COLLABORATORY OF URBAN RESILIENCE AND ENERGY

INDIAN SMART CITIES

A THEMATIC APPROACH EXPLORING ITS SUCCCESS

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EXECTUTIVE SUMMARY

More than half the World's population now lives in urban areas (Dirks, Gurdgiev & Keeling, 2010). As a result of this rapid urbanisation, cities are employing smart and innovative solutions to develop sustainably and improve the quality of lives of citizens (Harrison, 2015). India proposes to build 'smart cities' to help combat the issues of rapid urbanisation and increase economic prospects. Through analysis of both grey and academic literature, this report aims to provide the Collaboratory for Urban Resilience and Energy (CURE) with insight into how the notion of 'smart' is conceptualised in the Indian context. Refining the focus, this report will use CURE's four key research themes as a lens through which to investigate the proposed smart city developments.

This report engages with the most relevant and pioneering project of Dholera in the state of Gujarat, however will draw upon other key examples where appropriate. In exploring Dholera from a resilience perspective, it was recognised that predominant 'top-down' methods of resilience were proposed, however this needs to concurrently be alongside 'bottom-up', citizen led initiatives that draw upon social capital to achieve a smooth running of a smart city (Giffiger *et al,* 2007; Odendaal, 2003). In relation to spatial systems, since there is not ubiquitous access to technology, building a sustainable future is performed through a more elitist approach. Concurrently, it changes the platforms in which governance is contested; to be more digital in nature. Regarding the connection between energy society and space, it was found that the smart city bypasses those who need them most and favour areas better suited for economic development. It was concluded that India's interpretation of the smart city needed a more 'bottom-up' approach which included the role of the citizen more.

LIST OF FIGURES

1.0 INTRODUCTION

More than half the World's population now lives in urban areas (Dirks, Gurdgiev & Keeling, 2010). As a result, this rapid urbanisation creates sustainability challenges that cause urban governments to change the way they operate, even down to the citizen level. However, through innovative development of these urban centres, smart cities are now arguably the new urban utopias of the 21st century and are marketed across the world as solutions to the challenges of urbanisation and sustainable development (Datta, 2015). In order to help mitigate these real world issues we must make concerted, collaborative efforts across sectors as well as between disciplines (McCormick *et al.,* 2013). Hailed by Evans (2015) to hold huge amounts of untapped human resources, universities popularly utilise processes which co-produce knowledge to address sustainability challenges. The synergy of probing student research and academic organisations breeds a wealth of knowledge that best meets current needs. In light of this, this research will work closely with the Collaboratory of Urban Resilience and Energy (CURE) to unpick smart urbanism in India and investigate the main challenges both governments and citizens face with regards to India's Smart City Mission (SCM). Refining its focus, this report will use CURE's four key research themes as a lens in which to analyse the proposed smart city developments.

In India, in particular, there has been a move towards building 100 new smart cities in the future in order to spur economic growth and urbanisation (Datta, 2015). In order to truly capture current smart city developments, this report will focus on the most relevant and pioneering project of Dholera in the state of Gujarat, however will draw upon other key examples where appropriate. Dholera exhibits what has been called an 'instant urbanism' (Murray, 2013) as such makes a poignant and worthwhile focus of this report.

1.1 ABBREVIATIONS:

SCM - Smart City Mission

2.0 METHODOLOGY

This report is largely based on analysis of secondary data. Both grey and academic literatures form the corpus from which the analysis of smart cities in India took place. The literature was searched through search engines such as Google Scholar and Science Direct. Literature was searched for using key words from CUREs four research themes, further systemising the data collection. Key words such as 'Dholera smart city' were used in conjunction with 'resilience' in order to yield the more representational sample. This method provides a systematic way of developing a relevant corpus making for focused analysis and comparison across different literature. It also provides a well organised and structured report for CURE organisation.

3.0 RESULTS AND DISCUSSION

3.1 RESILIENCE THINKING

Resilience thinking is at the heart of CUREs four main themes and is used as a framework through which human interactions with the environment are studied and understood (CURE, 2017). Resilience can be defined as returning to a state of equilibrium after facing stress or damage, sustaining a certain regime (Ernston et al, 2010). However more recent studies are focusing on resilience as a way of adaption, moving past this state of equilibrium and transforming and innovating into new and exciting spaces (Pendall *et al,* 2009). Resilience thinking is a way for developing countries like India to leap frog over dated industrial technology and straight into more sustainable development which uses new technologies and innovations.

Smart cities are an example of this resilience thinking that uses innovation and technology to transform into a city of the future; to give it transformative capacity (Ernston et al, 2010). Innovation holds an important role in allowing urban areas to become resilient and adapt in the face of challenge. Smart cities are inherently government driven due to the cost, expertise and multi stakeholders employed to create them (Chourabi *et al,* 2012; Griffith, 2001) and holds citizen collaboration with private actors at the heart of its operations (Giffinger *et al*, 2007; Odendaal, 2003). The transformation of Dholera into a smart city requires policy changes to facilitate its rapid construction (Datta, 2015; Chourabi *et al*, 2012). This report has found that, indeed, new policies are being put in place with regard to the acquisition of land from the rural farming population (Datta, 2015). It is apparent that even before Dholera city is operational it's top down governmental

approach to development is already clashing with the values of the citizens and inciting protest from local citizens (Chourabi et al, 2012; Datta, 2015). As discussed later, bottom-up, citizen-led approaches to governance are key to a successful and smooth running of a smart city (Giffiger *et al,* 2007; Odendaal, 2003). However, local populations best understand what works in their environment and have the power to directly enforce and direct behavioural change in the city (Seyfang and Smith, 2007). Top down government initiatives are necessary for the success of the construction of the smart city, however, bottom up and grass roots initiatives must also be employed for a smart city to be completely successful and work at the citizen and government level. It is hoped that as Dholera smart city progresses it will take the community into account more.

The vision of Dholera stands separate from other utopian smart city experiments in the fact that it has been created by and for the purpose of the corporate sector (Datta, 2015; Doherty, 2013). These stakeholders wish to create Dholera in the vision that best suits their needs and the Indian government is encouraging in the prospect of new global financial investment. This is in opposition to what smart cities stand for; ultimately to improve the quality of life of citizens and create an environment of participation and inclusion (Chourabi *et al,* 2012).

3.2 CLIMATE RESILIENCE:

The IPCC (2007) has concluded that increased temperatures, sea-level rise and an increase in extreme weather events is due to anthropogenic activity. Adaptation to address these potential impacts requires urgent attention (Adger, Arnell, & Tompkins, 2005), particularly in developing countries, where a high proportion of urban populations are poor or otherwise vulnerable to climate-related disruptions (Balk et al., 2009). Therefore, 'smart' cannot stand only for the ease with which bills can be paid online, or the availability of Wi-Fi connectivity; it is also to ensure a greater resilience to extreme weather events and climate shocks (Warrier, 2017).

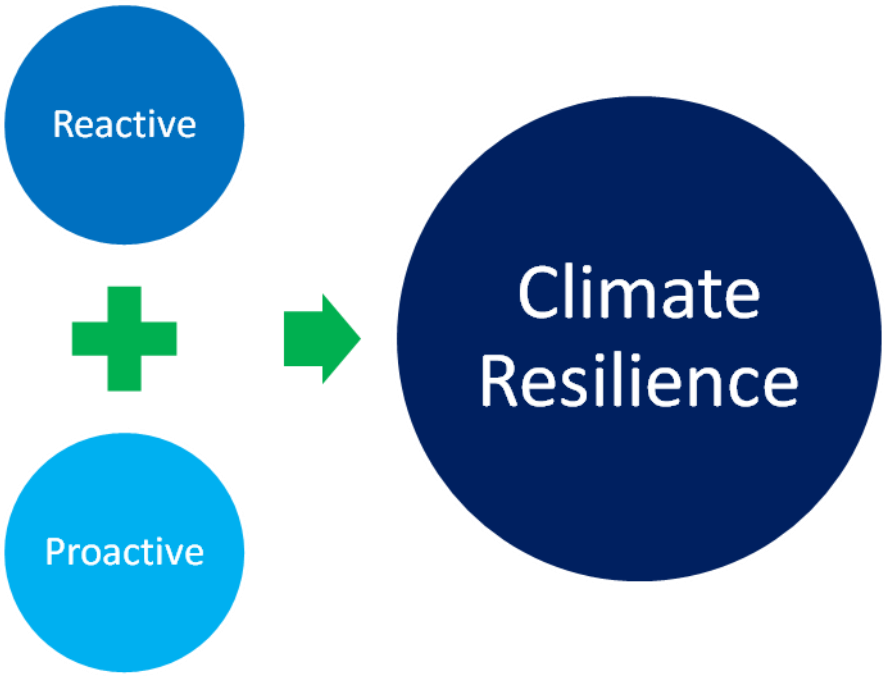

Figure 1 – Vertical equation to show theoretical components of climate resilience

3.2.1 THEORETICAL COMPONENTS:

Recently hailed as the new driving force behind enhancing climate resilience (Adger et al., 2007; Wolf *et al.,* 2010), social capital offers ways into understanding how society contributes and responds to climate change (Pelling and High, 2005). Using this framework, Jordan (2015) splits climate resilience into two key interpretations: reactive and proactive (Fig.1). Reactive resilience focuses on strengthening the status quo and creating resistance to change, thus it can strengthen the current political and government regime or trajectory of change (Jordan, 2015). Proactive resilience emphasizes the inevitability of change and aims to establish a system that is able to adapt to new circumstances (Walker et al., 2002).

In India, the SCM (2017) proposes a top-down approach whereby climate resilient strategies will be implemented by the Indian Government. Examples are found in the air quality monitoring in Jaipur, the traffic management system in Raipur, the flood risk assessments in Dholera and the water level sensors proposed in Bhopal. Here, citizens are building resilience to extreme climatic events, yet, these initiatives are largely reactive and simply deemed as 'coping' mechanisms (Jordan, 2015: p. 111) which do not address climatic issues head on. On the other hand, strategies which involve structural changes which address the underlying causes of climate variability, otherwise known as proactive

resilience (Jordan, 2015), are only seen in a few incidences. For example, identified in Figure 2, the SCM proposals (2017) aims to alter energy production networks in Agartala and New Town Kolkata through the use of solar farms. Although these represent initiatives that can adapt to new circumstances (Walker et al., 2002), they are implemented through government channels and do not include social capital, bottom-up forces.

25	Air Pollution Monitoring	Raipur, Panaji, Ranchi, Faridabad	4
26	Solid Waste Management	Bhagalpur, Raipur, Panaji, Imphal, Shillong, New Town Kolkata	6
27	Sewerage	Agartala,	1
28	SCADA – Power	Chandigarh	1
29	Solar Farm/ Solar City	Agartala, New Town Kolkata	2
30	Street Lighting	Lucknow, New Town Kolkata	2
31	Solar Panels	Imphal	1

Figure 2 – SCM Proposals extracted from the Indian Government website (2017) showing the proactive nature of the intended climate resilience.

3.2.2 CHALLENGES:

Overall, this way that India aims to build climate resilience does not suggest radical change; it is aimed at maintaining the broader status quo (i.e. maintain business as usual development paths), rather than engaging in political debate concerning the underlying factors that determine vulnerability to climate variability and change (Jordan, 2015). Resilience built in this way is appealing to governments, multilateral and bilateral agencies; it is something that can be achieved through persistence and robustness of the current system. A more collective approach is needed whereby risk sharing, mutual assistance and collective action help push social risks to the community level.

3.3 SPATIAL SYSTEMS:

An area that underpins and directs CURE's research is the theme of interconnections and spatial development structures (CURE, 2017). It is apparent that Indian smart cities have been able to utilise CURE's evolved research perspective of 'interconnection of thinking'. Agued by Datta (2015), the global knowledge co-produced from previously built neo-liberal cities, knowledge cities, technology cities, IT hubs and eco-cities has been used to inform India's digitally led city making initiative. Bunnell (2015) argues that geographers need to continue to look critically at the inequitable socio-spatial effects of smart cities. Therefore, focusing down to a national scale, it is clear that due to these globally produced interconnections, spatially distinct areas are created where poverty and smart city developments are separated to North Eastern and South Western areas (Figure 3 and 4). Through

analysis of relevant grey literatures, it is apparent that no attention has been given to alleviating such gross socio-economic spatial inequalities.

Fig.3: Spatial distribution of the first 20 Indian Smart Cities. (Source: Basu, 2017)

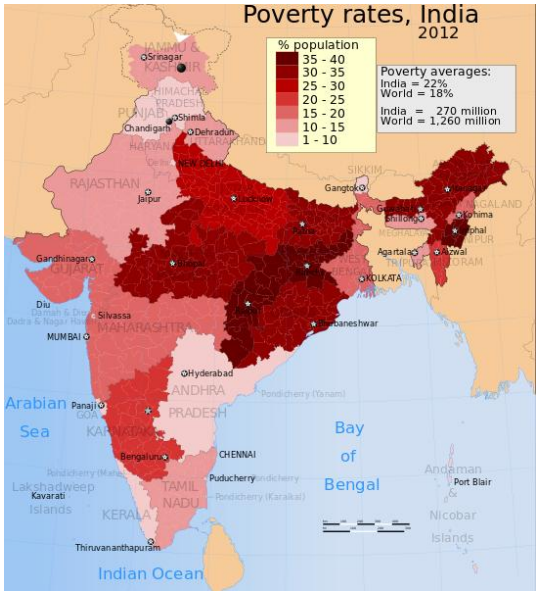

Fig.4: Spatial distribution of Poverty rates in India in 2012. (Source: Wikimedia.org, 2017)

3.3.1 ICT SYSTEMS:

The most influential SCM strategy relating to this theme is the implementation of centralised, government operated, information and communication technology (ICT) systems. Specifically in Dholera, Gujurat, plans have been made to include this technology into its infrastructure components such as smart grids and multimodal transport networks (Pagdadis, 2013). The Government of India (2017) state ICT systems help build a smart, socially attractive modern city, which boosts economic development of the region, quality of life and efficient management of city wide infrastructure. By connecting its smart credentials to a central control room it shapes the mode of urban governance to be exclusively technocratic in nature; serving corporate interests and controlling its population (Datta, 2014). The Indian government (2017) claims it will support active citizen participation, however, fundamental arguments premise themselves on questioning which type of citizen is able to do so.

3.3.2 CHALLENGES:

This proposed socio-technical shift in governance will be met with issues of large-scale expulsion (Sassen, 2014) of those that cannot fit into its smart city-based 'high-tech strand of developmental utopianism' (Bunnell, 2002: 267). This marginalisation of citizens is explored by Harrison (2017) who denotes this process of 'smartification' deeply affects the way people go about their daily routines, personal mobility and citizen ideology. The assumption by the Indian government that there is ubiquitous access and technology literacy facilitates social exclusion and elitist enclaves (Harrison, 2017). Choe et al. (2008) concurs by arguing the control of big data will serve the interests and aspirations of the political elite and middle classes. Foucault's notion of eco-governmentality is apparent here in the way that those in power; the government and the elite have the control to construct the environment and ultimately manage the lives of those living within the space (Vanolo, 2014). Maintenance of this disconnect between proposed initiatives and levels of technology literacy spurs arguments that smart cities will ultimately be corrupted through 'urban wikileaks', where grassroots hacking of digital technologies will democratise and equalise social power (Datta, 2014). This has profound effects on the nature of urban governance where traditional struggles which operate in social, economic and environmental spheres are altered to social, material and digital (Sassen, 2011) (Fig.5). Within smart city developments like Dholera, the environment will be vastly state controlled and regulated, leaving political struggles to be tackled and embedded in digital systems (Chatterjee, 2004).

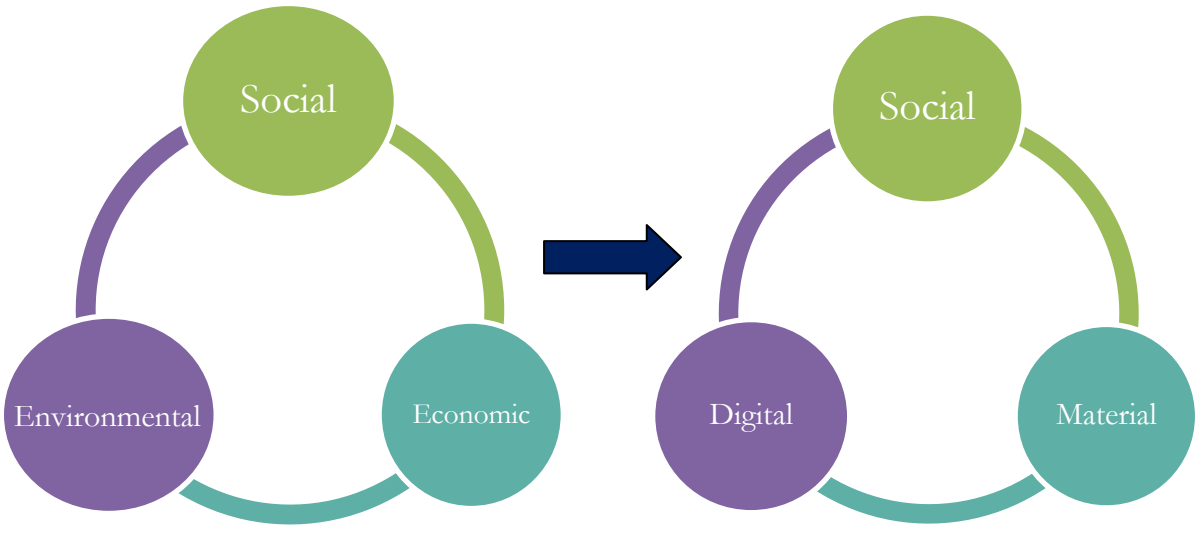

Figure 5: Diagrams showing the new components that interconnect to form new platforms where Indian smart city urban governance may take place.

3.4 ENERGY SOCIETY AND SPACE:

CURE's 'Energy Society and Space' theme focuses on how changing energy systems are shaped and caused by 'technological change, cultural practices, environmental problems and social inequalities' (CURE, 2017: 1). With cities consuming and producing the most energy globally, they are situated as key agents for social, economic and technological change (ibid). In addition to this, smart cities are hubs of knowledge, technology and infrastructure, thus playing an even more important role when considering energy use and smart solutions (Kitchin, 2014).

India is the sixth largest electricity consumer in the world despite the electrification rate of the country only being 44% (Bhide, 2010). Rural areas in particular suffer with a lack of a reliable energy supply from electricity and so have to use extremely inefficient fuel sources such as biomass wood and dung (ibid). The use of these energy sources is extremely polluting, their economic inefficiency means that rural dwellers, also the poorest in India are spending significantly more on energy than urban residents who have electricity (ibid). 69% of the electricity in India is provided by the burning of India's coal which is of very low quality and efficiency, further exacerbating air pollution.

In the face of rapid urbanisation and increasing energy insecurity, smart cities have been employed as innovative solutions. Smart cities such as Dholera is built on a green field site and so does not need to overcome any existing infrastructure when providing energy (Anthopoulos and Vakali, 2012). This aspect of construction has allowed Dholera city to put in place smart grids (Fadaeenejad, 2014). Smart grids allow citizens to have reliable access to quality power, a cost effective way to fuel economic development and the addition and management of renewable energies (ibid). These smart city energy initiatives provide a solution to India's energy provision disparity if used in the poor rural areas that need it most. However, as discussed previously India's first 20 smart city initiatives are not to be built in India's poorest areas as illustrated by figures 3 and 4 and therefore won't be used to help aid those most in need.

4.0 CONCLUSION

4.1 KEY FINDINGS AND NEXT STEPS:

This report has aimed to provide CURE with an overview of how the notion of 'smart' is conceptualised in the Indian context. Using Dholera as an example, key themes emerged which reflected disregard for citizen participation; which is an element found to be central to the long term success of the smart city (Giffinger et al, 2007; Odendaal, 2003).With regard to spatial systems, challenges lie in the fact that the new government-led, top-down technology implementation of ICT systems assume ubiquitous access and literacy. As a country rife in poverty, not only does it make massive assumptions of access, it alters the platforms in which governance is contested. Furthering this view, a need of citizen-led, social capital approaches to resilience is needed for the SCM to be fully effective. This is captured in Jordan's (2015) conceptual explanations of adaptive responses to climate pressures; not simply 'coping' with climatic events and thus strengthening the current system of governance and neo-liberal society. Hence, next steps for Indian smart cities, and therefore CURE's research, is to extend work in bottom-up initiatives and consider the role of the citizen. Having said this, smart cities, eco-cities and low carbon urbanism all draw on the idea that experimentation can generate more liveable, prosperous and sustainable urban futures (de Jong et al . 2015), hence why they still pave the way for future urban living and stimulate much academic debate.

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