because of its expected subsequent job opportunities of which these groups can benefit. This suggests a form of neoliberal citizenship in which economic development that create benefits that 'trickles down' its citizenry (Cardullo et. al 2019). That is under the presumption that these projects attract businesses, that indeed provide these job opportunities to marginalised groups – something that is not assured, as the proposal does not mention any new incentive for businesses to do so.[132]

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[131] Source: *Smart City Mission Statement & Guidelines*, page 7, Ministry of Urban Development, GoI, June 2015.
[132] Source: II2, data archivist. February 26, 2020. Interview with author.

In respect of Bengaluru's proposal, 'inclusive economic growth' may refer to the redevelopment of two historic markets (project 3, appendix I), which jobs are mostly occupied by a low-income groups. It could be implied that by revitalising the markets, more job opportunities could be created, or alternatively, better revenue could be made.[133] However, this is not explicitly detailed, nor how these positive effects would take place.[134]

Second, marginalised groups are expected to benefit from the overall improvement of infrastructure and services. As described in the SCM guidelines, smart cities – among other objectives - ought to work towards adequate water, electricity and sanitation supply, as well as efficient public transport and affordable housing.[135] Here, affordable housing is the only objective which explicitly states it would benefit – and thus include – marginalised groups.

This corresponds with Bengaluru's proposal, where inclusivity of marginalised groups is exclusively directed to the provision of social housing through redeveloping slums.[136] One slum redevelopment project was included in the proposal (project 6, appendix I), but had been pulled out by the Karnataka Slum Board afterwards.[137]

In respect to these 'acts of inclusivity', one should consider the limited scope and available resources to implement the projects. The majority of funds are dedicated to area-based development projects (ABD) in the city core,[138] rather than in the periphery, where expansion of the state infrastructure coverage is most needed (see chapter 3). As such, the description of the smart city that guarantees full coverage of infrastructure should rather be seen as an optimistic intention declaration for future development policy, that conveniently corresponds to the set of localised and achievable goals in the areas of ABD projects. As such, only marginalised groups that work or live in the vicinity of the ABD projects might benefit from them.

The SCM officials have taken this limitation in consideration, as the SCM guidelines prescribe the following:

> "Since [the] Smart City [Mission] is taking a compact area approach, it is necessary that all residents feel there is something in it for them also to make it inclusive".[139]

As such, participating cities were instructed to include at least one pan-city project in their proposal. gain, also this statement suggests inclusivity is interpreted as one where 'all citizens can benefit', rather than to solve or alleviate the causes of marginalisation I have set out in chapter 4.

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[133] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.
[134] As such, it is an interpretation of the author of this thesis.
[135] E.g. robust IT connectivity, good governance, safety and security of citizens.
[136] In other words, bulldozering slums and the rebuilding the location with new housing. In this ABD project, housing, roads, and a community centre would have been built.
[137] Presumably, because of the prospects of delaying its implementation. Almost three months after Bengaluru was selected to participate, the Karnataka Slum Board development corporation announced the redevelopment of the slum to be completed within five months (without the SCM). Source: Deccan Herald. *Houses for slum dwellers.* September 21, 2017. https://www.deccanherald.com/content/634123/houses-slum-dwellers.html Accessed June 28, 2020.
[138] The HLRN Report argues that only 8% of the urban population in participating Smart Cities are beneficial from area-based development.
[139] Source: *Smart City Mission Statement & Guidelines*, page 9, Ministry of Urban Development, GoI, June 2015.

Sharing 'the right to benefit' – Bengaluru's smart city projects

As demonstrated above, Bengaluru's proposal attains similar notions on inclusivity as the SCM Guidelines; inclusivity is seen as assurance that 'all citizens will benefit' and can have some form of access to the new infrastructures and services. As such, inclusivity does not exclusively refer to the marginal population as conceptualised in this thesis; attention is also explicitly paid to the access of infrastructure for the elderly, differently-abled, women and children, regardless of socio-economic or socio-political background.[140,141] Although the inclusivity of these groups should be appreciated, it renders meeting the standards of inclusivity as a checklist, a research participant argued.[142] Hence, I will argue that a general interpretation of 'inclusivity for all' can lead to a lack of attention, or even adverse effects to one group, which can be compensated by more attention to other groups, without the project losing its status of being inclusive.

Neighbourhood security

In assuring that benefits of the proposal also includes benefits relating to women, children and elderly, the proposal aims to be inclusive for these citizens by setting the official goals 'reduction in crimes, including crimes against women and children' and 'enhance neighbourhood safety and security'.[143] In explaining the demand for these objectives, the proposal states:

> "With the ascending IT sector in the city, Bengaluru has seen an exponential population influx. A resultant of which triggered strain of existing infrastructure, change in social structure, income disparity and loss of equity in access to public goods, all of which have had an influence on growing crime rates in the city."[144]

This statement portrays the perceived demand for improving neighbourhood security with a 'smart pan-city project'. The project entails a combination of community policing and the rollout of a security surveillance network (see appendix II, project 6b). This is the only project that is described as using real-time and big data technology, including automated CCTV-monitoring, face- and number plate recognition software, and a GIS based-crime information system. These technologies will collect geo-tagged crime statistics, which will be published publicly.[145]

Urbanisation is (correctly) seen as a cause for 'insufficient infrastructure', 'change in social structure' and 'income disparity'. However, more problematically, is the assumption that these consequences of urbanisation are equated to increasing crime prevalence. If cameras and increased patrolling are implemented intentionally in infrastructure-deficient and poverty prone regions of the city, crime statistics will likely be higher in these areas because of intensified policing.

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[140] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Page 16-17, 43, Ministry of Urban Development, GoI, 2017.
[141] Source: E3, meeting with managing director of Bangalore Smart City Limited. February 20, 2020.
[142] Source: II2, data archivist. February 26, 2020. Interview with author.
[143] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru,* page 17. Ministry of Urban Development, GoI, 2017.
[144] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Page 50, Ministry of Urban Development, GoI, 2017.
[145] Additionally, the project also includes the establishment of citizen-volunteer beat patrol groups in addition to police patrols.

Furthermore, publicly publishing of crime data will result in further deprivation of land value, the attractiveness of high-crime areas, which shuns development and new middle- and high-income population, and thus lead to ghettoisation. Increased law enforcement motivated by income disparity is thus likely to have adverse effects for marginalised groups (e.g. migrants, slum dwellers), leading to increased stigmatisation and discrimination (Fassin 2013). According to Datta (2018), the described measures – e.g. such forms of surveillance on the margins – are legitimised by inaccurate perceptions of an "objective technocratic rationality" and "practices of democracy" (414).

At last, where inclusivity is defined by benefits for women and children in terms of improved security, marginalised groups risk further exclusion and marginalisation as a result of this effort. Thus, to be truly inclusive, the design of smart city projects should compare the 'inclusion by benefits' of one group by the adverse effects of the other – the marginalised population.

Inclusivity by means of citizen participation – Smart Citizenship

Kitchin observes a discursive emphasis among market and state actors on the inclusivity and citizen empowerment of smart cities, which is used as a justification to dismiss critical voices against this discourse (2015, 4). As such, various scholars (Datta 2018; Hill 2012; Lee et al. 2020; Cardullo et al. 2019) argue that through the smart discourse the terms of citizenship are changing, deteriorating democratic practices. Focusing on India's SCM, Datta describes how citizens are 'enumerated' and 'recruited' by the State's pedagogic call for a 'Smart Citizenry' (2018, 411). In setting out the challenges the SCM might meet, the guidelines dictate the following:

> "The Smart Cities Mission requires smart people who actively participate in governance and reforms. Citizen involvement is much more than a ceremonial participation in governance. Smart people involve themselves in the definition of the Smart City, decisions on deploying Smart Solutions, implementing reforms, doing more with less, and oversight during implementing and designing post-project structures in order to make the Smart City developments sustainable. The participation of smart people will be enabled by the SPV[146] through increasing [the] use of ICT, especially mobile-based tools."[147]

As comes forth, the SCM instructed participating cities to go through length in practicing citizen participation.[148] Citing Bengaluru's proposal,

> "The citizens of Bengaluru are actively involved with the developments in the city. Roughly 1.5 million responses were gathered for the campaign to make Bengaluru a smart city".

Furthermore, of the 5.2 million people who were contacted via social media and online messaging, in addition to utilising some offline methods. Roughly one million citizens have voted for the proposal.

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[146] Special Purpose Vehicle, a newly-created parastatal organization that implements the proposal – see section 6.3.
[147] Source: "15. Challenges", *Smart City Mission Statement & Guidelines*, page 18, Ministry of Urban Development, GoI, June 2015.
[148] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.

Hill (2012) critiques such practices of digital citizen participation, conceptualising it as a deteriorating "'push-button' democracy". As online endorsements of bureaucratic governance practices are seen as a stand-in for democratic deliberation, it legitimises State action that surpasses the constitutional electoral processes (see section 4.2).

E-governance and citizen participation

The emphasis on citizen participation as a form of inclusivity becomes even more apparent when one analyses Bengaluru's pan-city projects. Many of these projects are characterised by participative forms of e-governance; I refer to three projects. The first project, a citizen grievance redressal application for *all* departments of the BBMP and parastatal agencies, operated by a central command centre (project 3, appendix II); the second, that aims to establish volunteer 'beat patrols' to increase neighbourhood security (project 6a, Appendix II); and thirdly, a citizen app for 'participatory budgeting', that aims to 'consolidate neighbourhood and ward level inputs' (project 4, appendix II).

In respect to the latter, through this citizen app citizens can vote how ward budgets will be used in their areas. Although on the surface this may seem to improve inclusivity, the application has the risk to intensify segregation and marginalisation, primarily because of the utilitarian approach underlying a community voting system. As demonstrated in section 3.2, most peripheral wards have a very heterogeneous population, in respect to more homogenous population of wards in the core. These peripheral wards have at least 20-40% low-income households and slums presence, but not a majority (map 5, section 3.1). Thus, if residents of a ward vote for budget allocation, it is likely that middle- and upper class will have the decisive power. In turn, this will prioritise the interests of those groups over those of the marginalised population, likely leaving the interests of the latter – e.g. affordable and accessible infrastructure – untouched. Even without taking the demographic constitutions of wards in consideration, citizen participation thus becomes 'a necessity' for groups to be represented in their interests (Datta 2018).

This also corresponds to the legitimacy of Bengaluru's SC projects. Bengaluru's proposal recognises a lack of participation as "one of the three greatest risks that could prevent the success of the pan-city projects", which they aim to mitigate by creating "awareness educative programmes". It details that 'digital education will be enabled to enhance the use of technology".[149] As such, the State takes on a pedagogic approach to transform the city population into a 'smart citizenry' (Hollands 2015, 70; Datta 2018, 15).

Nevertheless, various sources argue that digital illiteracy is an imminent problem that can contribute to the exclusion of elderly and poor.[150] It can create a 'digital divide' (Van Dijk 2006) that results in "digital spaces that emerge from smart citizenship as a functional separation between 'sealed-off technological enclaves and leftover marginalised spaces'" (Vanolo 2014, 891).

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[149] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Page 52. Ministry of Urban Development, GoI, 2017.
[150] Source: II2, data archivist. February 26, 2020. Interview with author.

Inventively, Bengaluru's proposal details the establishment of physical 'smart kiosks' to overcome "the limitations of digital reach [of] all socio-economic strata of the urban population".[151] It stipulates that "the coordinators designated at these kiosks will be trained to assist illiterate and physically challenged" and that the kiosks, equipped to register citizen feedback and disburse online information, will be strategically placed at central locations and transportation nodes.

Conclusively, on a more critical note, active citizenship gets problematised by the pedagogic, enumerative and 'enlisting' approach of the State towards citizen participation (Lee et al. 2020, 2; Hollands 2015, 70; Datta 2018). As Datta argues, the introduction of 'smart people' in policymaking, prescribe citizens to be "tech-savvy, entrepreneurial and work on behalf of the state, innovation and growth. [...] In this role, smart people [become] collaborators and endorses of the smart city, rather than critical and active citizens" (2018, 413). This process of institutionalisation is not unique to the smart city mission. As I have argued in section 4.2, active members in civil society have become institutionalised by the State, which has produced hybrid forms of governance.[152]

The most prominent example of an institutionalising project in Bengaluru's proposal concerns voluntary community policing (project 6b, appendix II). In this project, the State aims to recruit residents to participate in local beat patrol groups and security committees to increase neighbourhood safety. As such, also through smart city projects, the State institutionalises citizens active in civil society, transferring a part of the State's responsibility to its citizenry. Groups that cannot or do not want to participate, are likely to end up in a marginalised, underrepresented position.

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[151] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru.* Ministry of Urban Development, GoI, 2017.
[152] E.g. how resident welfare association members take up the role of monitoring and fixing infrastructure, or how during the COVID-19 crisis the State recruited volunteers to be 'Corona warriors'. Source: *Mobilising state and citizens against COVID-19: lessons from Karnataka.* World Economic Forum. May 13. 2020. https://www.weforum.org/agenda/2020/05/mobilising-against-covid-19-lessons-from-karnataka/. Accessed August 4, 2020.

5.3 Implementation of Smart City projects: stakeholder functions, financing and the periphery as a potential location

In chapter 4 I have set out the different governance practices of and relations between state-, market- and civil society actors that produces a set of strategies that citizens can tend to require infrastructural access. By utilising the four proxies of social exclusion (Aasland and Fløtten 2001), I explained how these practices can lead to social exclusion of marginalised groups. In this section I make a parallel by assessing the functions of the most prominent actors in the implementation of Smart Cities[153]. By analysing the financing of the smart city plans as vantage point (see figure 13 below), I set out how the exclusion of infrastructural access might get aggravated under the current design of the smart city mission. In addition, will give some brief suggestions by research participants how these forms of exclusion could potentially be prevented.

Figure 13: **Financial resources for Smart City projects, SC Proposal Bengaluru (left), expected sources of funding of SCM in its entirety (right)**

SC Proposal Bengaluru[a]

Expected sources of funding under the entire SCM[b]

Legend

- Convergence with existing budgets and govt. schemes
- Central government funding
- State/ULB funding
- Other / e.g. operating revenue ABD projects
- Revenue enhancement measures (property tax collection)
- Public Private Partnerships
- Debt
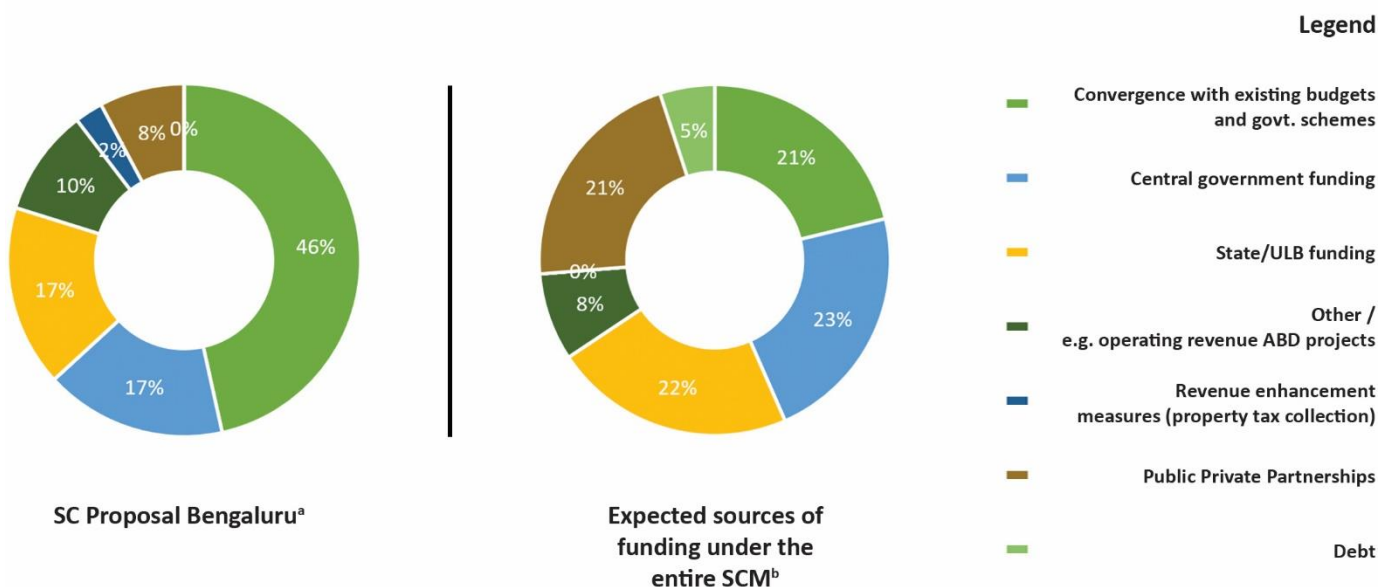
Source[a]: SCM Proposal Bengaluru 2017, 53
Source[b]: Economic Survey of India, Volume II, 2019
(Indiabudget.gov.in /economicsurvey/eco_sur_vol(iiallchapter).php)

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[153] As is prescribed in the guidelines and proposal, and suggested in the India Smart Cities Readiness Guides and HLRN report.

Enhancing the bureaucratic state capacity through SPV governance and Smart City projects

The Ministry of Housing and Urban Affairs (MoHUA)[154], might have been the initiator of the Smart City Mission, but its influence on to formation and implementation of the projects has been rather small since the selection of the 100 cities.[155] Following the neoliberal decentralisation trend, the ministry limits its authority to releasing funds, advising and monitoring the participating cities. The mission directorate focuses on creating various tools[156] and mediating between different market stakeholders and state actors – e.g. the state government, ULB and SPV[157]. The SCM funds each participating city 480 crore rupees (56.5 billion euro), given that the state government and ULB together fund the same amount – altogether right for 34 percent of Bengaluru's budget (see figure 13).

The national government thus takes a distanced position, where in Bengaluru the Karnataka State Government and the BBMP share the responsibility for the content and implementation of the Smart City projects. However, taking into consideration the troublesome relationship between the two government-tiers and the maze of parastatal agencies, one can imagine the implementation of multi-stakeholder projects to be slow, cumbersome and politicised.[158] This argument is substantiated by the slow implementation of Bengaluru's Smart City 'Special Purpose Vehicle' (SPV). In a media interview, Karnataka's urban development principal secretary argued:

> "The scheme has a process to follow, such as local level development coordination, delegation of power, and appointment of [a] project management consultant. We faced a lot of struggle for eighteen months in putting the system in place as per the mandatory procedure of SCM".[159]

Ironically, the currently completely operational SPV, called 'Bengaluru Smart City Limited', is installed to overcome the same bureaucratic sluggishness. Various of the planned pan-city proposals are supposed to alleviate the strains on cross-departmental cooperation. Specifically, project 1 (municipal finance), project 2 (improvement of property tax collection) and project 5a (Online project information system for public project management) – see appendix II.

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[154] Formerly called Ministry of Urban Development (MoUD).

[155] In the early phases of the SCM, the MoUD/MoHUA had a larger role as took facilitate the city challenge, selecting the 100 cities who would participate in the mission. The cities were selected among those proposed by the state governments. Bengaluru was late in the selection and originally denied by the state government to participate; the city did not meet the necessary parameters. "Bengaluru is terribly managed. It did not meet the criteria for the top six cities [that Karnataka state could propose]".
Source: Business Standard. *Why some cities were kept out the smart city list.* August 31, 2015. https://www.business-standard.com/article/economy-policy/why-some-cities-were-kept-out-of-the-smart-city-list-115083000835_1.html. Accessed June 28, 2020.

[156] E.g. roadmaps, blueprints, best practice examples.

[157] Source: *Smart City Mission Statement & Guidelines*, page 16, Ministry of Urban Development, GoI, June 2015.

[158] This can be argued if one analyses the process of establishing the SPV (which took a very long time)..

[159] Source: Interview with Karnataka Principal Secretary of Urban Development Anjum Parwez. *In* ETGovernment. *Karnataka: our smart cities are on track.* October 10, 2019. https://government.economictimes.indiatimes.com /news/smart-infra/karnataka-our-smart-cities-are-on-track/71518317. Accessed June 28, 2020.

Till these strains are alleviated, the SPV takes on a powerful bureaucratic position. As the SCM guidelines describe, the rights and powers of the state government, parastatal agencies, the ULB and municipal councils are delegated to the SPV, "to ensure operational independence and autonomy in decision making and mission implementation" [160] – see table XII.

<div style="border:1px solid black; padding:1em;">

Table XII: Key functions of the SPV as by Bengaluru's Smart City Proposal[161]:

1. *Approve and sanction projects*
2. *Act as a fund manager and implement the smart city proposal with complete operational freedom*
3. *Resource mobilisation*
4. *Ensure timely completion of the projects*
5. *Regularly monitor and review the projects*
6. *Enter into contracts, partnerships and service delivery arrangement*
7. *Collect taxes, user charges, surcharges as authorised by the BMPP*
8. *Operation and management of the assets till the time they are handed over to the BMPP*

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The comparative ease in which the SPV can operate might explain how almost half of the SPV's budget is derived from convergence with other State schemes and budgets – more than double compared to the expected average smart city budget (see figure 13 above). It can be argued that in the case of Bengaluru, the SPV is effectively utilised as a tool to implement projects that were planned regardless, as it manoeuvres bureaucratic and inter-departmental disputes – a loophole, so to say. By pooling the resources of national and state funds, in combination with the legitimisation of the smart city mission and state and ULB departments, the SPV primarily operates in autonomy sovereignty of prior existing governance institutions. As such, until the SPV gives the custody over the smart city projects to the state government and the BBMP, the SPV functions as a sovereign governance stakeholder.

Critical voices, for example by the HLRN and various academic sources (Idiculla 2017; Bon 2015), argue that governance by SPVs is not democratic, as the elected representatives of ULBs (e.g. ward corporators) can hardly held the SPV accountable for its actions. Drawing a parallel to parastatal agencies and urban planning expert groups, also here bureaucratic governance is enabled at the cost electoral governance.

The SPV draws its legitimacy based on citizen participation through civil society, which as discussed in section 5.2, is understood as an inclusive and unproblematic practice. It does so in two ways. First, the politically influential civil society groups participated in the establishment of the proposal, whilst a large part of the Bengaluru's citizens have (digitally) voted in favour for the approval of the plans. In respect to the latter, this is what Hill (2012) critically refers to as "push-button democracy".

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[160] Source: *Smart City Mission Statement & Guidelines*, Ministry of Urban Development, GoI, June 2015.
[161] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru,* page 69, Ministry of Urban Development, GoI, 2017.

Second, the bureaucratically functioning of the SPV is also after the drafting of the proposal legitimised through citizen participation practices. For example, in the case of the redevelopment project of Bengaluru's central park (Appendix I, project 5), the SPV organised a public consultation for citizen input.[162] Notwithstanding, few civil society members have critiqued this consultation through media outlets, arguing that the SPV used one-way communication and practices top-down planning, not properly opening the floor to those present at the consultation.[163]

As such, one can observe how the state capacity to facilitate infrastructure is enhanced through increased bureaucratic governance. At first, through the SPV, by means of the perceived legitimacy of citizen participation, rather than through electoral representatives. In a later stadium, bureaucratic governance is intensified in two ways by the pan-city projects. First, as explained in section 5.2, by further institutionalising civil society as bureaucratic governance representative, legitimising the SPV's practices through citizen participation. Second, by projects that alleviate the strains on cross-departmental cooperation, allowing for more efficient bureaucratic governance.

Conclusively, the enhancement of bureaucratic governance practices might indeed further its transparency and accountability. However, it comes at the cost of democratic electoral practices that ensured transparency and accountability in the first place – a trade-off that should not be taken lightly.

Marketisation of infrastructure through smart city development

Whereas the various state actors fund a large part of the SCM, multiple methods have been utilised to create a return of investment from the projects. These methods - namely, PPPs, development charge levies, and rent monetisation - underwrites the presence of the neoliberal governance discourse, and can have severe implications for the inclusivity of related infrastructures.

Public-Private Partnerships (PPPs)

First of all, the general perception is that state actors are not deemed capable of developing technological projects (see section 4.2). Participating cities were instructed to outsource the formulation of the proposals to consultancy firms listed by the federal government, and ought to tender for 'smart technology' by international ICT companies such as IBM and Cisco (Datta 2018, 410).[164] As such, market actors are perceived as more capable than the state actors, where market stakeholders are thus institutionalised in smart city planning.

Furthermore, eight percent of the implementation and operation costs of Bengaluru's SC projects are covered by market actors, through Public-Private Partnerships annuity models[165] (see figure 13). In such models, either (or both) the projects' construction or post-construction operation and management are outsourced to private parties who have the opportunity to monetise the

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[162] On February 2, 2020.
[163] E.g.: Citizen Matters. *Isn't looking beyond Cubbon Park a Smarter Plan?* February 26, 2020. https://bengaluru.citizenmatters.in/cubbon-park-smart-city-project-redevelopment-43008 accessed on June 5, 2020.
Bangalore Mirror. *Keep it natural, say citizens on plans for Cubbon Park.* February 3, 2020. https://bangaloremirror.indiatimes.com/bangalore/others/keep-it-natural-say-citizens-on-plans-for-cubbon-park/articleshow/73881097.cms. Accessed on June 5, 2020.
[164] Source: *Smart City Mission Statement & Guidelines*, Ministry of Urban Development, GoI, June 2015.
[165] 234,28 crore INR, +- 27,63 million in euros as of 1st of July 2020.

operation of the projects (e.g. by selling advertisements on smart street lighting). The SPV, who establishes the PPP contracts, finances a part of these projects to overcome the viability gap of that would otherwise prevent profitability for the investing private parties. As such, eventual extra costs to ensure inclusivity could be covered by the SPV – through governance funds.

However, as these market actors geared towards profit-making, the dependency on external stakeholders can lead to non-contextual, non-adaptive, and non-responsive implementations (Allam 2018, 125).[166] In other words, as a research participant argued, market actors do not have a natural incentive to assure inclusivity of the projects in which they are involved. The marketised infrastructure could target the upper- and middle-class population, rather than ensuring the infrastructure's accessibility and affordability for marginalised groups. Therefore, the State should provide such an incentive, she suggested.[167]

As such, as 'smart infrastructure' gets marketised through PPP-projects, infrastructure as public good becomes transformed to a product for consumption (Graham and Marvin 2002), which can create exclusion of infrastructural access for marginalised groups without the capital means (proxy 2). Arguably, given its positionality of initiator of the project, the State could assure the inclusivity of marketised infrastructure through incentives through subsidies for infrastructures targeting less affluent citizens, or by paying for the increased viability to extend the delivery to marginalised groups. This could be done through an inclusive project design, whilst assuring the inclusive measures stay in place, also after the Smart city mission has ended.[168]

Smart city projects as an enhanced revenue model: charges and rents

Like market players seek a return of investment, various SPV-controlled ABD projects[169] have mechanisms to raise revenue – effectively, a state actor marketising infrastructure. The generated revenue is in turn intended to fund the respective smart city projects. The proposal mentions at least three mechanisms. First, by increasing the cost of utilising infrastructure, e.g. by raising ticket prices for electric busses. Second, by creating additional revenue by renting out additional market space, 'smart cubicles' and 'smart parking'. Third, by the additional revenue generated through advertisements and selling waste collected by smart dustbins. Two remarks can be made.

First, although additional revenue is used to pay for the initial improvement, increasing the prices of facilities that lower-income groups use (e.g. bus and market space) could harm its affordability, and thus the accessibility for marginalised groups. As such, for the projects to be inclusive, the perceived economic benefits of the improvement should outweigh these additional costs.

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[166] Further research could give insights into *which* market actors have played a role in the formulation of the proposal and tendered for facilitating smart technology; as most projects are still under tender or getting detailed, it was not possible within the possibilities of this research to do so.
Source: II2, data archivist. February 26, 2020. Interview with author.
[168] In interview II2, the participant argued that many corporations are only concerned with inclusivity for the during of state projects.
[169] Meaning, projects in which the operation and management is not outsourced to the market, but remains under custody of the SPV till the custody is transferred to respective parastatal agencies – e.g. electric busses to the BMTC.

Secondly, with the SPV monetising waste collected by the smart dustbins, it might risk removing income sources of waste pickers, who segregate and sell the waste that is collected by the BBMP (Bhan 2019). The SC proposal does not indicate if any measures are taken to compensate 'informal work' that might be replaced through smart city development.

Essentially, raising charges or monetising on formerly 'informal' production is not wrong per se. In line with the proposal's conceptualisation of inclusivity, these projects need to consider the adverse external effects for marginalised groups, and should be sufficiently compensated with economical 'benefits', in order for the SC projects to be inclusive.

Data and the State's responsibility vis-à-vis formal citizenship rights – Tax enhancements

Next, pan-city project 2 (see appendix II) aims to improve property tax collections by use of drone technology to 3D model the entire city. As is set out in section 5.1, with the minimal efficiency of property tax collection in Bengaluru, and the tax being the primary income of the BBMP, it is understandable that a more effective method is desirable. With the use of data technology, the project thus intends to move from a 40-45% coverage (as of 2017) to 100% property tax collection.

What however is not detailed in the proposal[170] are the ethical and socio-political consequences of the project. For example, how will the State, the BBMP and the SPV deal with un-serviced, low-income housing, or unplanned slums in regard taxation? Is it ethical to charge these taxes when the State does not provide the minimal infrastructural services – "no taxation without representation"? At the same time, it questions the State's position towards 'illegal settlements'. Pellisery et al. (2016) argue that when taxes accepted who are remitted by 'informal residents', the presence of these residents become more legitimised and implies a sanctioning from the local authorities (116). As set out in section 4.2, this problematises property ownership (Chatterjee 2004 in Chakrabarti 2007).

As such, by mapping and 3D modelling the city, it can be argued that the increased access of data comes with the increased responsibility to act upon the absence of infrastructural facilitation – thus, not only to increase tax revenue. Simultaneously, it forces the State to take a position on the citizen rights of households that do not have property rights. The increased data efficiency can thus improve or adverse the position of marginalised groups, which depends on normative and political decision-making of (bureaucratic) state actors.

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[170] Possibly because of the limitation of words allowed by the SCM Guidelines.

5.4 A missed opportunity: scale, replicability and the Smart City in the urban periphery

In regard of its financial plan, Bengaluru's proposal exclaims how its financing is based on "the strategic pillar of fiscal sustainability":

> "The strategic and financing plan of Bengaluru is based on the concept of prudence and practical implementation of the projects through resources which are available and/or can be easily raised."
> [...] "While there are other means of financing like Debt, Land Value Capture [LVC], Public-Private Community Partnerships [PPCPs], Bengaluru's SCP has been prepared on the principles of sound revenue management for ensuring financial stability and economic viability of the SPV."[171]

The accomplishment to establish a debt-free proposal should be well-credited, as well as preventing a potential threat of funding gaps. Indeed, the latter 'new' modes of financing such as LVC and PCPP have been critical received (e.g. Bon 2015; Franceys & Weitz 2003), but also embody potentially favourable outcomes (e.g. Sharma 2018) that will probably not be met with the current design of Bengaluru's proposal.

In Bengaluru's proposal, 94.03 percent of the prospected financial resources are allocated to the area-based projects. This partly follows the instructions of the SCM Guidelines, that stipulates how the "pan-city [project] is an additional feature to be provided". As such the city is instructed to select a compact area, given the SCM's approach to ABD projects.[172] Cities' selection should be based on citizen-participation, but also ought to make a choice of a development type (retrofitting, redevelopment, greenfield) with a corresponding area size (respectively, 2km², 0.2km² and 1km²). Furthermore, the instructions read in bold that "only one 'area' should be selected".[173]

       The reason for this strong emphasis for this design is the potential for the ABD projects to raise the land value. Land value is determined by its demand, which is based on the intrinsic value of its environment, but also on the quality of utilities and amenities. By investing in a small area land value rises, which in turn is generally beneficial for current landowners, businesses, investors, and local authorities.[174] In a discussion with an urban planner, she argued that the SCM initially set out to create as much land value as possible in order to create a replicable business model for investors[175]. In other words, by demonstrating the land-value additions under the selected 100 selected smart cities by the creation of 'lighthouse projects', it would become attractive for investors to invest. As the guidelines read, "the focus is [...] to create a *replicable* model which act like a *lighthouse* for other aspiring cities. [...] It is meant to set examples that can be *replicated* both within and outside the city, catalysing the creation of similar smart cities [...]" [emphasis added]. This is deemed necessary, as

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[171] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru,* page 78-79. Ministry of Urban Development, GoI, 2017.

[172] Source: *Smart City Mission Statement & Guidelines*, page 7-8. Ministry of Urban Development, GoI, June 2015.

[173] Source: *Smart City Challenge Round 3: Smart City Proposal Bengaluru,* page 23. Ministry of Urban Development, GoI, 2017.

[174] A higher land value, or in other words, a high demand for the respective land, generally leads to more construction, a higher floor-area ratio (FAR), more economic activity and thus also higher property taxes.

[175] Source: II4. Urban planner. March 9, 2020. Interview with author.

the urban planner explained, because 'participating cities will never have as much money pumped into the city again' (paraphrased) – referring to the large quantity of state funds the participating cities mobilised.

Bengaluru has taken a radically different approach as initially set out by the SCM, especially in comparison to other metropoles and cities in Karnataka (see table XIII below). Instead of the approximate two km² for retrofitting, Bengaluru's ABD area spans 21.8 km², which is a lot, even compared to other cities portrayed in table XIII. By taking such a large (and patched) area without significantly more funds, it can be expected that land-value addition will be much lower than when a similar amount would have been invested to a smaller area. As such, land value capture as a finance tool might not have been selected, but would also not have worked under this design – which might as well be the reason why it is not utilised.

Instead, it can be deduced that Bengaluru selected a large patched area in the city core, including the Central Business District and administrative centre, the historical markets, lakes and parks, that could converge with other existing budgets of governance actors. Here, a clear choice for Bengaluru's city core has been made, as it "belongs to and is used to everyone", the proposal details. Indeed, the centre core of Bengaluru has the highest footfall, but if the intention is to replicate the efforts of the ABD projects in other areas in the city, this should not be a determining factor. Furthermore, as citizens were asked to vote for selected areas, it seems only logical that the areas are voted for are those that most people know and (have) visit(ed) – the centre. As argued in the previous section, the conceptualisation of inclusivity 'benefits for everyone, irrespective of social position" is thus clearly observable, but the benefits provided to citizenry disregard the existing inequalities.

The core is often a preferred location for smart city development (DeFalco 2019, 15), as well as in Karnataka (see table XIII). Of course, retrofitting the centre with technological 'smart trinkets' might enhance 'the identity and experience of the city'. However, it does not imply that in these areas the best social impact will be made. Therefore, it can be argued that the choices of smart city projects are based on middle-class priorities related to modernisation (Hoelscher 2016), rather than the facilitation of infrastructure for those most in need.

Table XIII: Size and scale of ABD smart city projects (metropoles and Karnataka smart cities)

Name	Population 2011	ABD Scale			ABD area (acres, sq. km)		ABD development costs		Core	Peri-phery
		Retrofitting	*Redevelopment*	*Greenfield dev.*	*Acres*	*Km²*	*₹, millions*	*€, millions*		
Bengaluru	8,443,675	✓	✓		5380	21.8	16.85	198.6	✓	

Smart city metropoles

Name	Population 2011	*Retrofitting*	*Redevelopment*	*Greenfield dev.*	*Acres*	*Km²*	*₹, millions*	*€, millions*	Core	Peri-phery
Delhi	16,349,831	✓			550	2.23	6.69	78.8	✓	
Chennai	8,653,521	✓			1,717	6.95	8.78	103.5	✓	

Karnataka smart cities

Name	Population 2011	*Retrofitting*	*Redevelopment*	*Greenfield dev.*	*Acres*	*Km²*	*₹, millions*	*€, millions*	Core	Peri-phery
Hubballi-Dharwad	943,788	✓		✓	3,092	12.51	14.17	167.0	✓	✓
Mangaluru	499,487	✓	✓		1,628	6.59	17.07	201.2	✓	
Belagavi	490,045	✓			n/a		16.55	195.0		✓
Davanagere	434,971	✓			785	3.18	7.04	83.0	✓	
Shivamoga	322,650	✓	✓		1,500	6.07	14.59	171.9	✓	
Tumakuru	302,143	✓			1,355	5.48	18.92	223.0	✓	

Discussion, policy recommendations and conclusion

An alternative orientation towards the smart city

Taken the current scope, scale and focus of Bengaluru's SC projects in account, it would be worthwhile to experiment with smart city projects for the improvement of basic infrastructure. This should include water-, sanitation-, waste- and public transport facilities in Bengaluru's peripheries, in particular in wards in the vicinity of economic development, like Doddanekundi.

Open green space in such wards has become scarce and are in need to be preserved, by which low land-value does not need to be maintained to attract even more business campuses – new areas for economic development could better spread out to areas currently without much job opportunities. Simultaneously, as wards like Doddanekundi are characterised by urban fragmentation and splintered urbanism, all residents would benefit from improved (access to) basic infrastructure, as it will not only improve the livelihood conditions of marginal groups, but also enhance the liveability and urban experience of the middle- and upper class. Improved infrastructure equally accessible for all would also lead to higher land-value, which can be beneficial for residents and investors, under the condition enough social housing will be constructed to service the lower-income and migrant population, which can be realised by State policy and economic incentives. Through a focus on these peripheries, financially viable projects could take place through land-value capture, in cooperation with investors and businesses, preferably those located in the vicinity of the respective development.

As the State is limited in resources, financial partnerships are inevitable. However, the objective of the (inclusive) smart city – alleviate urbanisation pressures and improve access to basic infrastructure, by the use of smart technology - should not be depressed by the interests of market actors. The State could use its resources to incentivise inclusive infrastructure to keep infrastructure affordable – whether facilitated by the State, market, or civil society. The smart city plans should be based on the dialogue with residents of *all* socio-economic backgrounds. the citizen participation on which these plans should be based, ought not be an average of those who had the opportunity to join the dialogue, but rather on the direct needs expressed by the residents in the area for which the project aims to improve its infrastructure.

As such, with a focus on expanding the access of basic infrastructure – regardless of the socio-economic of political background of those who use it – the smart city projects could be truly inclusive. Not through a 'some benefits-for-all' manifesto, or by aggravating urban fragmentation or further expulsion of marginalised groups to the fringes of the city, but by equally sharing urban space.

6. The potential for inclusive smart cities in the urban periphery

This research project has set out to explore the potential for inclusive smart cities for marginalised groups in the peripheries of Bengaluru. Practices related to smart cities – e.g. perceptions, intentions, strategies and decisions on scope and scale – do not occur in isolation of the urban context, as I have demonstrated in the foregoing empirical chapters (Kitchin 2015; Glasmeier and Christopherson 2015).

When one sets the findings on Bengaluru's infrastructural configuration next to the findings of the discourse analysis of smart cities, comparisons can be made that demonstrate the origins, problems and motivations that shaped Bengaluru's smart city plans as they are today. Let me briefly list some of the findings to demonstrate the contextual linkage between smart cities and infrastructural configurations.

First, a troubled cooperation between state actors might lead to the convergence of planned development plans in the smart city proposal, executed by an efficient yet democratically problematic SPV. Second, bureaucratic governance empowered through civil society participation is likely to further gain power through smart city projects, at the cost of electoral governance and the representation of marginalised groups. And lastly, civil society seems to be further institutionalised by the State through the various pan-city projects, rendering the city's inhabitants more as 'enlisted' cooperative volunteers, rather than citizens that critically assess the State.

The gravity of these findings – among others discussed in previous sections – is dependent on the readers' familiarity with India's governance practices on urban infrastructure. For the Indian reader, some of these findings may occur as common sense, or just the regular turn of events. Nevertheless, what is new is the in-depth analysis of an infrastructural configuration explicitly brought in relation to smart cities. By using relatively concrete and tangible conceptualisations for a post-structuralist analysis, I aimed to create an easily accessible cross-cultural understanding of a socio-cultural context in which smart cities can take shape. This could contribute to overcoming the amplification of stereotypes, normative statements on 'the Other', or pessimism about smart city development in areas in which the use of such technology used to be uncommon. As such, we can learn from these socio-geographical differences, and create and understanding of the complications, limitations and potential of inclusive smart cities, and decipher what applies universally, as well as what does apply in specific local contexts.

As argued in the theoretical framework, the body of academic literature on the negative consequences of smart city development is rapidly growing. Much of the critique (e.g. by Kitchin 2014; Allam 2018; Datta 2018) can be recognised in the case of Bengaluru – For example, on the adverse effects that are related to the neo-liberalisation of governance (Allam 2018) and the transformative power of smart cities on citizenship (e.g. Cardullo et. al 2019; Lee et. al 2020).

However, these phenomena are taking place both within and outside the smart city discourse. This observation can be linked to Glasmeier and Christopherson's argument that smart cities do not function as an entity itself, but are dependent on its pre-existing legacy infrastructure (2015). As Bengaluru's infrastructural configuration is neo-liberalising and hybridising, whilst transforming the relations between the State, market and civil society, the practices of smart cities will also change respectively.

Furthermore, Kitchin (2015) argued correctly that the smart city has taken many different conceptualisations upon entering the public discourse. Nevertheless, the various warnings regarding the effects of big data and technocratic governance that are set out in critical academic literature, should be seen in the light of the particular conceptualisations in which the smart city takes place. As Bengaluru – and likely many other cities – have little on automated big data systems included in its proposal, this critique seems to be less relevant. Comparatively, academic warnings related to smart cities' transformative practises on citizenship definitely are relevant for Bengaluru's peripheries (e.g. Datta 2018; Cardullo 2019; Lee et al. 2020). Hence, again, the importance of contextual and ethnographic analyses cannot be understated.

Five potential pathways a more inclusive infrastructure through smart city development

For the remainder of this discussion chapter, let us return to the main research question:

> *How can smart city applications be functional and inclusive in Bengaluru's urban peripheries,*
> *given the city's forms of governance and infrastructural configuration(s)?*

If inclusive smart cities refer to improvement of the access to basic (legacy) infrastructure for marginal groups, as I suggested above, I argue that in order to ensure its inclusivity of (future) smart city projects, the following five pathways ought to be taken in account:

Five potential pathways for inclusive Smart Cities:

1. *Increase state capacity to enhance infrastructural governance and extend the infrastructure delivery of state infrastructure to marginalised groups.*

2. *Enhance quantity/quality of infrastructure data by the utilisation of smart technology.*

3. *Incentivise the market for more inclusive marketised infrastructure.*

4. *Enable and incentivise marginalised groups' equal access to civil society practices.*

5. *Protect electoral governance to secure the 'unconditional' check-and-balance system on bureaucratic governance practices.*

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1. Increase state capacity

Regardless of the city's infrastructural configuration, the State has the executive power to alleviate hindrances to infrastructural access, whether infrastructure is facilitated by the State, market or civil society. Ultimately, it is a policy decision made by the State whether the infrastructure network hybridises and neo-liberalises the infrastructural governance. As such, the practices in which market providers or civil society groups take over duties of the State do not imply that state actors lose the responsibility to ensure that all citizens have reasonable access to infrastructure, regardless of their socio-economic background.

In the case of Bengaluru's peripheries, the hybridisation and liberalisation of infrastructure could be understood as a necessity; the State does not have the capacity to facilitate all citizens, and therefore need to resort to cooperating with the market and civil society. The smart city projects are aligned to this trend, but also enable better cross-departmental communication, more tax income and easier access to data and information. As such, smart city development can increase the capacity of the State to govern infrastructure, which is a condition to effectively expand the state infrastructure network. Thus, if desired, the State can decide to rely less on the facilitation by market- and civil society actors through smart city development. By doing so, marginalised groups in the peripheries can be included by being serviced through the state infrastructure network – in similar fashion as the infrastructural access for most of the inhabitants living in the city core.

2. Enhance quantity and quality of available infrastructure data

The smart city is usually defined through the use of big data, IoT and real-time tracking technology utilised to gain insight in flux, usage, problems and maintenance of infrastructures. With only a few of Bengaluru's projects making optimal use of these technologies, the abovementioned conceptualisation is not fully embraced by Bengaluru, even though the city's governance actors are dealing with a sincere data deficiency regarding its infrastructures. Smart city technology can alleviate these issues whilst potentially ensuring that those generally not seen by the State – e.g. marginalised groups, migrants, temporary residents – are noticed, and subsequently serviced.

Increasing data availability is part of a formalisation process of the city's population that generally operates in spheres of informality. In this sense, it has pros and cons for marginalised groups. 'Being seen through data' could create the moral obligation for the State to expand marginalised groups' access to infrastructure. Simultaneously, how States act upon data is still depending on their normative policy decisions. For instance, normative questions may arise, such as if the State ought to service citizens who do not have legal land rights, who have not yet paid taxes, and who might infringe on the 'modern experience' of the city.

As such, although I would recommend the expansion of data collection in order to make better policy, by using data to *be able to facilitate* to marginalised groups, caution is needed. If such technology is utilised, the critique and warnings set out in academic literature should be taken into consideration. For example, if the State becomes overly solutionist and too reliant on data, one needs to be wary that it does not disrupt 'informal' practices which marginalised groups rely on to make a living, and thus not creating adverse the effects the 'inclusive smart city' is aiming to reduce in the first place.

Therefore, even with enriched data access, continuous dialogue with affected citizens remains necessary. As argued in section 5.4, citizen participation in the formulation of smart city plans should not be an average opinion or vote of confidence by the average population. Rather, it should be based on community analysis and co-creation, exploring the needs, challenges and limitations of the area or community the project aims to improve through its infrastructure.

Finally, data should be equally accessible for *all* governance actors to ensure the most inclusive outcomes, whilst making ethical considerations regarding data privacy. Infrastructure data can indeed be monetised by state- and market-actors, e.g. through PPPs or selling or by granting the solitary right to data access. However, if an infrastructural configuration relies on marketised infrastructure, restricting the access to data would harm a fair market competition, disadvantaging the more socially inclusive initiatives.

3. Incentivise the market for inclusive infrastructure

Given the limited resources of state actors it is logical that States resort to marketising infrastructure. However, as argued in section 5.3, and in relation to the statements above, I argue that the State has the opportunity to ensure access to inclusive market infrastructures through incentives. Some potential solutions to ensure inclusivity are subsidies, favourable PPP contracts in exchange for concessions that ensure inclusive access, or through the State paying for the viability gap. Utilising such measures is likely to be considerably cheaper than expanding the state network. Moreover, through these efforts, marginalised groups are better ensured access to infrastructure, and further segregation as a result of the neo-liberalisation of infrastructure can be prevented.

4. Enable and incentivise marginalised groups' equal access to civil society practices

Many citizens of Bengaluru have adopted various ways to organise in order to create better options for infrastructure deliveries. By pooling time and resources, tending to autoconstruction, civil society groups have become relevant actors in the hybridised infrastructural configuration. Furthermore, through the maintenance and controlling of state infrastructure, and by mobilising political power to participate in policy-making at bureaucratic offices, civil society groups have taken upon state-institutionalised functions. State actors applaud both processes and encourage citizen participation in these civil society practices. This enthusiasm extends as far as that participation may almost be perceived as the norm for (local) infrastructural access, rather than a voluntary form of altruism, performed by good-intentioned citizens with an abundance of time.

Indeed, citizen participation can be a great way to ensure that citizen needs are heard, through bottom-up citizen input, whenever they voice their concerns. However, civil society activities are often organised through exclusive participation of economic classes; marginalised groups are therefore generally in a disadvantaged position compared to middle- and upper-class citizens to capitalise on the benefits available through citizen participation.

Simultaneously, as demonstrated in section 5.2 and 5.3, Bengaluru's smart city projects intensify the State's interactions with civil society, and even rely on active citizen participation for the success of these projects. Through projects related to citizen apps, online grievance platforms, participatory e-governance and community policing, the scale (or speed) of civil society's hybridisation and institutionalisation processes will likely be amplified. If the marginalised population cannot equally participate and benefit equally to other citizens, the participatory projects will not improve their livelihoods, because it will likely lead to further societal segregation. As such, for smart city projects to be inclusive, it needs to overcome the socio-economic fragmentation that occurs through active citizen participation – particularly in an institutionalised civil society.

It can be argued that States do have the capability to ensure that marginalised groups will have a more equal footing in participatory smart city projects. As Bengaluru inventively demonstrates, the State can offer offline and physically localised ways for citizens to utilise (participatory) e-governance practices through 'smart kiosks'. This strategy may indeed prevent the adverse effects of the 'digital divide', though I would strongly recommend future research to verify the effectiveness of these kiosks.

Nevertheless, there is more a State can do to ensure inclusive access to infrastructure and infrastructural governance. First and foremost, like the Housing and Land Rights Network (HLRN) suggests[176], the State should adopt a rights-based mindset in the conceptualisation and realisation of the smart city, focussing on the access to basic infrastructures for all. Furthermore, I argue this mindset should be fostered among market and civil society actors as well, to assure that all actors in the infrastructural configuration create multiple modes of infrastructure, accessible for marginalised groups. For market actors, see pathway 3 above. In regard to civil society, if active citizens perceive the access to basic infrastructure as an intrinsic right of being an inhabitant of the city, regardless of socio-economic background, the State and civil society could cooperate to make the city more liveable for everyone.

The State could, for example, provide best-practice examples of cross-class community engagement through media campaigns, with the aim to foster awareness of the benefits of including the marginalised in civil society practices. Furthermore, the State could incentivise civil society groups with financial support for successful efforts to include marginalised groups in their activities, if that would lead to better access to infrastructure. Most likely, various other ideas along these lines could take shape to prevent any exclusionary effects by the State's intensified call for citizen participation, for smart city projects and general infrastructure facilitation alike.

5. Protect electoral governance

Bengaluru has wholeheartedly embraced citizen participation as part of its smart city plans. With a design that assures that the position of marginalised groups is not negatively affected through this emphasis, citizen participation can potentially be a good strategy for inclusivity. Nevertheless, an over-reliance on citizen participation can be just as harmful.

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[176] Source: *India's Smart Cities Mission: Smart for Whom? Cities for Whom?* [Update 2018]. Housing and Land Rights network, New Delhi, 2018.

Through the institutionalising of civil society and the normative expectation that citizens ought to participate as 'smart citizens', civil society participation loses its voluntary character. To be strongly nudged towards aiding the State in infrastructural management to secure infrastructures access, should not be uncritically characterised as 'inclusive policy'; participation ought to remain voluntary and access to basic infrastructure should be unconditional, regardless of one's spare time to contribute to the city.

As demonstrated in section 4.2, citizens can elect representatives to protect their interests and secure improvements in infrastructural access, underpinned by the democratic principles of electoral check-and-balances. However, through the institutionalisation of civil society practices, bureaucratic governance actors gain increasing legitimacy to make infrastructure policy, circumventing electoral representatives. Various pan-city smart city projects are amplifying this process. Furthermore, similar to infrastructural governance managed through parastatal agencies, electoral control becomes even further isolated through the deployment of an SPV for the implementation of smart city development. Increased bureaucratic power might indeed lead to more efficient implementation of infrastructural or governmental improvements. As such, I recommend to closely scrutinise the design of future smart city projects and protect electoral governance practices. It is vital to ask whether a quick, efficient and unhindered bureaucratic governance is worth the trade-offs of a diminishing capacity of democratic electoral practices, in particular when less affluent citizens rely mostly on the latter.

Reflection on the utility of the pathways – project limitations and recommendations for further research

The five pathways discussed above can be instructive for both the design of future smart city development, as well as guidance for Bengaluru's projects that still need to be implemented. These recommendations are derived from the contextual research that analysed Bengaluru's infrastructural configuration, discussed in chapters 3 and 4. The proposed pathways provide multiple angles, points of attention and potential options to alleviate the already existing forms of marginalisation in relation to infrastructural access. These forms of marginalisation thus not only occur in relation to smart city development, but (will) interact with any urban development project that might take shape in the context of Bengaluru. As such, the pathways can be instructive for other development projects as well.

Furthermore, although each city has a unique infrastructural configuration, the issues set out against the context of Bengaluru are likely to correspond with other cities in India and the Global South. Problems related to state capacity, neo-liberalisation and the rights and duties of citizenship are present in many urban localities, though in which the conceptualisation and implementation of smart cities may differ greatly. As such, I believe it would be fruitful to adapt the five pathways as a framework for a comparative analysis between cities practicing smart city development. Doing so would not only test the generalisability of the potential pathways, but also provide an overview of how various governance actors interact with the problems the pathways aim to alleviate. In turn, this would be instructive to further define which steps state actors can take to ensure the inclusivity of smart city development.

This project has some flaws and limitations that impact the validity and reliability of the research, which could potentially be overcome through selecting a different research design, expanding the scope of the research, and having more favourable circumstances in the field. For example, due to the shortened on-site fieldwork period – as a result of the Covid-19 pandemic – this research lacks in direct data sources detailing the emic perspectives of marginalised groups. Likewise, in-person interviews with State actors would have resulted in a more valid comprehension of their perspectives on Smart Cities than a document discourse analysis could. Further research that includes first-hand accounts of these groups – e.g. through interviews, focus groups or workshops – would provide valuable insights that complement the current knowledge on the topic.

On a similar note, due to the limited circumstances, the research has only one in-depth case study, a peripheral ward with much international economic development, has been included in the data collection. In the intended design of the research, I proposed a comparison with a ward without such development to isolate the variables and conditions for smart city projects to take foot. Future research that would make such comparison could better assert the external validity of this case study for other peripheral wards.

Lastly, to capture developmental change, any researcher is likely to struggle with the aspect of time in respect to the empirical reality they aim to capture. This research has been able to demonstrate how the intentions, agendas, perspectives and conceptualisations of smart city development, but lacks an analysis in an empirical reality on how these aspects will really affect the livelihoods of marginal groups after the implementation of such smart city projects.. Longitudinal research that tracks these changes over the various phases of the realisation of smart city plans would fill the research gap. Ideally, a mixed method research would collect quantitative data to register the changes in livelihoods, set in comparison with qualitative data that would follow the perceptions, aspirations and agendas of marginalised groups. Such qualitative data would provide a more tangible account of the impact of smart city development. This thesis can thus be deemed a good explorative pre-study that provides contextual background, with various hypotheses to be tested in such research project.

Conclusion

The smart city as development strategy is steadily gaining more and more traction among urban policy makers throughout the world. Likewise, this type of development increasingly catches the attention of the public and becomes a topic of debate among academia. Scholars in development studies, urban policy and governance should consider their position that could potentially be mobilised for a positive societal impact, e.g. through recommending inclusive designs for 'smart' urban development. Whereas policy practitioners may currently be too easily satisfied, scholars could take a pragmatic approach towards smart city development, rather than pursuing the expansion of a primarily pessimistic body of academic literature.

Because indeed, smart cities projects seem to have an inherent risk of trade-offs, that may undo the positive outcomes the initiative initially aimed to alleviate. Notwithstanding, I have intended to demonstrate the beneficial as well as the adverse consequences of smart city development. I argue that by expanding the knowledge on how to prevent such trade-offs, and making this knowledge available for the general public, smart city projects could move towards practices that are more inclusive for those who could use it the most. Smart city planners need to adapt socio-technological strategies that ensure that an ever-growing, highly-heterogenous urban population in the peripheries get serviced in their basic needs. This is, as I have demonstrated, a tremendously difficult task, considering the multitude of perspectives, aspirations and agendas of the various infrastructural governance actors. Through a multi-actor analysis, taking the various positions in separate consideration rather than in one-size-fit-all approach, smart city projects are most likely to be feasible, successful and inclusive.

We are fortunate that smart city development has become associated with inclusivity. With an audience for inclusive practices among state actors, market players, various civil society groups and scholars, a pro-active stance for cooperation could ensure that smart cities are not only associated with inclusivity, but that its practices can be adapted to lead to truly inclusive smart cities.

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Appendices

List of appendices:

Appendix I: Area-based development (ABD) projects in Bengaluru's Smart City Proposal[177]

Project Nr.	1	2	3	4	5	6	7
Name project	**Revitalization of historic heart of city**	**Integrated mobility Towards creating Vibrant destination**	**Upgradation and Redevelopment of historic economic centres**	**Innovation of downstream clean-up of Drainage system**	**Protection and Redevelopment of Centrally located Parkland (Cubbon park)**	**Increasing affordable Housing stock through Slum redevelopment (swathanthra palya slum)**	**Upgrading a government Hospital with heritage Value (kc general Hospital)**
Activity	Retrofitting centre/central business district	Retrofitting - 2 bus stations - 1 market, - 1 park - 1 metro station with road upgradation.	Redevelopment - 2 markets	Redevelopment/ Retrofitting - Revitalising 2 lakes.	Retrofitting & Redevelopment - 'placemaking and park beautification'	Redevelopment - slum redevelopment (removed from SCP)	Retrofitting/ upgradation
Components	- 51,6 km road upgradation, - e-toilets - smart parking, - smart dust bins (420) - Smart telecom towers - smart street lighting (4200) - smart bus shelters - e-buses (150) - e-rickshaws (150) - smart traffic signals - CCTV Surveillance	- smart parking, - start-up cubicles, - roof top solar panels and smart metering, - e-toilets, - watering points - smart dustbins, - digital information board(s).	- smart dustbins - bio methane plant(s) - composting pit(s) - recycling unit(s) - smart pop-up vendor kiosks (900) - smart car parks (60) - roof top solar panels with smart metering - E toilets - Water ATMs - CCTV surveillance	- sewage/lake water cleaning measures - green bridges - pedestrian and cycle paths - solar trees -street lighting - e-toilets - water ATMs - Smart dust bins -CCTV surveillance	- tourist information kiosk - pedestrian and cycle paths - smart street lighting - smart parking - e-toilets - water ATMs - Smart dust bins - CCTV surveillance	- Housing units (689) - 2.7km road improvement - 1 community centre	- adjacent road improvement - improvement of structural stability of hospital building - rooftop solar panels - solar/energy effienct street lighting
Costs (rupees, crore)	1221,69 cr INR	246.43 cr INR	200.92 cr INR	38.10cr INR	6.26 cr INR	44.11 cr INR	12.27 cr INR

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[177] The projects' descriptions are as similar as possible to the lexicon used in the proposal.

Appendix II: Pan-City projects in Bengaluru's Smart City Proposal[178]

Project Nr.	1	2	3	4	5(a)	6(a)	6(b)	7
Name project	Municipal finance	Improvement in property tax collections for the whole city in a phased manner	Grievance management	Participatory budgeting	Online project Information system for Public project Management	Improvement of neighbourhood safety: community policing	Improvement of neighbourhood safety: security surveillance network extension	B-trips (Bengaluru travel related information and planning system
Components	- Municipal Audits to enhance credit rating - City Dashboard as a single MIS for the city as a whole (across civic agencies) - Roadmap for tapping the municipal bond market as a viable source of funding infrastructure projects - Surveying wards and streets to accurately report condition of infrastructure and update progress	- 3D building mapping for city using drone technology for property assessment, public assets, regulation and revenue augmentation	- Central command centre for accepting citizen queries across agencies on a unified platform. - Respond and resolve grievances with transparent reporting of progress - Smart kiosks for reporting grievances for people without digital reach (10/ward)	- campaigns and drives to involve residents and publish the collated and analysed results - Citizen app that consolidates neighbourhood and ward level inputs from the citizens	- Platform for information sharing on status of ongoing public projects between agencies on a spatial platform **5(b)** - Open data portal for citizen information and Innovation - 1 common platform for city information available to people at large	- From 15 to 50 police stations with community policing - deployment of citizen volunteers who act as security representatives from local communities (beat patrol, committees - 8000 smart equipment with internet data packs for beat patrols - awareness through campaigns and adverts - capacity building at police stations - publish reports on crime statistics	- 5000 CCTV cameras for recording and monitoring across the city with 2-level security protection of recorded data - hi-tech centralised command centre with automated video monitoring and analytics software for face/pattern/ number plate recognition and real time sharing of data with emergency and law enforcement agencies - GIS-based police and crime information system	i. Single smart card for all public transport (bus, metro, train) ii. PIS system iii. Smart kiosks for information with coordinator for maintaining and helping people becoming smart kiosk friendly
Costs (rupees, crore)	10.2cr	5cr 27 lakh/yr	31cr 3.48cr/yr	2cr 1.5cr/yr	5cr each 50 lakhs/yr each	32.4cr 7.8cr/yr	25cr 3.75cr/yr	

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[178] The projects' descriptions are as similar as possible to the lexicon used in the proposal.

Appendix III: Overview of research activities

#ID	Research Item	Description	Type of data
Events and (participant) observations			
E1	*Rally for Bangalore 2.0*	Youth incubation rally to attract youth for participation in civil society.	Notes on participant observation, informal conversations.
E2	*National consultation on transparency and accountability regarding urban governance*	Conference of civil society groups and NGOs concerned with urban governance, infrastructure and/or civil law.	Notes on conference speeches, group discussions.
E3	*Meeting with SCM Bangalore director*	Short introductory meeting with the director of Bengaluru's SPV in the company of two PhD students of ISEC.	No particular data, contextual impressions, rapport.
E4	*Rejuvenated lake visit*	A rejuvenation project by citizen initiative. Managed by CSR funds, BBMP supportive. Slum located next to the lake.	Observational notes and notes on conversation with manager of the lake park.
E5	*Visual surveys peripheral ward in the South*	I joined a PhD student of ISEC to his field location in a southern ward in the urban periphery. Aided in visual surveys.	Observational notes, reflective learning activity.
E6	*Designed dialogues*	meeting of civil society, with presentations and discussion group of projects.	Notes on small-scale civil society meeting
E7	*IASSI Conference (speech gov official).*	Conference organized by the host organisation ISEC. Multiple lectures and speeches attended, one of which by Principal Secretary of Urban development Anjum Parwez (Karnataka state government).	Notes on conference speeches
E8	*Bangalore development Summit in Lalbagh*	Development Summit in Lalbagh park, organized by VK (a Bengaluru Kannada newspaper) in cooperation with BBMP.	Notes on the conference debate on Bangalore Masterplan.

Field days in Doddanekundi

#ID	Research Item	Description
FD1	*Day 1: Doddanekundi village*	Doddanekundi village is a somewhat isolated part of the ward, a bit distanced from most of the international economic development.
FD2	*Day 2: Doddanekundi extension, Kundahalli Colony, Brookefield, BEML layout, Thubarahalli layout.*	The visited region is on the one hand very developed with modern buildings of offices, factories and gated communities. On the other hand, there are many slums and PG buildings in the direct vicinity, where urban poverty and a lacking infrastructural access is visible.
FD3	*Day 3: BEML Layout, AECS Layout, Kundahalli Lake Area, Vijayanagar industrial area.*	BEML and AECS are residential layouts with presumably primary lower-, lower-middle and middle class housing; less partly apartments/gated communities).

Interviews

#ID	Research Item	Description	Type of data
II1	*Informal interview with urban planner*	Urban planner active in civil society	Notes on interview
II2	*Interview with data archivist, historian*	Curator of small-scale civil society discussion groups and workshops. Has organised a workshop on smart city development in 2017.	Notes on interview
II3	*Interview and walking interview with RWA member in Doddanekundi Village*	Inhabitant of Doddanekundi, active with resident welfare association and monitoring BBMP functions in layout (waste management).	Notes on interview
II4	*Informal interview with urban planner*	Urban planner active in civil society; prepared smart city proposals in other cities.	Notes on interview
II5	*Informal interview with water and waste management expert*	Chemist and scientific entrepreneur concerned with lake, water and waste management	Notes on interview
SI6	*Semi-structured interview with urban planner*	Interview with specific questions on research on ward committees and smart cities	Notes on interview
SI7	*Semi-structured Interview with a ward committee member*	Ward committee member in peripheral ward, active in civil society and collects dry waste and socio-demographic data of her particular ward.	Notes on interview
II8	*Informal Interview with a ward committee member*	Ward committee member in peripheral ward.	Notes on interview

Discourse document analysis

DC1	*SCM Mission Statement and Guidelines (2015)*	Primary and most instructive document from the ministry of Urban Development (MoUD, GoI) – currently named the Ministry of Housing and Urban affairs (MoHUA).	Data on smart city discourse (national perspective)
DC2	*SC Proposal Bengaluru*		Data on smart city discourse (city perspective)
DC2b	*Appendixes SC proposal Bengaluru*		Data on smart city discourse (city perspective)
DC3	*India Smart Cities: Success Stories from Mission Cities (2017)*	Several case studies of smart city projects throughout India that are deemed successful by the MoUD, GoI. Insightful to understand what is deemed as 'good' and inclusive smart city development.	Data on smart city discourse (national perspective)
DC4	*HLRN Report Smart Cities for Whom?*		Data on smart city discourse (marginal groups perspective)
DC5	*B.Pac and C.SMART recommendations*		Data on smart city discourse (civil society perspective)

Quantitative data analysis and GIS mapping

QD1	*BBMP Ward data based on census data (2011)*	Downloadable excel file from BBMP website; spreadsheet with 2011 census data per ward	Quantitative data set
QD2	*Property Tax data 2018-2019*	List of collected property tax per ward, amount of paying properties	Quantitative data set (converted for analysis)
QD3	*BBMP Microplans*	198 separate files depicting socio-demographic data, e.g. housing typology, income typology, local maps of ward, etc.	Quantitative data set (assembled and converted for analysis)
Additional sources			
/	Doddanekundi Maps sensing local	Various geospatial data on the ward Doddanekundi (no. 85). Geospatial data on housing, land use, open green spaces, public infrastructure and facilities and more. Data is collected through a architecture college project with local students who live in this particular ward. Data can be consulted on https://sensinglocal.wixsite.com/doddanekkundifutures/blog.	
/	Media reports	Various – see footnotes. Primarily retrieved from Indian (local) newspapers, civil society news site or professional specialised news sites	

Appendix IV: Additional tables, figures and case studies

Additional tables

Additional Figures

Case studies on the data deficiency of the State

Table VI: Demographic data on wards in Bengaluru (Section 3.1)

	Core [a]	Urban periphery [b]	City (core and periphery)	% core	% periphery
Spatial data (2011).					
Source: BBMP ward information data file					
Area size (sq. km)	202.6 km²	506.5 km²	709.1 km²	28.57%	71.43%
Demographic data (2011).					
Source: Census 2011, retrieved from BBMP ward information data file					
Population	4,921,964.00	3,521,711.00	8,443,675.00	58.29%	41.71%
Population density (per km²) [c]	24,294.00	6,953.03	11,907.59		
Decadal population growth [cd]	18.44%	120.60%	52.49%		
Households	1,191,730	910,101	2,101,831	56.70%	43.30%
Average household size	4.13	3.87	4.02		
Household density (per km²) [c]	5,882	1,797	2,964		
Decadal Household growth [cd]	33.12%	142.53%	67.35%		

[a]: Core defined as inner BBMP zones (West, East, and South).

[b]: Periphery defined as outer BBMP zones
 (Yelahanka, Dasarahalli, Rajarajeshwari, Bommanahalli, Mahadevapura).

[c]: Calculated average over the average within wards (Bayesian averages).

[d]: Decadal growth over 2001-2011.

[e]: 1 crore = 10 million, Indian measure.

[f]: As of the exchange of June 1st, 2019. € 1.00 : ₹ 84.097.

Table VII: Property tax data on wards in Bengaluru (Section 3.1)

	Core [a]	Urban periphery [b]	City (core and periphery)	% core	% periphery
Spatial data (2011).					
Source: BBMP ward information data file					
Area size (sq. km)	202.6 km²	506.5 km²	709.1 km²	28.57%	71.43%
Property tax data (Financial year 2018-2019).					
Source: BBMP					
Tax-paying properties	579,452	753,871	1,333,323	43.46%	56.54%
Total property tax collection in crore [e] (rupees)	₹ 1,000.05	₹ 926.42	₹ 1,926.48	51.91%	48.09%
Total property tax collection in euro's [f]	€ 118,916,572	€ 110,161,908	€ 229,078,480		
Average tax collection per property in rupees [c]	₹ 15,887.10	₹ 12,627.55	₹ 14,448.72		
Average tax collection per property in euro's [cf]	€ 188.91	€ 150.15	€ 171.81		
Average tax collection per km² in rupees [c]	₹ 51,518,013.89	₹ 22,141,694.71	₹ 27,167,977.72		
Average tax collection per km² in euro's [cf]	€ 612,602.28	€ 263,287.57	€ 323,055.25		
Average per ward contribution to total tax collection (sum of 198 wards) [c]	0.39%	0.73%	0.51%		
Average km² contribution to total tax collection	0,25%	0,09%	0,14%		

[a]: Core defined as inner BBMP zones (West, East, and South).
[b]: Periphery defined as outer BBMP zones
  (Yelahanka, Dasarahalli, Rajarajeshwari, Bommanahalli, Mahadevapura).
[c]: Calculated average over the average within wards (Bayesian averages(?)).
[d]: Decadal growth over 2001-2011.
[e]: 1 crore = 10 million, Indian measure.
[f]: As of the exchange of June 1st, 2019. € 1.00 : ₹ 84.097.

Table VIII: descriptive statistics ward Doddanekundi (ward no. 85) (Sections 3.1 and 3.2)

	Doddanekundi	Average periphery	Average core
Population (2011)	63083	53,359.26	37,2387.61
Area km²	12.0	7.7	1.5
Population density, km² (2011)	5270	6953.03	24,294.00
% Decadal population growth (2001-2011)	186.50%	142.53%	18.44%
Households (2011)	17755	13,789	9,028
Household density, km² (2011)	1.480	1792	5882
Average household size (2011)	3.55	3.87	4.13
% Decadal household growth (2001-2011)	235.80%	142.53%	33.12%
Average percentage property tax to total collection (f. year 2018-19)	3.05%	0.73%	0.39%
% HH in regular housing (2017)	53.72%	n/a	n/a
% HH in slum housing (2017)	3.80%	n/a	n/a
% HH in Large apartment housing (2017)	42.48%	n/a	n/a

Table IX: Selected E-governance initiatives utilised by Government of India, Karnataka state and BBMP (Section 4.1)

Name initiative	Initiator	Function	Additional information
Aadhaar number register	*Government of India*	Register for the online application of social security schemes Biometric identification number	- Individuals in India can apply regardless of nationality. - In 2018, 1.22 billion people were enrolled in the schema (+- 90% of total estimated population).
Karnataka One	*Karnataka State Government*	Online governmental services	E.g. for paying bills, fines, taxes, requesting information on government projects, application for Aadhaar registration, birth certificates, etc.
Seva Sindhu	*Karnataka State Government*	Online governmental services	
Namma Bengaluru	BBMP	Grievance addressal	Inhabitants of Bengaluru can file complaints about a government service, e.g. when waste is not collected, or a streetlamp is not functioning. As of July 2019, grievances were not addressed timely or correctly, a newspaper reported.[179]

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[179] Source: The Hindu. Sahaya app of little 'Sahaya', complain citizens. July 2, 2019. https://www.thehindu.com/news/cities/Bengaluru/sahaya-app-of-little-sahaya-complain-citizens/article28264197.ece. Accessed June 9, 2020.

Figure 9: Walking bridge financed by CSR funds in KC General Hospital (Section 4.2)

Figure 11: Karnataka State Advisory for Resident welfare Associations during COVID-19 9th of May 2020 (section 4.2)

GOVERNMENT OF KARNATAKA

No. HFW 174 ACS 2020

Karnataka Government Secretariat
Vikasa Soudha
Bengaluru, dated: 22.5.2020

CIRCULAR

Advisory forResident Welfare Associations during COVID-19
09-05-2020 (Version 3.0)

In view of ongoing COVID 19 pandemic, following measures shall be implemented or adhered to by all Resident Welfare Associations(RWAs):

1. Residents to be screened before entering the campus using thermal Scanner by designated person by holding the thermal scanner 3 to 15 cm away from the forehead. If temperature is >37.5°C (>99.5°F) and or with flu symptoms like cold, cough, sore throat, and headache such residents shall be isolated and referred to the nearest fever clinic/ hospital for medical checkup or call Apthamitra14410.
2. No Visitors should be allowed.
3. Surveillance at entrance and other areas through CCTV monitoring for physical distancing should be provided.
4. Handwash/ sanitizers are to be provided at entrance and exit.
5. Information Education communication materials approved by the Government should be promptly printed and displayed. Kindly visit https://karunadu.karnataka.gov.in/hfwfor more details.
6. Lifts, common areas, railingsare likely to be touched by the residents,hence should be frequently disinfected using 1% Sodium Hypochlorite solution. Encourage the residents to use stairs.
7. Common areas like parks,walk ways used for walking and jogging can be used, subject to strict maintenance of physical distancing (more than 1 metre). These places should not get converted into socializing points defeating the purpose of preventive measures put in place.
8. Summer camp activity/outdoor games activities are strictly disallowed within premises.
9. Gymnasiums, sports facilities,swimming pools recreational and club facilities are to be closed.
10. Segregated waste disposal should be carefully monitored. One fixed place identified for dumping waste in separate bins by the Residents. The residents should observe hand hygiene, cough etiquette, wear mask and avoid overcrowding while going out to dump waste. The driver and loader of the waste collection van should be screened before entry and they should not be allowed go beyond the waste collection area.
11. Washrooms must be disinfected based on GOI guidelines.(https://www.mohfw.gov.in/pdf/Guidelinesondisinfectionofcommonpublicplacesincludingoffices.pdf).
12. It shall be the duty of the Resident Welfare Association /society to ensure that all those people who have been advised home quarantine stay indoors in their homes and do not move around in the society, community spaces or in the city casually. Any breach of quarantine of the suspect can cause uncontrolled spread of the infection in the entire community. His /Her information should be given to the local health authorities.

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Case studies on the State's data deficiency (Section 4.1)

Case study I: Infrastructural data and State capacity

In general, India ranks as one of the least effective countries in property registry (The World Bank, 2016 in Sharma 2018). Bengaluru is no exception. In 2016-2017, eighty percent of Bengaluru's built-up area was not assessed (Ministry of Finance 2017 in Sharma 2018), whereas taxes were paid over only 40 to 45 percent of the known property.[180] As most property tax is collected in industry-, office- and apartment-heavy wards, the capacity to collect taxes is most likely correlated to the amount of formal economic activities and housing, BBMP is being limited to govern in urban space with more 'informal' activities. With property tax collection being the primary income source of the BBMP, efficient tax collection is of much interest for the ULB – a poor tax collection rate aggravates the dependency on the state government and underlines BBMP's restrained reach of governance.

Similarly, Bengaluru's primary source for demographic data is India's national census, which is only conducted once a decade. Considerably, many policy decisions that are implemented in 2020 are thus based on nine-year old data, which impedes strategic resource allocation. For example, the current boundaries of Bengaluru's wards (in July 2020) are based on population data from the 2001 census; data that is 19 years old. In an interview, a ward committee member explained that regardless of the size or population figures, the number of BBMP staff members and financial resources for each ward are the same. Taking the case of Doddanekundi, the ward has an area surface of 12 km² and had in 2011 a population of 63.000; Marathahalli, a neighbouring ward of Doddanekundi, only has 3.1 km², with 39.000 inhabitants, and should thus have less infrastructural needs than Doddanekundi. This discrepancy has led to a lot of frustration among ward committees and civil society groups.[181,182]

The inconsistency in proportional allocations has been noted by the BBMP. New ward boundary delimitations have been drawn to better represent the urban growth. The implementation met a lot of delays and is expected to be made official later in 2020. However, these new delimitations are based on the census data from 2011, and are thus, again, 9 years old. As such, they do not account for those years of population growth. Based on these and other examples encountered during analysis, data used by state actors is thus often limitedly available, unreliable or outdated.

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[180] Source: Smart City Challenge Round 3: Smart City Proposal Bengaluru. Ministry of Urban Development, GoI, 2017.

[181] Source: SI7, ward committee member. May 19, 2020. Digital interview with author.

[182] Source: Citizen Matters, Bengaluru. *Delimitation will not solve Mahadevapura's traffic, infrastructure woes.* March 7, 2020. https://bengaluru.citizenmatters.in/bbmp-ward-delimitation-notification-unscientific-mahadevapura-infrastructure-services-43301. Accessed May 24, 2020.

Case study II: Data-sharing across state actors

Ward Committees, being the most decentralised governing tier, have much difficulty to acquire data that the BBMP and parastatal agencies are ought to provide. This data is often unusable, or is not provided at all.[183] "Data is not easily available or easy to understand", a ward committee member explained. "I have knowledge about waste, which makes it easier to get data and to understand it, but I don't know anything about roads". This makes it challenging to evaluate the plans of the BBMP or parastatal agencies, she exemplified.

In response, ward committee members, such as the abovementioned, might collect data themselves, sometimes in cooperation with NGOs or civil society groups. After waiting a long time for a response on a request for urban waste data, the ward committee member decided to collect the data with a few other interested citizens. Together, they attempted to measure and geotag waste production over 40 housing blocks.[184] The data was purposed for the proposition of small waste recycling plants. The group also wanted to collaborate with the ward staff, which would enable the ward health inspector to better target enforcement on waste-dumping and -segregation, the committee member argued. "There is no technological innovation, no dashboard, and a complete lack of data", the ward representative concluded.

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[183] Sources: SI6, Urban Planner. February 25, 2020. Interview with author.
SI7, ward committee member. May 19, 2020. Digital interview with author.
[184] Source: SI7, ward committee member. May 19, 2020. Digital interview with author.