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India and the Politics of Climate Change: policy paradigms and the local city state

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List of Abbreviations

AAP	Aam Aadmi Party
AC	Asbestos Cement
ACWUCL	Aurangabad City Water Utility Company Limited
ADB	Asian Development Bank
AIMIM	All India Majlis-e-Ittehad-ul-Muslimeen
AMC	Aurangabad Municipal Corporation
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BJP	Bharatiya Janata Party
BPMC	Bombay Provincial Municipal Corporation
BSP	Bahujan Samaj Party
BSUP	Basic Services for Urban Poor
CAA	Constitutional Amendment Act
CDP	City Development Plan
CIDCO	City and Industrial Development Corporation of Maharashtra
CRCAP	Climate Resilient City Action Plan
CRISIL	Credit Rating and Infrastructure Services India Limited
DEA	Department of Economic Affairs
DES	District Energy Systems
DI	Ductile Iron
DPR	Detailed Project Reports
DSR	District Schedule Rate
EC	European Commission
EESL	Energy Efficiency Services Limited
EU	European Union
FIR	First Information Report
GDCR	General Development Control Regulations
GHG	Green House Gas
GIS	Geographical Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoG	Government of Gujarat
GoI	Government of India
GoM	Government of Maharashtra
GTPUD	Gujarat Town Planning and Urban Development
GUDM	Gujarat Urban Development Mission
GWSSB	Gujarat Water Supply Sewerage Board
ICLEI	International Council for Local Environmental Initiatives
IHSDP	Integrated Housing and Slum Development Program
IIPDF	Infrastructure Project Development Fund
INC	Indian National Congress
INR	Indian Rupee
IUC	International Urban Co-operation
JICA	Japan International Cooperation Agency

JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KLD	Kilo Litres per Day
kWp	kilowatts peak
LEDs	Low Emissions Development strategy
MJP	Maharashtra Jeevan Pradhikaran
MLD	Million Litres per Day
MNRE	Ministry of New and Renewable Energy
MoHUA	Ministry of Housing and Urban Development
MoU	Memorandum of Understanding
MoUD	Ministry of Urban Development
MoEFCC	Ministry of Environment, Forest and Climate Change
NAPCC	National Action Plan on Climate Change
NCP	Nationalist Congress Party
NDA	National Democratic Alliance
NGO	Non-Governmental Organization
NIUA	National Institute of Urban Affairs
NRW	Non-Revenue Water
NSIC	National Small Industries Corporation
NWSC	National Water and Sewerage Corporation
PIL	Public Interest Litigation
PPP	Public Private Partnership
RMC	Rajkot Municipal Corporation
RUDA	Rajkot Urban Development Authority
SAPCC	State Action Plan on Climate Change
SAUNI	Saurashtra- Narmada Avataran Irrigation scheme
SCADA	Supervisory Control and Data Acquisition
SCC	Science Community Centre
SCM	Smart Cities Mission
SDC	Swiss Agency for Development and Cooperation
SHS	Shiv Sena
SJMMSVY	Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana
SLBs	Service Level Benchmarks
SPML	Subhash Projects and Marketing Limited
SPV	Special Purpose Vehicle
UDD	Urban Development Department
UIDSSMT	Urban Infrastructure Development Schemes for Small and Medium Towns
UIG	Urban Infrastructure & Governance
ULB	Urban Local Body
UPA	United Progressive Alliance
WWF	World Wildlife Fund

Chapter One

1. State Capacity and Urban Climate Action

1.1. Introduction

Climate change is undoubtedly the biggest Gordian knot facing us today. Cities in the global South like India, housing high concentration of population, are highly vulnerable to the impacts of climate change, especially water scarcity.

Water scarcity¹ is a major challenge for Indian cities- a manifestation of rapid urbanization² and development deficits- which will be exacerbated by changing climatic patterns (e.g., variation in temperature and precipitation³). For instance, variations in temperature and precipitation patterns are projected to increase pressure on existing urban water supply systems⁴ (Hurlimann and Wilson, 2018) through reduced water availability and increased energy cost- thereby making it difficult to meet both current and future needs⁵. Furthermore,

¹ Cities in India are already dealing with water insecurities such as declining water tables, deplorable quality and supply of water.

² By 2050 the global population living in cities is projected to increase up to 6.4 billion (Shah and Kulkarni, 2015). In developing countries like India, cities are growing rapidly (current urban population is 377 million as per the 2011 Census). India's urban population has continued to grow exponentially post-independence, and is projected to increase to 800 million by 2050 (Shah and Kulkarni, 2015), by which time more than half the country will be urban (United Nations, 2014). The process of urbanization accompanied by industrial development increases pressure on existing resources (e.g., per capita water demand), and gives rise to an unprecedented challenge for efficient resource management and service delivery.

³ Water insecurity, including water scarcity, is a major water challenge associated with climate change (Bates et al., 2008; Hunt and Watkiss, 2011; Major et al., 2011; Li and Bou-Zeid, 2013; Duran-Encalada et al., 2017; Lele, et al., 2018; Tosun and Leopold, 2019; Leal Filho, 2019) in semi-arid regions (IPCC, 2014). An increasing urban population coupled with changing climatic patterns (Leichenko, 2011), compounds pressure on available resources like water (World Water Assessment Programme, 2017). For instance, variation in temperature and precipitation patterns is projected to exacerbate pressure on existing urban water supply systems (Hurlimann and Wilson, 2018)- reduced water availability and increased energy cost- thereby making it difficult to meet both current and future needs. Also, variation in precipitation patterns can compound disparities between water supply and demand (Major et al., 2011).

⁴ Urban water supply services involve sourcing and treatment of drinking water, provision of water, reuse and disposal of waste water and storm-water management. In cities, both formal and informal water supply systems are vulnerable to the impacts of climate change (Major et al., 2011). Formal systems include storage, supply and distributions systems servicing citizens connected to the municipal system. Informal systems include extracting water from wells to provision citizens not serviced by municipal supply.

⁵ Urban water supply systems with unreliable water supplies are more vulnerable due to growing population and changing climatic patterns (Major et al., 2011).

the water sector is a highly energy and carbon intensive sector⁶ (Roshani et al., 2012), contributing to global GHG emissions⁷.

Since water insecurity threatens urban resilience⁸ cities⁹ need to take climate action to build resilience¹⁰ against current and future risks. Climate actions are broadly categorised as measures to cope with (adaptation¹¹) or reduce the impacts (mitigation¹²) of climate change. These measures are unique to a city (based on geographic, political, governmental and socio-economic factors). With respect to water adaptation, measures mainly focus on improving water supply¹³ by reducing existing vulnerabilities and improving capacity to deal with climatic impacts. Whereas, water mitigation measures prioritise energy efficiency and GHG emission reduction of the water supply systems¹⁴. Both these measures serve different purposes, but can

⁶ The entire process involved in supplying water typically sourcing water from various reservoirs, treating and distributing it, and finally treating and disposing wastewater requires energy (Cohen et al., 2004; Klein et al., 2005). With reduced water availability, provision of urban water supply will become costlier (Muller, 2007).

⁷ Urban areas contribute significantly to global anthropogenic Green House Gas (GHG) emissions (Satterthwaite, 2008; UN-Habitat, 2016), due to high energy consumptions, which typically involve burning fossil fuels (Leal Filho, 2019).

⁸ Urban resilience is the ability of a city to withstand shocks and stresses and retain identities, structure and key processes (Leichenko, 2011).

⁹ Given that the impacts of this global challenge are felt across geographies, boundaries, sectors and scales (Andonova and Mitchell, 2010), and increasingly localized (Stone Jr., 2012), climate action needs to be attended at the local level. Cities play an important role with respect to climate action. Cities house a considerable concentration of resources and assets (Schauser et al., 2010; EEA, 2012), and are centres of power and representation, which aid in climate action (Krellenberg et al., 2017). Cities provide opportunities to design and experiment innovations (Broto and Bulkeley, 2013; Sami, 2017; Lee and Jung, 2018). In this light, cities are crucial in dealing with climate concerns (Betsill and Bulkeley, 2006; Stone Jr., 2012; Revi et al., 2014).

¹⁰ Since climate change manifests in different forms, there is no one solution to address it. Consequently, a range of policy responses (Peters, Jordan, and Tosun, 2017) are required to combat the impacts of climate change. Given that water insecurity threatens cities, both water adaptation and mitigation measures need to be pursued to maximise water security (Paton et al., 2014), and build resilience. It must be noted that, these measures are unique to each city as they depend on the local needs and conditions.

¹¹ Climate adaptation involves the process of adjusting to existing (reactive) and future (anticipatory) climate impacts (Adger et al., 2005). Climate adaptation measures address existing development deficits (non-climatic sectors), and adapt to projected impacts of climate change. Adaptation measures not only aim to reduce the damage (Fleig, Schmidt and Tosun, 2017) and vulnerability caused (Field et al., 2012), but also improve the (adaptive) capacity (Chuku 2009; Halsnaes and Trorup 2009; Pouliotte, Smit, and Westerhoff, 2009) and resilience of systems to adjust to climate change (IPCC, 2014). Adaptation measures are highly localised (Laukkonen et al., 2009) and contextual.

¹² Climate mitigation involves quantifiable measures that combat climate change by reducing GHG emissions (IPCC, 2007; Matthews et al., 2014; Berry et al., 2015; Hatfield-Dodds et al., 2017). Climate mitigation strategies prioritise energy efficiency, reducing energy consumption and resources (e.g. financial), implementing renewable energy (Laukkonen et al., 2009), and improving green cover (Pietrapertosa et al., 2019).

¹³ Some of the urban water adaptation measures include augmentation of existing water supply systems, pricing incentives, efficient use of water, improving water quality, water reuse and conservation, investment in small scale infrastructure, relocation / resettlement, urban-rural partnership, and integrated approach to water management (Hurlimann and Wilson, 2018).

¹⁴ Some of the water mitigation measures include a) water conservation/ demand reduction (less energy required to source, treat and distribute water), b) recycling water (reusing water will reduce demand for freshwater which requires burning of fossil fuels), c) energy efficient water supply, d) solar water heating systems, e) land use and watershed management (watershed management leads to sequestration of greenhouse gases) (Major et al., 2011).

have overlapping benefits¹⁵, that cumulatively improve water security¹⁶. Furthermore, urban climate action works within a multilevel governance framework, as it involves multiple stakeholders¹⁷ (state and non-state) working at different levels (international, national, sub-national and city) and contributing differently. However, local stakeholders¹⁸ are most relevant for furthering climate action in cities. Among the local stakeholders, the state at the local level¹⁹ is a key actor for improving water security and driving climate action (see fig. 5 in annexure).

Also, mitigation measures push for efficient use of water as supplying water is an energy intensive process and efficient use of water will not only reduce demand for water but also reduce the energy consumption (see Tosun and Leopold, 2019).

¹⁵ Often adaptation measures include a mitigation co-benefit and vice versa.

¹⁶ Water security involves ‘safe drinking water and protection from water related disasters’ (Enqvist and Ziervogel, 2019, p.2).

¹⁷ Multiple stakeholders, including other state and non-state actors (Özerol et al., 2020; Muñoz-Erickson, Miller, & Miller, 2017) & institutions (Pierre & Peters 2012; Aylett, 2014), driven by a common belief, contribute differently to urban climate action.

Firstly, cities lack the technical capacity to pursue climate measures, and need to engage with a range of stakeholders to overcome this deficit. Also, the nature of climate challenges demands cross-disciplinary knowledge and expertise that is distributed among individuals and organisations (Willems and Baumert, 2003), working at different levels of the governance system (Finan and Nelson, 2009; Amundsen, Berglund, and Westskog, 2010; Corfee-Morlot et al., 2011; Nalau, Preston, and Maloney, 2015), and across sectors such as private sectors, civil societies and academia (Bulkeley, 2010; Shi et al., 2016; Chu, 2018). These interactions influence formulation of (local) climate norms (Lemos and Agrawal, 2006).

Secondly, cities, especially medium sized cities studied here, lack the financial resources to execute measures. Cities in India continue to rely on union and state/sub-national government funding to pursue measures (Sami, 2017, 2018).

¹⁸ The polycentric governance model shifts attention from the central government (Zarhani, 2019), and highlights the role of bottom up or local level action (Fuhr, Hickmann and Kern, 2018; Biesbroek and Lesnikowski, 2018) in tackling collective action problems like climate change. Local stakeholders are better equipped to further urban water adaptation and mitigation measures, as they are rooted to the ground realities- local knowledge is crucial for climate action. In this light, it has been argued that, local stakeholders are equipped with the necessary knowledge and skill sets (Aligica and Tarko, 2012) required to address local priorities, and transnational challenges like climate change (Barber, 2013).

¹⁹ Governments play the role of initiating, facilitating and implementing climate measures (Lund et al., 2012). Local governments witness the risks and vulnerabilities (context-specific) and can address them immediately due to their proximity to these impacts (Bulkeley 2010; Hunt and Watkiss 2011; Carmin, Anguelovski, and Roberts 2012; Sami, 2018). Therefore, the state initiates and enables policy measures, both with respect to climate adaptation (Jordan and Huitema, 2014; Biesbroek et al., 2018) and mitigation. In fact, urban local bodies are known to pursue climate policies independent of national efforts (Aall, Groven, and Lindseth, 2007).

Other state and non-state stakeholders assist the city government in improving its financial (e.g. fund local measures) and technical (e.g. improve access to information, monitor progress, and disseminate information) inadequacies.

The study aims to contribute to the limited scholarship on effective urban climate action (adaptation²⁰ and mitigation²¹) and governance in the global South²².

The main research question of this study is: *why do comparable Indian cities have different outcomes in improving water security and pursuing climate action?* Two medium sized cities- Rajkot in the state of Gujarat and Aurangabad in the state of Maharashtra- were identified using the Mill's Method of Difference (explained later). Water scarcity has been a problem for the cities which have fairly comparable characteristics (demographic, geographical, climatic). Both cities belong to relatively prosperous and urbanised states/ regions, and witness similar governance challenges. Additionally, the cities are pursuing the same paradigm of controlling clientelism to achieve the goal of improving water security. Despite these commonalities the cities are pursuing different policy paradigms- a climate friendly one with improved water security and climate action (Rajkot) versus a climate regressive one with severe water insecurities and no climate action (Aurangabad).

Urban water and climate governance in India is impeded by institutional, jurisdictional, technical and fiscal governance barriers. Additionally, clientelistic practices further exacerbates water insecurities in cities. It is puzzling that Rajkot improved its water supply and furthered climate measures by transcending clientelism, whereas Aurangabad was unable to do so. Several theoretical framings (e.g., state, society, and state-society centric) and governance frameworks (polycentricism and multiple streams framework) have been explored as alternative explanations to understand the variation between the policy paradigms.

²⁰ Adaptation is a fairly new and unexplored domain, with weak standard protocols or norms for planning and few exogenous actors (Anguelovski and Carmin, 2011; Biesbroek and Lesnikowski, 2018). Unlike mitigation, adaptation gained prominence after the Paris Agreement, which identified broad goals (e.g. reducing vulnerability, improving adaptive capacity, and building resilience) as opposed to targeted and measurable mitigation objective that involves limiting warming (Biesbroek and Lesnikowski, 2018).

Also, there is little knowledge about efficient and effective adaptation strategies (Doherty et al., 2016), whereby the urban space is a relatively new and upcoming sphere. Moreover, benefits associated with adaptation measures (e.g. reduced vulnerability, improved capacity and resilience) are highly contextual and not easily quantifiable.

²¹ It has been argued that, mitigation action is limited to global efforts- addressed mainly by national governments and international agreements (Biesbroek et al. 2009). There is a need to understand the mitigation potential, energy use and GHG emissions, associated with the water sector (Rothausen and Conway, 2011).

²² Existing scholarship highlighting the influence of public administration on climate action is limited (Biesbroek et al., 2018). In India existing work on climate governance (Dubash, 2012; Williams and Mawdsley, 2006) is limited to the national level.

Furthermore, the few studies on urban climate action in India have focused on the implementation of climate measures, and the role of different stakeholders in influencing action. However, policy formulation (Adger et al. 2003; Brooks, Grist, and Brown, 2009; Bulkeley, 2010; Romero Lankao and Qin, 2011; Carmin, Anguelovski, and Roberts, 2012), and institutionalization of urban climate action is understudied and under-theorised (Aylett, 2014).

Following a state centric approach, the study argues that, improved state capacity, attributed to ideational evolution within the city government, resulted in effective implementation of adaptation and mitigation policies, by overcoming governance challenges like clientelism. Ideas within the state evolve due to the combination of bureaucratic puzzling and political powering involving social learning. This process of bureaucratic puzzling and political powering is influenced by the administrative tradition and political beliefs/commitment, respectively. Ideational churning fosters a bureaucratic-political rationality favouring a particular (programmatic) policy. Furthermore, the study shows the influence of state capacity on the framework of ideas guiding policy goals, that is policy paradigm- climate friendly versus a climate regressive paradigm.

Rajkot's climate friendly policy paradigm is attributed to the ability of the city government to overcome clientelism and effectively implement water adaptation and mitigation instruments. Ideational evolution, a result of bureaucratic puzzling and political powering, within the city government improved its ability to pursue a climate friendly paradigm. Whereas, in the absence of ideational churning within the urban local body in Aurangabad (inadequate puzzling and skewed powering), water adaptation and mitigation instruments could not be effectively executed. In fact, the state at the local level was driven by the rent-seeking tendencies of powerful vested interest groups. The city pursued a climate regressive paradigm with strong clientelistic practices leading to escalating water insecurities and no climate action.

Empirical evidence with respect to water adaptation and mitigation instruments for the two cities was collected through in-depth field engagements in India. The study relies mainly on primary data (collected through elite interviews). Water policies of Aurangabad and Rajkot have been analysed longitudinally from the 1990s till 2020. Comparative process tracing was used to examine the causal process connecting the research variables to understand variation in policy paradigms over a common time frame.

The introduction chapter sets the context of the study in terms of the research focus, theoretical approach and methodology. It sets out to answer how cities in the global South, especially India, build water resilience in the face of climate change. The chapter presents the research puzzle, a variety of theories as alternative explanations, and the theoretical framework of the study. It then moves on to the methodology of the study including case selection and analysis,

along with the timeline of the study. The chapter concludes by providing a brief overview of the dissertation.

1.2. Research puzzle

This section highlights the study's research puzzle. The two cities are fairly comparable and experience similar governance barriers that impede service delivery and climate action. However, only one city was able to control clientelism to pursue a climate friendly policy paradigm (improved water security and climate action). Several theories including a) society (e.g. social movements, social capital, local leadership, and party competition or ideology or networks or centre- state relations), b) state (e.g. political leadership, state capacity, bureaucratic norms or performance or autonomy, political will/commitment), and c) state-society centric (e.g. epistemic communities, transnational advocacy networks) explanations of effective service delivery are explored below to understand the variation in policy paradigms. Furthermore, urban climate action is often explained through frameworks such as polycentrism and multiple streams framework. However, all the above explanations of improving service delivery and furthering climate action do not explain the variation in policy paradigms of the two cities.

1.2.1. Governance barriers

This section presents a range of interconnected governance barriers influencing service provision and climate action in Indian cities. Specifically, these challenges influence water supply management in cities leading to water insecurities.

Clientelism, manifesting in the form of ethnicity²³ and/ or class²⁴ in India (Mukherji, 2018), is a major governance challenge impeding development. In a clientelistic setting, the state yields

²³ Clientelism on the basis of ethnicity is seen when voters belonging to a particular caste vote for leaders belonging to the same caste. For instance, in Uttar Pradesh the scheduled caste largely voted for the Bahujan Samaj Party (BSP), which targeted the scheduled caste (Chandra, 2004).

²⁴ Class based clientelism involves two kinds of relationships.

One involving powerful social forces who push forward their interests. For instance, the import substituting model persisted in India as the state was penetrated by industrialists/capitalists (enjoyed financial support and production licenses), professionals/bureaucrats (controlled the economy) and farmers (demanded subsidies) (Bardhan, 1984). Similarly, Vanaik (1990) states that the dominant classes (e.g. agrarian bourgeoisie) had greater political clout that influenced electoral (rural) support. Furthermore, in India mass politics continues to interfere with economic reforms (e.g. farmers, major vote banks, want free electricity) (Varshney, 2007). Also, India's relatively weak industrialization (compared to East Asian states) has been attributed to the state being captured by elite interests (capitalist class) and social coalition (Chibber, 2003).

The other type of class based clientelism involves politicians who are tolerant of pro-poor illegalities (e.g. allowing the proliferation of illegal informal settlements) in exchange for votes (Chatterjee, 2011). Similarly, Bardhan and

to the pressures of powerful social forces. Clientelistic²⁵ relations involve the differential treatment of voters such as targeted benefits and privileges²⁶ (Chandra, 2004, 2007; Stokes, 2007; Wilkinson, 2007; Hicken, 2011), and biased policy execution (e.g., enforcing rules and fee payments in a discretionary manner) in exchange for political support (Post, 2018).

With respect to urban water adaptation and mitigation, clientelism (mainly class based) is seen in the form of local politicians a) backing illegal activities (e.g., water thefts), b) promoting private water tanker lobby, and c) manipulating policy execution (e.g., directing services to certain wards, assisting contractors acquire sizeable contracts). Disparities in water supply are explained by an enmeshed nexus of local councillors, local vested interest groups (contractors, private water tanker lobby, citizen groups) and city bureaucrats. In the presence of vested interests²⁷ or social forces²⁸ the state is relatively autonomous as it has been captured by dominant proprietary classes (Chatterjee, 2010). Consequently, the state exhibits embedded particularistic characteristics (Herring, 1999), that is the inability to execute power and pursue its will due to the presence of social forces²⁹.

Furthermore, in India, urban climate action is impeded by a range of governance³⁰ challenges. Cities continue to operate within a centralized governance system³¹ (Khosla and Bhardwaj, 2019) due to poor implementation of the decentralizing policies such as the 73rd and 74th Constitutional Amendment Act³² (CAA) (Beermann et al., 2016). Consequently, city

Mookherjee (2011) suggest that, political parties and governments maintain power by supporting (e.g. strategic transfer of public services) marginalized groups in exchange for votes.

²⁵ These practices, which counter universalistic standards (Roniger, 2004), hamper long term development (e.g. public goods and services) as short-term goals are pursued through private transfers to certain groups, thereby contributing to inequality (Bardhan and Mookherjee, 2011).

²⁶ Clientelism leads to selective distribution of services and opportunities (Kitschelt and Wilkinson, 2007) (e.g. jobs, project contracts, biased bidding for public works, private negotiations involving public resources) in exchange for political support (Roniger, 2004).

²⁷ Organizations that influence (public) policy making through policy suggestions to ensure that the interests, often economic, of their members are met (Knill and Tosun, 2012).

²⁸ An illustrative example is the case of (economic) reforms in India's power sector which is controlled by the politically powerful farmers who demand for free electricity (Mukherji, 2014).

²⁹ Welfare politics is compromised due to the presence of powerful social forces who mediate the state to further their interest (see Chandra, 2007; Manor, 2013; Piliavsky, 2014; Mukherji, 2016; Mukherji, 2017).

³⁰ Institutional, jurisdictional, technical and fiscal factors act as barriers for urban climate governance (Beermann et al., 2016).

³¹ The central government provides guidelines, and financial support to state/sub-national governments, and local governments are responsible for implementation of urban development plans (Sharma and Tomar 2010) with little leeway in planning processes (Khosla and Bhardwaj, 2019) and finances (Weinstein et al., 2013; Sami, 2017; Sami, 2018).

³² The act assigns greater governance powers to municipal governments such as urban planning, provision of services and amenities.

governments have weak capacities³³ to pursue climate action. This is compounded by the lack of climate awareness and acknowledgement at the local level³⁴. India still does not have an urban climate policy to guide local level action. Also, there are no dedicated institutions at the local level to deal with urban climate concerns in India³⁵ (Sami, 2017). As a result, local governments fail to mainstream climate concerns in urban planning processes (see Kumar and Geneletti, 2015) and municipal agendas³⁶. Moreover, concepts such as climate change and sustainable development are not prioritised in political agendas, especially in the case of Indian cities. Grappling with the above-mentioned governance issues Indian³⁷ cities do not seem to possess the characteristics and motivation to further climate action. It is puzzling how certain cities in India are actively pursuing climate measures including both water adaptation and mitigation instruments.

1.2.2. Divergent policy paradigms

The study unravels the puzzle of how a city is able to transcend clientelism and effectively pursue adaptation and mitigation instruments to improve water security, when others are unable to do so. The two cities share similar characteristics (e.g., demographic, climatic, geographic and land use pattern) and governance challenges and grapple with water shortages, yet they are pursuing different policy paradigms. Rajkot's policy paradigm is climate friendly (improved water security and climate action), whereas Aurangabad follows a climate regressive paradigm (severe water scarcity and no climate action). Rajkot effectively implemented a range of water

In India's federal structure, responsibility for policy formulation and implementation is divided between the union, state, union territories and local bodies. The legislative decision making is divided into union, state and concurrent list. Water and public services fall under the state list, and forest and electricity fall under the concurrent list.

³³ State/sub-national governments do not empower ULBs to enhance their technical, financial, human capacities (Sami, 2017). This capacity varies across sub-national/ states in India.

³⁴ It has been assumed that, a global concern like climate change needs to be addressed at the national or global level (Sharma and Tomar, 2010); Sami, 2017). Additionally, local governments lack the understanding and awareness about broader urban environmental issues including climate change impacts, and the approaches to address these issues (Sami, 2017).

³⁵ Additionally, urban planning and environmental management are fragmented and distributed across various agencies (ULBs, parastatals and state level agencies) with little or no coordination between them (Sami, 2017).

³⁶ There are no incentives for urban local bodies to institutionalise climate action (Khosla and Bhardwaj, 2019). Often climate action has to compete with other issues on the local agenda for 'priority, budget and manpower' (Dewulf et al., 2012 p. 2). This is exacerbated by the lack of domestic financial support for urban climate action & policies (Sami, 2018).

³⁷ For India, climate change is a developmental issue and India is characterised by a weak state captured by powerful social actors and clientelistic politics.

adaptation³⁸ and mitigation³⁹ instruments to improve water security. In addition, the city acknowledged the climate adaptation and mitigation potential of existing and planned measures, and voluntarily⁴⁰ institutionalised⁴¹ a climate action plan in 2019. On the other hand, Aurangabad failed to effectively implement a range of adaptation and mitigation instruments. Additionally, there is no climate awareness and recognition of climate co-benefits of existing and planned developmental instruments.

Rajkot is able to provide regular water supply (20 minutes per day) at a relatively affordable rate (INR 840 for domestic users), whereas in Aurangabad water supply is irregular (45 minutes and once in five or six days) with a high-water tariff (INR 4500 for domestic usage). Rajkot was able to improve its water security and pursue climate action by overcoming clientelism, whereas Aurangabad's water insecurities persisted and increased over time.

1.2.3. Alternative explanations

This section discusses a range of theories to understand the divergent policy paradigms of Rajkot and Aurangabad. Effective service provision has been understood by state, society, state-society based explanations (see table 1 below). Each of these theories has been classified under structural (action driven by group of actors or organizations/ institutions) and agency (actions driven by individuals) driven explanations.

³⁸ Rajkot's adaptation instruments include a) augmentation of existing water reservoirs, b) introduction of new water supply schemes, c) strengthening existing water distribution system, d) controlling non-revenue water loss, e) conserving rainwater, and f) monitoring water consumption (see details in empirical chapters).

³⁹ Mitigation instruments implemented by Rajkot include a) using alternative energy sources like solar energy (e.g. solar water heating system, solar water treatment plant), and b) promoting energy efficiency (e.g. upgrading water pumping machinery). These measures not only reduced the energy consumption, but also reduced the GHG emission contribution of the water sector (see details in the empirical chapters).

⁴⁰ It is puzzling that Rajkot institutionalised a climate action plan, as India still does not have an urban climate policy. Also, there is no framework guiding cities to incorporate climate action into local agendas.

⁴¹ Cities often embed climate agendas into established functions of municipal bureaucracies (Rosenzweig et al., 2011; Aylett, 2014) such as existing developmental plans (Carmin et al., 2012a, b; Groven et al., 2012; van den Berg and Coenen, 2012). It is relatively easy to embed climate action into standard operating procedures, municipal budgets and urban spatial plans (Anguelovski and Carmin, 2011; Chu, 2018), since there are synergies between climate action and local priorities- no additional cost and multiple objectives are served thereby reducing competition between adaptation and development policies (Aylett, 2014). In addition, cities channelise available resources to support and sustain multiple agendas (Aylett, 2014), and interact with a range of stakeholders to ensure that adaptation and mitigation goals are achieved alongside local priorities.

Table 1: Relevant literature explaining service delivery

Structure	Agency
State centric: bureaucratic performance, bureaucratic norms, embedded & autonomous bureaucracy, political will/commitment;	State centric: strong political leadership;
Society centric: social movement, social capital, dense party networks, party ideology, party competition, centre-state relations;	Society centric: local intermediaries
State-society centric: transnational advocacy networks, epistemic communities	

State centric theories attribute effective implementation of welfare regimes to the state, that is either to the bureaucracy or political-executives. For instance, scholars attributed service delivery to strong political leadership⁴² (Rudolph and Rudolph, 2007; Sitapati, 2016; Jenkins and Manor, 2017) or political commitment/ will⁴³ (Manor and Duckett, 2017; Zarhani, 2019). A leadership driven explanation (agency argument) cannot justify sustained efforts (adaptation and mitigation instruments), that is beyond the tenure of a political head, in this case a mayor. Similarly, ideational churning within the state, leading to clearly designed policy proposals in Rajkot, cannot be attributed only to the political will/commitment of the legislative branch; there is need to consider the influence of the bureaucrats. In Aurangabad, the political executives including senior politicians interfered with decision making processes leading to worsening of the city's water supply system with time. Thus, effective implementation of policies cannot be restricted to a particular political leader or the political commitment of the city government alone.

Similarly, scholars have looked at bureaucratic explanations to understand improved service provision. For instance, Bustikova and Corduneanu-Huci (2017) attribute reduced clientelism

⁴² Regional level political leaders play an instrumental role in driving economic growth and welfare regimes (e.g. the influence of Chief Minister, Chandrababu Naidu, in transforming Andhra Pradesh) (Rudolph, and Rudolph, 2007).

Reforms in India post the balance of payments crisis were attributed to the then Prime Minister, Narashima Rao (Sitapati, 2016).

The effective implementation of the universal Right to Work scheme in certain regions/states of India (e.g. Rajasthan, Madhya Pradesh) has been attributed to the role of the Chief Minister (Jenkins and Manor, 2017).

⁴³ Manor and Duckett (2017) assess the influence of political commitment of leaders in addressing poverty and inequality issues in Brazil, China, India, South Africa.

Similarly, the agency of political executives is important in explaining better service delivery in Andhra Pradesh and compared to Bihar (Zarhani, 2019).

to historically high performing bureaucracies, leading to improved service delivery⁴⁴. Likewise, bureaucratic norms⁴⁵ are said to influence the ability of the state to efficiently execute policies (Mangla, 2015). Some argue that successful welfare policies are due to an embedded⁴⁶ (Pepinsky, Pierskalla, and Sacks, 2017; Bhavnani and Lee, 2018) and autonomous bureaucracy⁴⁷ (Evans, 1995). Although the bureaucracy played an important role in designing and executing policies in Rajkot, the above explanations are insufficient to explain the city's success. Unlike Aurangabad, the bureaucracy in Rajkot was embedded autonomous, and also had a history of performing well, however these were not the only factors driving programmatic policies. The mayor's office was actively involved in supporting bureaucratic policy ideas. Rajkot's policies were an outcome of both the bureaucracy and political executives pushing for adaptation and mitigation instruments. Furthermore, the bureaucracies in Rajkot and Aurangabad were guided by similar bureaucratic norms, that is improving water supply for all citizens, yet the cities are pursuing different policy paradigms. The above theories do not acknowledge the significance of ideas within the state in influencing effective implementation of policies.

A society driven explanation suggests that, the society (e.g., citizens, civil societies, private sector) is responsible for good governance. The social capital theory is one such society-based theory, which suggests that social networks enable societies to engage with the state and demand services. For instance, Kruks-Wisner (2018) suggests that citizens with weak ties with their community and exposure to social networks⁴⁸ are able to make diverse claims from the state, which improves access to services. Another example is Putnam's assessment for good governance and provision of public goods which are attributed to better norms of civic engagement among communities (Putnam et al., 1994). Water has been a political issue in

⁴⁴ The authors argue that, Kerala's good administrative performance reduced infant mortality rates.

⁴⁵ Himanchal Pradesh and Uttarakhand were compared with respect to primary education. Bureaucratic norms in both the regions varied, which influenced service delivery—Himachal Pradesh was able to meet local needs, unlike Uttarakhand.

⁴⁶ An embedded bureaucracy is rooted within the society and aware of ground realities (Pepinsky, Pierskalla, and Sacks 2017), which if accompanied by accountability mechanisms (e.g., media) (Bhavnani and Lee 2018) can provide better services to citizens.

Similarly, Ricks (2016) shows how locally embedded officials were able to address the needs of citizens in Taiwan.

⁴⁷ Brazil, India and Korea are compared with respect to industrial transformation which was influenced by the structure of the state and nature of state-society interactions. The state in Korea unlike the other two states was an embedded and autonomous one.

⁴⁸ These networks or ties (weak) overcome social (e.g., caste, gender) and spatial boundaries thereby exposing citizens to new ideas, information and potential brokers and also organize interests. Citizen with stronger ties with their communities are influenced by social and spatial characteristics resulting in limited and parochial claim making.

Rajkot, and so the city government prioritised water issues. In addition, over time there was a general awareness about water security including climate issues, especially within the state. Therefore, water and climate efforts were not driven by community efforts. In the case of Aurangabad, individuals tried to demand better access to water and lower the tariff rates from the city government, however these efforts were periodic and did not mobilise any change. Thus, there is no evidence of improved service provision, especially water supply due to better community engagements in Aurangabad.

Similarly, local community leaders (with no party affiliation) act as intermediaries between the state and society, and facilitate welfare development for their communities (Mitra, 1991; Manor, 2000; Krishna, 2007; Jha, 2018a). As mentioned above, Rajkot's pan city efforts (as opposed to community specific efforts) are attributed to a proactive urban local body, and cannot be explained by community leaders. Aurangabad's limited efforts to improve water security are also attributed to the state, that is the sub-national government, and not to local community leaders.

Additionally, some scholars suggest that social movements, collective action against a collective problem, lead political leaders to deal with issues (Tarrow, 1994). Although, Aurangabad witnessed social mobilization for better water supply these efforts were often ignored (by the city government), and water insecurities increased over time. Whereas in Rajkot, there were no social movements, yet water security improved due to a motivated state pursuing programmatic adaptation and mitigation policies. Hence, a society driven and party-based explanation are inadequate to explain the introduction of policy instruments in Rajkot. Additionally, these explanations also fail to explain the divergent policy paradigms pursued by two comparable cities.

Another school of thought brings in the role of political parties in improving service delivery. For instance, Adam Auerbach (2016) suggests that parties with dense networks in informal settlements ensure better facilities (basic services). This explanation is inadequate to explain the macro-level outcomes seen in Rajkot. Firstly, all water and climate related policy adjustments were driven by the city government, and not by any particular political party in Rajkot. Secondly, engagements between the local administration and domain experts (e.g., academic partners, citizen association groups, retired bureaucrats, civil societies), involved building technical capacities of the state. This engagement was not seen as an opportunity by

the state to provide services to its citizens (through experts) in return for political support. Thirdly, all political parties in Rajkot prioritized water issues. Furthermore, the dense party network argument may explain micro-level phenomena, but it does not explain macro-level outcomes such as citywide policy interventions leading to water resilience. Likewise, in Aurangabad, there were no dense community level networks affiliated with political parties working towards improving water supply practices. In the case of Aurangabad, there were few political parties working with communities to provide better water service. However, these efforts were limited to a micro level, that is ward or community level.

Similarly, Kohli (1987) uses party ideology to explain redistributive politics by studying the case of Communist Party of India- Marxist, which holds a pro-poor ideology. Political parties routinely, knowing the importance of water as fundamental to life, try to ensure that their constituents get water. In the case of Aurangabad, this has been done in an informal manner (e.g., political leaders tolerated water thefts and promoted private water tankers), which is problematic as it did not solve clientelism. In Rajkot, programmatic water policies were collectively prioritized by the bureaucrats and political executives of the urban local body, which addressed the problem of clientelism. Also, since water was a political issue, all political parties strived to improve the city's water supply. Therefore, the party ideology argument doesn't hold true in both cities.

Another party driven explanation focuses on party competition leading to effective implementation of service provision. For instance, a two-party system is considered to be more effective than a multi-party system in providing benefits to citizen (Chhibber and Nooruddin, 2004). This argument cannot explain Rajkot's improved water security and adoption of climate measures, and Aurangabad's inability to do so. Both cities have multiple political parties as opposed to two major competing parties, yet Rajkot performed better. In Rajkot, the political parties comprised of the Indian National Congress (INC), BJP, Bahujan Samaj Party (BSP), and independent or non-partisan politicians. Whereas, political parties in Aurangabad included the INC, BJP, Shiv Sena (SHS), BSP, Aam Aadmi Party (AAP), All India Majlis-e-Ittehad-ul-Muslimeen (AIMIM), and non-partisan politicians. Furthermore, despite the presence of multiple political parties, electoral politics in both cities show the dominance of a single political party. In Rajkot, the BJP has been in power for over 40 years (except a few years), and in Aurangabad Shiv Sena (occasionally in alliance with the BJP) has been the major ruling political party. Therefore, Chhibber and Nooruddin's (2004) explanation of a two-party

competition cannot explain the policy outcomes with respect to water either in Rajkot or in Aurangabad.

Gopal (1989) puts forward a political party driven explanation, attributing effective implementation of policies to good centre- state/ sub-national relations. Discretionary support is provided by the central government to states/sub-national governments with same political parties or coalitions in power at the union level (see Sinha⁴⁹, 2003). This argument too fails to explain the case of Rajkot and Aurangabad. Rajkot located in Gujarat has largely had the BJP in power at the sub-national level since the 1990s till date, except for a few years (1990- March 1995, October 1996- 1998). At the central level several coalitions including the Congress-led United Progressive Alliance (UPA), and the BJP-led National Democratic Alliance (NDA) have been in power, apart from wider Third-front coalitions. The UPA government's urban infrastructure scheme (2005-2014) was a milestone for urban development in the country. Despite the Congress being in power at the union level and the BJP at the sub-national level, Rajkot effectively channelised central schemes and funds to pursue policy instruments- a tough case. On the other hand, Aurangabad situated in Maharashtra, according to Gopal's argument should have received considerable support (e.g., urban infrastructure scheme 2005-2014) to pursue adaptation and mitigation instruments. The Congress party was in power in Maharashtra for the bulk of the duration of the UPA government- easy case. However, the city of Aurangabad failed to utilize these opportunities and improve its condition. In fact, both union and sub-national/state level politics did not seem to influence local policy paradigms.

At times state-society centric debates are used to explain successful welfare regimes. Scholars attribute policy success and change to exogenous factors, that is transnational advocacy networks or international organizations (Keck and Sikkink, 1999; Betsill and Bulkeley, 2004; Betsill and Bulkeley, 2006; Toly, 2008; Bulkeley, 2010; see Knill and Tosun, 2020). Additionally, domestic non-governmental organizations (NGOs) transcend political blockages with the assistance of a network of international or domestic NGOs to mobilise their state to change a particular policy, creating a boomerang effect (Keck and Sikkink, 1998). However, this explanation does not explain the case of Rajkot, as transnational advocacy networks and international NGOs were not involved in decision making processes at the local level. Also,

⁴⁹ Aseema Sinha (2003) shows how political explanations -biased allocation of national resources to states/sub-national governments ruled by opposition party- are inadequate to explain divergent industrial investment flows in Gujarat, Tamil Nadu and West Bengal.

external agencies, typically donor agencies, provided the city government with technical (e.g., capacity building activities) (see Anguelovski and Carmin 2011; Chu 2016), and to a limited extent financial assistance (e.g., conducting studies, piloting interventions). Members of the international non-governmental organization (International Council for Local Environmental Initiatives (ICLEI)) working closely with the local administration in Rajkot, stated that, “*ICLEI facilitated knowledge generation and training activities*”, and “*disseminated information, and piloted a few interventions*”. In the case of Aurangabad there were no presence of both international and domestic NGOs assisting the city government to pursue climate measures.

In a similar vein, scholars focused on the role of experts⁵⁰ (Hall, 1993) or epistemic communities in influencing policy measures (Haas, 1989; Haas, 1992 a,b; Adler, 1992; Gough and Shackely, 2001; Cross, 2013). For instance, epistemic communities, working closely with the state, influenced policy negotiations and state behaviour (e.g., protection of the Mediterranean⁵¹, protection of the ozone layer⁵²). There is a definite presence of epistemic communities in Rajkot, however, they do not explain the city’s success with respect to water and climate measures. This group of actors acted as information generators on specific issues, and engaged with the state on an ad hoc basis- no permanent advocacy group/ network institutionalised by the city government. Moreover, policy planning and execution was managed entirely by the ULB, and epistemic communities were not involved in this process. In Aurangabad, the city government occasionally engaged with select domain experts, and they too were only responsible for providing information and technical assistance.

Furthermore, governance frameworks like polycentrism and the multiple streams framework do not explain Rajkot’s success. A polycentric governance framework⁵³ acknowledges the importance of multiple stakeholders including local stakeholders to cope with climate change that requires specialised knowledge and adequate resources. However, this framework does not

⁵⁰ Experts such as bank officials were instrumental in the process of social learning leading to first or second order change (Hall, 1993).

⁵¹ Experts were responsible for setting the international agenda along with influencing their own state’s behavior towards pollution control (Haas, 1989).

⁵² A network of specialists was responsible for the effective coordination of national level policies to protect the ozone layer (Haas, 1992b).

⁵³ A polycentric system involves multiple independent decision-making bodies functioning within a common institutional setting (Ostrom, 2010), as opposed to a single governing unit, a monocentric system.

A monocentric governance is a top-down approach, whereby agenda setting, management of public goods, and implementation of policies (Termeer et al., 2010; Aligica and Tarko, 2012) is monitored by the central government.

explain the role of ideas emerging from the city government that enabled effective implementation of policies in Rajkot. In Aurangabad, policies were pursued mainly due to the sub-national government (top down) and not due to bottom-up approaches pursued by the city government.

Similarly, a multiple streams framework does not explain Rajkot's improved water security and climate action. The framework suggests that agenda setting is influenced by a crisis, and political events (e.g., change in administration). Experts or specialists are involved in policy formulation. Rajkot's policy instruments were formulated and executed by city bureaucrats- this process did not involve experts. Furthermore, policy decisions undertaken by the city government were not influenced by a change in political or administrative leadership. The city bureaucrats built on the institutional memory to design new instruments. Also, policy instruments, excluding contingency measures, were executed to improve water security and not to address a prevailing crisis. Despite persistent water insecurities (crisis) and periodic change in administration, the state in Aurangabad was unable to improve its water security.

1.3. Theoretical framework

This section presents the theoretical framework of the study. Within a multi-level governance setting, the state at the local level is an important actor. The basic premise of this study is that, a climate friendly paradigm (seen in Rajkot) is attributed to the capacity of the state at the local level to effectively execute adaptation and mitigation instruments by transcending governance challenges like clientelism. Improved capacity is attributed to the power of ideas within the state, which evolved in a gradual and path dependent manner.

Ideational churning within the state at the local level was facilitated by the combination of bureaucratic puzzling and political powering involving social learning, which created a bureaucratic-political rationality favouring a particular policy. Bureaucratic puzzling and political powering are influenced by the administrative tradition (an embedded autonomous and cohesive bureaucracy versus a fragmented and embedded particularistic one) and political belief supporting policies (clientelism vs programmatic policies), respectively. Ideas within the state in Rajkot evolved with time, which improved the ability to effectively pursue adaptation and mitigation instruments, despite the presence of vested interest groups. However, the state

in Aurangabad was unable to control clientelism and execute policies as there was no evolution of ideas.

Furthermore, improved state capacity nudges a city towards a climate friendly policy paradigm with improved water security and climate action, as is seen in Rajkot. The city introduced several adaptation and mitigation policy instruments under the existing policy paradigm to improve water security. Moreover, the state at the local level initially designed and executed policies in a disaggregated manner (first layer). This changed over time to a consolidated policy package comprising of both adaptation and mitigation instruments- the climate action plan (second layer), also incorporated under the existing policy paradigm. Therefore, a layered second order policy change is observed in Rajkot, which was driven by ideational churning (as opposed to materialistic factors) within the city government (endogenous and structural factors). On the other hand, there was no policy change in Aurangabad. Over the years only a few policy instruments were implemented (by the state/sub-national parastatal agency), whereby several major policy techniques were not implemented, and water insecurities persisted. The city government was driven by materialistic interest of powerful vested interest groups.

The study employs a state centric approach to explain the variation in policy paradigms pursued by the two cities. For the purpose of the study, the state comprises of the city government (both the administrative⁵⁴ and legislative⁵⁵ branch) as the key stakeholders in designing policy proposals, navigating various interest groups and effectively implementing policy instruments. However, the state is not considered to be a monolithic entity, a Leviathan⁵⁶, as it comprises of the legislative, administrative, political parties, and also the society. In addition, in the case of India, the governance system is multi-tiered with multiple agencies working across these levels- central, state/ sub-national and local. Furthermore, ideational evolution within the city government occurs within a group of individuals (structural explanation), and is not limited to an individual.

⁵⁴ Comprising of the bureaucracy and Commissioner.

⁵⁵ Consists of the local councillors, standing committee members and Mayor.

⁵⁶ Thomas Hobbes defined the state as a supreme authority (Heywood, 2004). Similarly, Machiavelli perceived the state, a political being, as the highest authority (Bluntschli, 2000).

1.3.1. Research variables

The dependent and independent variables, identified based on secondary data and field engagements, include:

- **Dependent variable (DV):** state capacity to:
 - transcend clientelism
 - pursue water adaptation and mitigation instruments
- **Key focal variable:** ideational evolution within the city government

State capacity

In most Indian cities service provision such as urban water supply is the responsibility of urban local bodies. The state⁵⁷, in this case at the local level, is an important actor for the study. State capacity is a key conceptual variable for the study with respect to effective policy execution. Among the two cities studied here, the state in Rajkot built its capacity to effectively implement water adaptation and mitigation instruments, despite the presence of powerful social actors. The same capacity is missing in Aurangabad, where clientelistic practices prevailed.

The study argues that, improved state capacity⁵⁸ is attributed to ideational churning within the city government and backed by strong political will. Traditionally, scholarship on state capacity has focused on material resources (e.g., fiscal and coercive capacity) and legal competence (see Mann⁵⁹, 1984; Tilly⁶⁰, 1985; Migdal⁶¹, 1988; Levi⁶², 1988; World Bank, 1997⁶³; Fukuyama⁶⁴, 2004; Besley and Persson⁶⁵, 2010). The scholarship has over time expanded to include

⁵⁷ Policy outcomes are dependent on state structures and policy legacies. The state influences politics and associated processes in a society (Orloff and Skocpol, 1984). In order to understand, analyse and manage developmental processes, it is extremely important to acknowledge the significance and role of political processes and institutions in influencing outcomes (Reich and Balarajan, 2012). Thus, the state is an important conceptual variable (Nettle, 1968).

⁵⁸ In order to understand politics associated with maldevelopment it is imperative to distinguish and understand “the degree of government rather than their form of government” (Huntington, 1968, p.1) - the capacity of the state to create, and maintain political order. State capacity is an essential prerequisite for growth and citizen welfare (see Naseemullah, 2016).

⁵⁹ The state has the power to pursue actions without negotiating with the civil society groups (despotic power), and implement political decision by penetrating civil societies (infrastructural power).

⁶⁰ State capacity is the ability of the state to extract resources from citizens to raise revenue for delivery of services.

⁶¹ States plan & execute policies, penetrate society, regulate social relationships, and extract and use resources.

⁶² The ability of the state to provide collective goods, improve coordination of people and resources.

⁶³ The ability of institutions to provide basic services, infrastructure and regulate the economy.

⁶⁴ The ability to plan & execute policies, and enforce laws.

⁶⁵ Ability of the state to raise revenue and enforce regulations.

bureaucratic and societal interactions (see Reuschemeyer and Evans⁶⁶, 1985; Migdal, 1988; Evans⁶⁷, 1995).

However, improved state capacity to effectively execute programmatic policies can also be attributed to ideas within the state, which is an under-explored and under-theorized concept. For instance, ideas⁶⁸ within the state resulted in effective implementation of the rural employment scheme in undivided Andhra Pradesh (Mukherji and Jha, 2017; Mukherji, Zarhani and Raju, 2018; Mukherji and Zarhani, 2020). Ideas enable the state to be embedded⁶⁹ within the society and yet act autonomously (from social forces)- an embedded autonomous state (see Evans, 1995).

Policy outcomes can be better understood by bringing ‘ideas back in’ (Lieberman, 2002 p.69). Ideas⁷⁰ are socially constructed views such as beliefs, values and expectations shared among individuals and institutions, which influence decision making process. Peter Hall argued that ideas help define the nature of a policy problem⁷¹ (Blyth, 2001), policy goals and instruments to achieve it (Hall, 1993). Following a constructivist approach, ideas influence state behaviour⁷², policy making, and lead to policy paradigm change. For instance, Blyth (2002) suggests that economic ideas influence institution formation and change. Institutionalisation of the Right to Information in India, an institutional change, is explained by ideas of transparency within the state (Jha, 2018b). Similarly, Schmidt (2011) shows the influence of ideas on economic policy change in Europe.

Furthermore, ideas driving policy change need to be associated with agents or organizations, as ideas are not free floating (see Risse-Kappen, 1994). The study employs a structural

⁶⁶ Effectiveness is attributed to a capable bureaucracy and coherent state organization.

⁶⁷ A state that is socially embedded and yet autonomous leads to effective implementation of policies.

⁶⁸ The bureaucracy introduced measures such as introducing a a) social audits office to oversee the scheme, b) system of direct transfer of money to the villagers, c) field assistant to regulate work under the scheme.

⁶⁹ The state embeds itself within the society to understand local challenges and design socially relevant solutions (see Pepinsky, Pierskalla, and Sacks 2017; Bhavnani and Lee 2018).

⁷⁰ Ideas define our values and preferences, and inform our understanding of political problems (Beland and Cox, 2010).

⁷¹ Ideas provide stability, and structure as they act as roadmaps in uncertain environments (Blyth, 2001), and mitigate coordination problems due to multiple equilibria and institutional persistence, (Goldstein and Keohane, 1993; Finnemore and Sikkink, 1998). Also, ideas enable relevant actors to challenge existing institutions and policies (Blyth, 2001).

⁷² Alexander Wendt, a constructivist, suggests that (shared) ideas influence the structure of human association and the identities and interests of actors (Wendt, 1999).

argument⁷³ by focusing on ideas within the state at the local level. Ideas, are not only embedded in individuals, but are also expressed as “collective memories, government procedures, educational systems and the rhetoric of statecraft” (Legro, 2005:6). Ideas within the city government, particularly group of city bureaucrats, lead to a climate friendly paradigm. Since ideas emerged from the city government the study argues that, endogenous factors and not exogenous ones, engender autonomous decision making leading to policy change. Ideas influencing policy change or alterations can be attributed to endogenous factors (domestic institutions) (see Mukherji, 2017; Jha, 2018b). For instance, India’s globalization was due to ideational churning within domestic institutions, that is the state (Mukherji, 2014). Therefore, in order to understand state behaviour and policy outcomes it is important to understand “why the state thinks in the way it does” (Mukherji and Jha, 2017, p54).

Apart from ideas within the state, strong political will is imperative for effective execution of policies. Policy ideas can be adopted and executed only when backed by strong political will, which insulates the bureaucracy from vested interests. For instance, Mukherji (2014) argues that India’s globalisation and deregulation after the 1991 balance of payment crisis was driven by ideas held by the technocrats who were powered by the then Prime Minister against the dominant class coalitions. Similarly, the national rural employment guarantee scheme was effectively executed in undivided Andhra Pradesh due to ideas within the bureaucracy which were actively supported by the political executives, that is the then Chief Minister (see Mukherji and Jha, 2017; Mukherji, Zarhani, Raju, 2018; Mukherji and Zarhani, 2020). Ideational evolution translates into (programmatic) policy proposals, which can be adopted and executed only when they are backed by strong political will⁷⁴ (see Heclo, 1974; Mukherji, 2014; Mukherji and Jha, 2017; Mukherji and Zarhani, 2020). A supportive political environment backing policy ideas is crucial for implementation, especially of programmatic policies.

Unlike existing state centric theories (discussed under alternative explanations), this study highlights and distinguishes the importance of the bureaucracy and the political executives in improving state capacity. The study will build on existing literature of state capacity to show

⁷³ Structural debates focus on actions influenced by institutions and shared beliefs, whereas agency driven approaches are actions motivated by individuals or actors (Hurd, 2008).

⁷⁴ In a similar vein it has been argued that, that political systems need the capacity to act along with political will to pursue climate measures (Biesbroek et al., 2018).

the influence of ideas within the state in improving its capacity/ability⁷⁵ to autonomously pursue programmatic policies.

Ideational evolution: causal process

This section discusses the causal process leading to change in state thinking. The evolution of ideas, leading to improved state capacity, is facilitated by a combination of bureaucratic puzzling and political powering (see fig. 1). Following Hugh Heclo's argument, 'governments not only power, but they also puzzle' (Heclo, 1974 p. 305), the study argues that policies are not just an outcome of power and conflict, but also emerge from policy deliberations during a crisis⁷⁶.

Policies are an outcome of collective puzzling/deliberations of what to do in uncertain circumstances⁷⁷. Puzzling involves concerted effort to define a social problem⁷⁸ and identify an optimal solution, which is informed by diverse knowledge systems⁷⁹ and multiple policy options (see Heclo, 1974; Hall, 1993; Culpepper, 2002; Blyth, 2007; Hoppe 2011; Dewulf et al., 2012; Vink et al., 2013; Wood, 2015; van der Steen et al., 2016; Stock et al., 2020). This process leads to the formulation of policy proposals with alternative solutions to solve social problems. Puzzling strategies typically involve bureaucrats⁸⁰, but is not limited to this group of actors, who support a particular policy idea⁸¹.

A policy idea develops due to bureaucratic puzzling, however effective implementation of this idea requires the support of relevant stakeholders. Powering is the use of power and authority to implement solutions to address social challenges (Heclo 1974; Hall 1993; Lieberman, 2002;

⁷⁵ State capacity is a product of autonomy (see Skocpol, 1985) and ideas (see Mukherji, 2016) within a state.

⁷⁶ A crisis arises because "conditions have changed and policy has not, or vice versa, or because both have changed" (Heclo, 1974, p307).

⁷⁷ Uncertainty leads policymakers to think about 'what went wrong' and 'what needs to be done' (Blyth, 2007).

⁷⁸ In order to rally adequate support for policies, puzzling requires clearly defining the problem at hand, and the scope, focus and time frame of the solution effectively (van der Steen et al., 2016). In order to choose optimal solution relevant policy ideas are 'road tested' (Blyth, 2007 p.761) through the process of collective deliberation.

⁷⁹ This process involves converging different and sometimes contradictory opinions to build a common understanding of an issue to effectively address it. Discussions over problems are based on technical insights (Knill and Tosun, 2020 p.198).

⁸⁰ In uncertain circumstances, policymaking involves collective puzzlement of the government on behalf of the society (Hall, 1993; Stock et al., 2020).

Bureaucrats are not only involved in policy formulation and implementation, but also in agenda setting (Knill and Tosun, 2020).

⁸¹ For instance, Heclo (1974) argues that the bureaucrats puzzled over welfare policies in Sweden and Britain, whereas Culpepper (2002) discusses the influence of trade unions and corporations in influencing bureaucratic puzzling.

Hoppe, 2011; Dewulf et al., 2012; Vink et al., 2013; Mukherji, 2014; Wood, 2015; van der Steen et al., 2016; Stock et al., 2020). Powering strategies usually involve political actors and is considered to be an exogenous process. Addressing policy issues is not only a cognitive and knowledge intensive process (see van der Steen et al., 2016), but also requires necessary support from relevant stakeholders promoting a policy choice or neutralising any opposition from vested interest groups. Powering involves the ability to create support/acceptance for a particular policy idea, and effectively channelise available resources to execute tangible instruments, thereby leading to policy adoption and execution.

Effective implementation of programmatic policies requires bureaucratic puzzling and political powering strategies. The two processes are interconnected⁸² - ‘puzzling sets up powering, and powering opens the space for puzzling⁸³’ (van der Steen et al., 2016, p.8). For instance, the Mahatma Gandhi Rural Employment Guarantee scheme was effectively implemented in Andhra Pradesh due to the combined effects of bureaucratic puzzling and political powering (Mukherji and Jha, 2017; Mukherji and Zarhani, 2020). The study aims to bridge the gap in existing literature on state capacity⁸⁴ by highlighting the combined influence of puzzling and powering strategies on service delivery.

The process of puzzling and powering is preceded by evidence-based deliberations among policymakers⁸⁵ over a policy problem, that is social learning. Learning helps identify policy gaps and loopholes in the system. This process⁸⁶ is driven by learnings from past experiences, and access to new information (Heclo, 1974; Hall, 1993), leading to a change in thinking or policy beliefs (see Mukherji⁸⁷, 2014). New policies are path dependent⁸⁸ on previous policies,

⁸² Puzzling and powering are two sides of the same coin used to address long term and complex policy issues (van der Steen et al., 2016).

⁸³ For instance, despite puzzling efforts among relevant stakeholders, policy measures may not be executed and get ‘permanently shelved’ (Stock et al., 2020, p.5) if they lack adequate support of relevant stakeholders. On the other hand, Stock (2020) argues that in the absence of puzzling powering will lead to a single policy option.

⁸⁴ Effective service provision either focuses on puzzling strategies (see Peter Evans, 1995; Mangla, 2015; Bustikova and Corduneanu-Huci, 2017) or powering strategies (see Manor and Duckett, 2017; Zarhani, 2019).

⁸⁵ Learning is not limited to an individual, but can also be a group or collective phenomena (Heclo, 1974; Wood, 2015), facilitated by policy feedback (King and Hansen, 1999) or experiences (May, 1992).

⁸⁶ The concept of policy design links closely with social learning, as it involves interaction between multiple actors to understand a problem and identify policy tools or alternatives based on past experiences, knowledge and evidence in achieving policy goals (see Howlett, 2014; Howlett and Mukerjee, 2014).

⁸⁷ India’s economic change in the 1990s was due to endogenous ideas driven by previous policy failures (state regulated import substituting model).

⁸⁸ Hugh Heclo stated that, “innovative creations are decisively shaped by the content of previous policy” (Heclo, 1974, p5). New policy ideas are shaped by prevailing ideas within a state (Legro, 2005). Therefore, policy outcomes are path dependent on state structures and policy legacies.

and the beliefs of policymakers are influenced by the flow of information⁸⁹ and experiences. Despite the advantage in decision making process⁹⁰, the state does not have ‘ready-made solutions⁹¹’ (Culpepper, 2002, p. 778) to address policy problems. The state engages with the society⁹², through domain experts⁹³, to access necessary information to design technically and politically feasible solutions⁹⁴. However, the state continues to be the key actor in pursuing policies, as the experts or epistemic community⁹⁵ act as knowledge partners⁹⁶ who come together to support the state as per need⁹⁷ and are not a permanent committee or advocacy network. These interactions embed the state with its ground realities making it more likely to identify gaps in existing policies and creatively think of social needs, and optimal technological solutions.

The combination of bureaucratic puzzling and political powering leads to ideational churning within the state. This evolution of ideas creates a bureaucratic-political rationality favouring a particular policy (programmatic serving all citizens or clientelistic benefitting certain groups). Programmatic policies can be effectively executed if bureaucratic-political rationalities are synergised. This insulates the state from powerful interest groups, thereby improving the ability of the state to execute policies.

⁸⁹ Learning is influenced by information or knowledge which guides policymakers with decision making processes. This policy knowledge is said to be an outcome of policy analysis and program evaluation (see James and Jorgensen, 2009). Often ideas or information or arguments are transformed into policy knowledge that can be useful for policy making (see Radaelli, 1995).

⁹⁰ Decision makers, like bureaucrats, have accumulated expertise such as procedural knowledge (e.g., awareness of domestic programmes & schemes, and are able to manage crises (Knill and Tosun, 2020)) and professional training.

⁹¹ Trade unions and corporations helped the state formulate optimal policies (Culpepper, 2002).

⁹² The state and society are in a constant state of flux (Migdal, 2001), sharing a mutually empowering relationship (Migdal, Kohli, and Shue, 1994) and collectively spearheading programmes.

⁹³ Policy formulation through the process of learning involves the inclusion of experts (Hall, 1993) or specialists who provide information for a particular policy issue (Knill and Tosun, 2012; Vink et al., 2013; Wood, 2015). This is true of knowledge intensive domains like climate and environmental issues (Hannigan, 2006; Termeer et al., 2011), whereby the state and society need to maintain synergistic ties.

⁹⁴ This engagement with the society enables the state to understand the needs of the society, identify the gaps and loopholes in the system, and improve its capacity by filling technical and knowledge deficits, without being captured by social forces. This process of learning creates a feedback mechanism connecting the society with the state.

⁹⁵ An epistemic community comprises of experts, belonging to diverse backgrounds and driven by a common belief, who hold domain specific and policy relevant knowledge for a particular issue (Adler, 1992; Haas, 1992 a, b).

⁹⁶ Policymakers engage with actors outside the state to acquire information (Biesbroek et al., 2018) and review policies especially in “light of latest scientific discoveries and on-going policy processes in the climate change domain” (Vink et al., 2013, p.3).

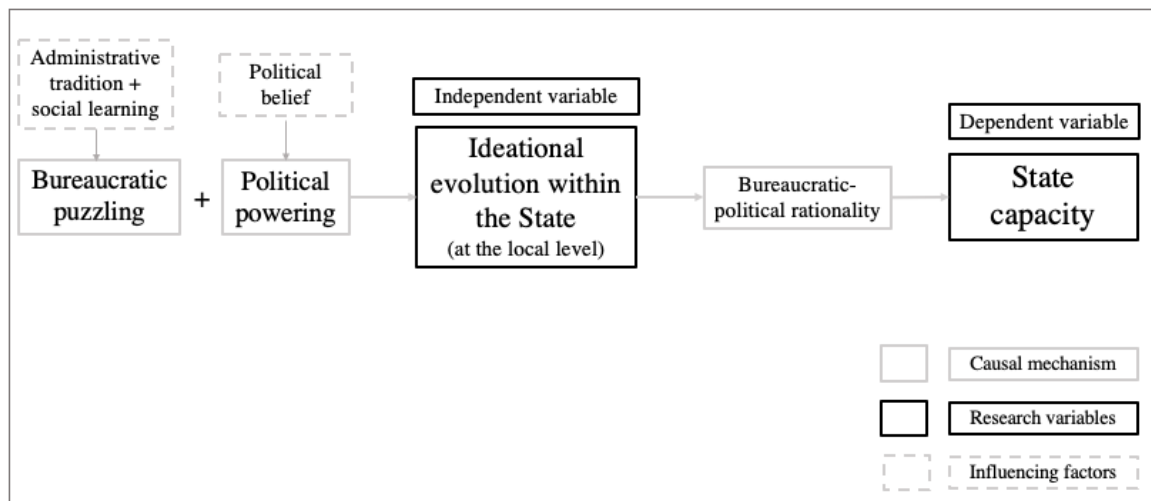
⁹⁷ This group of experts help the state understand interlinkages/correlations between issues (Knill and Tosun, 2020).

Bureaucratic puzzling and political powering are influenced by the administrative tradition and the political will/beliefs, respectively. Administrative tradition is determined by a bureaucracy that works as a cohesive unit to pursue a particular policy idea. Additionally, this bureaucracy can be embedded in the society⁹⁸, yet autonomous from social forces (Evans, 1995). Puzzling within such a bureaucracy involves learning from previous policy failures and access to new information that creates a rationality favouring programmatic policy instruments. This process leads to the identification of alternative policy instruments that can be used to achieve a policy target. On the other hand, bureaucracies can be embedded particularistic -bureaucracy mediated by powerful vested interest groups (Herring, 1999)- whereby puzzling is inadequate and there is not learning from previous policies. This leads to clientelistic policy choices favouring powerful vested interest groups.

Powering strategies are influenced by political belief or will. The underlying beliefs of political executives could either favour clientelistic practices or programmatic policies. These values can be influenced by bureaucratic puzzling strategies. Puzzling within embedded autonomous bureaucracies often lead to clearly defined problems and programmatic policies, thus making it easier to convince political executives to back programmatic policy ideas. On the other hand, when puzzling strategies are mediated by social forces policies are skewed in favour of certain powerful social actors, thereby encouraging political executives to promote clientelism. Moreover, the political rationality could vary from bureaucratic ones. Despite, effective puzzling strategies leading to programmatic policy proposals, political executives may favour clientelistic policies. Beliefs of political executives can be independent of bureaucratic beliefs leading to different rationales, whereby a political rationale wins over a bureaucratic rationale. Programmatic policies can be effectively pursued only when bureaucratic and political rationality are synergised (see Mukherji and Zarhani, 2021).

⁹⁸ Designing socially relevant policies requires additional technical information (Knill and Tosun, 2020)- often limited or missing within the state.

Figure 1: Causal process connecting the research variables



The above figure provides a diagrammatic representation of the causal process explaining how ideas within the state lead to improved state capacity. The ability, to pursue programmatic water adaptation and mitigation instruments, is an outcome of ideational churning within the state. Ideational evolution creates a bureaucratic-political rationality favouring a particular policy idea. Thinking within the state changes through the combination of bureaucratic puzzling and political powering. Bureaucratic puzzling is influenced by the administrative tradition and learning from previous experiences and new information. The administrative tradition is determined by the type of bureaucracy (embedded autonomous bureaucracy working as a cohesive unit versus a fragmented embedded particularistic bureaucracy). Political powering is influenced by the political belief favouring a particular policy idea (clientelism versus programmatic).

1.3.2. Causal process applied to the empirical examples

This section applies the causal process explaining ideational evolution to empirical findings from the cities. Although the urban local bodies⁹⁹ were driven by the policy paradigm of controlling clientelism, over time the two vary in terms of their policy paradigms. Findings from Rajkot suggest that the city government was able to improve its capacity to pursue programmatic policies by overcoming governance challenges like clientelism. Policy execution in Rajkot was facilitated by the evolution of ideas due to effective bureaucratic puzzling and strong political powering strategies. Ideas are therefore the focal explanatory variable of this study. Materialistic explanations¹⁰⁰ do not explain effective execution of water adaptation and mitigation instruments leading to improved water security and climate action.

⁹⁹ As mentioned earlier the urban local body is the key actor, more specifically city bureaucrats (water works and town planning department), and political executives (the Mayor and Standing Committee members). The city government often engaged with the society, that is domain experts/consultants on specific policy issues.

¹⁰⁰ Materialistic explanations focus on material needs, incentives and power (Moore, 1966; North and Weingast, 1989; Thelen, 2004) to explain changes in policies.

For instance, the Glorious revolutions and the formation of the Bank of England was due to the rise of the capitalist class, thereby holding the Monarch accountable for transactions (North and Weingast, 1989).

Similarly, Moore (1966) (influenced by Marx) suggested that the rise of democracy in Great Britain was influenced by the rise of the bourgeoisie/ capitalist class.

The evolution of Germany's formalized skill development/training institutions was due to the power of artisans, which is not seen in Japan, Britain or the US (Thelen, 2004).

On the other hand, the state in Aurangabad was unable to pursue programmatic policies as it lacked the capacity to control clientelism. In fact, the few policy instruments introduced by the sub-national government were not furthered by the city government. At the local level, puzzling strategies were weak or missing and powering strategies were skewed in the favour of powerful social actors. As a result, there was no evolution of ideas within the city government in Aurangabad. In fact, the city government was driven by materialistic factors (e.g., short term financial gains and electoral motives). Furthermore, the administrative traditions and political beliefs held by the political executives differed in the two cities. This influenced bureaucratic puzzling and political powering in the cities. The following section will show how ideational evolution within the city government when backed by strong political will results in programmatic delivery of water and promotion of climate action.

Rajkot

The city witnessed governance challenges such as lack of capacity (financial and technical) and clientelism (e.g., local politician tolerant of water thefts, powerful water tanker lobby truncating policy execution, biased policy execution). The city government was able to build its capacity to introduce water adaptation and mitigation instruments. Decision making in Rajkot was influenced by ideational churning within the urban local body, and not by changing material parameters (economic interests, political power).

Rajkot's administrative tradition is defined by an embedded bureaucracy, which worked as a cohesive unit to autonomously pursue adaptation and mitigation instruments. The city's policy choices were influenced by social learning. This process involved the city government engaging with domain experts (e.g., citizen association members, non-government organisations, academic partners etc.) to access new information and technology (e.g., adaptation and mitigation instruments), and collectively deliberate over previous policy failures (inadequate municipal water due to poor technical and financial capacity, and clientelistic practices). This feedback mechanism enabled the bureaucracy to a) learn from previous policies & experiences (e.g., water supply scheme), b) clearly identify policy problems, and c) subsequently prioritise issues to be placed on the municipal agenda.

Puzzling in Rajkot involved city bureaucrats (e.g., city and sectoral engineers (see fig. 2)). These actors collectively puzzled over social problems (e.g., water thefts and inadequacies,

declining groundwater levels, high energy consumption levels), and autonomously identified technically feasible policy instruments. Some of the adaptation and mitigation instruments identified through this process broadly include augmenting water supply, conserving available water (e.g., strengthening water distribution networks including reducing non-revenue water loss, harvesting rainwater), monitoring water consumption, promoting alternative energy and energy efficient (water) practices. Policy problems were addressed in a systematic and incremental manner (new policy ideas built on previous ones¹⁰¹) based on the ability of the city government to execute instruments (e.g., availability of funds). For instance, the tender process was improvised (e.g., strict quality checks of third party were introduced, no changes in the tender process were allowed, a penalty for delays was introduced) to transcend the exploitative nexus of vested interest groups. Additionally, the bureaucrats identified and customised domestic schemes and programmes to support policy instruments. Respective Commissioners prioritised the water sector, and encouraged city bureaucrats to improve the city's water supply. Moreover, the Commissioners also participated in awareness campaigns and monitored implementation process. Puzzling strategies translated into setting the municipal agenda¹⁰² and formulating proposals to address social problems through adaptation and mitigation instruments. Consequently, the city bureaucrats, carriers of new policy ideas, planned and proposed several new policy instruments along with enforcement mechanisms to improve the city's water supply by overcoming clientelism.

With respect to powering strategies, the political executives prioritised water issues and favoured programmatic adaptation and mitigation instruments. The bureaucrats worked as a cohesive unit to mobilise the political executives to back policy ideas. Powering strategies (endogenous) involved the political executives¹⁰³ (see fig. 2), typically the mayor and members of the standing committee, and occasionally the general body members. Powering strategies backed technical thinking leading to adoption of instruments (through resolutions or orders). Additionally, powering influenced in non-technical ways such as insulating bureaucrats from pressure and interference, mobilising citizens, local councillors, and sub-national and national

¹⁰¹ With respect to water adaptation, in the initial years the focus was to improve the local water sources, following which the city government prioritized improving the city's water systems. It is only in recent years that the urban local body is monitoring water consumptions.

The initial mitigation instruments focused on energy conservation, however with time the city government also focused on the emission reduction potential of instruments.

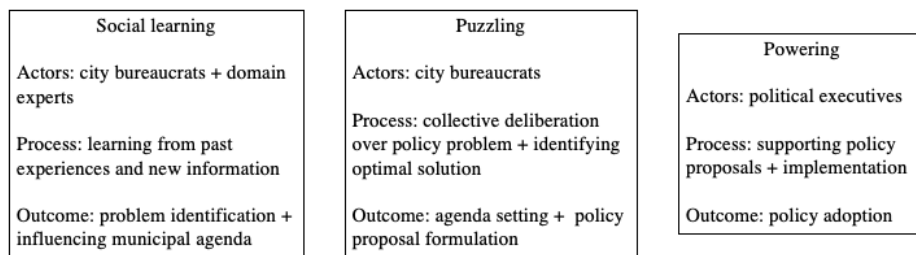
¹⁰² This agenda is classified as institutional or action agenda, comprising of specific issues requiring understanding of prevailing policies, which is 'up for serious consideration by decision makers' (Knill and Tosun, 2020 p. 85).

¹⁰³ The political executives backed policy ideas after assessing the political, technical and financial feasibility and winnability of instruments.

governments to support instruments. Political support resulted in effective execution of instruments. Technocratic efforts were also leveraged by active participation of respective Mayors in various campaigns and (climate) workshops.

The combination of effective bureaucratic puzzling and strong political powering changed thinking of the city government in support of new policy instruments to improve water security and control clientelism. Additionally, the climate adaptation and mitigation co-benefits associated with existing and planned instruments were acknowledged. This ideational churning within the urban local body created a cohesive bureaucratic-political rationality favouring and leading to adoption of adaptation and mitigation instruments, despite the presence of social forces. Consequently, Rajkot was able to improve its water security and pursue climate action by transcending clientelism.

Figure 2: Puzzling and Powering model



The figure represents the actors involved, process and outcome(s) of puzzling, powering and social learning.

Aurangabad

Aurangabad witnessed similar governance challenges like Rajkot. However, the city government in Aurangabad lacked the capacity to design and execute water adaptation and mitigation instruments. There was no evolution of ideas within the city government. In fact, materialistic factors influenced decision making processes.

Aurangabad's administrative tradition was influenced by an embedded particularistic bureaucracy that was fragmented and showed rent-seeking propensities. Furthermore, social learning was skewed. The urban local body engaged with selective specialists who promoted interests of powerful social actors. In many cases experts with ground knowledge were not consulted. Consequently, there was a) no learning from previous policy failures (e.g., schemes were not modified despite poor results) and new information (e.g., pilot studies rarely conducted before implementing instruments across the city), and b) preferences of powerful

actors influenced the municipal agenda (e.g., privatised water supply).

Puzzling strategies especially at the city level were poor or often missing. Policy proposal formulation was either limited to a few senior bureaucrats or facilitated by the state/sub-national parastatal agency with no involvement of city officials. As a result, majority of the policy proposals were driven by material interests of powerful social actors¹⁰⁴. The urban local body failed to adequately design and execute instruments, due to strong clientelistic practices. For instance, the city government had several opportunities to pursue water adaptation instruments (e.g., strengthen the water distribution network, reduce non-revenue water loss), but was unsuccessful in the presence of powerful social actors. Similarly, the city government was unable to introduce and execute mitigation instruments¹⁰⁵. In addition, water challenges were not prioritised by the Commissioners'. Moreover, the bureaucracy proposed to introduce a range of policy instruments under an all-inclusive policy instrument¹⁰⁶, which was financially onerous and risky to operationalise- putting eggs in one basket. Furthermore, the bureaucrats did not adhere to requirements set by the union or sub-national governments to acquire financial support nor were domestic schemes adjusted to the local setting. The limited water instruments introduced were facilitated by the sub-national/state government, which the city government did not further. In the absence of effective bureaucratic puzzling clientelistic policies were pursued.

The political belief held by Aurangabad's political executives promoted clientelistic practices, whereby interests of few were served at the cost of others. Although a relatively small number of new policy instruments were proposed by a few bureaucrats (fragmented as opposed to Rajkot), majority of these were never executed. In the absence of clearly defined policy proposals the mayor's office was not convinced to back policy ideas. In fact, political pressure was used to interfere with policy planning (e.g., privatising water supply distribution) and execution (e.g., divert project contracts, truncate scheme etc.). Consequently, some policy ideas were adopted on paper, but were never executed due to the presence of powerful vested.

¹⁰⁴ The city privatised distribution of water supply which furthered interests of few and fostered rent seeking activities.

¹⁰⁵ Solar water heating systems are mandated in building by-laws by the sub-national government. The city government did not participate in planning and designing the policy proposal.

¹⁰⁶ The urban local body, under the influence of powerful vested interest groups and a powerful political leader, proposed to implement a mega water supply scheme (in one go) on public private partnership mode. Instead of incrementally introducing policy instruments as per the need/priority, the government planned to include all policy instruments under an all-inclusive policy, without leaving any scope for piloting on a small scale.

Programmatic policies were not pursued in Aurangabad as there was no evolution of ideas within the city government. Thinking within the state did not change with time due to inadequate bureaucratic puzzling and skewed political powering. The city's water insecurities persisted as it was unable to effectively introduce water adaptation and mitigation instruments. Also, climate co-benefits associated with existing instruments remained unrecognised. The urban local body in Aurangabad was driven by materialistic gains (e.g., monetary benefits, political power). The bureaucratic-political rationality promoted clientelistic policies. Consequently, despite similar material conditions in the two cities (e.g., access to funds, powerful political leaders), the state in Aurangabad was unable to improve water security and further climate measures.

1.3.3. Policy change: pathway and causal process

This section discusses the influence of state capacity on the policy paradigm of the two cities. The ability of the state to control clientelism and introduce new policy instruments under the existing paradigm leads to a climate friendly policy paradigm. This is an incremental and layered policy change, which resonates with Peter Hall's second order policy change (explained below). Since the prevalent paradigm remains unaltered this is not a case of policy paradigm change, but rather a within paradigm change (in Rajkot). The layered second order policy change is driven by ideational churning within the state at the local level (endogenous factors).

The study observes a second order policy change. The city government had the capacity to introduce new adaptation and mitigation instruments under the existing paradigm to achieve the overarching policy target. A policy paradigm¹⁰⁷ change occurs when old policies are unable to adapt and deliver under new circumstances. This change in policies can be driven by alterations in the setting and/or instruments used to achieve a policy goal, and/or a change in policy goal. Peter Hall (1993) classifies policy changes into three different levels: first, second and third order change¹⁰⁸. A change in the setting of a policy instrument, that is the level of

¹⁰⁷ A policy paradigm is a framework of ideas (including values, principles and worldviews (Campbell, 2004)) and standards that define the nature of the problem, specify the goals (Carson, Burns and Calvo, 2009), and instruments to achieve policies (Hall, 1993). A particular idea is shared by policy actors (Daigneault, 2014), and cannot be attributed to a particular policymaker.

¹⁰⁸ For instance, the policy goal could involve improving fiscal issues of elderly, the instrument or technique to achieve this goal could be an old age pension scheme, and the setting could be the level at which the benefits were set (see Hall, 1993).

policy requirement (Knill and Tosun, 2020), is a first order change¹⁰⁹. A second order change involves a change in the policy instrument used to attain a particular policy goal¹¹⁰. Finally, a third order change involves a change in the core components of policymaking process- a paradigmatic shift that is a radical and incommensurable change in policy discourse¹¹¹. Although, Peter Hall's policy change model explains national level policy change, this study applies the model to understand change in policies at the micro level.

The study shows that the incremental policy change occurred in a layered manner. The change in policies and institutions is a gradual¹¹² (Cappoccia, 2016), incremental (Streeck and Thelen, 2005), and a path dependent¹¹³ process (Capoccia and Kelemen 2007). Incremental policy change can be explained through a range of paths (e.g., layering¹¹⁴, conversion¹¹⁵, drift¹¹⁶, displacement¹¹⁷, exhaustion¹¹⁸). The study focuses on the layered path model, which explains how new rules are added to existing institutions, which evolve differently from old rules¹¹⁹. For instance, India's telecommunication sector transitioned from a government monopolised sector (old ideas) to one with competing private players and institutionalisation of a telecom regulator (new rule) in a layered manner (Mukherji, 2014). Similarly, Jha (2020) discusses how the Right to Information (RTI) in India emerged in a layered manner, wherein norms of

¹⁰⁹ For instance, Hall (1993) illustrates how budget adjustments were made (between the 1970s- 80s) without challenging the underlying objective of Britain's macroeconomic policy- setting of monetary and fiscal instruments were altered as a response to past experience.

¹¹⁰ An example of second order change is the introduction of cash limits on departmental expenditure by the British government to monitor public expenditure as the government was unable to monitor the expenditure under the former system (Hall, 1993).

¹¹¹ A change in overarching policy discourse including goal, instruments and core ideas- the new policy is substantially different from the previous one. A paradigmatic change, a concept borrowed from Thomas Kuhn's scientific revolutions (Schmidt, 2011; Carstensen and Matthias, 2018), involves a significant change from the previous policy equilibrium (Cashore and Howlett, 2007; Carson et al., 2009). Also, policy change can occur in a particular sector or across multiple sectors (Daigneault, 2014). For instance, Britain witnessed a radical transition in policy discourse from Keynesian to monetarist macro-economic policies in the late 1970s (Hall, 1993)— one major idea is replaced by another.

¹¹² Institutional change is a difficult process, which reflects underlying processes of imperfect compliance, rule reinterpretation, and coalition-building among social and political actors" (Capoccia, 2016:1099).

¹¹³ Previous policies influence existing and new ones (Heclo, 1974; Sacks, 1980; Weir and Skocpol, 1985), thereby exhibiting path dependency involving elements of continuity and change (Thelen, 1999).

¹¹⁴ New rules are added to existing institutions without replacing old rules (see Schickler, 2001; Streeck and Thelen, 2005; Mukherji, 2009; Mahoney and Thelen, 2010; Mukherji, 2014; Jha, 2018b; Mukherji and Zarhani, 2021).

¹¹⁵ Reinterpretation of old norms for new purposes (socially relevant) (see Thelen, 2004).

¹¹⁶ Old rules are not adapted to a new environment, which changes their impact. Changing circumstances alter the influence of institutions and policies (see Hacker, 2004; Hacker, Pierson, & Thelen, 2015).

¹¹⁷ New rules replace older ones (see Streeck & Thelen, 2005).

¹¹⁸ Overextension of old norms leads to their decay as they are no longer fit for prevailing conditions (Streeck, 2009).

¹¹⁹ A layered change occurs in the presence of strong opposition or veto players (Mahoney and Thelen, 2010; Mukherji and Zarhani, 2021).

openness were attached to the existing norms (of secrecy). Typically, first and second order change involve incremental and cumulative adjustments in policies without challenging or replacing the existing policy paradigm¹²⁰. New action can be pursued under the same policy paradigm by attaching new ideas to older ones (Schmidt, 2011). For instance, climate measures are aligned and incorporated into existing policy paradigm (see Biesbroek et al., 2018), and pursued through prevailing institutional structures.

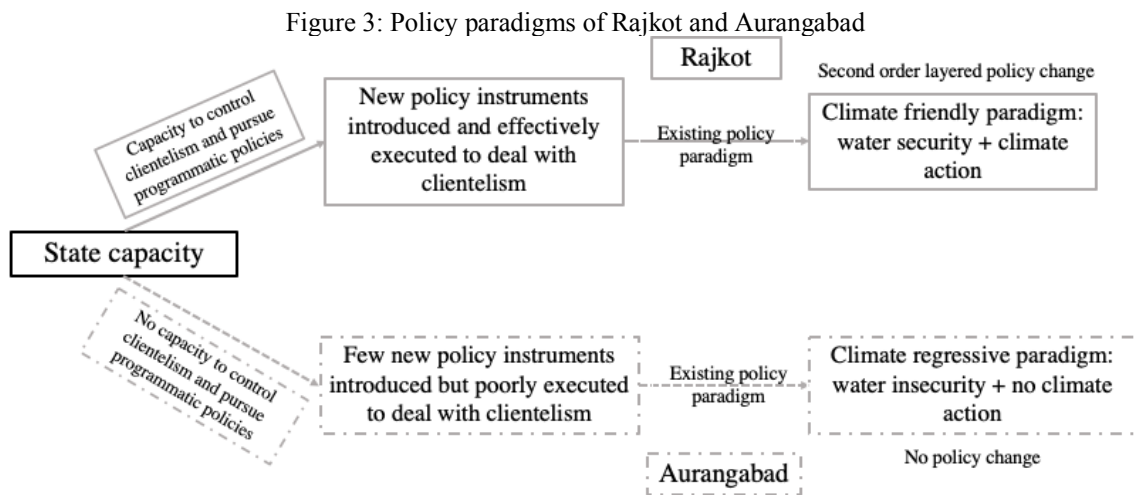
Furthermore, this study argues that a layered second order policy change was driven by endogenous and ideational factors. Ideas within the state, which evolved gradually and in a path-dependent manner, play an important role in explaining policy change. A paradigm change is explained by a change in belief system (see Coleman et al., 1996; Daigneault, 2014). More specifically, ideas shared by domestic actors or held within domestic institutions (endogenous factors), as opposed to materialistic and external factors influence policy making and change. For instance, India's globalisation and deregulation in the 1990s is explained by the dominant economic ideas within the state (Mukherji, 2014; Mukherji and Zarhani, 2021). The study shows how ideas within the city government were instrumental in building the ability of the state to overcome clientelism and lead to a second order policy change. In comparative politics literature the process of policy (paradigm) change is under-theorized (Schmidt, 2011). This research aims to contribute to the limited scholarship in comparative politics on policy change, especially at the micro level.

1.3.4. Connecting theory with empirics

This section discusses how improved state capacity, a result of ideational churning within the state, influences a city's policy paradigm. The two cities vary in terms of their policy paradigm- Rajkot's policy paradigm has become climate friendly over time, whereas Aurangabad's paradigm is climate regressive. The city government in Rajkot was able to overcome clientelism and make policy adjustments by introducing a range of new water adaptation and mitigation instruments under the existing policy paradigm- within paradigm change. Effective implementation of new policy instruments nudged the city towards a climate friendly paradigm with improved water security and climate action. Since new policy instruments were incrementally introduced under the prevailing policy paradigm a second order layered policy

¹²⁰ Minor adjustments, re-designing existing programmes, to status quo can incrementally address policy problems (Peters et al., 2017).

change is observed in Rajkot (see fig. 3). Policy adjustments in Rajkot are not a case of paradigm change, but instead a within paradigm change. On the other hand, the state in Aurangabad lacked the capacity to implement several policy instruments due to the presence of strong vested interest groups. Consequently, clientelistic practices persisted leading to escalating water insecurities and no climate action- a climate regressive paradigm. The figure below diagrammatically represents the causal process explaining divergent policy paradigms observed in Rajkot and Aurangabad.



The diagram shows the relevance of State capacity in overcoming clientelism and nudging the city towards a climate friendly paradigm. Rajkot's paradigm is a climate friendly as opposed to Aurangabad which has a climate regressive paradigm.

Rajkot

The city government in Rajkot had the capacity to nudge the policy paradigm to become climate friendly. Given rapid urbanization and associated governance challenges, especially clientelism, Rajkot's water supply was increasingly becoming inadequate to meet growing needs. Over time the urban local body incrementally implemented a range of adaptation and mitigation instruments under the existing paradigm to strengthen its water security. Ideas within the city government evolved through a combination of bureaucratic puzzling and political powering, which enabled it to overcome clientelistic practices and effectively implement policy instruments with programmatic benefits. Transition in the state's ideational

milieu occurred in a structural manner, as a group of stakeholders were involved in planning and decision making¹²¹, among which the city government¹²² was the most influential actor. Considering the financial and technical capacity the urban local body realised that the most feasible option of improving the city's water supply was by introducing new policy techniques (adaptation and mitigation), and not by changing the policy setting or policy goal. Consequently, the city government implemented new or re-designed existing policy instruments under the existing paradigm to improve water supply. The policy instruments were introduced in an incremental manner that built on previous policies and current needs. For instance, in the initial years the water adaptation instruments prioritised augmenting water supply to improve local water availability. This was followed by instruments to conserve and improve municipal water supply (e.g., upgrading water distribution networks, conserving rainwater, and controlling non-revenue water loss). In recent years, the city is focusing on controlling water demand by monitoring water consumption.

Similarly, with respect to water mitigation in the initial years policy instruments were implemented with an aim of reducing energy consumption (e.g., energy audits, solar water heating systems). Over time, the urban local body also recognised the GHG emission potential of existing and future instruments (e.g., solar water treatment plant). Additionally, the city actively pursued climate measures. Apart from increased climate awareness, a climate action plan was ratified by acknowledging climate co-benefits of existing and planned developmental instruments. The policy instruments, involving adaptation and mitigation co-benefits, were introduced in a layered manner under the prevailing paradigm in an incremental manner which built on previous policies.

The climate action plan was incorporated into the local agenda, which reinforced the existing policy goal driving the dominant paradigm. The institutionalisation of a climate action plan shows a shift in policy approach of the city government, that is transition from disaggregated policies to an aggregated policy. The state, until 2019, had not acknowledged the interlinkages and cumulative climate effect of existing and planned instruments. Consequently, the policies

¹²¹ For instance, the bureaucrats engaged with experts to access new information, and the city bureaucrats (water works and town planning engineers) were responsible for formulating and executing all policy proposals. Additionally, bureaucrats mobilised the political executives to support policy ideas. Therefore, policy ideas were not held by any particular individual, but were shared among the city bureaucrats, who were occasionally assisted by experts.

¹²² Decision making in Rajkot was driven by the city government, and was beyond the purview of experts and other state officials (e.g. Gujarat government and union government).

were disaggregated- first layer. However, over time thinking within the state changed (due to puzzling and powering), which enabled the recognition of interconnections between existing instruments along with associated climate adaptation and mitigation co-benefits (see table 2), and the need for a consolidated plan to simultaneously meet developmental and climate objectives. Consequently, the local administration consolidated a climate plan, an aggregated policy package, by incorporating a range of disaggregated micro policy (adaptation and mitigation) instruments- second layer. This approach helped the state overcome problems¹²³ associated with layering such as overlapping efforts, confusion, contradiction over strategies and competition over resources (see Vij et al., 2018). Furthermore, there was no paradigm change in Rajkot as new policy ideas were pursued under the prevailing policy paradigm, which remained unaltered.

The urban local body did not change the policy settings as all new policy instruments continued to be implemented either at ward or city level. Instead, a policy change at the second order level was observed in Rajkot as new policy techniques were introduced under the existing paradigm to improve water security and pursue climate action. Thus, ideational churning within the city government (endogenous factors) improved the ability to pursue water adaptation and mitigation instruments under the existing paradigm, by transcending clientelism. Over time Rajkot's policy paradigm became climate friendly.

Aurangabad

In the case of Aurangabad, the policy paradigm was a climate regressive one. The city government lacked the capacity to overcome clientelism and effectively implement several policy instruments (e.g., mega water supply scheme, regularization scheme), with adaptation and mitigation co-benefits, which would have improved water security. The limited water adaptation instruments introduced (e.g., water supply scheme, and conserving rain water) were facilitated by the sub-national government with limited or no involvement of the urban local body. The city did not pursue any water mitigation instruments. In addition, there was a general lack of climate awareness and acknowledgment of climate co-benefits associated with existing and planned instruments within the urban local body. Powerful social forces (e.g., political class and private agencies) interfered with decision making processes and furthered their

¹²³ Firstly, by acknowledging climate co-benefits associated with existing instruments most of the problem associated with layering were addressed. Secondly, the bureaucrats, with the support of experts, understood how to frame policy proposals relating to climate change, and effectively channelised resources for the same.

interests. Due to inadequate bureaucratic puzzling and skewed political powering involving no social learning there was no evolution of ideas and clientelistic practices prevailed leading to escalating water insecurities. The inability to effectively pursue adaptation and mitigation instruments suggests that there was no policy change in Aurangabad.

1.4. Methodology

This section discusses the methodology used to finalize the two cases, and analyze the performance of the cities with respect to water supply management and climate action. The first part of this section highlights how the Mills method of difference was used to identify the two comparable cities. The second half of the methodology section discusses the use of historical process tracing to assess the influence of ideas, as opposed to material factors, in improving state capacity to further programmatic policies, and variation between the cities with respect to the policy paradigm.

1.4.1. Case selection methodology

The study uses a comparative research design to compare cities with respect to water security and climate action. Cities are the unit of analysis of this study. These cities are geographically discrete cases, which were compared across a common sector (water) and time frame (1990s till 2020). Following George and Bennett's (2005) definition of case study method¹²⁴, the study conducted a within-case analysis along with a comparison between the cases. By focusing on a small number of cases¹²⁵ this method of analysis allows an in-depth analysis of a large number of features within a particular case¹²⁶. This method helps in theory development and testing, along with identification of complex interactions and causality.

The method of structured focused comparisons was used to identify two fairly comparable cities¹²⁷ showing different outcomes with respect to the policy paradigms pursued. The method is focused as it selectively studies certain aspects of a case, and structured as data collection and analysis are guided by a general and standardized¹²⁸ set of questions (George, 2019). This

¹²⁴ Case studies enable conceptual refinement and validity along with the identification and assessment of variables, hypothesis, and causal mechanisms (George and Bennett, 2005).

¹²⁵ Case study analysis, focus on a small number of cases as compared to statistical methods (Lijphart, 1971).

¹²⁶ Gerring (2004) defines a unit/case as a spatially bound phenomena at a given point or over a period of time. This method helps trace the causal process longitudinally (see Gomm, Hammersley and Foster, 2000).

¹²⁷ It must be noted that it is impossible to find perfectly similar cities. In fact, there are variations within a city.

¹²⁸ In order to ensure controlled comparisons between selected cases it is useful to use standardized questions as it helps gather comparable data from the cases (George, 2019).

method is also known as the Mills Method of Difference. The method comprises of the comparison of (small n cases) two similar situations- one in which a phenomenon occurs and one in which it does not¹²⁹ (Lijphart, 1971; Skocpol and Somers, 1980; King, Keohane and Verba, 1994). This approach helped choose relevant variables by negating irrelevant variables and explains different outcomes (DV) between comparable cases. Based on local and sub-national/state level criteria (described below) two million plus, non-metropolitan and fairly comparable cities were identified, which varied¹³⁰ in their performance with respect to water security and climate action.

1.4.2. Case selection criteria

The case selection process comprised of two processes: a) selecting comparable sub-national/states, and b) finalizing medium sized cities. The subsequent section enlists the criteria for case selection.

State/region selection criteria

The following criteria are held constant to choose the sub-national/states:

- state with a high rate of urbanization (as per 2011 census) } First filter
- state performing above the national average in terms of socio-economic indicators }
- state with a State Action Plan on Climate Change (SAPCC) } Second filter
- state which has witnessed urban and climate (water) interventions } Third filter

Based on the first filter, high level of urbanisation deduced from a high percentage of urban population, the top five sub-national/states¹³¹ were identified. The subsequent filters (second and third) were applied to the top five urbanised sub-national entities/states. These states

¹²⁹ According to John Stuart Mill the method of difference involves comparing two instances which are “similar in all (relevant) circumstance except one” (Mill, 1869 p. 281). This method enabled scholars to use comparative history as a tool of causal analysis to refute alternative explanations and highlight the key causal argument (Skocpol and Somers, 1980). For instance, Brenner (1976) used the method of difference to study the variation in economic development across Europe overtime. Gary Hamilton (1977) studied the change in consumption patterns in China with respect to foreign products overtime, by using the method of difference. Similarly, the method of difference was used to compare industrialization in China and Japan overtime (Moulder, 1976).

¹³⁰ The causal variable and outcome or phenomena being examined vary between the cases (see table 6 in annexure).

¹³¹ Tamil Nadu (48.4 per cent), Kerala (47.7 per cent), Maharashtra (45.22 per cent), Gujarat (42.6 per cent) and Karnataka (38.7 per cent). As per the 2011 census, India has 31.1 per cent of urban population.

performed reasonably well in terms of select socio-economic and service delivery indicators. In addition, all five regions/states had a climate action plan, which was endorsed by the National Steering Committee on Climate Change. The next step involved narrowing two comparable regions/states. A third filter was used, based on a review of the number¹³² of service delivery related and climate interventions from 1990 till 2020.

Based on the above-mentioned criteria, Maharashtra showed the highest number of interventions followed by Gujarat, and Tamil Nadu. Considering the focus of this study, that is in-depth comparative analysis, and limitations in terms of resources and time constraints two¹³³ field sites were finalized- Maharashtra and Gujarat. Both regions/states were among the top five urbanized regions/states, and comparable in terms of socio-economic and service delivery indicators (see table 7 in annexure). Additionally, the two states/regions have a shared history of governance structures and institutional memory (both emerged out of the erstwhile Bombay presidency), which adds to the richness of comparison. Furthermore, the two regions/states adopted major urban policies (e.g., 74th CAA (1992), Jawaharlal Nehru National Urban Renewal Mission (JNNURM) (2005), Atal Mission for Rejuvenation and Transformation (AMRUT) (2015), Smart Cities Mission (2015)). In addition, the regions have drafted a State Action Plan on Climate Change. It is also important to highlight that Gujarat is the only region/state in India to have a dedicated department for climate change (established in 2009), which is headed by the Chief Minister of Gujarat.

The next step involved the identification of two comparable yet geographically discrete cities from the neighbouring regions. Among a range of cities within the two regions/states, the study prioritized non-metropolitan and million plus cities. The focus on medium sized¹³⁴ cities was because existing scholarly work especially with respect to cities and climate action has been limited to metropolitan cities (e.g., Mumbai, Delhi, Bangalore, Kolkata) of India.

¹³² Efforts were made to capture all relevant interventions in the realm of urban service delivery and climate change. However, there may be a possibility that some measures may have been overlooked due to lack available (online) information, which is not expected to significantly alter the existing number of urban interventions in the regions/states.

¹³³ A focus on two cases will ensure a more comprehensive analysis of each case.

¹³⁴ Medium sized cities are relatively less complex than bigger cities, and also more manageable to study.

Two cities from each region/state, Maharashtra and Gujarat, were identified based on certain criteria.

City selection criteria

With respect to finalizing two comparable cities the following criteria were held constant:

- city with a population between one lakh to ten lakh¹³⁵ (one million) and experiencing simultaneous development pressures from economic and population growth;
- land-locked city located in vulnerable ecosystem (e.g., semi-arid or an arid region experiencing low rainfall);
- considerable land-use transformation observed (e.g., increase in built up area and decline in green cover and water reservoirs).

According to the above criteria the two million plus and non-metropolitan cities finalized include- Rajkot in Gujarat, and Aurangabad in Maharashtra (see fig. 6 in annexure). Both cities are land-locked and located in arid or semi-arid regions- Rajkot is located in the arid Saurashtra region and Aurangabad belongs to the semi-arid Marathwada region. In addition, these arid and semi-arid regions experience scanty and erratic rainfall, and faced severe water insecurities (see table 8 in annexure). Furthermore, increasing urbanization accompanied by development compounded pressure on existing resources like water. Finally, Rajkot and Aurangabad experienced a significant change in their land use patterns (e.g., decline in water resource(s)) and a considerable increase in the built-up area) over a period of time (see fig. 7 and 8 in annexure). The cities belong to two highly urbanized regions/states with comparable socio-economic and service delivery indicators. Therefore, the two cities are fairly comparable on demographic, geographic, climatic characteristics and land use pattern. Despite commonalities, the cities vary with respect to water security and climate action.

Timeline of the study

The study intends to assess the influence of ideas within the state in influencing a policy paradigm. Therefore, a temporal analysis starting from the 1990s till 2020 was conducted to compare the cities with respect to water supply management and climate action. India's

¹³⁵ Class I C as per the 2011 Report on Indian Urban Infrastructure and Basic Services (Link: http://www.indiaenvironmentportal.org.in/files/Estimating%20Investment%20Requirements_Urban%20Infrastructure%20Services%20in%20India_HPEC%20Report_MoUD_2011.pdf).

liberalization (1991¹³⁶) was an impetus for the urbanisation process in the country. Several national policies and international agreements were introduced, which facilitated urban development and climate action, such as

1. the Central government put in place the 74th Constitutional Amendment Act (CAA) (1992) which led to decentralization of power from state and central to local level bodies¹³⁷,
2. India became a member of the United Nations Framework Convention of Climate Change (UNFCCC) in 1992 and ratified the Kyoto Protocol in 2002,
3. The Jawaharlal Nehru National Urban Renewal Mission¹³⁸ (JNNURM) (2005) was launched by the central government to foster development of cities. This is now re-named as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015,
4. The first climate action plan National Action Plan on Climate Change¹³⁹ (NAPCC) was initiated in 2008. This was followed by sub-national governments drafting State Action Plans for Climate Change,
5. The Smart Cities Mission was launched by the central government in 2015.

Variations between the cities

The two cities have to ensure water supply to all- which has been the overarching policy goal. Although both cities were governed under similar central level stipulations, Rajkot was able to introduce a range of adaptation and mitigation instruments to improve water security, while Aurangabad did not. Table 2 highlights the instruments implemented by the two cities from the 1990s till 2020.

Table 2: Urban water and climate measures

Aurangabad	Rajkot
<i>Climate measures and awards</i>	
Measures • Piloted solar PV on the corporation building • Action plan: solar city master plan Awards • Declared a Solar City	Measures • Climate Resilient City Action Plan ratified in 2019 • City level vulnerability assessment • Sector wise emissions inventory

¹³⁶ The census data in India becomes more standardised from the 1990s.

¹³⁷ Climate action and resilience building will be at the local level (cities) (Sharma and Tomar, 2010; Revi et al., 2014).

¹³⁸ A landmark intervention, the JNNURM sought into invest significant resources into building infrastructure for 65 cities as well as back up the infusion of capital through incentivizing states and cities to undertake reforms as mentioned under the 74th CAA. It has currently been continued in the form of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Smart City programme since 2015.

¹³⁹ Also, adaptation gained international importance in the 2000s after the 2007 Bali Action Plan, and the Cancun Adaptation framework (2009) with the former intervention bringing adaptation into the notice of the Indian state.

	- Action plans: low carbon mobility, pollution control, solar city, low emission development strategies - Climate awareness campaigns and exhibition organized for government officials and citizens - Energy Conservation Building Code implemented Awards - Declared a Solar City, 2008 - Member of Global Covenant of Mayors for Climate & Energy (since 2015) - National Earth Hour Capital Award, 2015-16 - One Planet City Challenge award, 2018 - Member of Gujarat Covenant of Mayors for Climate & Energy (since 2019) - One Planet City Challenge award, 2020
<i>Water adaptation instruments</i>	
- Augment and conserve water supply - one water supply scheme introduced by sub-national government parastatal agency - introduced a water supply scheme, facilitated by the sub-national government parastatal agency - Rainwater harvesting systems mandated through a common development control regulation, facilitated by the sub-national government - Reduce Non-Revenue Water (NRW) loss (several weak attempts to regularise illegal connections) - Improving water distribution system and implementing an additional water supply scheme (three failed attempts to improve water supply)	- Augment water supply - built new water reservoirs (e.g., dams), - redirected (irrigation) water for drinking water purposes - increased reservoir capacity (dam height increased, de-silted reservoirs, connected existing dams with an express feeder pipeline to ensure uniform water availability in all zones) - Conserve water - rainwater harvesting systems mandated through building bye laws - Strengthened water distribution system (built water storage and filtration tanks, strengthened existing and laid new water distribution networks) - Reduced Non-Revenue Water (NRW) loss (institutionalised a water check team, introduced a strict regularization scheme, upgraded existing pipelines, installed the Supervisory Control and Data Acquisition (SCADA) system to monitor water flow) - Monitor water consumption - metered (24*7) water supply
<i>Water mitigation instruments</i>	
- Conserve municipal finance - monitor energy consumption (irregular energy audits) - Energy conservation - solar water heating systems mandated through the common development control regulation, facilitated by the sub-national government	- Energy conservation - Monitor energy consumption (regular energy audits of water pumping machinery) - solar water heating systems mandated through the city's General Development Control Regulations (GDCR) - Energy efficiency and emission reduction - installed solar powered water treatment plant, - upgraded water pumping machinery, - decentralised waste water treatment plant

Source: data collected from field work in both cities

The cities vary in terms of the adaptation and mitigation instruments introduced. In order to understand this variation, it is imperative to trace the causal processes that explains the

evolution of ideas within the two urban local bodies and its influence on state capacity leading to policy change.

1.4.3. Methodology for analysis of cases

This section discusses the use of comparative process tracing to deductively¹⁴⁰ analyse the cases longitudinally to tease out causal processes connecting the research variables, and feedback mechanism. The two cases are fairly comparable¹⁴¹, yet their policy paradigms differ. Over time, Rajkot improved its water security and pursued climate action, whereas Aurangabad was unable to do so. The cases vary in terms of the cause (key focal/independent variable) and observed effect (dependent variable), which leads to different policy paradigms- climate friendly versus climate regressive paradigm. Historical processes were traced to show the influence of ideational churning within the city government on state capacity, which in turn influences the policy paradigm.

The study emphasizes the importance of ideas in ensuring effective service delivery. A temporal analysis¹⁴² helped delineate the influence of cognitive commitments (ideas) of policy makers (from material conditions/factors) on decision making processes. Among a variety of methods¹⁴³ used to understand policy making, the study used historical process tracing to show the relations between ideas¹⁴⁴ and policy execution. The cases were first analysed individually, and then compared with each other in terms of water policies over a common time frame. Process tracing¹⁴⁵, helped narrow the cause(s)¹⁴⁶ and establish causal relationship between the

¹⁴⁰ Through deductive reasoning, the focus is to assess an existing theory. This process involves coming up with certain hypothesis, making observations and confirming the theory.

¹⁴¹ At the state/sub-national level: socio-economic, political factors and service delivery indicators. At the city level: demographic, geographic, climatic factors and landuse change.

¹⁴² Linkages between the cause and outcome can be understood by writing history backwards (Bengtsson and Ruonavaara, 2017).

¹⁴³ A range of methods such as statistical correlations & regressions, counterfactual reasoning, and process tracing (see Yee, 1996) have been used to study policy making.

¹⁴⁴ Alan Jacobs argued that, ideational effects can be studied through 'long term longitudinal analysis' (Jacobs, 2015, p.23).

¹⁴⁵ Process tracing enables the examination of how a process took place (Gerring, 2007; Bennett, 2008; Checkel, 2008) leading to a particular outcome by assessing the evidence on processes, sequences, and conjectures (Bennett and Checkel, 2015). This method corresponds with that of solving a crime, whereby a detective uses available evidence (e.g. clues, suspects, motivations etc.) to explain the crime (Bennett, 2010).

Process tracing facilitates the following a) identifying and describing social & political phenomena, b) testing existing hypothesis & discovering new hypothesis (Bennett and Checkel, 2015; Beach and Pedersen, 2019), c) understanding causal claims & mechanism, and d) addressing challenges such as spuriousness, selection bias & reciprocal causation (Collier, 2011).

Process tracing can be applied to both micro and macro level analysis provided the causal path is uninterrupted.

¹⁴⁶ A single case is dissected into multiple interconnected (historical) sequences to understand causal processes between an independent variable (cause(s)) and the dependent variable (effect).

independent and dependent variables within a single case¹⁴⁷- thereby going beyond correlations¹⁴⁸. This method, qualitative in nature (Mahoney, 2010), helped investigate the implications of a causal process, including the causal mechanism¹⁴⁹ and chain¹⁵⁰ within a single case¹⁵¹, along with the motivation of actors and organisations. All potential alternative explanations for an outcome (equifinality)¹⁵² were tested using this method. Since process tracing studies the causal mechanism within a single case, the study employed comparative process tracing. Comparative process tracing is a two-step process that allows both within case and between case analysis of causal mechanisms (see Bengtsson and Ruonavaara, 2017). The first step involved identifying & reconstructing the historical accounts or paths (e.g., events, mechanisms, decision making processes) that connect the cause and effect within a case. This step helped understand the cause of policy paradigms pursued by Rajkot and Aurangabad. The second step involved dividing and organizing the temporal context, periodization (1990 till 2020), which facilitated comparison between the causal processes in different settings (cities). Thus, water adaptation and mitigation instruments implemented by Rajkot and Aurangabad were traced over a common time frame to identify the causal process explaining variation in policy paradigm.

1.4.4. Data collection

The unit of analysis of the study is medium sized non-metropolitan Indian cities¹⁵³. A major challenge of conducting a historical analysis of these cities is the availability of information. Data management has not been a priority for the two city governments studied here¹⁵⁴. The study draws evidence from intensive field work in Gujarat (Rajkot, Gandhinagar, Ahmedabad) and Maharashtra (Aurangabad and Mumbai). The study predominantly depends on

¹⁴⁷ Bennett and Checkel (2015) defined within-case evidence as evidence from within a temporal, spatial or topical domain.

¹⁴⁸ Process tracing establishes causal direction & chain of steps between the research variables that cannot be explained by statistical analysis (Bennett, 2010).

¹⁴⁹ A causal mechanism is a complex system that generates an outcome or behaviour as a consequence of interacting elements (Glennan, 1996 p.52). Causal mechanisms unpack the processes (Imai et al., 2011) or causal relationship/ phenomena (Gerring, 2010) connecting the research variables, that is the interlinkages between the independent and dependent variable (Falleti and Lynch, 2009).

¹⁵⁰ Causal chain is explained by the sequence of events that explain change and causations.

¹⁵¹ Bennett and Checkel (2015) defined within-case evidence as evidence from within a temporal, spatial or topical domain.

¹⁵² Process tracing overcomes the problem of equifinality, a disadvantage of controlled focused comparison method, and reduces the risk of omitted variable bias (George and Bennett, 2005).

¹⁵³ Official records, especially historical documents, are either not well maintained or destroyed or withheld from general public.

¹⁵⁴ Both city governments have only recently started digitizing data. With respect to data management Rajkot has been more systematic & organized as compared to Aurangabad.

interviews¹⁵⁵ to understand the perspectives of decision makers at the micro-level, uncover the political economy¹⁵⁶ (e.g., clientelistic and rent-seeking activities), and understand the process of policy making. Interviews are important to trace causal processes (George and Bennett, 2005), especially in case study research (Tansey, 2007). Specifically, elite interviews¹⁵⁷, include actors involved in policymaking (Boucher, 2017), enable corroborating existing findings, tracing political events¹⁵⁸, and understanding constructs (e.g., belief & value systems) of a group of political actors (Beamer, 2002). Interviews¹⁵⁹ were conducted with a range of stakeholders including government officials (local¹⁶⁰, state/sub-national¹⁶¹ and national¹⁶² level), retired bureaucrats¹⁶³ (local and state level), local citizen association group members¹⁶⁴, academics¹⁶⁵, international donor agencies¹⁶⁶ and civil society members (local¹⁶⁷ and national¹⁶⁸). Information was cross checked by asking a same set of questions to multiple respondents. Interviews are one of the qualitative research tools to acquire primary data from the field, especially when documentary evidence is limited or missing.

¹⁵⁵ The interviewees were assured that information or material procured by the researcher was for purely academic purposes. The material gathered would be processed, stored, and used in adherence to ethical norms applicable to academic research globally.

¹⁵⁶ Aseema Sinha (2005) argues that, such informal information cannot be captured through formal statistics.

¹⁵⁷ Popularly used to study politics associated with the state.

¹⁵⁸ Elite interviews help reconstruct political episodes by unraveling hidden or undocumented informal processes that preceded decision making (Tansey, 2007).

¹⁵⁹ Interviews had open ended questions and did not rely on a questionnaire. Additionally, one interview led to another- snowball sampling.

¹⁶⁰ The city bureaucrats interviewed included deputy engineers (10) and executive engineers (3) of water works department, executive engineer of electricity department (1), city engineers (6), town planning officials (5), deputy Commissioner (technical) (1), Commissioners (2). Additionally, interviews were conducted with other officials working with the urban local body including the personal assistants to the Commissioner (2), urban development project officers (4) and consultants (7), and accounts officers (4).

Local political executives interviewed included current (2) and former Mayors' (4), members of the standing committee members (8), water works committee members (2), and personal assistant to standing committee chairman (2). In addition, local councillors (12) were interviewed.

¹⁶¹ Government officials (7) involved in urban development schemes and programmes working at the sub-national level along with officials of parastatal agencies (3) were interviewed.

¹⁶² Government officials (2) working at the national level who were involved in urban development programmes and schemes were interviewed.

¹⁶³ Former bureaucrats working at the city level (e.g. executive engineers (3), town planning officials (2), Commissioners' (6)) and officials who worked at the sub-national (2) level were interviewed. Retired bureaucrats from the two cities provided historical information on decision making processes.

¹⁶⁴ Citizen association group members interviewed included builders (5), architects (3), education (1).

¹⁶⁵ Several academics (9) working on climate action, urban governance or regional governance issues were interviewed.

¹⁶⁶ Representatives from several donor agencies (6) at the national offices in Delhi were interviewed.

¹⁶⁷ Civil society members (11) working on water, climate and governance issues were interviewed.

¹⁶⁸ Non-governmental organization and research institute members (12) working on urban climate issues were interviewed.

Furthermore, information collected via interviews was complemented with available policy related material (e.g., government and NGO reports, meeting minutes, municipal resolutions & orders and newspaper articles) sourced from relevant organizations (e.g., government, research institutes). Additionally, national level information was collected from New Delhi. Data was collected in four field visits during August to September 2018, March to April 2019, August to November 2019 and February to March 2020. Given the dearth of information for the two cities, this research strategy helped collate comparable information, especially in terms of decision-making processes.

1.5. Introducing the dissertation: chapters

The study aims to understand the variation in policy paradigms pursued by comparable Indian cities. The first chapter contextualises the study and discusses the research puzzle, alternative explanations, theoretical framework and methodology. The subsequent three chapters focus on empirical findings from the two cities, along with a chapter that compares the cities and summarizes findings.

The introduction chapter focused on contextualising the purpose of the study -why comparable Indian cities facing similar governance challenges vary in their policy paradigms. A range of state, society and state-society centric theories were discussed as alternative explanations for the study. The study employs a state centric approach to argue that, improved state capacity, attributed to ideational evolution within the state, nudges the city towards a climate friendly paradigm by transcending governance challenges. Causal processes explaining a) ideational churning within the state due to puzzling and powering, and b) layered second order policy change have been discussed in detail. This is followed by the methodology section that describes the method (Mills method of Difference) used to identify the cases, analyse the causal processes within and across the cases (comparative process tracing), and collect empirical data from the field sites.

The second chapter traces Rajkot's water adaptation instruments from the 1990s till 2020. A range of policy instruments were introduced by the city government in an incremental and path dependent manner under the existing paradigm. Broadly, Rajkot's adaptation instruments include augmenting water supply, strengthening water distribution network including controlling non-revenue water loss, conserving available water, and monitoring water

consumption. Ideational churning within the urban local body improved its ability to pursue programmatic water adaptation policies despite the presence of powerful vested interest groups.

The third chapter focuses on Rajkot's mitigation instruments. The city implemented policy instruments such as installing energy efficient water pumping units, using solar energy for heating and treating water. In the initial years the policy instruments introduced prioritised energy conservation. However, the urban local body's commitment changed over time to accommodate GHG emission reduction concerns. Additionally, the city government acknowledged the adaptation and mitigation potential of existing and planned instruments through a climate action plan. Ideas within the state enabled the city government to choose and execute optimal mitigation instruments.

Rajkot's city government was able to improve its ability to transcend clientelism and implement adaptation and mitigation instruments with programmatic benefits due to ideational evolution within the state. The combination of bureaucratic puzzling and political powering changed thinking within the state which fostered a bureaucratic-political rationality favouring programmatic policies. Effective implementation of water adaptation and mitigation instruments nudged the city towards a climate friendly policy paradigm with improved water security and climate action. A layered second order policy change observed in Rajkot was facilitated by structural and endogenous factors, that is idea held by the city bureaucrats.

The fourth chapter discusses Aurangabad's water adaptation and mitigation instruments. With respect to adaptation, the city prioritised strengthening the water supply and distribution network. Although a range of policy instruments were proposed to improve the city's water supply, only a few instruments were executed- all facilitated by the sub-national government's parastatal agency. The urban local body was unable to execute programmatic adaptation instruments as it was inclined towards rent-seeking activities. Similarly, with respect to mitigation, the city took negligible efforts (facilitated by parastatal agency) to reduce its energy consumption with no focus on emission reduction. Additionally, the city government did not acknowledge the climate co-benefits associated with existing and planned instruments. The embedded particularistic state in Aurangabad lacked the capacity to pursue water adaptation and mitigation instruments. Ideas within the state did not evolve as bureaucratic puzzling was inadequate and political powering was skewed in the favour of material interests of vested

interest groups. Consequently, the city's policy paradigm was a climate regressive one with severe water insecurities and no climate action.

The final chapter of the thesis is divided into an analysis and conclusion section. The analysis section compares the cities with respect to the adaptation and mitigation instruments implemented. There is a variation not only in the number of instruments implemented by the two cities, but also in the approach of policy execution. The urban local bodies vary in terms of their capacity to pursue programmatic instruments, which influences their policy paradigm- Rajkot's climate friendly versus Aurangabad's climate regressive paradigm. The combination of bureaucratic puzzling and political powering lead to ideational evolution in Rajkot's city government. The bureaucracy in Rajkot was embedded autonomous and working as a cohesive unit to learn from previous experiences and design optimal policies, which were backed by political belief supporting programmatic policies. This fostered a bureaucratic-political rationality favouring execution of programmatic policies. On the other hand, there was no ideational churning within the city government in Aurangabad, as bureaucratic puzzling was inadequate and political powering was skewed. The embedded particularistic bureaucracy involving no learning from previous experiences was influenced by political beliefs favouring clientelism. Consequently, clientelistic practices prevailed leading to escalating water insecurities. The conclusion section summarises the thesis and reiterates the importance of ideas within the state on improving state capacity to execute programmatic policies. Learnings from the two cities could influence similar analysis on policy formulation and change in cities, especially of the global South.

Chapter Two

2. Rajkot's water adaptation action: an example of thinking and acting locally

2.1. Introduction

This chapter discusses how a medium sized non-metropolitan Indian city was able to build its capacity to become resilient against water scarcity by pursuing water adaptation measures. Many Indian cities located in arid and semi-arid regions face water scarcity due to depleting groundwater tables leading to reduced availability of water supply. Climate change, especially variations in temperature and precipitation pattern, will threaten urban water supply systems exacerbating existing insecurities. Rajkot, located in the arid Saurashtra region of Gujarat, is an illustrative example of the same as it has experienced acute water shortages since the 1970s (see table 14 in annexure). The city's inherent hydrogeological¹⁶⁹ and climatic characteristics, and rapid urbanization caused severe water insecurity. Implementation of new policy instruments to address water challenges were impeded by inter-connected governance challenges such as poor (technical and financial) capacity, minimal decision-making power, and clientelistic practices. This was coupled by the lack of a favourable climate governance framework supporting local action (see introduction chapter).

Rajkot was able to overcome these governance challenges and effectively implement new (adaptation) instruments. The city's paradigm became climate friendly over time¹⁷⁰- improved water security along with climate action. Climate adaptation action involves measures that help cope with climate impacts by addressing existing developmental objectives and adapting to the potential impacts of future climate extremes. The city's water adaptation measures can be broadly categorised as augmentation of water supply, conservation and efficient use of water- all of which cumulatively improved water supply over time, and had an adaptation co-benefit (e.g., improved water quality, availability and groundwater levels). Additionally, Rajkot not only acknowledged associated adaptation co-benefits, but also voluntarily institutionalized a

¹⁶⁹ The city has a hard sub-surface stratum leading to poor percolation of rainwater & recharge of groundwater, and disproportionate availability of groundwater. Additionally, there are no perennial water sources in or near the city.

¹⁷⁰ Rajkot transitioned from a situation of coping with recurrent water scarcity to one where water security improved, especially with respect to the provision of drinking water supply (e.g. daily supply of water). Additionally, the city has actively pursued climate measures.

Climate Resilient City Action Plan¹⁷¹ (CRCAP) (first city of Gujarat to do so)- all of which reinforced the city's vision to improve water security.

The chapter shows how the state at the local level in Rajkot was the main actor in improving water security and furthering climate action¹⁷². Using a state centric approach, the study attempts to demonstrate the following points: a) effective implementation of instruments is explained by improved state capacity. This improved capacity is explained by ideational churning within the state; ideas evolved through the process of bureaucratic puzzling and powering strategies, b) a layered second order policy change is observed in Rajkot- within paradigm change. Improved capacity enabled the city government to systematically¹⁷³ implement a range of policy instruments to achieve the policy goal under the existing paradigm- not a policy paradigm change¹⁷⁴. This policy change was driven by ideational evolution within the city government, that is due to endogenous factors. Additionally, this change is explained by structural as opposed to an agency driven argument, as ideas evolved within a group of city bureaucrats and was not limited to an individual actor.

The second section of this chapter briefly discusses the theoretical approach of the study, and situates the case of Rajkot's water adaptation trajectory in the framework. The third section briefly describes the methodology employed to collect data for the city. The next section provides an overview of the city including the local governance structure, water challenges and governance, and local and regional level politics. The fifth section discusses Rajkot's water challenges and associated adaptation measures introduced by the city government. Rajkot's water adaptation trajectory has been traced from the 1990s¹⁷⁵ till 2020 and divided into three phases (first, second and third). Finally, the chapter concludes by emphasizing the role the state

¹⁷¹ The city council sanctioned the climate action plan- a resolution was passed first by the RMC legislative branch (RMC, 2019a; RMC, 2019c) to institutionalize the plan.

¹⁷² Several state and non-state actors (see table 9 in annexure), each contributing differently, were involved in improving Rajkot's water security. However, the city government was the main actor as it is responsible for designing and executing water policies, and therefore responsible for the provision of water within the city's jurisdiction.

¹⁷³ The urban local body implemented policy instruments or techniques to address local water challenges. In the initial years the city was grappling with severe water shortages, so local water supply was augmented. Following which, several water conservation instruments were introduced to address the problem of inadequate water supply. Finally, instruments to monitor water consumption were being implemented along with an institutionalised climate action plan.

Peter Hall (1993) describes second order policy change as incremental and sequenced adjustments to existing policies without altering the overarching paradigm- layered change.

¹⁷⁴ The city government did not change the policy setting and overarching policy target.

¹⁷⁵ The point of departure of the project is from the 1990s (see details in introduction chapter).

at the local level in furthering and sustaining efforts of achieving (water) sustainability and resilience.

2.2. Theoretically contextualising Rajkot's water adaptation trajectory

This section situates the case of Rajkot's water adaptation measures within the theoretical model of the study. As mentioned in the introduction chapter, one of the major challenges impeding service (water) provision is clientelism. Typically, in a clientelistic setting service delivery is not uniformly distributed across a city, as certain groups receive targeted benefits and privileges in exchange for votes. For instance, in order to safeguard votes local councillors/politicians turn a blind eye to activities such as water thefts or excuse their wards from certain schemes (e.g., regularizing illegal water connections). Similarly, powerful councillors pressurise the city government to prioritise their wards over the vulnerable ones while executing instruments (e.g., upgrading water distribution pipelines). Furthermore, powerful vested interest groups (e.g., politically affiliated builders, contractors and private water tanker lobby) exert pressure on the city government to pursue their interests (e.g., acquire sizable contracts, truncate government schemes). This exploitative nexus of local actors, including local councillors and vested interest groups (local contracts, citizen groups, private water tanker lobby), interfere with the workings of the local body and impede policy execution causing disproportionate access to water. Coupled with this, city governments face other governance challenges like inadequate technical and financial capacities and poor decision-making power to implement local instruments. Also, urban climate action is often not acknowledged and pursued by city governments, nor adequately supported by the domestic governance framework (e.g., no urban climate policy or institution) in India.

Over time Rajkot transitioned from being water scarce to a city with improved water security (e.g., regular municipal water supply to all), and promotion of climate action- a climate friendly paradigm. This transition is attributed to the ability of the city government to address its governance challenges and effectively implement water adaptation measures. As illustrated in the introduction chapter, gradual and path dependent evolution of ideas within the city government improved the capacity to meet stated objectives, that is water supply to all by controlling clientelism. Ideational churning within the state is attributed to the combined effect

of bureaucratic puzzling¹⁷⁶ and political powering¹⁷⁷ (see Heclo, 1974). This process changes thinking within the city government, which engenders a bureaucratic-political rationality in favour of a particular policy benefitting all citizens. Policies could be effectively implemented only when bureaucratic and political rationality are synergised. Furthermore, bureaucratic puzzling is influenced by the administrative tradition¹⁷⁸ and social learning¹⁷⁹, while political beliefs¹⁸⁰ influenced political powering strategies.

Rajkot's administrative tradition- an embedded autonomous bureaucracy working cohesively- along with learning from previous policy experiences strongly influenced the bureaucratic puzzling process. With respect to social learning¹⁸¹, the city bureaucrats were often assisted by domain experts both from state and non-state actors¹⁸² to understand societal needs better, access new information¹⁸³, and disseminate information¹⁸⁴ to citizens. It must be highlighted that these actors were invited on an ad hoc basis to support the city government (e.g., for a particular project, meeting, workshop), and were not a permanent committee or advocacy network. Engagements with domain experts embeds the state within the society, which helped

¹⁷⁶ Puzzling involves development of shared understanding of the policy challenge(s), and identifying relevant solution(s) from a range of policy choices. This process influences municipal agendas and leads to the formulation of clearly defined policy proposals.

¹⁷⁷ Policy proposals can only lead to effective adoption and execution if they are backed by relevant stakeholders- powering strategies.

¹⁷⁸ Administrative tradition is influenced by the type of bureaucracy- an embedded autonomous bureaucracy (see Evan, 1995) working as a cohesive unit- favoring programmatic policies versus one which is fragmented and embedded particularistic (see Herring, 1999)- favoring clientelistic policies.

¹⁷⁹ Policy making can be an outcome of learning from previous policies and access to new information. Social learning often leads to programmatic policy choices that benefit all citizens.

On the other hand, there can be no learning within city governments, which leads to clientelistic policy choices.

¹⁸⁰ Political beliefs could favor either programmatic or clientelistic policies.

¹⁸¹ Policy formulation reflects learning from previous policies. For instance, given the city's lack of adequate water supply leading to water insecurities, the city government proposed to introduce several water supply schemes. Similarly, the city government pushed forth the notion of mandating rainwater harvesting systems to improve the groundwater levels of the city. Also, existing norms of acquiring water connections were simplified to encourage citizens to legalise their illegal connections or acquire new ones.

¹⁸² Domain experts acted as information generators and provided technical assistance. For instance, the city officials of Rajkot engaged with multiple state (e.g., retired bureaucrats, members of the Gujarat Climate Change department) and non-state stakeholders (e.g., non-governmental organizations, citizen group members, academic partners, members of the chamber of Commerce) to review and deliberate on the climate resilient city action plan. Similarly, the city bureaucrats invited members of the citizen association group particularly builders and architects while modifying the development control regulations to mandate rainwater harvesting systems in all new buildings.

¹⁸³ The government engaged with academic partners and research organizations to acquire information about new techniques.

Additionally, NGOs occasionally assisted the city government with capacity and network building activities, piloting projects along with collating and disseminating information.

Often, international actors, mainly multilateral agencies, provided technical and financial assistance for piloting new instruments.

¹⁸⁴ The local media, including television newspapers and radio, was used to spread awareness and sensitize citizens.

design socially optimal policies. Despite being embedded within the society the city government was able to autonomously formulate policy proposals and execute them. The process of learning enabled the city government to identify challenges leading to water insecurities (e.g., geomorphological and climatic issues), and inability to address these challenges (governance issues such as clientelistic practices). Following which, the bureaucracy puzzled and powered over policy choices.

Puzzling strategies in Rajkot mainly involved the city bureaucrats (e.g., deputy and executive engineers of respective departments, city engineers, and headed by the Municipal Commissioners'). Almost all Commissioners of Rajkot prioritised water supply practices and personally supervised the execution of instruments (e.g., supply of water within the city jurisdiction, implementing the regularisation scheme). Several city officials (deputy engineers of water works department, city engineers, and deputy Commissioner) during interviews confirmed that, "*Rajkot's Municipal Commissioners prioritised water issues*", and "*the city government has had dedicated officials who collectively addressed water issues*". Driven by the strong memory of water crisis, the city bureaucrats¹⁸⁵ (e.g., water works and town planning department) collectively deliberated over the policy problems. As a result of collective puzzlement, the nature of problems was identified- lack of local water sources, depleting ground water tables, high Non-Revenue Water¹⁸⁶ (NRW) loss, inadequate municipal water supply, and high-water consumption levels- all of which were causing water insecurity in the city. Consequently, technically feasible solutions (e.g., designing new and re-designing existing policy instruments) that built on previous policies were identified and proposed by the city bureaucrats. Broadly, the adaptation measures recommended by the bureaucrats included a) augmenting water supply¹⁸⁷, b) conserving water supply¹⁸⁸, and c) efficient water

¹⁸⁵ Bureaucrats are involved in both policy formulation and implementation (Knill and Tosun, 2012).

¹⁸⁶ NRW loss involves unbilled water consumptions, and losses with respect to system input volume (Jang, 2018).

¹⁸⁷ Some of the water augmentation instruments included constructing local water reservoirs (e.g. dams), sourcing water from alternative water sources (e.g. redirected (irrigation) water for drinking water purposes), and increasing reservoir capacity (dam height increased, de-silted reservoirs, connected existing dams with an express feeder pipeline to ensure uniform water availability in all zones).

¹⁸⁸ Several instruments were introduced to conserve and improve the city's water supply. For instance, rainwater harvesting systems were made mandatory by modifying building byelaws.

The existing water distribution networks was upgraded (e.g., water storage capacity was improved, more durable water distribution pipelines were installed).

Also, NRW loss was controlled (e.g., installed the Supervisory Control and Data Acquisition (SCADA) system to monitor water supply transmission, institutionalised a water check team, regularised illegal water connections, simplified administrative process of acquiring water connections, replaced water distribution pipelines).

consumption¹⁸⁹ and institutionalising a climate action plan¹⁹⁰. Additionally, the city government recognised the adaptation potential of existing and planned measures, and formulated a consolidated climate action plan. These adaptation measures involved policy adjustments such as introducing new policy instruments to achieve the overarching policy goal of ensuring “water supply to all”. Furthermore, puzzling strategies also resulted in the urban local body harnessing and customising domestic (centre and sub-national/state level) schemes and programmes to implement adaptation instruments to address local water challenges.

The political belief held by the political executives favoured adaptation measures benefitting all citizens, as opposed to clientelistic policies. This belief guided powering strategies within Rajkot’s urban local body. Effective execution of policy proposals needed adequate support of relevant stakeholders, especially the political executives. Bureaucrats mobilized support, through clearly defined policy proposals, of the legislative branch, that is the mayor’s office and the Standing Committee members. Multiple stakeholders, both state and non-state actors, during interviews emphasised that, “*political will and commitment was very important for effective implementation of interventions*”. The political executives assess political acceptability before approving policy proposals either as a resolution or an order, and accordingly sanctioning the budget for policy execution. Political powering not only backed technical thinking (e.g., adopting policy proposals), but also influenced in non-technical ways (e.g., transcended clientelism¹⁹¹ and rent-seeking activities¹⁹², mobilized citizens¹⁹³, local councillors¹⁹⁴ and sub-national¹⁹⁵ government to support policies). Backing of Rajkot’s political executives insulated bureaucrats from any form of pressure or interference (e.g., regularising illegal water connections, modifying building bye laws to mandate the use of rainwater harvesting), thereby enabling effective execution of proposed adaptation measures.

¹⁸⁹ The city is piloting 24*7 metered water supply to check the water consumption levels.

¹⁹⁰ As part of the climate action plan the bureaucrats, aided by experts, acknowledged climate adaptation co-benefits associated with existing and planned policy instruments, and the relevance of incorporating climate goals with municipal objectives.

¹⁹¹ Support of the political executives enabled bureaucrats to introduce strict enforcement rules without any pressure from local councillors who try to truncate schemes (e.g. regularization scheme).

¹⁹² Due to political backing bureaucrats were able to follow the tendering process (lowest bidder acquires tender contract) without being manipulated by vested interest groups (politically affiliated contractors, builders) trying to acquire installation contracts.

¹⁹³ The political executives sensitized citizens through media about local policies being implemented by the RMC (e.g. regularization scheme, modification of building byelaws) to mobilize their support.

¹⁹⁴ The mayor’s office, especially the standing committee members would mobilise local councillors to support policy decisions, and also convince citizens in their wards to promote uptake of instruments (e.g. regularize illegal connections, upgrade water distribution pipelines, rainwater harvesting systems).

¹⁹⁵ Political executives, the mayor or chairman of standing committee, would appeal to the Gujarat government to support Rajkot’s policies or follow up approval of sub-national government schemes and policies.

Also, the political executives not only actively supported technocratic policy ideas, but also mobilised the Gujarat government to improve the city's drinking water supply (e.g., during a crisis water was diverted to Rajkot from other cities or originally reserved agriculture, and local measures supported through state/sub-national government schemes and policies). Moreover, with respect to explicit climate measures the mayor actively participated and represented the city at multiple climate forums (e.g., Member of the Global Covenant of Mayors for Climate & Energy). This awareness and proactiveness amongst the political executives leveraged climate efforts within the bureaucracy. Rajkot's legislative branch backed (programmatic) adaptation policies over clientelistic ones both during the planning and execution phase, as water was politicised and hence adequately prioritised.

The combination of bureaucratic puzzling and political powering changed thinking within the city government. Ideas within the city government evolved gradually to address prevalent water challenges. Unlike the case of Aurangabad facing similar water challenges (discussed later in the thesis), the city government in Rajkot prioritised and systematically invested in the water sector¹⁹⁶ given that it is fundamental for survival and growth. In the 1970s and 80s, the urban local body introduced contingency measures to deal with water crisis. However, in the 1990s the city government prioritised augmentation of the city's water supply. Following which, the urban local body prioritised conserving water between the mid-2000s as NRW loss was high, municipal water supply was falling short, and groundwater was not a very sustainable source to meet growing needs. From 2017 onwards, apart from conserving the city's water supply and strengthening water holding capacity of reservoirs, the government also introduced measures to keep a check on water consumption levels. Additionally, a climate action plan was voluntarily incorporated into the existing municipal agendas to further the city's climate commitment¹⁹⁷. Various stakeholders (e.g., RMC officials, academics and local media personnel) emphasized that, "*the bureaucratic and legislative arm of the urban local body frontally addressed water issues of Rajkot given its universality*". Ideational churning within the city government created a synergised bureaucratic-political rationality in favour of making policy adjustments to control clientelism and improve water supply for all citizens. Thus, the urban local body was able to build its capacity to control clientelism and incrementally introduce adaptation instruments to address its water challenges.

¹⁹⁶ Rajkot's municipal agendas and budgets reflect that water was prioritised by the city government.

¹⁹⁷ The existing ideology of improving water supply for all evolved further to incorporate climate concerns.

A layered second order policy change is observed in Rajkot, which is attributed to endogenous and ideational factors. According to Peter Hall (1993), a second order policy change involves a change in the policy instrument to achieve the overarching policy goal. Despite the presence of powerful social forces (e.g., local councillors, citizen groups including builders and architects, private water tanker lobby), the urban local body incrementally made policy adjustments by introducing several adaptation instruments to improve water security for all. For instance, in the initial years the urban local body introduced policy instruments to augment water supply¹⁹⁸. After which, the city government prioritised improving the municipal water supply through water conservation techniques¹⁹⁹. In recent years, the urban local body made provisions to efficiently use water²⁰⁰, and institutionalised a climate action plan²⁰¹ which reinforced the prevalent policy paradigm. New policy instruments were used to achieve the existing policy target- water supply for all. The policy setting, that is the level at which policies are implemented, and the policy goal were unaltered. Rajkot's adaptation story does not exemplify a radical and incommensurable policy paradigm change, but shows a second order policy change- within paradigm change.

The second order policy change occurred in a layered manner. The new or re-designed policy instruments were incorporated incrementally and in a path-dependent manner under the existing paradigm, without replacing it. Additionally, the climate action plan was attached to the prevalent municipal agenda without changing it. Until recently, the city government was pursuing disaggregated policies without recognising the associated climate co-benefits- first layer. However, in 2019, the state acknowledged interlinkages between developmental objectives and climate adaptation co-benefits reflected in a consolidated climate action plan, which was voluntarily incorporated into the local agenda- second layer.

¹⁹⁸ Some of the water augmentation instruments included building new water reservoirs, improving water holding capacity of existing reservoirs, re-directing water from other cities and reserved for agriculture.

¹⁹⁹ The conservation instruments included expanding and upgrading the existing water distribution network (e.g. built water storage & filtration tanks, installed durable water distribution pipelines), reducing the NRW loss (e.g. formulated a water check team, regularised illegal water connections, installed bulk water monitoring system), and harvesting available water (e.g. mandating rainwater harvesting systems).

²⁰⁰ The city is piloting 24*7 metered water supply.

²⁰¹ The climate action plan comprised of a detailed vulnerability assessment and solutions to improve resilience. Apart from explicit climate measures, the urban local body recognized climate co-benefits associated with existing and planned developmental measures.

The layered policy change is attributed to ideational evolution within the city government (endogenous factors), particularly a group of city bureaucrats (structural factors). Rajkot's policy measures were not driven by materialistic factors such as gaining power or by pecuniary interests. For instance, water has been a political issue in Rajkot and every political party strived to improve the city's water security. Additionally, the city government including the bureaucrats and political executives prioritised improving the city's water supply, without being compromised by vested interest groups. Furthermore, the change in policy was driven by endogenous factors, that is ideational churning with the state at the local level. Ideas within the state evolved gradually (discussed above), leading to the adoption of several (adaptation) policy instruments to control clientelism and improve water security. More specifically, ideas within the city bureaucrats²⁰² influenced formulation of policy proposals under the supervision of committed Municipal Commissioners'. These proposed water policy instruments were effectively executed due to strong support of the legislative branch in Rajkot. In addition, ideational evolution enabled bureaucrats to identify and adopt domestic policies to local setting. The central and sub-national government influenced local measures by providing financial & technical assistance. Similarly, international donor agencies only facilitated research and pilot studies, which assisted city officials while formulating policy proposals. Occasionally, non-governmental organizations assisted the urban local body with capacity & network building activities (e.g., conducting training workshops), and in documenting and disseminating information. Thus, Rajkot's policy measures were driven by ideas shared by a group of city bureaucrats who were backed by local political executives.

2.3. Data collection in Rajkot

This section discusses the methodology employed to collect data from the city. Given that Rajkot is a medium sized non-metropolitan city, the information available was limited and scattered²⁰³ (see fig. 16 in annexure). Therefore, this empirical chapter uses data obtained from in- depth engagements with the field (Rajkot, Gandhinagar, Ahmedabad (Gujarat), and New Delhi, India). This engagement with the field helped process trace the policy instruments and causal mechanism from the 1990s till 2020. Field work involved sourcing available

²⁰² Within the city government, it was the bureaucrats managing sectors like water, electricity and town planning, as opposed to those affiliated with the environment department, involved in pursuing water adaptation measures. Also, the decision to voluntarily institutionalise a climate action plan by incorporating climate objectives into existing developmental goals was spearheaded by the local bureaucrats, without any mandate to do so.

²⁰³ Data management is not a priority issue for ULBs. Additionally, digitization of data especially of past records is poor especially in medium sized cities studied here.

information (government reports, NGO reports, policy documents, and newspaper articles) from relevant organizations (government, research institutes). Also, empirical material was collected through expert interviews with government officials (local²⁰⁴, state/sub-national²⁰⁵ and national²⁰⁶ level), retired bureaucrats (local²⁰⁷ and state/sub-national²⁰⁸ level), citizen association group²⁰⁹ members (e.g., builders, architects, education), academics²¹⁰, and civil society²¹¹ members (local, state and national), and local councillors. Since the focus of the study is on tracing decision-making at the local level, interviews helped trace the processes such as puzzling and powering within the city government, which were not documented. It must be noted that field work analysis involved transcribing interviews, translating documents²¹², and reviewing collated information.

2.4. Rajkot city: an overview

This section briefly discusses Rajkot's profile in terms of geographic, demographic, economic and political factors. In addition, the section also highlights the city's water challenges & institutional framework.

2.4.1. About the city

Rajkot²¹³, one of the four million plus cities of Gujarat²¹⁴, is located in Saurashtra, a semi-arid region in Gujarat state, (see fig. 9 in annexure). The city is the political and economic²¹⁵ centre of Saurashtra region (RMC, 2012a).

²⁰⁴ City level bureaucrats interviewed involved- deputy engineers (5) and executive engineer (2) of the water works department, executive engineer of electricity department (1), city engineers (6), town planning officers (4), urban development project officers (4), consultants (4), accounts officers (2), Deputy Commissioner (technical) (1), personal assistant to Commissioner (1), Commissioner (1).

Additionally, members of the political arm of the urban local body were also interviewed. The Mayor (1), standing committee members (5), water works committee members (2), personal assistant to standing committee chairman (1), local councillors (9).

²⁰⁵ Officials working at the sub-national level were interviewed (5).

²⁰⁶ Officials in charge of urban development projects at the national level were interviewed (2).

²⁰⁷ Former Commissioners' (4), executive engineers (2), town planning officials (2), and Mayors (3) were interviewed.

²⁰⁸ Former officials working at the sub-national level were interviewed (2).

²⁰⁹ Members of citizen association groups were interviewed (builders (3), architects (2), and education (1)).

²¹⁰ Several academics working on Rajkot's urban water, climate and governance issues were interviewed (7).

²¹¹ Members of civil societies (5), non-governmental organizations and research institutes (6) were interviewed.

²¹² Majority of the information collected was in regional language, and these had to be translated into English.

²¹³ The city has a population of 1.3 million (Census, 2011) and an area of 127 square kilometres (sq. kms). Since the 1990s Rajkot's population has almost tripled, close to 16 lakhs today (see table 10 in annexure). Over time, the demand for water supplied has increased and existing water supply schemes became insufficient.

²¹⁴ The other million plus cities of Gujarat include Ahmedabad, Surat and Vadodara.

²¹⁵ The economic growth of the city is attributed to industrial, and trade activities (CapaCITIES, 2018) accompanied by a booming real estate and construction industry (RMC, 2012a). Rajkot has emerged as a manufacturing hub for many industries. Additionally, as per the City Corporate Plan (RMC, 2010a) majority of

The Rajkot Municipal Corporation (RMC) is the main governing agency responsible for the provision and maintenance of the city's civic infrastructure (e.g., water, housing, transport, waste, energy etc.), and administration (as per multiple laws listed in box 1). The corporation comprises of a legislative branch (elected body of councillors, who are members of either the General Body or the Standing Committee, Water Works Committee headed by a mayor), and an administrative branch (headed by a Municipal Commissioner and assisted by a set of bureaucrats manning different departmental responsibilities) (see fig. 10 in annexure). The Municipal Commissioner identifies priority sectors and sets a vision for the city²¹⁶. The city bureaucrats formulate policy proposals and tender contract²¹⁷. Additionally, policies are executed by the bureaucrats once adopted by the legislative branch. The mayor's office approves policy proposals in the form of resolutions or orders, and sanctions budget to execute policy measures. For the purpose of this study the RMC is the key stakeholder involved in water policy measures.

2.4.2. Water challenges

Water scarcity was a major issue in Rajkot. The city, like most areas located in semi-arid regions had a history of severe water scarcity. Rajkot experienced four severe water crises in 1973-74, 1986-87, 1999-2000 and 2012-13. This has been compounded by the lack of a perennial water source & limited supply of local water²¹⁸, weak water supply distribution network²¹⁹, high Non-Revenue Water²²⁰ (NRW) loss, and water wastage.

Rajkot's workforce (77 per cent) is involved in manufacturing, trade and service sectors. This development parallels the focus of the Gujarat government since the 2000s- strengthening the manufacturing sector.

²¹⁶ The Commissioner can also issue orders (do not require legislative approval) with respect to water measures.

²¹⁷ The city bureaucrats formulate a tender contract after a policy proposal is approved/adopted by the legislative branch.

²¹⁸ This can be attributed to scanty and erratic rainfall patterns (annual average is 500mm), and the rocky soil strata (RMC, 2012a; CapaCITIES, 2018), which limited natural water percolation.

This resulted in intermittent availability of groundwater in the city, whereby deeper wells were drilled to acquire water. Hence, Rajkot predominantly depended on surface water from local reservoirs (dams and lakes) and other rivers like Bhadar and Narmada, especially during the summer months.

²¹⁹ Like most Indian cities, Rajkot relied on old systems to provide water to an increasing population, which were inadequate, and old leading to water loss and contamination (e.g. leakage in pipelines, mixing of waste water with drinking water).

²²⁰ NRW is the water lost from unbilled authorised consumptions, and losses with respect to system input volume (Jang, 2018). The city witnessed significant service delivery failures due to water theft (e.g. illegal water connections and direct pumping of water). The nexus of actors- executive, political and private- in the city contributes to the clientelistic environment. For instance, the politically affiliated elected representatives (councillors) safeguard their vote banks by deterring implementation of certain instruments, and turning a blind eye to illegal activities. Similarly, the technocrats are influenced by political pressure and prioritise implementation of instruments in certain localities leading to disproportionate service delivery.

These challenges are exacerbated by fragmented and inadequate capacities (e.g., financial, technical) within the city government. Most urban local bodies in India grapple with the above-mentioned challenges resulting in poor service provision and water insecurity. Despite these complex and interwoven problems, the urban local body in Rajkot took significant and long-term measures to address clientelism and improve the water security. Given the water challenges of the city the water sector was always a priority for the city government.

2.4.3. Water supply governance

Rajkot²²¹ sources drinking water from different (surface) sources - dams (e.g., Aji, Nyari, Bhadar and Narmada), and lakes (e.g., Lalpari and Randarda lake)- located within a distance of 5 to 65 kms (see fig. 11 & table 11 in annexure). The domestic users are the major water users²²² (RMC, 2012; RUDA, 2031) (see fig. 12, 13, 14 and table 12 in annexure).

The RMC, particularly the water works department²²³, is responsible for providing portable drinking water within the city limits²²⁴. The department under the supervision of the Municipal Commissioner collectively works on designing and implementing policy measures. Residents receive water for precisely 20 minutes per day, and the current water tax for residential users is INR 840, and for non-residential users is INR 1680 per year (see table 13 in annexure).

Furthermore, since water is a sub-national/state subject, is it the responsibility of the Gujarat government to provide bulk water to cities, including during water shortages. Also, since cities lack the (technical and financial) capacity to implement large scale interventions such as constructing water reservoirs, the sub-national/state government assists cities with such interventions.

²²¹ Rajkot has a hot and dry climate, and receives an average of 500 mm of rainfall annually (RMC, 2006; RMC, 2010a; RUDA, 2031).

²²² Given the water scarcity situation, the corporation does not encourage (drinking water) demand from industrial and commercial consumers (RMC, 2010a).

²²³ The water works department reports to the administrative head, the Municipal Commissioner. Each administrative zone (see fig. 9 in annexure) of the city is supervised by a city engineer who is supported by deputy engineers, who are supported by assistant engineers and work assistants (see fig. 15 in annexure). Furthermore, the urban local body employs close to 100 valve operators (patrollers).

²²⁴ This includes the operation of head-works and the corresponding distribution networks.

2.4.4. Regional politics

At the local and state level, the Bharatiya Janata Party (BJP) and the Indian National Congress (INC) have been the primary competing political parties, with some representation from the Bahun Samaj Party (BSP) and independent leaders. However, one political party, the BJP, has had a strong hold in Rajkot. The city has been the base of the Bharatiya Jana Sangh party²²⁵ for over four decades. Since the 1990s, except for a few years, the BJP has been in power in Rajkot due to the support of the once powerful oil lobby. A party competition or centre- state/sub-national relations explanation cannot explain Rajkot's success (explained in the introduction chapter). Furthermore, both economically and politically, Rajkot has been a gateway to the Saurashtra region of Gujarat. Eleven of the 33 districts of Gujarat fall in the Saurashtra region, and the region boasts 56 out of Gujarat's 182 assembly seats.

At the sub-national/state level the BJP has been in power since 1995, except for a brief period from October 1996 to March 1998 when the Rashtriya Janata Party was in power. Also, the city and Saurashtra region had strong political representation at the sub-national/state level. Major sub-national/state level leaders (e.g., Mr Keshu Patel, Mr Vaju Valla, Mr Vijay Rupani, Mr Narendra Modi etc.) were elected from Rajkot. Consequently, Rajkot's drinking water needs were prioritized by the sub-national/state (through state/sub-national sponsored schemes²²⁶).

2.5. Rajkot's water adaptation trajectory

This section discusses Rajkot's water adaptation trajectory that have been traced from the 1990s (point of departure) till 2020. Rajkot emerged as a water secure and climate conscious

²²⁵ The Jana Sangh party was a right-wing political party (popular between 1950s till the 1970s), and predecessor of BJP in the 1980s.

²²⁶ All political leaders supported introduction of new policy instruments to improve Rajkot's water security. For instance, Mr Keshu Patel, former Chief Minister of Gujarat (1995, 1998-2001) belonged to Saurashtra region, and supported water conservation initiatives in the region (e.g., building check dams in the Saurashtra region under the Sardar Patel Sahabhagi Water Scheme). Similarly, Mr Vaju Valla, former Member of Legislative Assembly (MLA) from Rajkot constituency and Cabinet Minister in the Gujarat Government (held positions such as Minister of Finance, and Labour and Employment), had as the Mayor of Rajkot ensured that the city had adequate drinking water especially during a water crisis (e.g. facilitated transporting water from Gandhinagar to Rajkot). Both the former and current Chief Ministers of Gujarat, Mr Narendra Modi (2001- 2014) and Mr Vijay Rupani, MLAs from Rajkot constituency, launched schemes to improve water security especially in drier parts of Gujarat (e.g Saurashtra, Kutch).

Provision of drinking water has been the main priority of the state/sub-national government, this is followed by providing water for irrigation and commercial usage. The RMC (2010) shows that during scarcity years Rajkot has acquired water due to the support of the state/sub-national government which re-directed some water for drinking water purposes from reservoirs reserved for irrigation (e.g. Aji III, Demi I & II and Fophal dam). Furthermore, the Wakaner intervention rescued Rajkot from crisis, but the village in Wakaner (and neighbouring villages) started experiencing a water shortage (Down to Earth, 2002). Similarly, water was transported by trains from Gandhinagar to meet Rajkot's water needs.

city by overcoming governance limitations common to most Indian cities. The city had a memory of acute and recurring water shortages, which led the city to make several policy adjustments to control clientelism and improve water security.

Several policy techniques or instruments adopted by the city qualify as adaptation measures²²⁷. Based on the dominant ideology driving policy instruments, Rajkot's water adaptation trajectory is divided into three phases: a) the first phase (1990-2003): augmentation phase, b) second phase (2004- 2016): conservation phase, and c) third phase (2017- 2020): efficiency and climate action phase. One common factor across the three phases was the ideation to improve water security for all. In the first phase, driven by a memory of water shortages, the city prioritised strengthening its local water sources, since there was no perennial source of water. In the second phase, policy instruments focused on conserving water to address local challenges such as old and inadequate water distribution networks. In the third phase, the city continued to augment its water supply and improve the distribution networks. Additionally, efforts were made for efficient water consumption and reduction of water loss, along with the ratification of a climate action plan.

This section explains how ideas within the city government evolved through the process of bureaucratic puzzling and political powering. The bureaucracy was cohesive and embedded autonomous, while political beliefs held by the political executives favoured programmatic policies. This ideational churning improved the capacity of the state to overcome oppositional forces and effectively execute adaptation instruments benefitting all citizens. Additionally, a layered second order policy change is observed, as several new adaptation instruments were introduced in an incremental manner under the existing paradigm, without altering it. This policy change is attributed to ideational churning within the city government (endogenous and structural factors).

2.5.1. First phase: 1990- 2003 (augmentation phase)

The first phase is characterised by instruments to augment the city's water supply. Since the 1970s, Rajkot's water challenges included a lack of perennial water source, and inadequate water supply schemes to meet growing needs. Additionally, the city had witnessed several

²²⁷ Most of the water related measures had a climate adaptation co-benefit, the potential of which was acknowledged in a climate action plan.

water crises, which resulted in the introduction of short term and expensive contingency measures²²⁸. Following puzzling strategies, the introduction of new policy instruments (e.g., modified existing and designed new water supply schemes) under the existing paradigm seemed to be the most technically feasible option. The urban local body made some efforts to introduce policy instruments since the 1970s, which gained momentum from the late 1980s- reflected by the range of augmentation instruments introduced (refer to table 3 in annexure).

Some of these new instruments were met with opposition, especially from the villages whose (agricultural) water needs were curtailed to address Rajkot's water needs. The administrative and legislative branch worked as a cohesive unit to improve the city's water supply. Since water has been a political issue, Rajkot's legislative branch backed technocratic policy proposals of augmenting water supply, which would benefit all citizens. The local political executives mobilised the Gujarat government to support the city's drinking water needs through schemes and programmes, which helped overcome any opposition. Interviews with officials of the Gujarat Water Supply and Sewerage Board (GWSSB) suggested that, "*drinking water was a top priority for the Gujarat government*". The urban local body, occasionally supported by the Gujarat government, effectively implemented instruments to augment the city's water supply. Although, these measures included an adaptation co-benefit (e.g., improved water tables and availability of water), the city government had not acknowledged the interlinkages in this phase.

a. Policy instrument: water supply schemes

The city government introduced several policy instruments since the late 1970s to augment water supply. The water supply schemes introduced included constructing water reservoirs (e.g., Nyari I dam in 1975), and reserving and redirecting irrigation water for drinking water purposes (e.g., Lalpari and Randarda lake in 1983-84; Bhadar dam in 1988-89; Nyari II dam in 1998-99). Additionally, from the early 2000s the city acquired additional water (e.g., at Raiyadhar water treatment plant in 2003-04) from Narmada River under a sub-national government sponsored scheme (Sardar Sarovar project). All water supply schemes were introduced under the existing paradigm, without altering it.

²²⁸ Contingency measures mainly involved sourcing water from reservoirs outside the city. For instance, the water was sourced from irrigation dams which was reserved for irrigation purposes (1973-74), transporting water from other cities by trains (1986-87), sourcing groundwater from surrounding villages (1999-2000), and depending on water from perennial rivers like Narmada (2012-13) (see table 9 in annexure).

Puzzling over water supply schemes

Rajkot's bureaucrats, especially from the water works department, collectively deliberated over the water challenges (e.g., inadequate water supply schemes, no perennial water source) the city faced. Additionally, the bureaucrats realised that significant municipal resources (e.g., cost of sourcing and treating water) were being expended in sourcing water from outside the city²²⁹ to meet local water needs. Interviews with deputy engineers of the water works department suggests that, "*the bureaucrats worked as a team to identify the existing water challenges and find feasible solutions to improve access to (bulk) water*". Furthermore, the bureaucrats engaged with technical consultants such as retired city officials and other state officials, especially from the GWSSB, while formulating the policy proposal (e.g., redirecting water reserved for irrigation); the sub-national government was in-charge of managing irrigation water. The city bureaucrats proposed to augment the city's water supply through new instruments such as new water supply schemes²³⁰. Bureaucratic efforts were leveraged by the support provided by respective Municipal Commissioners' who prioritised the water sector in the municipal budget. City engineers of Rajkot stated that, "*the Commissioners' encouraged bureaucrats to prioritise augmentation of the city's water supply*". The policy proposal to introduce new water supply schemes for the city were actively backed the Commissioner.

Powering over water supply schemes

The proposed policy proposal, along with budget assessments, to augment the city's water supply were backed by Rajkot's political executives, as these would improve the city's water supply. Political support resulted in the adoption of proposed instruments through municipal resolutions, which facilitated policy uptake. Interviews with retired RMC bureaucrats (e.g., former Commissioners' and town planning officer) suggest that, "*the ruling party built its political capital amongst citizens by actively supporting Rajkot's water measures*". Powering strategies were also helpful in non-technical ways. Support of the local political executives enabled the city bureaucrats to approach the Gujarat government with their policy proposal of redirecting water reserved for irrigation to meet Rajkot's (commercial hub of Saurashtra

²²⁹ Dependence on Narmada water (hundreds of kilometers away from the city) has increased the cost and energy consumed by the water sector in Rajkot.

²³⁰ A water reservoir was built to improve the water supply.

Additionally, existing irrigation schemes were modified to provide for Rajkot's drinking water needs. Furthermore, as a precautionary measure the city continues to tap water from perennial sources such as the Narmada river.

Any climate adaptation measures were purely incidental at this stage. The primary motivations of the urban local body was not water adaptation, but rather water security and eventually political benefit.

region) drinking water needs. Additionally, the political executives, including the mayor and standing committee chairman, actively followed up with the sub-national government to approve and execute the proposed water supply scheme. Support of the Gujarat government was crucial as they had the capacity to execute Rajkot's new water supply schemes. Some of the new instruments (e.g., Bhadar dam water reservation in 1988) were met with opposition from villagers as it would compromise their water requirements. Rajkot's political executives mobilised the Gujarat government, particularly the then Minister of Health who belonged to the Saurashtra region²³¹, to convince the villagers that only a partial amount of water would be reserved for Rajkot. Additionally, the sub-national government, following the national water policy²³², prioritised drinking water needs over irrigation and commercial needs. The sub-national government's approval of the water supply scheme to support Rajkot's drinking water needs, helped overcome opposition from villagers.

The urban local body built on former experiences and engaged with technical consultants to introduce water augmentation instruments. The RMC autonomously pursued new water supply schemes without succumbing to societal pressure. Ideas within the RMC changed due to the combined effect of bureaucratic puzzling and political powering leading to a synergised rationality. The bureaucratic-political rationality prioritised the introduction of new water augmentation instruments that would serve the needs of all citizens.

The dominant ideology in the first phase prioritised augmenting the city's water supply. New water supply schemes were introduced as policy instruments under the prevalent paradigm to improve Rajkot's water security. The embedded autonomous bureaucracy cohesively formulated policy proposals and appealed to the sub-national government to support the city's water supply schemes. Backing of the sub-national government and support of the mayor's office in Rajkot helped transcend opposition from agricultural users. The adaptation potential of these policy instruments was not recognised by the city government in the first phase.

2.5.2. Second phase: 2004-2016 (conservation phase)

Following augmentation measures pursued in the first phase, the urban local body focused on conserving the city's water from the mid-2000s. The prevalent water challenges of the city

²³¹ The Minister was also a chairman of the cooperative bank. Many farmers from the region were members of this bank, and so it was easier to influence them.

²³² The National Water Policy revised in 2012 prioritizes water for drinking and domestic purposes.

included declining groundwater tables, high NRW loss causing financial deficits, and poor municipal water supply. In the second phase, bureaucratic puzzling (involving city bureaucrats headed by respective Commissioners') resulted in the introduction of a range of adaptation policy instruments (e.g., improving water tables, upgrading municipal water distribution system and reducing NRW loss), without altering the existing paradigm. The city government engaged with domain experts (e.g., builders, retired officials, multilateral agencies) to access new information and design socially optimal solutions. Although the state at the local level was embedded within its social setting, it was autonomous from societal forces (e.g., local councillors, citizen group members). Furthermore, the bureaucrats were able to identify and customise domestic policies and programmes to implement these instruments.

Rajkot's political executives, mainly the mayor and members of the standing committee, actively backed the measures during the planning and execution process. Political support enabled effective implementation of the policy instruments. Powering strategies backed technical thinking leading to the formulation of several resolutions to conserve water. Furthermore, political support was provided in non-technical ways such as insulating city bureaucrats from political pressure and opposition, thereby enabling strict enforcement of rules and smooth tender process and policy execution. Additionally, the Mayor's office mobilised local councillors and citizens to back new policy instruments without causing any hindrance. Similarly, the political executives followed up with both the sub-national and central government to (financially and technically) back their efforts through schemes and programmes. Adaptation potential of existing measures (e.g., self-sufficiency, improved water availability, reduced water contamination) were not acknowledged in the second phase.

a. Policy instrument: rainwater harvesting systems

In 2004, Rajkot mandated the installation of rainwater harvesting systems which would benefit all citizens²³³. The city's building bye laws²³⁴ (General Development Control Regulations²³⁵ (GDCR)) were modified in 2004, making it one of the first cities in Gujarat to do so. As per the new legislations, rainwater harvesting systems had to be installed in every new building, without which the completion certificate would be withheld (see box 2 in annexure). The city continues to implement this instrument²³⁶. This policy instrument was incorporated under existing norm, that is the development control regulations which remained unaltered.

Puzzling over rainwater harvesting systems

The city bureaucrats from the water works and town planning department collectively puzzled over designing and implementing the policy instrument. These efforts were actively encouraged by the then Commissioner, as it would improve water security. Through this process the nature of the problem was defined- low levels of groundwater which were disproportionately available and municipal water supply would fall short, especially during the summers and when rainfall was scanty. Deputy engineers of the water works department and a former executive engineer suggested that, "*RMC bureaucrats backed by the then Commissioner actively pursued the proposal of mandating rainwater harvesting systems*". Before formulating the policy proposal, the bureaucracy piloted the instrument at a ward level and over public buildings. The RMC bureaucrats engaged with experts from the Science Community Centre²³⁷ (SCC) to understand the technology and pilot test the instrument. The chairman of the SCC stated that, "*the RMC would regularly engage with their centre to learn about the technology*". This also helped set a precedent for others in the city to implement the instrument. Furthermore, the city bureaucrats from the water works department popularised the

²³³ It must be noted that this rule is not applicable to informal settlements which are of a temporary nature and lack proper housing facilities.

²³⁴ The sub-national/state government recommends certain measures to city governments; however, it depends on the urban local body how instruments will be implemented. It is noteworthy that the city government actively pursued this policy measure following the state Town Planning and Valuation department's, recommendation. This can be attributed to its history of water scarcity, and the city's geomorphology.

²³⁵ While formulating the GDCR some points are mandatory, while some can be modified by the urban local body. For instance, out of 50 points in the GDCR 30 are compulsory for all ULBs, while the remaining 20 points can be tweaked and incorporated by a ULB. The GDCR was modified through the Rajkot Urban Development Authority (RUDA).

²³⁶ Given the long-term benefits involved with this instrument the urban local body has continued to implement rainwater harvesting systems in schools and public buildings across the city. Also, the urban local body has implemented rainwater harvesting systems in more than 16 affordable housing schemes. Unfortunately, due to the hard sub-surface strata rainwater harvesting systems have not been uniformly adopted by the citizens of Rajkot.

²³⁷ A research centre funded by the city government which conducts workshops and exhibitions to create awareness among citizens.

instrument among citizens through ward level meetings, and awareness campaigns about the merits of harvesting rainwater to recharge bores, especially for a water scarce city like Rajkot. Engagements with domain experts and citizens also exposed city bureaucrats to ground realities, and citizen concerns. Additionally, senior bureaucrats (the then Commissioner) and political executives (the then Mayor²³⁸) participated in several awareness campaigns to mobilise citizens to voluntarily harvest rainwater to recharge bores. A senior journalist from a local magazine stated that, “*RMC officials engaged with citizens to promote the uptake of rainwater harvesting systems*”. Results of the pilot study helped the RMC bureaucrats formulate a policy proposal to incorporate rainwater harvesting systems into the city’s development control regulations. Modifying the building bye laws would ensure uptake of the instrument, and avoid hindrance during implementation from citizen groups and commercial interests, especially the builders lobby, who were hesitant to support this measure due to the additional costs that would be incurred on them.

Powering over rainwater harvesting systems

The policy measure was included into the city’s building bye laws because it was actively supported by Rajkot’s political executives. The city officials, through detailed feasibility reports, convinced the political executives²³⁹ that a) the long-term benefits would outweigh the initial capital cost, and b) this was in the larger interest of the city. Powering strategies backing the technical proposal, enabled city bureaucrats to appeal and mobilise the Gujarat government’s town planning department via the Rajkot Urban Development Authority²⁴⁰ (RUDA) to modify Rajkot’s building bye laws. Furthermore, the Mayor’s office followed up with the sub-national government to ensure policy approval. Since this was a recommendation of the state/sub-national government itself, and given Rajkot’s history of water challenges it was easy to mobilise the Gujarat government. This measure was opposed by Rajkot’s builder lobby, who were sceptical of the associated costs of implementing the measure. Incorporating the policy instrument under the city’s development control regulation helped the bureaucracy neutralise resistance and ensured its uptake. Additionally, the RMC organised a consultation to assuage citizen group concerns- involving experts including citizen and interest groups (architects and planners, builder lobby) and retired officials- by deliberating on long-term

²³⁸ These engagements are seen in bigger cities not in smaller cities like Rajkot.

²³⁹ The Congress was in power at the local level at this time, and like the BJP, they actively championed the cause of water resilience to ensure they gain political mileage.

²⁴⁰ RUDA is the sub-national government’s parastatal agency involved in development control regulations.

benefits of the measure. Furthermore, the political executives sensitised citizens about the instrument through the local media and awareness campaigns. Similarly, local councillors were also asked to encourage citizens in their respective wards to implement the measure at a household level. Political support, provided in technical and non-technical ways, helped the uptake of rainwater harvesting systems.

The bureaucracy was able to learn from its previous experiences and design a policy instrument to improve groundwater levels. The bureaucracy was embedded within the society, through its engagement with the SCC, and independently designed the policy proposal and proposed to mandate rainwater harvesting systems through the city's building bye laws. Effective execution of the policy instrument was facilitated by changed thinking within the city government which was a result of the combined effect of bureaucratic puzzling and political powering. Ideational churning within the state at the local level led to a synergised bureaucratic-political rationality favouring mandatory uptake of rain water harvesting systems²⁴¹.

b. Policy instrument: upgrading water distribution system

The urban local body prioritised strengthening the city's water distribution network from 2005 onwards. A range of policy instruments (e.g., augmenting water storage and treatment capacity, and upgrading distribution pipelines) were introduced to improve water security. Several policies focusing on urban development- introduced by the union and sub-national/state government from the mid-2000s- were channelised by the city government to address Rajkot's water problems. Central schemes utilised by the RMC included the Jawaharlal Nehru National Urban Renewal Mission²⁴² (JNNURM) (2005), the Atal Mission for Rejuvenation and Urban

²⁴¹ Over time, the urban local body has begun actively promoting green building concepts like rainwater harvesting systems in its housing policies, which is now backed by builders to remain competitive.

²⁴² JNNURM was India's first major urban infrastructure scheme introduced by the central Ministry of Urban Development (MoUD) (see box 3 in annexure). The key issue areas of the mission were Urban Infrastructure & Governance, and provision of Basic Services for the Urban Poor. Under the mission the urban local body has received funds to implement two water supply projects. For instance, the corporation utilized the JNNURM scheme to install more durable ductile iron (DI) pipelines in certain parts of the city.

Transformation²⁴³ (AMRUT) (2015), and the Smart Cities Mission²⁴⁴ (SCM) (2015). The first mega urban infrastructure scheme facilitated development in medium sized cities like Rajkot. This was corroborated by a city engineer of RMC who felt that, “*schemes like JNNURM helped develop cities like Rajkot*”. This was elaborated by a RMC technical head who stated that, “*prior to JNNURM the city would target one sector per year (due to lack of funds), however the JNNURM scheme helped streamline and holistically prioritise sectors*”. Selection under the JNNURM mission improved Rajkot’s chances of acquiring funds from other centrally sponsored schemes and programmes²⁴⁵. Additionally, the corporation also received grants from the Finance Commission (e.g., 13th, 14th and 15th). Similarly, Rajkot benefitted from sub-national/state sponsored schemes particularly the Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana²⁴⁶ (SJMMSVY) launched in 2009-10 by the government of Gujarat. The RMC, till date, has been supported (financial and technical) by these domestic schemes and programmes to improve its water supply systems. A range of policy instruments were incorporated under the existing paradigm to improve the city’s water security.

²⁴³ Following the JNNURM scheme the Government of India, through the Ministry of Housing and Urban Affairs (MoHUA) (previously MoUD), launched a second version of the urban mission in 2015, the AMRUT mission which identifies water supply & sewerage as priority sectors (see box 4 in annexure). Following measures implemented under JNNURM, the urban local body has continued implementing instruments under the AMRUT scheme. For instance, the corporation identified areas in the city to implement water supply systems (e.g. constructing headworks, water treatment plants, and developing or improving the distribution network). In addition, the city government has been reconstructing water storage tanks across the city (RMC, 2018m). Till date the urban local body implemented 23 water supply projects under AMRUT.

²⁴⁴ In 2015, GoI introduced another urban development initiative the Smart Cities Mission (SCM) targeting infrastructure development along with promotion of smart solutions in 100 Indian cities (GoI, 2015b). The urban local body augmented existing local water reservoirs, and is planning to connect or regenerate water networks between the local water bodies. The city government excavated local water sources to improve the water holding capacity, and groundwater overtime (RMC, 2018n; RMC, 2019b,d). Another example under the SCM is the implementation of the Eye Way project, a joint venture between urban local body and Rajkot police, that improves surveillance of service provision (e.g. water levels in dams and drainage, illegal activities), environmental indicators (e.g. ward wise temperature and rainfall, red alert during heatwaves, pollution levels), alongwith public safety and traffic management.

²⁴⁵ For instance, as part of the JNNURM selection procedure the city government formulated a comprehensive project proposal following specific guidelines. This experience enabled the local body to avail funds under AMRUT and SCM, which had similar procedures. Rajkot was selected under both missions; therefore, bureaucrats didn’t need to make extra effort of convincing sub-national and central nodal agencies.

²⁴⁶ The government launched the SJMMSVY to support cities, improve urban infrastructure & basic civic facilities in urban areas, after the abolishment of Octroi in Gujarat in 2007. The discontinuation of Octroi has been a long-standing contentious issue between central and state governments (Rath, 2009). Until 2007, Gujarat was amongst the few states, including Maharashtra and Punjab, who continued to collect Octroi. Under the SJMMSVY, the Gujarat government reviews city project proposals, and funds the approved projects. Within the city government, the technical heads conduct feasibility studies and subsequently prepare project proposals. The usage of money under this scheme lies with the discretion of the urban local body. The second phase of the scheme was launched in 2012-13 (GoG, undated).

Puzzling over upgrading water distribution system

The city bureaucrats, from the water works department, collectively defined the nature of the problem and identified technically feasible policy instruments to strengthen the water distribution network. The city's water distribution network was old and inadequate (e.g., old pipelines, water storage and filtration tanks) leading to poor water supply. Subsequently, a range of policy instruments (e.g., strengthening existing or construction of new water storage reservoirs, laying new or replacing old pipelines, installing more durable material distribution pipeline, building new water treatment/filtration plants and pumping stations in and around the city) were proposed by the bureaucrats. Junior engineers of the water works department stated that, "*respective Commissioners' prioritised the water sector, which motivated them to identify measures to improve the city's water supply*".

Puzzling strategies also resulted in the identification of domestic schemes and programmes that would (technical and financial) support local policy instruments. Furthermore, bureaucrats apart from following standard protocols²⁴⁷ also used their personal networks²⁴⁸ to convince both the central and sub-national government to support²⁴⁹ local efforts. Additionally, encouraged by the then Commissioner (2004), the city bureaucrats with some assistance of domain experts²⁵⁰ formulated initial reports (e.g., the City Development Plan (CDP)) as part of a centrally sponsored scheme in-house²⁵¹ rather than outsourcing it to external agencies. The city official who consolidated the report stated that, "*the Municipal Commissioner supported efforts of formulating the CDP internally*". Following which policy proposals were formulated by customising central and state/sub-national level programmes and schemes with broad policy

²⁴⁷ The RMC bureaucrats fulfilled criteria (e.g., preparing detailed reports including the city's infrastructure & governance needs) set by the centre or state/sub-national governments, on the basis of which funds were allocated.

²⁴⁸ Unlike other cities RMC officials leveraged their personal networks in the Ministry of Urban Development (MoUD) to make a strong case for Rajkot. The city bureaucrats (and occasionally, the then Municipal Commissioner) regularly followed up on the project appraisal and sanction with the MoUD. Similarly, city officials persuaded sub-national/state officials to (financially) support Rajkot's policy measures including improving water security.

²⁴⁹ GoI provides funds and monitors implementation through the state nodal agency. The Government of Gujarat through the state level nodal agency, GUDM, acted as an intermediary in the process, collating and reviewing projects from cities and sending it towards the Centre. The ULB is responsible for preparing the DPRs and CDPs, and implementing projects. The cost of implementing projects was shared among the central, state and city governments (50:20:30 ratio).

²⁵⁰ The CDP was formulated in consultation of city officials and retired bureaucrats. It was felt that the local epistemic community and bureaucrats were more aware of ground realities and hence better placed to identify Rajkot's unique problems and accordingly identify solutions.

²⁵¹ In this process the city government saved a handsome amount (~ INR 30-35 lakh). It must be noted that Rajkot had some experience of formulating CDPs prior to the launch of JNNURM, as some motivated bureaucrats like Dr Anadkat had formulated similar reports (e.g., city corporate plan) for the urban local body.

prescriptions to the local setting²⁵². The city bureaucrats formulated the tender document involving third party quality checks and introducing a penalty for delays.

Powering over strengthening water distribution system

Bureaucratic puzzling efforts resulted in policy adoption due to powering strategies. The mayor and standing committee members approved the policy proposals and passed several resolutions, thereby enabling bureaucrats to execute the instruments. The political executives²⁵³ were convinced that the proposed policy instruments would improve water supply with minimal investment from the corporation, as considerable support would be provided by the union and sub-national government. Powering was not only used to support technical thinking, but also in non-technical ways. Since water has been a political issue, the political executives mobilised the local councillors to back policy execution without any hindrance (e.g., manipulating tendering process to acquire sizeable implementation contracts, diverting implementation in certain wards). Additionally, private water tankers were hired by the RMC to provide water to areas undergoing construction work (e.g., upgradation of pipelines) or to newly merged areas which were still not covered by the municipal water supply network. This helped the bureaucracy transcend the nexus of local vested interest groups (local councillors, and local contractors). Political backing insulated bureaucrats from any form of pressure, and ensured effective execution of policy instruments. Furthermore, political support enabled the city bureaucrats to mobilise the sub-national and national government to support Rajkot's measures. Occasionally, the political executives would follow up project approval with the sub-national government.

The RMC built on past policy measures and planned to strengthen its water distribution network by adopting several domestic urban infrastructural policies and schemes. As part of domestic schemes and programmes the urban local body engaged with consultants to acquire technical information about measures- embedding itself within the society. However, the city government autonomously formulated and effectively adopted policy proposals to address water challenges by controlling rent seeking activities. The combination of bureaucratic puzzling and political powering lead to ideational churning within the city government leading to a rationality supporting the upgradation of the city's water distribution network.

²⁵² Domestic schemes and programmes focused on general infrastructure development related measures. Given the city's water issues, the RMC prioritized water measures to strengthen water security.

²⁵³ Since water was a crucial issue for Rajkot, the then ruling party, Congress party, actively supported the strengthening of the city's water distribution network with the hope to remain in power.

c. Policy instrument: control non-revenue water loss

In continuation of water conservation efforts, the RMC took significant steps to reduce the city's non-revenue water loss. In 2012, a water check team was institutionalised to monitor water thefts, especially during summer months. Following which, an aggressive regularisation campaign was introduced in 2014. Within one financial year (April 2014 and March 2015), a total of 16626 illegal connections were regularized in the city²⁵⁴, this resulted in the urban local body earning approximately 332.051 lakh Rupees. In the same year, a (bulk) water auditing system was introduced to monitor the water supply- one of the first cities in Gujarat to do so. Furthermore, the urban local body, through domestic schemes and programmes (mentioned above) was already taking steps to install more durable pipelines (e.g., Ductile Iron (DI) instead of existing Asbestos Cement (AC)), which would reduce water leakages and thefts. All these policy instruments were introduced under the existing paradigm, without altering it.

Puzzling over non-revenue water loss

Despite efforts of augmenting and conserving water supply, the city witnessed water shortages due to high NRW rate (~40-50 per cent). Bureaucratic puzzling within the RMC resulted in the identifying and defining the nature of the problem (old and poor-quality pipelines and water thefts including ~ 40,000 illegal water connections²⁵⁵). Water thefts were attributed to complex bureaucratic procedures (e.g., complicated administrative process of acquiring water connection) alongside poor enforcement mechanisms, which disincentivized citizens to acquire legal connections. Furthermore, local councillors in order to safeguard their vote banks were tolerant of water thefts (an example of clientelistic practices). Domain experts (e.g., water works committee chairman²⁵⁶, valve operators²⁵⁷, GIZ²⁵⁸) were invited by the RMC to learn from previous experiences and improvise their policy approach by addressing societal needs. Such engagements improved understanding of city bureaucrats with respect to the local politics

²⁵⁴ Until date, the city government regularized 21697 illegal water connections, issued notice to 1259 direct pumping cases & 549 households wasting water, cut 5874 illegal connections, and the NRW loss in 2016-17 is down (from ~55 per cent) to 28 per cent (CapaCITIES, 2018).

²⁵⁵ Citizens construct underground water tanks and illegal connections below the level of the water distribution system resulting in inadequate or no water in the system. This also lowers water pressure in the pipelines (CapaCITIES, 2018).

²⁵⁶ The chairman was a local councillor with knowledge on the city's water issues.

²⁵⁷ The RMC works closely with field agents to operate the water distribution network. These actors are aware of illegal water connections. The bureaucrats involved valve operators in household level surveys to identify illegal water connections.

²⁵⁸ The GIZ assisted the urban local body in utilizing the existing SCADA system for processing indicators (e.g. track service delivery), and using Geographical Information System (GIS) for maintaining data.

and water challenges. The city bureaucrats, especially from the water works department, proposed to introduce a set of policy instruments to control the NRW loss- a) institutionalised a water check team²⁵⁹ in 2012 to identify water thefts²⁶⁰ during summer months, b) introduced a strict regularisation campaign²⁶¹ (consisting of household level surveys²⁶², simplification of rules for acquiring connection²⁶³, setting up regularization camps²⁶⁴, and enforcement of strict penalties²⁶⁵) in 2014 to control illegal connections, c) installed a Supervisory Control and Data Acquisition²⁶⁶ (SCADA) system to monitor bulk water flow and, d) continued upgrading water distribution pipelines²⁶⁷. These local measures were proposed to be furthered by the city government by adopting union (e.g., AMRUT) and/ or sub-national government (e.g., SJMMSVY) programmes and schemes. These bureaucratic efforts were backed by the then Commissioner who participated in puzzling strategies and also closely supervised policy execution (e.g., weekly update meetings with the bureaucrats). Multiple RMC bureaucrats (city engineers and deputy engineers of water works department) emphasised that, “*the Commissioner encouraged officials to collectively identify problems, and brainstorm on possible solutions*”. The city bureaucrats formulated a tender proposal including third party

²⁵⁹ The water check team involved city bureaucrats not just from the water works department, but also from different departments of the city government. The team of bureaucrats would supervise wards they were not responsible for, as this would control prevailing clientelistic practices.

This team was separate from the existing vigilance cell which would regularly monitor the distribution of water to the city (e.g. inspects the quantity and quality supplied, assesses the functioning of treatment & filter plants).

²⁶⁰ The urban local body regularized 1488 illegal water connections and 1800 direct pumping cases. Also, 350 cases of water leakages were identified and repaired (as per letter (RMC/ C-93) from RMC Commissioner to Chief Secretary, Government of Gujarat, dated 17th May 2013).

²⁶¹ A resolution was passed by the RMC standing committee (RMC, 2014c) supporting the regularisation of all illegal connections of the city.

²⁶² The survey helped identify households with municipal water supply. As a result, the bureaucrats could gauge areas within the city with illegal water connections based on their calculations (difference in water supplied and pressure in municipal taps).

²⁶³ The rules of acquiring water connections were relaxed for the duration of the campaign.

²⁶⁴ Regularisation camps were set up in municipal schools where officials would help citizens either acquire new connections or voluntarily regularise illegal connections by paying a fee of Rs. 2500. Citizens were given adequate time to regularize illegal connections.

²⁶⁵ After the stipulated period if the city officials found any illegal connections during their household level surveys the connection holder would initially have to pay Rs. 5500 and on later inspections, Rs. 7500 and a First Information Report (FIR) would be logged.

²⁶⁶ The urban local body in 2014-15 installed the real time bulk water audit system, a key component of the SCADA system, to monitor the water supply distribution network. It monitors inflow and outflow of water and distribution from various water sources and head-works (GIZ, 2016). The system was installed by a private firm on behalf of urban local body, which was responsible for training the city engineers for systems operation. A resolution was sanctioned (RMC, 2017a) by the RMC Standing Committee supporting this instrument.

²⁶⁷ The RMC, water works department, under AMRUT & SJMMSVY has been replacing old water distribution asbestos cement (AC) pipelines with more durable Ductile Iron (DI) pipes in different wards of the city. The AC pipelines are prone to leakage due to break and direct pumping (RMC, 2012b), and have negative health implications. DI pipelines reduce water leakage & wastage considerably, also the cost of operations and maintenance is lowered.

The RMC standing committee approved the introduction of new instruments to replace old AC pipelines with DI pipelines (see RMC, 2015; RMC, 2016a; RMC, 2018a, c; RMC, 2018n; RMC, 2018l).

quality checks and penalties for delays. Additionally, the bureaucrats used the local media²⁶⁸ to sensitise citizens and acquire their support. Finally, in anticipation of citizen resistance, the Commissioner and the city bureaucrats proposed to involve the Rajkot police to monitor the execution process, especially during regularization campaigns.

Powering over non-revenue water loss

All policy proposals²⁶⁹ to reduce NRW loss were actively backed by the mayor's office, typically the mayor and members of the standing committee. The political executives approved policy proposals to address NRW loss, and passed resolutions along with approving budget to execute measures. Furthermore, political support in non-technical ways was extremely crucial for executing the regularization campaign which faced resistance from citizens. Political backing at the local level enabled city bureaucrats to appeal to the sub-national and central government to support local initiatives. Occasionally, the Mayor and standing committee chairman followed up with the sub-national government to sanction the budget to finance Rajkot's policy instruments. The political executives mobilized local councillors to support RMC's efforts of controlling NRW loss (e.g., encourage citizens to regularize illegal connections and support the smooth implementation of the tender and execution process), as this would improve water supply for all, thereby safeguarding their vote banks. RMC officials (deputy and executive engineer of water works department) stated that, "*requests from local councillors or private water tanker lobby to excuse certain wards were not entertained either by the bureaucrats or the political executives*". Citizens were alerted about RMC's policy measures, especially the regularization scheme, through the local media. Additionally, the political executives involved the Rajkot police to support city bureaucrats while executing the regularization scheme, thereby dissuading opposition from powerful vested interest groups. Support from the legislative branch motivated the bureaucrats to execute instruments (e.g., confiscate motors used to steal water, terminate illegal connections, charge strict penalties, conduct bidding process), despite societal pressure. A member of the RMC water works committee stated that, "*the legislative branch and then Commissioner ensured that officials of the water works department were insulated from any interferences and no biases were*

²⁶⁸ The local media, especially radio, television and newspapers, were used to inform citizens about the regularization campaign. Also, the challenges faced by the RMC bureaucrats while executing the campaign were reported in the media to build pressure against illegalities, and acknowledge efforts of the city officials.

²⁶⁹ The urban local body would not incur any additional cost in implementing instruments to reduce the NRW loss. Regularization is a common practice for cities as it requires no additional cost. Whereas, installation of the SCADA system (RMC, 2016b, and RMC, 2014b) and replacement of old pipelines was supported by state/sub-national and central sponsored schemes.

encouraged". Political support in both technical and non-technical ways resulted in effective execution of policy instruments to control the NRW loss. Several city bureaucrats stated that, *"strong political support during planning and implementation along with a dedicated Commissioner and team ensured effective implementation of the regularisation campaign"*.

The RMC not only learnt from previous policy experiences, but also engaged with experts to reduce the NRW loss. Despite engagements with the society, the RMC autonomously designed and implemented policy instruments such as the regularization campaign, introducing the SCADA system, upgrading the pipeline and institutionalising a water check team. The combination of bureaucratic puzzling and political powering caused an ideational churning within the RMC, which influenced the bureaucratic-political rationality in favour of the above-mentioned policy instruments.

The second phase was driven by the dominant ideology of conserving Rajkot's water supply. Broadly, the policy instruments introduced in this phase involved mandating rainwater harvesting systems, strengthening the water distribution network and controlling the non-revenue water loss- all of which cumulatively improved water security. All policy instruments were incorporated under the prevalent paradigm, without altering it. The embedded autonomous bureaucracy worked cohesively to control rent seeking activities (e.g., promotion of politically affiliated contractors) and overcome clientelism (e.g., tolerating illegal connections in wards), and effectively implement instruments benefiting all citizens. The city government adopted sub-national and national level programmes and policies to conserve the city's water supply. The adaptation potential associated with these policy instruments were yet to be acknowledged by the RMC.

2.5.3. Third phase: 2017- 2020 (efficient water use phase)

The dominant ideology in the third phase focused on efficient use of water, which built on the first and second phase. Rajkot's growth (e.g., expansion of city limits, population increase) also resulted in increasing water demand. Apart from on-going conservation²⁷⁰ and

²⁷⁰ For instance, in 2019 the urban local body deepened its lakes under the centrally sponsored Smart Cities Mission. Additionally, the city government again under a centrally sponsored programme, AMRUT, is constructing the water supply network (e.g., DI pipelines) and storage facilities for newly merged areas. The RMC legislative branch supported the instrument (RMC, 2018m).

augmentation²⁷¹ measures, the city bureaucrats proposed to introduce a policy instrument to monitor water consumption and reduce wastage (e.g., metering water supply). Given former experiences²⁷², the RMC continued to adopt sub-national and national level schemes and programmed to further policy instruments. Additionally, adaptation co-benefits associated with existing and planned measures were acknowledged by the city government in a consolidated policy package, the climate resilient city action plan. Like all policy instruments, the climate action plan was incorporated under the existing paradigm. The dominant policy paradigm remained unaltered across the three phases. The state at the local level was provided technical assistance by experts in terms of new technologies and also in reviewing the climate action plan. The city government was embedded autonomous as it cohesively worked towards engaging with the society while being independent of any form of pressure or interference. Learnings from previous experiences helped the bureaucrats adopt sub-national and national level schemes and programmes to pursue policy instruments.

The legislative branch actively supported policy proposals (planning and execution) leading to effective execution of policies. Prior climate engagements at the Mayoral level²⁷³ made it easier to institutionalise the climate action plan without any legal mandate to do so. Bureaucrats are trying to neutralize anticipated opposition (e.g., local councillors) against monitoring water consumption by systematically involving the political executives in all phases (planning and execution of pilot study). Similarly, opposition against the climate action plan, especially from

²⁷¹ The urban local body, in 2017 used the sub-national government sponsored scheme, SJMMSVY, to increase the height of Nyari I dam which improved water holding capacity, and also reduced dependence on Narmada (RMC, 2008 and RMC 2012, and RMC, 2014a). The city government also connected existing local water reservoirs with each other through an express feeder pipeline (RMC, 2010b; RMC, 2018e, g).

Furthermore, in 2017, as part of the Saurashtra- Narmada Avataraan Irrigation (Sauni) scheme, local water sources like Aji I, Nyari I and Bhadar I dam were connected with Narmada River (through the Sardar Sarovar dam). Sauni Yojana was launched to divert excess flood water from Narmada to water scarce Saurashtra. The city government submits an annual scarcity report to the Gujarat government, who determines water allocations to the city. Similarly, Rajkot also utilised another sub-national government sponsored scheme launched in 2018, Sujalam Sufalam, to augment local reservoirs. In 2018, the city deepened its lakes (Lalpari and Randarda) before monsoons to improve their water holding capacity. Subsequently, the city government continued to utilise this scheme to improve water holding capacity of its local sources (e.g., Aji and Nyari dam).

²⁷² Given the institutional memory and reputation developed by the local body it was relatively easy for the city officials to convince the union (Ministry of Housing and Urban Affairs (MoHUA)) and state government (Gujarat Urban Development Mission (GUDM)) to continue supporting local measures in Rajkot. Rajkot's political influence, existing water challenges, as well as past records of implementation enabled it to acquire support from the Gujarat government. In addition, the current Chief Minister won from Rajkot West constituency, and this increased Rajkot's political influence.

²⁷³ Rajkot's Mayors' have been members of a global platform of leaders working towards addressing climate issues at the local level (e.g. Global Covenant of Mayors for Climate and Energy).

local councillors, was circumvented by involving relevant state and non-state stakeholders in reviewing the plan and incorporating it in the municipal agenda.

a. Policy instrument: 24*7 metered water supply

The city government in Rajkot as the next step towards improving water security, intends to monitor water consumption and accordingly levy user charges²⁷⁴. The RMC continues to rely on domestic schemes and programmes (such as AMRUT²⁷⁵) to pilot 24*7 metered water supply at a ward level. Following results of the pilot study, the urban local body aims to upscale this instrument across the city. Like previous policy instruments, this instrument was included under the prevalent paradigm, without altering it.

*Puzzling over 24*7 metered water supply*

Bureaucratic puzzling resulted in studying the (domestic) water consumption patterns in the city; this showed that both the demand for and the wastage of water was high across the city. Consequently, city bureaucrats, typically water works department under close supervision of the Deputy (technical) Municipal Commissioner, proposed the provision of continuous and metered water supply. Before implementing the instrument across the city, the city government proposed to pilot the instrument at a ward level²⁷⁶. The bureaucrats identified and adopted a central government sponsored programme, AMRUT, to pilot the instrument. RMC bureaucrats belonging to the water works department stated that, “*the Municipal Commissioner (2016-17) encouraged the water works department to actively pursue the measure, and innovatively think of ways to upscale the measure beyond a pilot study*”. As a result, the city government, in collaboration with the sub-national government and the Asian Development Bank²⁷⁷ (ADB), intends to expand the instrument across the city²⁷⁸.

²⁷⁴ The idea was initially floated by bureaucrats in 2012, however the city was incapable of implementing the instrument due to inadequate water availability.

²⁷⁵ The Amrut mission mandates ULBs to implement (even in pilot mode) 24*7 water meter project in order to avail funds/grants from the central government.

²⁷⁶ The project was piloted at a ward level (Chandreshnagar, west zone) before it was upscaled, as 24*7 water supply requires considerable upgradation of the distribution system (including operation and maintenance), and domestic water meters (including billing) (RMC, 2018f). The urban local body installed water meters in 15000 households to monitor user consumption and charge them based on consumption. The urban local body aims to implement volumetric or telescopic pricing. As per the Smart City proposal the city government planned to levy a INR 12 per kilo litre.

²⁷⁷ The RMC had prior experience of working with several international stakeholders as part of climate mitigation projects implemented in Rajkot. Therefore, the urban local body was aware of project calls and requirements of external agencies.

²⁷⁸ The proposed cost of the project is INR 300 Crore which will be implemented under Public Private Partnership (PPP) mode with assistance from ADB. The cost is shared between the city government (15 per cent), state

*Powering over 24*7 metered water supply*

Rajkot's political executives, including the mayor and standing committee members, actively backed the proposal of metering 24*7 water supply. The mayor's office was convinced that regulated consumption of water would improve water security for all. Powering strategies enabled city bureaucrats to mobilise the sub-national and national government to back their proposal. Moreover, the bureaucrats, based on former experiences of working with the Gujarat government and donor agencies, convinced ADB²⁷⁹ to expand the measure covering more households across the city, and mobilised the sub-national government²⁸⁰ to support their proposal. Furthermore, the political executives assured local councillors that this instrument would help the city transition from intermittent to continuous water supply- which would help increase their political capital. In the future, the RMC anticipates resistance from both citizens and local councillors against the water tariff policy supporting regulated water consumption. The bureaucracy intends to address this challenge by actively engaging the political executives (the mayor, members of the standing committee) and domain experts in formulating the policy to avoid any biases and ensure its suitability for the city. Strong support of political executives will help bureaucrats with the execution process.

The city government built on previous policies and new information acquired by engaging with experts to pilot the 24*7 metered water supply policy instrument. The bureaucracy worked autonomously while formulating the policy proposal and executing it on a pilot basis. Bureaucratic puzzling and political powering changed thinking within the RMC, which engendered a bureaucratic-political rationality supporting the monitoring and regulation of water consumption. This instrument when scaled up to the city level will improve water security for all.

government (15 per cent), and ADB (70 per cent loan). The aim was to cover approximately 45000 households (CapaCITIES, 2018).

²⁷⁹ The ADB supports sustainable water management projects such as 24*7 water supply in urban areas. This vision enabled the RMC bureaucrats to mobilise the agency to expand the measure.

²⁸⁰ Since the ULBs cannot take funds directly from external agencies, the city bureaucrats convinced Gujarat government (guarantor) to be one of the partners.

b. Policy instrument: climate resilient city action plan (water adaptation)

In 2018, the urban local body voluntarily²⁸¹ formulated a Climate Resilient City Action Plan²⁸² (CRCAP), which comprised of existing and planned adaptation instruments. The plan was formulated as part of an on-going climate project funded by the Swiss Agency for Development & Cooperation²⁸³ (SDC). In 2019, the urban local body incorporated the plan in its municipal budget, that is under the prevalent policy paradigm. This step did not alter but reinforced the dominant policy goal of improving water supply for all. The urban local body recognises the adaptation potential of instruments as part of the action plan.

Puzzling over the climate action plan

In continuation of RMC's climate commitments, the bureaucracy proposed to formulate a climate action plan. In 2017, the then Commissioner pushed city bureaucrats to formulate a consolidated action plan which acknowledges existing adaptation measures, and guides future adaptation action. The municipal bureaucrats planned to build on previous sector specific plans (e.g., solar city master plan, low carbon mobility, and low emission development strategies plan), to formulate a comprehensive action plan. Additionally, in the absence of a domestic urban adaptation framework, the bureaucrats channelised their prior experiences²⁸⁴ along with newly acquired knowledge to establish correlations²⁸⁵ between prevalent and planned developmental goals and climate objectives under the plan. An executive engineer involved in formulating the plan stated that, *“the Commissioner (2018) regularly engaged with the city officials to oversee the formulation of the plan, which encouraged the city*

²⁸¹ India till date has no urban climate policy, and there is no guiding global adaptation framework.

²⁸² The climate action plan comprises of a detailed vulnerability assessment of the urban system including a baseline situation analysis, climate risks assessment. The (water) adaptation instruments proposed in the plan will be implemented between 2018 and 2023 with an aim to reduce annual GHG emissions by 14 per cent by 2022-23 as compared to the baseline year of 2015-16. Based on the vulnerability assessment, adaptation potential of existing developmental activities was identified.

²⁸³ The SDC was already engaging with the city government on a climate project (CapaCITIES) aimed at building urban resilience, which made it easier to acquire financial and technical assistance from the agency.

²⁸⁴ Rajkot was actively pursuing climate measures. These engagements not only improved awareness but also improved the ability of the bureaucrats to identify and recognise the adaptation co-benefits associated with prevalent and planned development objectives.

²⁸⁵ Majority of the above-mentioned policy instruments not only improved service provision, but also resulted in better adaptive capacity and resilience of citizens.

For instance, upgrading the water distribution pipelines to ductile iron pipelines will not only improve water supply, but also has an adaptation potential of reduced NRW loss and improved water quality.

Similarly, water availability will improve due to regularising unauthorised water connections.

Likewise, monitoring water consumption through water meters will improve water availability and control wastage.

Augmenting water reservoirs and rainwater harvesting will improve water tables and reduce demand on municipal water supply (CapaCITIES, 2018).

officials”. Furthermore, the institutional memory of working with multiple stakeholders²⁸⁶ enabled the bureaucracy to invite domain experts to access new information and review the technical and political feasibility of the plan. These interactions created a feedback mechanism, which enabled the bureaucracy to consolidate a comprehensive plan including societal concerns. Technical assistance (e.g., conducting vulnerability assessments and risk analysis, assessing climate co-benefits) was provided by the International Council for Local Environmental Initiatives (ICLEI) to recognise the adaptation potential of instruments and consolidate the action plan. The city representative and deputy director of ICLEI emphasised that, “*the RMC bureaucrats actively engaged with them to learn about climate measures*”. Finally, the bureaucrats, supported by the Commissioner, proposed to incorporate the climate action plan into the municipal agenda to ensure its uptake alongside developmental goals, and transcend any resistance, especially from local councillors.

Powering over the climate action plan

The proposal to voluntarily formulate and ratify the climate action plan, was strongly supported by the mayor’s office. Previous climate engagements and global recognition²⁸⁷ had improved climate awareness and commitment among Mayors²⁸⁸ and political executives, especially over recent years. Additionally, the legislative branch approved the proposal to institutionalise a climate core team²⁸⁹ (state actors), and a stakeholder committee²⁹⁰ (non-state actors) to review the plan. Furthermore, the Mayor and standing committee chairman convinced the city’s councillors that the climate action plan will not lead to additional cost and tasks of the RMC,

²⁸⁶ The urban local body as part of one of its externally funded projects - Urban Low Emissions Development strategy (LEDs) project (2012-2016), had formulated a team of state and non-state actors to prepare the low emissions development strategy action plan. This approach was replicated while formulating the climate action plan.

²⁸⁷ Rajkot has won several awards for its climate commitments. For instance, Rajkot won the National Earth Hour Capital Award in 2015-16. Additionally, in 2018 and 2020 Rajkot won the Planet City Challenge award.

²⁸⁸ Rajkot’s Mayors’, usually ceremonial heads, actively participated and represented the city at various national and international climate platforms such as the Global Covenant of Mayors for Climate and Energy. For instance, Dr Jaimin Upadhyay, RMC Mayor (2015-18), former chairman of the standing committee, actively promoted Rajkot’s climate actions. He represented the city at the Global Covenant of Mayors for Climate and Energy.

These efforts marked local leaders as climate ambassadors, both domestically and internationally.

²⁸⁹ The climate core team comprised of 40 city officials from different departments of urban local body, Mayor & members of the standing committee and the Commissioner. The team: a) identified local problems with respect to environment and urban development, b) formulated a detailed emissions inventory, c) developed a city vulnerability assessment, and finally consolidated the climate action plan.

²⁹⁰ The city government invited a range of stakeholders- local NGOs, citizen groups, Rajkot chamber of commerce, community leaders, university partners (e.g. CEPT) and private sector organizations to review the plan.

Also, the corporation convinced the Swiss Agency for Development & Cooperation to provide technical assistance to formulate the action plan. The SDC was already engaging with the city government on a climate project (CapaCITIES) aimed at building urban resilience, which made it easier to acquire assistance from the agency.

and would only leverage on-going efforts of improving water security. Powering strategies encouraged the city bureaucrats to mobilise the donor agency (SDC) to support its effort. Political support facilitated integration of the climate action plan in Rajkot's municipal agenda in 2019. The legislative branch not only passed a resolution to this effect, which resulted in the incorporation of the plan in the city's agenda.

The climate action plan was formulated by the RMC by building on former experiences and engaging with domain experts. The urban local body ensured that the plan would meet the water needs of all citizens and not serve the interests of a few powerful social actors. Ideas within the state in Rajkot evolved through the combination of bureaucratic puzzling and political powering, thereby creating a synergised bureaucratic-political rationality. The bureaucratic-political rationality backed the formulation and institutionalisation of the climate action plan, which would reinforce the dominant policy goal- water supply for all. A former RMC Commissioner stated that, "*climate measures can be furthered when backed by city governments*".

The third phase was driven by the notion of efficient usage of water. Apart from water augmentation (e.g., improving water holding capacity) and conservation efforts (e.g., upgrading pipelines), the urban local body introduced a policy instrument, water meters, to monitor water consumption, and potentially ensure judicious usage. Additionally, climate adaptation co-benefits were recognised and institutionalised through a climate action plan. The policy instruments, incorporated under the existing paradigm, are envisaged to improve the city's water security by controlling clientelism and rent-seeking activities. The RMC continued to rely on domestic policies and schemes, along with some support from external agencies to pursue new policy instruments. Furthermore, the city government engaged with domain experts to acquire new information and improve their technical knowledge. Despite, engagements with societal actors, the RMC autonomously designed and effectively executed policies. Local councillors were mobilised against reserving contracts to politically affiliated contractors- thereby transcending any form of opposition.

2.6. Conclusion

Access to adequate water is crucial for a growing urban economy. The geomorphology, climatic conditions along with rapid urbanization caused severe water scarcity in Rajkot. Governance challenges, especially inadequate (technical and financial) capacities and clientelistic practices, hindered implementation of adaptation measures. However, over time Rajkot was able to improve its water security by effectively implementing a range of adaptation instruments by transcending governance challenges including clientelism. The chapter traced the city's adaptation measures from the 1990s till 2020, which reflects the ideational evolution within the urban local body. The instruments implemented from the 1990s have been divided into phases based on the prevalent ideology- a) augmentation of water supply in the first phase, b) conservation of water in the second phase, and c) efficient water consumption and institutionalisation of a climate action plan in the third phase- all of which were congruent with the policy goal of improving water supply for all. Ideas within the city government evolved over time to address water challenges and clientelism through the combination of bureaucratic puzzling and political powering.

Bureaucratic puzzling was influenced by the administrative tradition (embedded autonomous bureaucracy working as a cohesive unit) and strong learning from previous experiences and new information. The government engaged with domain experts including other state and non-state actors to improve their (technical and financial) capacity and policy approach due to better access to new information. Yet, policy planning and execution was independent of vested interests. Rajkot's city bureaucrats (water works and/ or town planning department), headed by the Municipal Commissioner, collectively deliberated over policy choices to define the nature of the city's water challenges, and proposed technically optimal adaptation solutions. Additionally, over time climate co-benefits associated with existing and planned developmental measures were recognised as part of a climate action plan. Furthermore, domestic schemes and programmes were identified and adopted to the local setting.

The proposed policy proposals were effectively executed due to support of the political executives, especially of the mayor and standing committee members, during the planning and execution process. Political powering not only supported technical thinking, but was also provided in non-technical ways (e.g., sensitising and mobilising citizens, local councillors, citizen groups and sub-national and national governments, and insulating bureaucrats from interference or pressure). Strong political support insulated bureaucrats from oppositional

forces (e.g., local councillors, citizen groups, private water tanker lobby), leading to effective execution. Political beliefs held by Rajkot's political executives favoured policy choices that would improve water supply for all as opposed to clientelistic ones. Political beliefs strongly influenced powering strategies in Rajkot. The combination of bureaucratic puzzling and political powering changed thinking within the city government to incrementally pursue adaptation instruments to control clientelism and improve the city's water security. Ideational churning within the city government created a synergised bureaucratic-political rationality favouring programmatic adaptation instruments. Ideational evolution within the urban local body had thus improved its capacity to introduce new adaptation instruments, despite the presence of powerful social forces.

Improved state capacity at the local level nudged the city towards a climate friendly paradigm (improved water security and climate action). Several new policy instruments were incrementally introduced under the existing paradigm, all of which cumulatively resulted in improved water security. This qualifies as a second order policy change, that is a within paradigm change. Since the overarching policy goal of improving water supply for all remained unaltered, there was no change in the city's policy paradigm. The second order policy change occurred in a layered manner as new policy instruments were attached to existing norms, without altering them. Additionally, the urban local body until 2019 pursued disaggregated policies, which changed to a more consolidated policy package, the climate action plan comprising of a range of (existing and planned) water adaptation measures. The layered second order policy change was influenced by ideas within the state at the local level (endogenous and structural factors), and not due to material factors (e.g., political power, economic interests). The urban local body was convinced, due to ideational churning, that the city's water security would improve through the incremental introduction of new policy instruments. Within a multi-level governance framework, the study shows that, the city government was the main actor in effectively planning and executing adaptation measures.

This chapter explains how ideational churning within Rajkot's city government improved the capacity over time to pursue a climate friendly paradigm that benefits all citizens.

Thus, the state in Rajkot exemplified its ability to solve collective action problems and think and act locally & globally.

Chapter Three

3. Rajkot's water mitigation action: another example of thinking and acting local

3.1. Introduction

This chapter focuses on the water mitigation measures implemented by a medium sized²⁹¹, non-metropolitan city, Rajkot, to combat the impacts of climate change and become water resilient. Water and energy security for Indian cities will be threatened due to the combined effect of urbanization and climate change. The water sector is a highly energy intensive sector contributing to considerable Green House Gas (GHG) emissions (see table 16 in annexure). In the case of Rajkot, the water sector consumes approximately 60 per cent of the total municipal energy and has the highest GHG emission levels (greater than 50 per cent in 2016) as compared to other sectors (CapaCITIES, 2018). In order to effectively implement water mitigation policies, cities need to overcome a range of inter-connected governance challenges such as lack of (financial and technical) capacity, no decision-making power, rent-seeking activities and the presence of strong oppositional forces. Additionally, India lacks a supportive climate governance framework guiding urban climate action (details explained in introduction chapter).

Over time Rajkot transcended governance challenges to implement a range of mitigation measures, which pushed the city towards a climate friendly paradigm (improved water security and climate action). Climate mitigation measures focus on combating the impacts of climate change by reducing GHG emissions²⁹². This chapter traces Rajkot's water mitigation measures, which broadly include improving energy efficiency, reducing energy consumption, and using alternative energy sources like solar. Cumulatively, these measures would improve energy and water security. These measures were aided by both domestic and international actors, which improved the city's recognition (global and domestic (see box 6 in annexure)), and ability to innovatively formulate and implement climate policy measures. Additionally, the city acknowledged the mitigation potential of existing and planned policy instruments. Moreover, the city voluntarily institutionalized a climate action plan in 2019²⁹³- first city in Gujarat to do

²⁹¹ Rajkot is a million plus and non-metropolitan city, classified as tier two or class I B city (population between 1-5 million) (Ahluwalia et al., 2011).

²⁹² Climate mitigation measures focus on reducing the impacts of climate change, whereas climate adaptation measures prioritise coping with the impacts of climate change.

²⁹³ As per RMC Standing Committee resolution (RMC, 2019a), and General Board resolution RMC, 2019c), the city council ratified the climate action plan.

so. This leveraged existing and future water security measures. New policy instruments implemented in the water sector were influenced by previous and/or on-going climate mitigation measures executed across different sectors like transport, electricity, and housing-policy learning (see table 15 in annexure).

This chapter highlights the influence of the state at the city level on improving water security and pursuing climate action²⁹⁴. A state centric approach is applied to explain the following points: a) effective execution of water mitigation instruments in the presence of vested interest groups was due to improved state capacity. As is illustrated in the introduction chapter, improved state capacity is due to evolution of ideas within the city government. This ideational evolution is facilitated by the combination of bureaucratic puzzling and strong powering strategies, b) implementation of water mitigation measures do not lead to a policy paradigm change (overarching policy goal remained unaltered), but qualify as a second order change- a within paradigm change. New policy instruments (e.g., solar water heating systems, solar water treatment plant, upgrading the water pumping machinery, decentralized waste water treatment plant) were introduced to achieve the dominant policy goal. This change occurred in a layered manner (new action incorporated under existing paradigm). Ideas within the urban local body (endogenous factors) explain the layered second order policy change. In addition, ideas were shared by a group of city bureaucrats (structural factors) and not held by individuals (agency driven argument). These observations corroborate with findings observed in Rajkot's water adaptation measures.

The subsequent section contextualises Rajkot's water mitigation instruments within the theoretical framework of the study. Following which, Rajkot's water mitigation trajectory has been discussed from the 1990s²⁹⁵ till 2020. Based on the dominant ideology driving mitigation policy instruments there are two broad phases- a) energy conservation phase, b) energy efficiency and emission reduction phase. This section discusses the impact of bureaucratic puzzling and political powering on policy formulation and execution. The chapter concludes by highlighting the role of ideas within the city government in controlling clientelistic and rent-seeking activities and furthering water mitigation instruments.

²⁹⁴ Urban water mitigation governance involves a range of stakeholders, both state and non-state (see table 9 in annexure), working across different levels. However, the city government in Rajkot was the main stakeholder in promoting and sustaining local policy measures.

²⁹⁵ The study timeline is from the 1990s (see introduction chapter).

3.2. Theoretically contextualising Rajkot's water mitigation trajectory

This section discusses the theoretical framework of the study and applied it to Rajkot's water mitigation measures. Rajkot witnessed severe water shortages, and consequently spent considerable resources (finances and energy) on providing potable water to its citizens. Furthermore, Indian cities experience a range of governance barriers while implementing development and climate objectives. City governments, especially in medium sized cities like Rajkot, lack the capacity, both technical and financial, and authority to pursue local policy measures. In addition, cities are prone to rent-seeking practices facilitated by nexus of vested interest groups (e.g., local councillors and contractors). The politically affiliated vested interest groups (e.g., builders and contractors) intervene with the working of the urban local body to acquire large execution contracts. Furthermore, climate concerns have not penetrated decision-making processes at the city level. City governments still perceive climate change as a global threat requiring national and global action. Additionally, the domestic climate governance framework is still weak (e.g., no urban climate policy or institution) to guide city level action. All these governance challenges cumulatively impede effective implementation of mitigation instruments leading to poor and disproportionate service provision.

Rajkot has over time moved towards a climate friendly paradigm with improved water security and climate action. The city was able to design and execute a range of water mitigation instruments that nudged the city towards a climate friendly paradigm. The study argues that, effective implementation of new instruments is attributed to improved capacity of the state at the local level. The basic premise of this research suggests that, gradual and path dependent evolution of ideas within state enables effective decision making by overcoming governance challenges (explained in detail in the introduction chapter). Ideational churning with the state is a consequence of bureaucratic puzzling²⁹⁶ and political powering²⁹⁷ (see Heclo, 1974). Thinking within the city government changes which creates a bureaucratic-political rationality in favour of a particular policy that serves all citizens. Only when bureaucratic rationality is aligned with political rationality can policies be effectively executed. Bureaucratic puzzling is

²⁹⁶ Puzzling strategies involve collective deliberations over a policy problem and potential solution. This process influences the municipal agenda and leads to policy formulation.

²⁹⁷ Powering strategies involve use of power and authority to execute instruments by neutralising or overcoming opposition. This process leads to adoption and execution of a policy proposal.

influenced by the administrative tradition²⁹⁸ and social learning²⁹⁹. Likewise, powering strategies are influenced by the political beliefs.

Bureaucratic puzzling in Rajkot was influenced by an embedded autonomous bureaucracy working as a cohesive unit, and learning from past experiences and new information. Social learning³⁰⁰ in the case of Rajkot involved learning from previous policies³⁰¹ and engagements with domain experts to access information on new mitigation instruments. Both state³⁰² and non-state³⁰³ stakeholders assisted the city government in understanding societal needs³⁰⁴, accessing new information and technology³⁰⁵ and disseminating knowledge³⁰⁶. As was the case of water adaptation measures, the city government in Rajkot engaged with experts as per its need for technical assistance, and did not formulate a permanent advocacy committee or group, especially to further climate action. More importantly, the city government in Rajkot was able

²⁹⁸ The administrative tradition can be determined by the type of bureaucracy. A bureaucracy can be embedded autonomous (engaged with society yet autonomous from vested interest groups) (see Evans, 1995), and work as a cohesive unit to pursue a policy. Such a bureaucracy favours programmatic policies benefitting all citizens. Another type of bureaucracy can be embedded particularistic –mediated by powerful social forces (Herring, 1999) and fragmented. Clientelistic policies are pursued by such a bureaucracy.

²⁹⁹ Policy making is influenced by previous policies and new information, leading to identification of a policy problem. This process precedes puzzling and powering strategies. Social learning leads to designing of programmatic measures. In cases where there is no learning clientelistic policies are pursued.

³⁰⁰ This process helped the state to understand the needs of its citizens, and access new information to design socially relevant policies.

³⁰¹ The urban local body built on former policy experiences. For instance, the previously formulated emissions inventory (e.g. as part of the solar city master plan) and action plans (e.g. low emission development strategy action plan, low carbon mobility plan) were used to consolidate the climate action plan. Additionally, new policy instruments (e.g. replacing inefficient water pumping units) built on existing ones (e.g. energy audits).

The Climate Resilient Climate Action Plan (CRCAP)- was formulated by consolidating existing action plans (e.g. solar city master plan, low carbon mobility, low emission development strategies plan).

Similarly, learnings (best practices) from previous climate measures, that is collective deliberations involving various stakeholders (including State and non-state actors), were adopted to formulate new policy instruments (e.g. the climate action plan).

³⁰² The urban local body was assisted by retired bureaucrats, Gujarat Town Planning & Climate Change department.

³⁰³ The city government engaged with citizen association groups, academic institutions, and civil society members.

³⁰⁴ The city government invited retired bureaucrats and citizen association members (builders and architects) to review the modified city development control regulations mandating solar water heating systems.

Similarly, the urban local body invited a range of stakeholders (e.g. members of citizen association groups & civil societies, academics, other State officials) to review the city's climate action plan. It must be noted that certain policy measures required coordinated effort across the different sectors or the urban local body. This coordination within the bureaucracy was also a learning process that was carried forward.

³⁰⁵ The urban local body connected with academic partners and research institutes to learn about new technologies. NGOs helped the city government build technical capacity and connect with climate networks, pilot interventions and manage knowledge.

International agencies mainly provided technical and financial support to pilot certain instruments.

³⁰⁶ The city government relied on local media (television, radio and newspapers) to sensitize citizens. Furthermore, domain experts assisted the urban local body to prepare knowledge dissemination channels (e.g. website to share climate related information).

to engage with domain experts, and yet design and execute programmatic policies despite the presence of powerful vested interest groups- embedded yet autonomous. This process of learning helped the Rajkot Municipal Corporation (RMC) identify problems (e.g., governance, geomorphological) impeding policy execution, leading to water and energy insecurities. This process was followed by bureaucratic puzzling and political powering.

The key stakeholders involved in puzzling strategies included the city bureaucrats (e.g. deputy and executive engineers of the water works and town planning department, city engineers, and the Commissioner) (see organizational map of the city government in Rajkot's water adaptation chapter). Rajkot's Municipal Commissioners prioritised the water sector by encouraging city bureaucrats to design and execute instruments effectively. Additionally, the Commissioners would occasionally participate in the execution of policy measures (e.g., personally supervised formulation of the climate action plan). Driven by the water insecurities and increasing demand, the city bureaucrats and occasionally the Commissioner collectively deliberated over existing policy problems (e.g., resource intensive & inefficient water supply systems) leading to water and energy insecurities. Subsequently, technically feasible³⁰⁷ policy instruments (e.g., promoting energy efficiency and renewable energy), which were influenced by previous policies, were proposed by the city bureaucrats. Following which, policy proposals were formulated to conserve energy³⁰⁸, improve energy efficiency³⁰⁹ and reduce GHG emissions³¹⁰. Additionally, collective deliberations among city bureaucrats, with assistance from experts, resulted in acknowledging the climate mitigation potential associated with existing and planned measures (e.g., improved energy & water security accompanied by GHG emission reduction)³¹¹. A climate action plan, comprising of all (water) mitigation instruments, was

³⁰⁷ The urban local body pursued instruments that were either suitable to the local context (e.g. using solar energy to replace conventional sources) or addressed the city needs (e.g. replacing water pumping machinery aided by domestic scheme).

³⁰⁸ Energy conservation measures include energy audits, and solar water heating systems.

³⁰⁹ Measures introduced to improve energy efficiency include upgrading water pumping machinery, using solar energy to treat water, and decentralising waste water treatment plant.

³¹⁰ The climate action plan acknowledged the mitigation potential of existing and planned measures.

³¹¹ Rajkot's climate measures were leveraged by the domestic climate governance framework. For instance, a Solar City Programme was introduced by the Ministry of New and Renewable Energy (MNRE) in 2008. Under this programme the RMC, assisted by an expert, assessed the renewable energy potential of the city, formulated a Solar City Master Plan, and institutionalised a solar cell.

In the same year, the central government introduced the first domestic climate policy, the National Action Plan on Climate Change (NAPCC). Following which, the Gujarat government formulated the State Action Plan on Climate Change (SAPCC), and institutionalised an independent climate change department (first of its kind in India).

Also, the state/sub-national government introduced policies to promote renewable energy (e.g. Gujarat Wind Power Policy in 2007, Solar Policy in 2009). The city government used these policies and institutions to further climate specific measures in Rajkot.

consolidated by the city bureaucrats. These water mitigation measures involved the introduction of new policy instruments under the existing policy paradigm. Moreover, puzzling strategies enabled the urban local body to direct domestic schemes and programmes, both centre and sub-national/state level policies, to improve its capacity to execute policy instruments. In some cases, the urban local body was also able to channelise international aid to pursue policy instruments (e.g., piloting solar powered water treatment plant).

Powering strategies in Rajkot were influenced by political beliefs that favoured mitigation instruments serving all citizens. The political executives in Rajkot (e.g., Mayor, members of the Standing Committee and occasionally the General Body) supported bureaucratic efforts during the planning and execution phase. Effective puzzling strategies made it easier to convince the mayor's office about the quantifiable benefits associated with implementing water mitigation instruments. Policy proposals were adopted through resolutions after evaluating the political feasibility of the instruments. Water issues, affecting all citizens, have been a political issue supported by mayors. Additionally, the political executives were aware about climate measures through previous and on-going climate measures across different sectors in the city (e.g., electricity, transport, housing). Also, respective Mayors of Rajkot were involved in various climate workshops and forums (e.g., Member of the Global Covenant of Mayors for Climate & Energy). Since the political executives were aware of climate issues, it was relatively easy for the bureaucrats to gain political support to adopt policies (e.g., institutionalising a climate action plan). Various city bureaucrats stated that, "*the legislative and bureaucratic branch of the city government shared synergistic ties*". Powering strategies not only backed technical ideas, but also supported in non-technical ways (e.g., control rent-seeking activities³¹², convinced citizen associated members³¹³, mobilised local councillors³¹⁴, and sub-national³¹⁵ to support measures). Consequently, the city officials were insulated from oppositional forces and could effectively execute mitigation instruments to improve energy and

³¹² The political executives ensured a smooth and transparent tender process including choosing a technically capable contractor. Often, local councillors push the Mayor's office to contract execution contracts to their contractors.

³¹³ The Mayor's office convinced citizen association members to support policy measures (e.g. solar water heating systems).

³¹⁴ Local councillors were mobilised by the Mayor's office to back policy measures without manipulating the tender process. Additionally, councillors were asked to sensitize citizens in their wards about policy measures.

³¹⁵ The political executives, especially the Mayor or chairman of the standing committee, mobilised the Gujarat government to support local measures or follow up approval of sub-national government schemes and programmes.

water security. Values shared by the bureaucratic arm aligned well with the political arm leading to adoption of programmatic measures, without being influenced by vested interests.

The combination of puzzling and powering resulted in the evolution of ideas within Rajkot's city government. There was a gradual and path dependent evolution of ideas within the RMC. Between 1990 and 2016, the city government introduced water mitigation instruments to conserve energy. Thinking within the urban local body evolved over time. From 2017 onwards, the RMC pursued instruments to improve energy efficiency and reduce the emission contribution of the water sector. Additionally, a consolidated climate action plan was voluntarily ratified by the city government to further the city's climate commitment. Ideational evolution within the RMC created a synergised bureaucratic-political rationality supporting mitigation instruments serving all citizens, as opposed to clientelistic policies. Therefore, the city government had the ability to introduce mitigation instruments to deal with its water woes. Rajkot's climate friendly paradigm is attributed to improved capacity of the city government. The study also argues that, there was a layered second order policy change in Rajkot, a within paradigm change. This change was influenced by endogenous and ideational factors. A second order policy change comprises of a change in the policy technique or instrument to achieve the policy goal (see Hall, 1993). The urban local body had the ability to address its governance challenges such as rent-seeking activities to introduce several mitigation instruments to improve water security for all. The underlying policy goal driving Rajkot's policy instruments, that is water supply to all, remained consistent over the years. There was no change in Rajkot's policy paradigm, which typically involves a radical and incommensurable shift- the new policy goal should be significantly different from the previous one. Additionally, the policy setting, the level at which policies are introduced, remained unchanged. What changed with time were the policy techniques or instruments used to achieve the overarching policy goal. For instance, in the energy conservation phase, instruments were introduced to reduce energy consumption of the water sector. In recent years, provisions were made to improve energy efficiency and reduce GHG emissions. Additionally, a climate action plan was institutionalised by the RMC. Pursuing climate measures did not alter the underlying policy goal or the bureaucratic system, but only strengthened it.

This second order policy change followed a layered path, as new instruments not only build on previous policies, but were attached to existing rules without replacing them. Initially, the urban local body was pursuing disaggregated water mitigation instruments without

acknowledging the inter-linkages and associated climate co-benefits- first layer. Over time the RMC formulated a consolidated policy package, the climate action plan, comprising of existing and planned water mitigation instruments- second layer.

Rajkot's layered second order policy change is attributed to ideational factors. Following a constructivist approach, the study suggests that (see introduction chapter), ideas play an important role in influencing policies and policy change. Materialistic factors (e.g., monetary gains, political power) do not explain the policy change observed in the city. For instance, every political party strived to improve Rajkot's water security. Additionally, policy formulation and execution were free of vested interests. Ideational churning within the city government improved its ability to pursue water mitigation instruments in the presence of powerful social actors. Furthermore, the layered policy change observed in Rajkot was due to endogenous or internal factors. The policy instruments introduced were a result of the gradual and path dependent ideational evolution within the urban local body. More specifically, Rajkot's water mitigation measures were influenced by the beliefs of the city bureaucrats and occasionally the Commissioner, who were backed by the legislative branch. Subsequently, policy proposals were formulated to introduce new mitigation instruments. Similarly, city bureaucrats harnessed and customised domestic schemes to execute policy instruments. Although multiple stakeholders (domestic³¹⁶ and international³¹⁷) influenced Rajkot's mitigation instruments (see table 9 in annexure), the city government was the main actor in driving a second order policy change. Therefore, with respect to water mitigation (as is seen in water adaptation) ideas within the Rajkot Municipal Corporation nudged the city towards a climate friendly paradigm.

3.3. Rajkot's water mitigation trajectory

Rajkot has been able to improve its water security and pursue climate action. This section traces Rajkot's water mitigation trajectory from the 1990s till 2020. Driven by the memory of acute water shortages³¹⁸ (mentioned in detail in the water adaptation chapter) and water problems (e.g., high energy consumption), the city government made several policy adjustments to

³¹⁶ The national and sub-national governments provided technical and financial assistance to local measures under schemes and programmes.

Domestic and international NGOs helped the RMC build its technical capacity and with data management.

³¹⁷ International donor agencies provided technical and financial assistance to pilot measures on behalf of the city government.

³¹⁸ During water scarcity the city would source water from outside the city limits which was a resource intensive process both in terms of money and energy.

improve the city's water security, by overcoming oppositional forces (e.g., citizen groups, local councillors, contractors).

Rajkot's mitigation instruments were driven by two dominant ideologies: a) energy conservation (1990-2016), and b) energy efficiency and emission reduction (2017-2020). Energy conservation efforts (e.g., energy audits, solar water heating systems) were driven by the need to reduce the water sector's high energy consumption. Over time, state thinking changed to include GHG emission reduction considerations along with energy efficiency (e.g., solar powered water treatment plant, energy efficient water pumping machinery, decentralised waste water treatment plant). In addition, in 2019 a climate action plan was ratified (see details in Rajkot water adaptation chapter), which acknowledged mitigation co-benefits of existing and planned measures. Cumulatively, the underlying goal of the policy instruments was to improve the city's water security.

The combination of bureaucratic puzzling and political powering resulted in ideational evolution within the city government. Improved capacity of the state in Rajkot, to pursue mitigation instruments in the presence of social forces, is attributed to changed thinking within the government. Furthermore, mitigation related policy adjustments suggest a second order layered policy change- a within paradigm change. The policy setting and goal remained unaltered, but new policy instruments were incrementally introduced under the existing paradigm. Ideational evolution within the city government (endogenous and structural factors) explains this policy change.

3.3.1. Energy conservation phase (1990-2016)

In this phase, the urban local body focused on energy conservation. The city witnessed several water crises from the 1970s, which were dealt with contingency measures (e.g., sourcing water from outside the city limits). This was coupled with the lack of a perennial water source. As a result, considerable energy was spent on sourcing water from outside the city, apart from what was being used to purify bulk/raw water, and supply treated water. In addition, in recent years Rajkot began sourcing water from the Narmada River to meet its growing needs. This further increased the energy consumption and municipal expenditure. Bureaucratic puzzling strategies (involving city bureaucrats headed by respective Commissioners') lead to the introduction of mitigation policy instruments (e.g., assessing energy consumption of the water sector and

reducing dependence on conventional energy source) under the prevalent paradigm- no change in policy goal. The RMC engaged with domain experts to access new information and understand ground realities better, which would lead to more optimal policy formulation. The city government was embedded within the society, yet decision making and policy execution was autonomous from vested interests.

Rajkot's political executives, mainly the mayor and standing committee members, actively supported technical thinking, that is policy ideas presented in the form of proposals were adopted through resolutions. In addition, non-technical support was also provided by the political executives. For instance, city bureaucrats were insulated from interference which ensured smooth and transparent tender process and policy execution. Relevant stakeholders (local councillors, citizen association group members³¹⁹) were mobilised by the mayor's office to support policy measures without causing any hindrance, especially in the execution process. Similarly, political executives mobilised the Gujarat government to support Rajkot's measures (e.g., amending development control regulations). Consequently, new policy instruments could be effectively introduced as the bureaucrats and political executives worked as a cohesive unit to pursue energy conservation instruments that would improve water supply for all. The mitigation potential of existing instruments was unacknowledged by the urban local body.

a. Policy instrument: energy audits

The urban local body introduced a policy instrument, energy auditing, to assess the energy consumption of the water sector. Since the 1990's, the city government conducted regular energy audits of water pumping units to assess the efficiency of the water pump sets. This instrument was included under the prevalent paradigm, without altering it.

Puzzling over energy audits

City bureaucrats of the water works department, backed by respective Commissioners', collectively deliberated over the policy instrument. A senior bureaucrat of the water works department stated that, "*the Commissioner encouraged bureaucrats and gave them a free hand to audit water pumping machinery to improve energy and financial efficiency and strengthen service delivery*". This process helped identify and define the nature of the policy problem- the

³¹⁹ Local citizen groups, especially builders lobby, were reluctant to implement solar water heating systems as it would involve additional cost.

water sector is highly resource intensive, both in terms of energy and finances. The bureaucrats of the waterworks department felt the need to assess the urban local body's energy consumption, especially with respect to the water sector. Consequently, the city bureaucrats formulated a policy proposal to conduct regular energy audits of water pumping machinery. The bureaucrats lacked the capacity to conduct such audits and hence engaged with experts who could assist them. The urban local body invited a public agency called the National Small Industries Corporation (NSIC) technical service centre to conduct energy audits on their behalf.

Powering over energy audits

The mayor's office actively supported policy proposals and passed several resolutions to conduct regular energy audits. Clearly defined policy proposals and active support of the Commissioner helped city bureaucrats convince the political executives. Additionally, budgetary approval was acquired as a public agency (relatively low cost of conducting audits) would be conducting energy audits on behalf of the RMC. It should be noted that at this point in time, such audits were not routinely conducted in Indian cities and therefore, gaining the support of the political executives was a major milestone. The political executives mobilised local councillors to support these efforts by ensuring a smooth and transparent tendering process. Consequently, political support enabled bureaucrats to effectively conduct energy audits without being manipulated by politically affiliated vested interest groups.

Learnings from policy experiences resulted in the introduction of energy auditing process. The city government engaged with domain experts to conduct energy audits- embedded within the society. However, policy formulation and execution were autonomously pursued by the urban local body by regulating rent-seeking activities. The combined effect of bureaucratic puzzling and political powering changed thinking within the city government which created a rationality favouring the policy instrument.

b. Policy instrument: solar water heating systems

Rajkot mandated the implementation of solar water heating systems with an aim to serve all citizens. The city development control regulations (General Development Control Regulations (GDCR)) were modified in 2004 to mandate implementation of solar water heating systems in

new buildings, without which a completion certificate³²⁰ would not be issued (see box 5 in annexure). Rajkot was the only city in Gujarat to mandate the implementation of solar water heating systems through its building bye laws. Subsequently, the city government installed multiple solar powered systems in municipal buildings and across the city³²¹. By 2011-12, there were approximately 16000 households with solar water heating systems (GoI, undated, b) in the city. The policy instrument was attached to the existing norm, that is the building bye laws which was unaltered.

Puzzling over solar water heating systems

City bureaucrats of the town planning department supported by the then Commissioner (in 2003-04) collectively puzzled over this policy instrument. Deliberations among the bureaucrats lead to identification of policy problem- high consumption of municipal energy. In order to reduce dependence on conventional energy the city bureaucrats proposed the use of renewable energy. After assessing the renewable energy potential of the city, a proposal was formulated to use solar energy. The technical capacity of the city bureaucrats (e.g., applications and consequences of renewable energy) was improved through engagements with experts through a knowledge exchange programme between Europe and Asia on environmental issues³²². Furthermore, to ensure uptake of solar water heating systems, the bureaucrats proposed to modify the city's building bye laws. A city engineer of the RMC stated that, "*incorporating solar water heating systems in Rajkot's development control regulations would lead to effective execution*". A public exhibition was organised by the RMC to sensitise citizens of Rajkot about the amendments and merits of implementing renewable energy, particularly solar energy. Additionally, the urban local body planned to incentivise the uptake of the policy instrument by providing property tax rebates³²³.

Powering over solar water heating systems

The policy instrument was included in Rajkot's building bye laws was possible because of strong support of local political executives. City bureaucrats backed by the Commissioner

³²⁰ All new buildings need to include solar water heating systems in their building plans, without which they will not acquire permission to construct and avail a certificate of completion.

³²¹ Solar grid connected systems were installed in a) all zonal office buildings, b) central zone civic centre, c) municipal schools, d) libraries, and e) sports complexes.

RMC also oversaw the installation of 200 solar powered street lights, 300 solar studs and blinkers (GoI, undated, b).

³²² Rajkot was part of the European Commission Asia Pro Eco Programme (2002-2004) to encourage the adoption of policies, technologies and practices that promote cleaner (renewable energy), more energy efficient, sustainable solutions to address environmental problems in Asia (European Commission, 2003).

³²³ The RMC Standing Committee passed a resolution supporting this measure (RMC, 2010c).

convinced the mayor's office, through a detailed policy proposal, that this instrument would improve service delivery and would be cost effective strategy in the long run (e.g., energy and financial savings). Since policy ideas were backed by Rajkot's political executives, the city bureaucrats could appeal and mobilise the Gujarat Town Planning and Valuation department via the Rajkot Urban Development Authority's (RUDA) to incorporate the instrument into the city's building bye laws. Convincing the state/sub-national officials was a straightforward process as this measure was a recommendation of the Gujarat government in the first place. Additionally, Rajkot was politically influential at the sub-national/state level³²⁴ (see details in the Rajkot adaptation chapter), and so its concerns, especially water, were prioritised. Mandating the instrument through building bye laws helped neutralise opposition³²⁵ from citizen association members, particularly the builders lobby who were wary of the policy instruments as it would mean additional construction costs. Additionally, the urban local body invited members of relevant citizen association groups (e.g., builders and architects) to discuss details of solar water heating systems, and explain how the long-term benefits would outweigh the initial capital cost. Similarly, local councillors were mobilised by the mayor's office to encourage citizens in their respective wards to implement the instrument. Powering strategies backed technical thinking and also supported in non-technical ways, which ensured promotion of solar water heating systems.

The bureaucracy addressed the problem of high energy consumption by learning from new information. The city government engaged with experts to improve its technical capacity and independently proposed to mandate the policy instrument through Rajkot's building bye laws. Ideational evolution was facilitated by the combination of bureaucratic puzzling and political powering. Consequently, a synergised bureaucratic-political rationality emerged favouring implementation of solar water heating systems through the city's development control regulations.

The energy conservation phase was driven by the dominant ideology of reducing energy consumption levels of the water sector along with improving municipal finances. The policy instruments introduced to conserve energy included regular energy audits of water pumping

³²⁴ Rajkot has been the economic and political hub of the Saurashtra region, and had strong political representation at the state/sub-national level.

³²⁵ Senior representatives of citizen association groups met with the Commissioner and Mayor to express concerns and dissuade the urban local body from amending Rajkot's building bye laws.

machinery and mandating solar water heating systems. All policy instruments were incorporated under the prevalent paradigm, without altering it. The embedded autonomous bureaucracy learnt from previous experiences and worked as a cohesive unit to pursue instruments. The city government was able to control rent-seeking activities (e.g., ensure energy audits are conducted by the lowest bidder and not a politically affiliated actor) and neutralise opposition (e.g., convince the builders lobby to support the measure). The mitigation potential of the policy instruments was yet to be acknowledged by the RMC.

3.3.2. Energy efficiency and emission reduction phase (2017-2020)

From 2017 onwards, the city government introduced policy instruments to improve energy efficiency and emission reduction. Apart from high energy consumption which increased with growing demands, the water sector also had the highest GHG emission contribution (57.6 per cent in 2015-16 (CapaCITIES, 2018)) as compared to other sectors (e.g., sanitation, electricity, transport). Previous policy instruments (e.g., energy audits) and improved access to new information through engagements with domain experts (e.g., citizen group members, non-governmental organizations, academic partners) enabled the RMC to creatively think of new policy instruments. Bureaucratic puzzling involved deliberations among city bureaucrats and respective Commissioners over mitigation policy instruments to improve energy efficiency and reduce emissions (e.g., solar powered water treatment plant, energy efficient water pumping machinery). Furthermore, in this phase the mitigation potential (e.g., emission reduction contribution) of all policy instruments was acknowledged by the RMC with assistance from domain experts. In addition, a consolidated policy package comprising of several mitigation policy instruments was formulated- the climate resilient city action plan. Domestic programmes and schemes were identified and customised by the city bureaucrats to pursue instruments.

Bureaucratic puzzling strategies were backed by strong political powering strategies. The political executives, mainly the mayor and standing committee members, supported the planning and execution of policy instruments. Technical ideas were backed by the mayor's office leading to the formulation of resolutions mandating implementation of policy instruments. Additionally, political support was provided in non-technical ways such as ensuring a smooth and transparent tender process, which helped curtail rent-seeking activities (e.g., politically affiliated contractors manipulating tender process to acquire sizeable

contracts). In addition, political backing helped mobilise the sub-national and national government to support Rajkot's policy instruments through programmes and schemes. As a result, the city bureaucrats were able to effectively execute instruments without any interference of politically powerful social actors. Effective execution of policy instruments was facilitated by a cohesive and embedded autonomous urban local body, who were driven by the objective to improve water supply for all. Policy instruments in this phase were mainstreamed into the prevalent paradigm, without altering it.

a. Policy instrument: energy efficient water pumps

The water sector has been a highly resource intensive sector. The urban local body introduced a policy instrument (e.g., energy efficient water pumping machinery) from 2015 onwards to improve energy efficiency along with service delivery. The city government channelised union and sub-national government schemes and programmes to execute the instrument. For instance, the city government benefitted from union government schemes such as the Jawaharlal Nehru National Urban Renewal Mission³²⁶ (JNNURM) (2005), and Atal Mission for Rejuvenation and Urban Transformation³²⁷ (AMRUT) mission (2015)). Rajkot, as part of the JNNURM programme, was able to build a positive reputation with the central and state/sub-national government. This improved the city's chances of acquiring their support under other urban development schemes and programmes³²⁸. Additionally, funds were channelised from a state/sub-national government sponsored scheme, the Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana³²⁹ (SJMMSVY) (2009-10). The policy instrument was implemented under the existing policy paradigm.

Puzzling over energy efficient water pumps

The city bureaucrats of the waterworks department collectively deliberated over the problems associated with old and energy inefficient water pumping machinery. Following regular energy

³²⁶ JNNURM was India's first major urban infrastructure scheme introduced by the central government (see box 3 in annexure).

³²⁷ Following JNNURM, the Government of India (GoI), through the Ministry of Housing and Urban Affairs (MoHUA) (previously MoUD), launched a second version in 2015, the AMRUT mission which identified water supply & sewerage as priority sectors (see box 419).

The AMRUT mission had provisions to improve energy efficiency of drainage and water supply of cities.

³²⁸ The city officials built on former experiences (e.g. JNNURM scheme guidelines of formulating detailed project proposals), while acquiring support under the AMRUT programme, which had similar protocols. The city bureaucrats were in a better position to mobilise the sub-national and central nodal agencies.

³²⁹ After the abolishment of the Octroi in 2007, the government of Gujarat launched the SJMMSVY to support cities improve their infrastructure. Under the scheme the government of Gujarat is responsible for funding and reviewing projects. The responsibility of designing and implementation of projects lies with RMC.

audits conducted by the RMC, the next step involved upgrading the water pumping machinery. RMC deputy engineers of the water works department stated that, “*the Commissioner supervised progress and encouraged them to pursue the measure as it would improve Rajkot’s water supply*”. In order to execute the policy measure, that is upgrading energy efficient water pumping units, the urban local body required improved capacity, both financial and technical. Subsequently, the city bureaucrats formulated a policy proposal, whereby the policy instrument would be furthered by adapting policy recommendations put forward by the central and state/sub-national schemes & programmes³³⁰. In order to avail funds from domestic schemes, especially centrally sponsored schemes, the water works department bureaucrats formulated project proposals (e.g., City Development Plan (CDP) and Detailed Project Reports (DPRs)), which was a requirement set by the central government. Before, replacing all water pumping machinery, the city bureaucrats made provisions to pilot³³¹ the instrument. Results of the pilot study enabled the city officials to formulate several policy proposals to replace water pumping machinery by adopting domestic programmes and schemes. Depending on the availability of funds allocated from the sub-national and national government, the RMC proposed to upgrade water pumping units in a phased manner (resolutions passed- RMC, 2005a, b; RMC 2006, RMC, 2007; RMC, 2011; RMC, 2013; RMC, 2014d; RMC, 2016c; RMC, 2017b; RMC, 2018b, d; RMC, 2019e). The urban local body also engaged with a technical consultant³³², to conduct an energy audit of water treatment plants and pumping stations across the city under the centrally sponsored AMRUT scheme (GoI, 2017). The tender document involving third party quality checks and penalties for delays was formulated by the city bureaucrats.

Powering over energy efficient water pumps

Bureaucratic puzzling efforts resulted in adoption of policies due to strong powering strategies. The political executives, including the mayor and standing committee members, supported technical ideas and passed several resolutions mandating the execution of the policy instrument. The bureaucrats of the waterworks department, backed by the Commissioner, had

³³⁰ Funds were allocated predominantly from the central government with contributions from state/sub-national and city governments (50:20:30). The state government, particularly, the Gujarat Urban Development Mission (GUDM), monitored projects on behalf of the Ministry of Urban Development (MoUD). City governments were responsible for a) formulating reports on the basis of which funds were allocated, and b) implementing projects.

³³¹ Following an energy audit in 1999, the RMC replaced inefficient pumping units at Bhadar dam site (2005-07).

³³² In 2016, Ministry of Housing and Urban Affairs signed a Memorandum of Understanding (MoU) with Energy Efficiency Services Limited (EESL), a joint venture under the Ministry of Power, Government of India. Through this venture, EESL conducted energy audits and assisted the urban local body in replacing inefficient water supply & sewerage pump sets with energy efficient pumping machinery.

In addition, EESL assisted the city government in consolidating a detailed report of the findings, on the basis of which the central government allocated funds to replace energy inefficient pumping machinery.

convinced the mayor's office that the proposed instrument would improve service delivery and energy efficiency with the support of sub-national and national government (minimal investment from the city government). Powering strategies not only backed technical thinking, but also supported in non-technical ways. Since water has been a political issue, the political executives mobilised the local councillors to back the measure by ensuring a smooth tendering process (lowest technical bidder and not a politically affiliated contractor was contracted the execution work). Powering strategies helped the RMC control rent-seeking activities facilitated by the nexus of local vested interest groups (local councillors and contractors). This political backing enabled city bureaucrats to appeal to the union and state/sub-national³³³ governments to support (financial assistance) Rajkot's water measures. Occasionally, the political executives would follow up project appraisals with state/sub-national nodal agencies. Therefore, the RMC bureaucrats navigated stakeholders at all three tiers of government (centre, state and local) to pursue local policy instruments.

Previous policy instruments influenced RMC's effort of upgrading water pumping machinery by customising domestic schemes and programmes. Under the union government scheme, the urban local engaged with a technical consultant to pursue the instrument. Policy formulation and adoption was pursued independently by the bureaucracy by mobilising support of relevant stakeholders. Bureaucratic puzzling and political powering collectively changed thinking within the city government. Ideational evolution within the RMC created a rationality supporting the upgradation of Rajkot's water pumping machinery.

b. Policy instrument: decentralised waste water treatment systems

The urban local body as the next step to energy efficiency intends to convert waste into energy. In 2015, the RMC, as part of an on-going climate mitigation project³³⁴, piloted a 100 Kilo Litres per Day (KLD) decentralised waste water treatment plant (e.g., Jilla garden in Rajkot) to generate energy (e.g., biogas) from the waste. Additionally, treated waste water would be reused for domestic purposes (e.g., gardening) instead of discharging directly into the river, which would reduce water pollution. Results of the pilot study will help the city government

³³³ Rajkot's political clout at the state/sub-national level ensured support from the Gujarat government.

³³⁴ The decentralized waste water treatment system was piloted under the Urban Low Emissions Development strategy (LEDs) project (2012-2016) (see table 15 in annexure).

scale up the instrument across the city. Like previous policy instruments, this instrument was executed under the existing paradigm, without changing it.

Puzzling over decentralised waste water treatment systems

The city officials, especially of the water works department, deliberated over the policy problem- high energy consumptions of conventional waste water treatment plant. Another challenge was the discharge of untreated waste water into Aji river, causing water pollution and affecting public health and the environment. Following which, the city bureaucrats proposed to reuse waste water to generate energy. A policy proposal was formulated to pilot decentralised waste water treatment plant, before scaling it up to the city level. The pilot study would be conducted under an on-going climate mitigation project, involving the RMC and supported by domain experts³³⁵. An executive engineer of the RMC stated that, “*the Commissioner (2015) backed the city bureaucrats of the water works department to formulate the policy proposal, and convinced the legislative branch of the urban local body to support the measure*”. Results of the pilot study would guide the city bureaucrats replicate this policy instrument across the city. This pilot study also influenced Gujarat’s new policy promoting the reuse and recycle of waste water. Furthermore, the city bureaucrats proposed community level awareness workshops to sensitize citizens about the utility of the instrument (clearer and hygienic neighbourhood), and gain their support.

Powering over decentralised waste water treatment systems

Technical thinking was backed by the political executives, that is the mayor and the standing committee members. A resolution was passed by the mayor’s office supporting the policy proposal to pilot the instrument. The city bureaucrats backed by the Commissioner convinced the political executives that this instrument will reduce energy consumption, control water pollution, and also generate biogas from waste. In addition, since the cost of piloting the instrument was borne by the European Commission and not by the RMC, it was easier to acquire support from the political executives. Since, the urban local body was already pursuing several climate measures (see table 15 in annexure), it was easier to gain political support, as there was significant political awareness and backing for climate measures. Powering strategies also backed in non-technical ways. Local councillors were mobilised by the political executives to sensitise citizens in their respective wards, and ensure a smooth tender process. Additionally,

³³⁵ The city government was assisted by the UN-Habitat and the International Council for Local Environmental Initiatives and the European Commission to reduce emission levels in cities (see table 15 in annexure).

the bureaucrats (built on former experiences) convinced an international donor agency, the European Commission, to pilot the instrument under an on-going climate project. Furthermore, powering strategies enabled the city bureaucrats of the town planning department to mobilise the state/sub-national government to mandate the implementation of decentralised waste water treatment plant in the city's development control regulations.

The urban local body accessed new information through domain experts to address water challenges. Despite engagements with the society, the RMC autonomously designed and executed the policy instrument. The combination of bureaucratic puzzling and political powering lead to evolution of ideas within the city government. This ideational churning created a rationality supporting the generation of energy from waste water. The policy instrument, when scaled up to the city level, has the potential to reduce pollution along with improving energy efficiency.

c. Policy instrument: solar water treatment systems

The city government continued its efforts of improving energy efficiency by promoting renewable energy to treat raw/bulk water. In 2018, a grid connected solar photovoltaic (PV) cells (of 145 kilowatts peak (kWp)) was installed on Aji water treatment plant (RMC, 2018f) to reduce energy consumption and GHG emissions. This policy instrument was supported by the state/sub-national government (the SJMMSVY programme) and an international donor agency, the Swiss Agency for Development & Cooperation³³⁶ (SDC). The policy instrument was piloted under the prevalent policy paradigm. Results of the pilot study influenced future policy proposals.

Puzzling over solar water treatment systems

The city bureaucrats (water works and electricity department) and the then Municipal Commissioner (2018), collectively deliberated over the policy problem of high energy consumptions of the water sector. With increasing growth, the demand for water will increase leading to higher energy consumptions. The city bureaucrats, based on former experiences of solar interventions, proposed to use solar energy to treat raw/bulk water. A feasibility assessment of the instrument was conducted by the bureaucrats with the support of domain

³³⁶ The SDC piloted the instrument as part of an on-going climate project, CapaCITIES (2016-19) (see table 15 in annexure). The cost of implementing the solar PV system was shared between SDC through the CapaCITIES project (70 kWp solar PV system) and the RMC under the SJMMSVY scheme.

experts (the International Council for Local Environmental Initiatives³³⁷, an international non-governmental organization). Following which, a policy proposal was formulated by the city bureaucrats, closely monitored by the Commissioner, to pilot the instrument. Considering the technical requirement and high capital investment, the pilot study was proposed in collaboration with the RMC, the state/sub-national government and the SDC³³⁸. Results of the pilot study were used by the bureaucrats to propose the replication of the instrument (in 2018-19 municipal budget) on other water treatment plants and pumping stations across the city.

Powering over solar water treatment systems

The RMC was able to effectively pilot the policy instrument as it was backed by Rajkot's political executives. The mayor's office, typically the mayor and members of the standing committee, backed technocratic efforts. It was relatively easy to mobilise political support because the Commissioner and bureaucrats, through puzzling strategies, showcased that this instrument would reduce municipal expenditure, and improve both water and energy security. Additionally, due to former climate action, particularly solar, the legislative branch was aware and supportive of the policy instrument. Apart from supporting technical ideas, political support was provided in non-technical ways. The mayor's office convinced the local councillors to support the instrument without manipulating the tender process (e.g., pushing for a local contractor to execute the measure). Additionally, powering strategies enabled the city bureaucrats, assisted by ICLEI, to appeal and convince the sub-national government and the donor agency (SDC) to support the instrument. Previous engagements with the stakeholders (Gujarat government and the SDC) along with a positive reputation of the RMC made it relatively easy to acquire their support.

The urban local body built on previous experiences and new information acquired through engagements with experts to pilot the use of solar energy to treat raw/bulk water. The RMC worked autonomously to formulate and execute the policy instrument by controlling rent-seeking activities. Thinking within the city government changed due to the combined effect of bureaucratic puzzling and political powering. Consequently, a synergised rationality emerged which supported the use of solar energy, especially in the water sector, to improve energy efficiency.

³³⁷ ICLEI has been working with RMC since 2009-10, primarily on climate mitigation projects across different sectors. This was one of the first water supply project involving the two entities.

³³⁸ The RMC built on its prior experiences of working with international agencies on several climate mitigation instruments.

d. Policy instrument: climate resilient city action plan (water mitigation)

In 2018, the RMC as part of an on-going SDC funded climate project³³⁹ consolidated a Climate Resilient City Action Plan³⁴⁰ (CRCAP) to reduce the city's GHG emissions (14 percent) by 2022-23 as compared to the baseline (2015-16). The plan, comprising of existing and planned (water) mitigation instruments, was voluntarily³⁴¹ ratified by the urban local body in 2019, without altering existing norms. The climate action plan reinforced RMC's existing efforts of improving service delivery, building energy efficiency and climate commitments. The plan, for the first time acknowledged the mitigation potential (GHG emission reduction contribution) of existing and planned (water) policy instruments.

Puzzling over the climate action plan

All the above-mentioned policy instruments involved mitigation co-benefits such as reduced GHG emissions and improved energy efficiency. Rajkot's climate action plan was a result of prior experience of pursuing climate action. Following previous and on-going climate efforts, the city bureaucrats proposed to formulate a consolidated policy package, the Climate Resilient City Action Plan (CRCAP). The Commissioner (2017) encouraged select city bureaucrats (involved in Rajkot's climate interventions) to prepare a climate action plan by building on existing sectoral plans (e.g., solar city master plan, low carbon mobility, low emission development strategies plan). In addition, in the absence of a domestic urban climate policy and improved climate awareness (through engagements with experts like ICLEI³⁴²), the bureaucrats recognised mitigation potential of existing and planned (water) policy instruments. In order to formulate a socially relevant action plan, the RMC engaged both state and non-state stakeholders to review the technical and political feasibility of the plan. The bureaucrats

³³⁹ The climate action plan was formulated under the CapaCITIES project (2016-19).

³⁴⁰ As mentioned in the water adaptation chapter, the climate action plan comprises of a vulnerability study of the city including a baseline situation analysis, climate risks assessment. A range of (water) mitigation instruments have been proposed, which will be implemented between 2018 and 2023. The mitigation potential of existing instruments has been acknowledged.

³⁴¹ India till date has no urban climate policy.

³⁴² ICLEI assisted the urban local body conduct vulnerability assessments and risk analysis and assess climate mitigation co-benefits.

proposed to institutionalise teams (core team³⁴³, and stakeholder committee³⁴⁴) to review the plan. Furthermore, the city bureaucrats proposed to mainstream the climate action plan into the municipal agenda to ensure its uptake and overcome any resistance (e.g., local councillors).

Powering over the climate action plan

The climate action plan was institutionalised because it was backed by the mayor's office, the mayor and standing committee members. The political executives were mobilised, by the bureaucrats and the Commissioner, to support the instrument as this would not only improve water security, but also fulfil the city's climate commitments (e.g., reducing the city's GHG emissions). The political executives sanctioned a resolution to formulate the plan, and approved the institutionalisation of a climate and stakeholder team to review the plan. Rajkot's former climate efforts and history of water scarcity made it easier to gain political support. The mayor's office was already conscious and supportive of Rajkot's climate measures. This was leveraged by the fact that Rajkot's Mayors³⁴⁵ were members of global climate and energy platforms such as the Global Covenant of Mayors for Climate and Energy, and the Gujarat Covenant of Mayors for Climate and Energy³⁴⁶ (see box 6 in annexure)- which positioned them as domestic and global climate champions. Political support was provided in non-technical ways. The mayor's office convinced the local councillors to support the plan as it would leverage existing efforts to improve water security and meet (national and international) climate commitments without any extra cost or burden on the bureaucrats. Powering strategies enabled city bureaucrats to convince the donor agency (SDC) to back its effort. The climate action plan was incorporated into the 2019 municipal agenda due to strong political support.

The climate resilient city action plan was an outcome of learning from past experiences and engagements with domain experts. The climate action plan comprises of instruments that would improve service delivery for all citizens, conserve energy and reduce GHG emissions. The combination of bureaucratic puzzling and political powering changed thinking within the

³⁴³ The climate core team comprised of 40 city officials from different departments of RMC, Mayor & members of the standing committee and the Commissioner. The team: a) identified local problems with respect to environment and urban development, b) formulated a detailed emissions inventory, c) developed a city vulnerability assessment, and finally consolidated the climate action plan.

³⁴⁴ The RMC invited a range of stakeholders- local NGOs, citizen groups, Rajkot chamber of commerce, community leaders, university partners (e.g. CEPT) and private sector organizations to review the plan.

³⁴⁵ Former Mayor Dr Jaimin Upadhyay (2015-18) and current Mayor, Mrs Bina Acharya (2018 onwards) have been members of the global platform promoting sustainable development across cities.

³⁴⁶ A tripartite MoU was signed (30th August 2019) between RMC, Gujarat Climate Change department (coordinator), and the European Union (EU) International Urban Co-operation (IUC) (funder and technical advisor). This network promotes sustainable development by prioritising climate and energy.

RMC. Consequently, a bureaucratic-political rationality emerged in favour of institutionalising a climate action plan for Rajkot.

The dominant ideology of this phase prioritised energy efficiency and emission reduction. The RMC introduced policy instruments such as installing energy efficient water pumps, decentralised water treatment plant, and using solar energy to treat raw/bulk water. In addition, a climate action plan (acknowledged mitigation potential of existing and planned measures) was voluntarily ratified by the city government. All the policy instruments were incorporated under the existing paradigm, without altering it. Previous policy experiences were channelised by an embedded autonomous bureaucracy to cohesively effectively pursue instruments by controlling rent seeking activities (e.g., contracting execution to politically affiliated contractors).

3.4. Conclusion

Impacts of climate change, especially on urban water supply, necessitates urgent action. Energy consumption levels of the water sector in cities will continue to increase with growing demands. A water scarce city like Rajkot implemented several water mitigations instruments to reduce GHG emissions along with improved energy and water security. Urban mitigation instruments are impeded by interconnected governance challenges such as weak capacities (e.g., financial and technical) and rent-seeking activities facilitated by nexus of vested interest groups (local councillors and contractors). Over time, the city was able to overcome its governance challenges and effectively pursue water mitigation instruments. This chapter traced the evolution of policy ideas within the RMC, reflected in the water mitigation instruments implemented, from the 1990s till 2020. The mitigation instruments introduced are divided into two phases- a) energy conservation (e.g., energy audits, solar water heating systems), and b) energy efficiency and emission reduction (e.g., upgrading water pumping machinery, decentralized waste water treatment plant, solar water treatment plant and climate action plan). Over time, ideas within the State evolved gradually in a path dependent manner. This ideational evolution was facilitated by the combination of bureaucratic puzzling and political powering. Puzzling strategies in Rajkot were influenced by the administrative tradition of the bureaucracy (embedded autonomous bureaucracy working as a cohesive unit) and learning from previous policies and new information. RMC actively connected with domain experts to access new information and technology, which enabled formulation of socially optimal solutions-

embedded within the society. Despite, engagements with the society, policy formulation and execution were independent of vested interests. Consequently, collective deliberations involving city bureaucrats headed by the Commissioner resulted in the introduction of a range of mitigation instruments to address existing water challenges. In addition, mitigation potential of existing and planned instruments was recognized under the climate action plan by the city government. Furthermore, domestic programmes and schemes were identified to support policy instruments.

Policy ideas were adopted and executed due to strong support of the mayor's office in Rajkot. The political executives, including the mayor and standing committee members, supported technical ideas by sanctioning resolutions. Additionally, political support was provided in non-technical ways- mobilizing local councillors, citizen association members and sub-national government to support technocratic efforts. Powering strategies enabled bureaucrats to appeal to the sub-national, national governments and donor agencies to back policy instruments. Consequently, the city bureaucrats were insulated from vested interests and could effectively execute instruments. Powering strategies were influenced by political beliefs held by the political executives, which favored mitigation instruments serving all citizens.

Ideas within the RMC evolved due to the combined effect of bureaucratic puzzling and political powering strategies. Ideational churning within the city government created a synergized bureaucratic-political rationality backing new water mitigation instruments, by controlling rent-seeking activities and opposition from social actors. Ideational evolution within the RMC thus improved the ability to effectively execute policy instruments.

Improved capacity of the city government nudged the city towards a climate friendly paradigm (improved water security and climate action). The RMC was able to introduce a range of new policy instruments under the prevalent policy paradigm to improve water and energy security. This corresponds with Peter Hall's (1993) second order policy change. There was no change in the policy paradigm as the overarching policy goal remained unchanged. This second order policy change occurred in a layered manner. New policy instruments were attached to existing bureaucratic norms, without altering the basic policy goal of improving water security. In addition, the city government pursued disaggregated mitigation policies (first layer) until recently. This transitioned to a consolidated policy package, the climate action plan (2018-19), comprising of several (existing and planned) mitigation instruments (second layer). This

layered policy change was driven by ideas within the city and not by materialistic factors (e.g., political power, economic interests). Ideational evolution within the RMC (endogenous and structural³⁴⁷ factors) led to the introduction of a range of policy instruments to water and energy security. Although the chapter acknowledges the involvement of several state and non-stakeholders, the urban local body is the key actor in effectively designing and executing water mitigation instruments.

This chapter illustrates how the ideational milieu within the RMC improved capacity to pursue a climate friendly paradigm serving all citizens. Thus, resonating with the water adaptation trajectory, the city government yet again exhibited its ability to think and act locally & globally.

³⁴⁷ Ideas of water mitigation instruments were shared by a group of city bureaucrats and were not held by individual bureaucrats.

Chapter Four

4. Aurangabad, a water resilient city?

4.1. Introduction

This chapter discusses how a medium sized Indian city failed to become water resilient. Climate change (variation in temperature and precipitation patterns) will compound pressure on already stressed urban water supply systems, especially for non-metropolitan³⁴⁸ cities like Aurangabad located in arid and semi-arid regions. The city's water sector is already vulnerable due to existing climatic conditions and urbanization trends. Urban water security is further weakened by a range of governance deficits including inadequate capacities (institutional, financial, and technical), and decision-making authority to plan and execute local policies. Additionally, clientelistic practices, involving differential treatment of voters, leads to disproportionate water supply across the city. Furthermore, climate concerns have not been acknowledged and formalized at the local level nor is urban climate action actively promoted by the Indian government. Cumulatively, these challenges hinder effective execution of policies, leading to water insecurities.

Aurangabad, located in the semi-arid Marathwada region of Maharashtra, is pursuing a climate regressive paradigm- severe water insecurities (irregular water supply) and no climate action. Unlike Rajkot, the city government in Aurangabad lacked the capacity to overcome its governance barriers including clientelism. Consequently, the city failed to introduce water adaptation (to cope with climate change impacts) and mitigation (to reduce climate change) instruments to become water resilient. This chapter traces Aurangabad's water adaptation and mitigation measures from the 1990s till 2020. The water adaptation measures introduced by the city are broadly classified as a) water augmentation instruments (water supply scheme) to improve water availability and b) conservation (rainwater harvesting systems, controlling non-revenue water loss and upgrading the water distribution system) instruments to improve water supply. While the water mitigation instrument implemented focused on reducing energy consumption (solar water heating systems) and not on reducing Green House Gas (GHG) emissions. The failure to effectively implement water adaptation and mitigation instruments lead to escalating water insecurities. Additionally, climate concerns have not been

³⁴⁸ Aurangabad is a million plus and non-metropolitan city, classified as tier two or class IB city. A class IB city is one with a population between 1-5 million (Ahluwalia et al., 2011).

acknowledged (e.g., establishing correlations between existing and planned developmental objectives and climate co-benefits) and institutionalized by the urban local body.

Unlike the case of Rajkot, the Aurangabad Municipal Corporation (AMC) was not the only actor involved in decision making processes. Several stakeholders such as the sub-national/state government's parastatal agency, sub-national government, senior politicians and private actors strongly influenced the city's water supply management. The study shows the following: a) the inability of the state in Aurangabad to overcome governance challenges, especially clientelistic and rent-seeking practices, and effectively implement water adaptation and mitigation instruments. This lack of (state) capacity was due to no evolution of ideas within the urban local body- attributed to inadequate bureaucratic puzzling in a fragmented and embedded particularistic bureaucracy involving no social learning accompanied by skewed powering strategies favoring clientelism; and b) there is no policy change (as is seen in Rajkot) in Aurangabad as new water adaptation and mitigation instruments were not effectively implemented.

The next section discusses the theoretical framework of the study and applies it to the case of Aurangabad. The third section discusses the methodology employed to collate data from the field site. This is followed by a section on the city's profile, city level governance structure, water and governance challenges along with the local and regional level politics. The fifth section traces Aurangabad's water adaptation instruments (e.g., rainwater harvesting system, water supply scheme, controlling non-revenue water loss and upgrading the water distribution network) introduced between 1990 till 2020. The next section discusses the city's water mitigation instruments (e.g., solar water heating system) traced across the same time frame. Finally, the chapter concludes by highlighting the role of ideas within the state at the local level in improving the capacity to become water resilient- which is missing in Aurangabad.

4.2. Theoretically contextualising Aurangabad's water resilience trajectory

This section situates Aurangabad's water adaptation and mitigation instruments within the theoretical frame of the study. The city's disproportionate service provision, particularly with respect to water supply, is an illustrative example of most Indian cities afflicted by multiple and inter-connected governance challenges. A major threat observed in most cities including Aurangabad is clientelism- whereby dispensations and concessions were extended to

supporters of powerful political leaders. Clientelistic practices were seen in various facets of water availability. For instance, local politicians in Aurangabad were tolerant of illegal activities like water theft in exchange for political support for specific issues and elections. Likewise, powerful councillors convince the city government to direct measures to their wards. Additionally, politically affiliated contractors and private water tankers have been able to successfully influence the state in Aurangabad to pursue their interest (e.g., acquiring large government contracts). In the absence of regular municipal supply, the city relied on private water tankers - an industry which had political support, and was often contracted out by the urban local body itself. Local politicians also manipulated the tender process to accommodate pecuniary interest of powerful social actors. Strong clientelistic practices caused intra-city differences and severe water insecurities. This was coupled by the lack of capacity (technical, financial and institutional) and weak decision-making power to make policy corrections. Furthermore, climate concerns have not been recognized and furthered by city governments. In fact, domestic urban climate governance in India is still in its infancy.

The introduction chapter illustrates that improved state capacity to pursue programmatic policies is attributed to the gradual and path dependent ideational evolution within the state. Ideas within the state evolve due to the combined effect of bureaucratic puzzling³⁴⁹ and powering³⁵⁰ strategies. Puzzling strategies are influenced by the administrative tradition³⁵¹ (type of bureaucracy- coherent and embedded autonomous vs fragmented and embedded particularistic) and social learning³⁵² (learning from past experiences and new information vs no learning from previous policies). Powering strategies are influenced by the political beliefs (clientelistic vs programmatic). The combination of puzzling and powering creates a bureaucratic-political rationality³⁵³ supporting particular policies (clientelism vs programmatic). Thus, ideas within the city government play an important role in improving water security and pursuing climate action.

³⁴⁹ Puzzling is defined as the collective deliberation over policy choices, and identification of an optimal solution to address issues in uncertain circumstances. This process leads to defining a problem & identifying optimal solutions, reflected in policy proposals.

³⁵⁰ Powering strategies involve mobilizing support of powerful stakeholders to neutralize opposition and execute policies effectively. Powering leads to adoption and execution of policies.

³⁵¹ An embedded autonomous bureaucracy working as a cohesive unit pursues programmatic policies, whereas a fragmented and embedded particularistic one favors clientelistic policies.

³⁵² Learning leads to identification of policy problems and influences the municipal agenda. Learning within a bureaucracy helps push for programmatic policies, whereas clientelistic policies are pursued in a bureaucracy involving no learning.

³⁵³ Policies are executed only when bureaucratic and political rationality are synergized. Often political rationale differ from bureaucratic ones, whereby the political rationality has more power in influencing policies.

Over the years, Aurangabad's water insecurities escalated and no climate action was pursued. A climate regressive paradigm is attributed to the inability of the city government to transcend clientelism and pursue water adaptation and mitigation instruments. This lack of state capacity is explained by the lack of ideational evolution within the city government. Since bureaucratic puzzling was inadequate and political powering was skewed there was no evolution of ideas within the city government in Aurangabad. Aurangabad's administrative tradition was influenced by a fragmented and embedded particularistic bureaucracy, that is it was mediated by powerful social actors. Additionally, there was no learning from previous policies and new information³⁵⁴.

Unlike Rajkot, Aurangabad's bureaucracy did not work as a cohesive unit. For instance, policy proposal formulation was not a collective process involving all city bureaucrats, but was limited to senior bureaucrats³⁵⁵ who were often driven by material interests (e.g., monetary gains, reducing municipal expenditure). Often policy proposals were formulated by officials working at the sub-national level, with no involvement of city bureaucrats³⁵⁶ in puzzling strategies. In fact, successive Commissioners did not prioritize the water sector nor engage in puzzling strategies³⁵⁷ nor motivate bureaucrats to pursue instruments, as was seen in Rajkot.

³⁵⁴ In Aurangabad, learning from previous policies and new information was skewed. For instance, new policies were not modified based on previous policy failures. New regularization schemes were not modified despite poor performance of previous schemes. In fact, the urban local body did not engage with experts to improve the scheme, nor invite field agents (aware of illegal connections) to assist in executing the policy. Similarly, despite a failed attempt of executing public transport policies under Public Private Partnership (PPP), the city government proposed to execute an all-inclusive water supply scheme under PPP basis. Additionally, local policy instruments were not thought through; for example, the need to install new water supply systems when existing systems were underutilized itself should ideally have been questioned. Furthermore, the city government engaged with selective experts who furthered the interests of powerful social forces. For instance, the state/sub-national parastatal agency was invited to review only the budgetary allocations, and not technical aspects, of the mega water supply scheme for the city. Similarly, the urban local body engaged with private consultants who prepared feasibility reports supporting privatization of water supply which would serve the interests of powerful social actors at the cost of the larger citizenry. Moreover, knowledge creation was monopolized by senior city bureaucrats. Most policy proposals designed by the city government did not involve junior level bureaucrats who were aware of ground realities and responsible for policy execution.

³⁵⁵ For example, the regularization scheme was formulated by a senior bureaucrat from the water works department without involving junior team members who were involved in executing the scheme.

³⁵⁶ For instance, all the water supply schemes of the city were designed and executed by the state/sub-national parastatal agency, with little or no involvement of the city bureaucrats. Similarly, city bureaucrats were not involved in formulating policy proposals for solar water heating systems and rainwater harvesting systems-mediated by the state/sub-national government officials (Maharashtra Urban Development department).

³⁵⁷ A lack of personal initiative from respective Municipal Commissioners- for example through personal monitoring of planning and implementation of policy instruments- did not help improve the motivation of subordinate bureaucrats, especially from the water works department. Simultaneously, this disconnect also made bureaucrats less likely to take initiatives.

The bureaucracy's embedded particularistic characteristics are evident from their engagement with selective experts who helped promote interests of powerful social actors. Similarly, vested interest groups (e.g., local councillors, private water tanker lobby) were able to mediate policy execution to truncate schemes and divert measures to certain areas.

In the absence of effective bureaucratic puzzling, policy problems were not adequately identified and optimal policy solutions were not proposed by the bureaucracy- reflected in poorly formulated policy proposals serving interests of few powerful actors. Furthermore, the city bureaucrats were unable to identify and channelize domestic schemes to pursue policy instruments. Additionally, protocols (scheme requirements³⁵⁸) to acquire funding from central government programmes and policies were not adhered to by the bureaucracy. Moreover, no serious efforts (e.g., awareness drives and exhibitions) were taken by the bureaucracy to sensitise citizens about new policies. Unlike the case of Rajkot, the city bureaucrats failed to recognize climate co-benefits associated with existing and planned (development) policies. In fact, no efforts have been made to formulate and institutionalise a climate action plan to guide future policy developments. All these examples show the lack of bureaucratic puzzling leading to poor policy choices (described in detail in the next section).

Political beliefs held by Aurangabad's political executives favoured clientelistic policies over programmatic ones. Due to inadequate bureaucratic puzzling the mayor's office was not adequately convinced to support policy ideas. In fact, political power was used to disrupt the process of puzzling. Additionally, political support was not provided in non-technical ways. For instance, the political executives did not mobilise relevant stakeholders (e.g., local councillors, citizen association group members, citizens, sub-national government) to support local measures. Furthermore, city bureaucrats lacked insulation from vested interest groups, especially during policy execution. In Aurangabad, there was a lack of synergy between bureaucratic puzzling and political powering strategies.

Political powering was skewed in favour of material interests of powerful vested groups over the city's water needs. As a result, the political class engaged in clientelistic and rent-seeking practices. For instance, water thefts were tolerated, tender process manipulated to promote

³⁵⁸ The city government applied for support under a central government sponsored scheme without adhering to scheme requirements (e.g. asked for financial support in orders of magnitude greater than the scheme limit).

certain contractors, local schemes were truncated to protect respective wards, measures diverted to certain areas or citizens of the city, private water tanker lobby promoted, sizeable contracts acquired by politically affiliated contractors, water supply was commercialized and privatized. In the absence of powering strategies, the city bureaucrats were unable to execute new instruments effectively (e.g., monitor upgradation of water distribution network and implementation of building bye laws, follow up policy approval with sub-national and national government, address citizen association group concerns regarding new measures). A former Municipal Commissioner confirmed that, “*the political arm of the urban local body had an upper hand as compared to the administrative arm, and political interference hampered various water supply schemes*”. In addition, various stakeholders also attributed strong political influence of senior political leaders, both at the regional and city level, on local decision making and policy execution³⁵⁹.

Unlike Rajkot, there is no policy change in Aurangabad. The city government not only failed to introduce new policy instruments, but also to effectively implement instruments introduced by the sub-national government. Furthermore, the policy setting and policy goals remained unaltered over the years.

In the absence of bureaucratic puzzling and strong powering strategies thinking with the city government did not change over time. Consequently, the bureaucratic-political rationality continued to support clientelistic policies as opposed to programmatic ones. Therefore, Aurangabad’s city government lacked the capacity to transcend powerful social forces and effectively execute water adaptation and mitigation instruments. This resulted in escalating water insecurities in the city (insufficient and irregular water supply) and no climate action. Therefore, Aurangabad’s paradigm is a climate regressive one.

³⁵⁹ For example, the first attempt at creating a mega water supply scheme for the city failed as the proposal was truncated due to the influence of a senior politician.

Moreover, the city government, despite knowing that the private agency was blacklisted (in neighboring Latur and by the Uttar Pradesh parastatal agency) contracted the execution of the mega water supply scheme to the agency due to political pressure.

Additionally, the urban local body was unable or unwilling to hold the private agency accountable for executing the mega water supply scheme under PPP in a timely and effective manner. Later on, administrative heads of the corporation were transferred from their posts for setting in motion and ultimately terminating the PPP water supply scheme.

4.3. Data collection in Aurangabad

This section briefly discusses the methodology used to collect data from the city. Information on medium sized and non-metropolitan cities is poorly maintained and scattered³⁶⁰. As compared to Rajkot, data availability was a serious issue in the case of Aurangabad. Consequently, data was collected from field engagements in Aurangabad and Mumbai in Maharashtra, and New Delhi, India. Previous data collection methodology (Rajkot) served as a template to collect information from Aurangabad. The city's water adaptation and mitigation instruments were traced from the 1990s till 2020. In Aurangabad, data collected involved policy documents, NGO reports, Public Interest Litigations (PILs), and newspaper articles from the urban local body and citizens. In addition, expert interviews were conducted with a range of state (city³⁶¹, sub-national³⁶² and centre³⁶³ level, and retired bureaucrats³⁶⁴) and non-state stakeholders (e.g., civil society members³⁶⁵, citizen association group representatives³⁶⁶, academics³⁶⁷) to collect primary data. Data analysis involved translating data³⁶⁸, transcribing interviews, and examining available information.

However, due to the COVID19 outbreak the field work in Aurangabad and Mumbai, Maharashtra was stalled³⁶⁹, with limited interactions with already established contacts over the telephone.

4.4. Aurangabad city: an overview

The following section gives a brief overview of the city including the geographic, demographic and economic factors. Additionally, the city's institutional architecture, water challenges and water supply governance, and the political climate have been discussed.

³⁶⁰ Data management and digitization is not prioritized by the municipal corporation.

³⁶¹ The city level officials interviewed included deputy engineers (5), executive engineer (1), town planning officers (1), accounts officer (2), consultants (3), personal assistant to Commissioner (1), and Municipal Commissioner (1).

Members interviewed from the legislative arm include the Mayor (1), standing committee members (3), personal assistant to standing committee chairman (1), and local councillors (3).

³⁶² Officials working on urban development issues with the Maharashtra government were also interviewed (2). Additionally, members of the sub-national government's parastatal agency were interviewed (3).

³⁶³ Government officials involved in urban development issues at the national level were interviewed (2).

³⁶⁴ Former Commissioners (2), executive engineer (1), and Mayor (1) were interviewed.

³⁶⁵ Representative of civil societies working on urban development issues were interviewed (6).

³⁶⁶ Members of citizen association groups were interviewed (builders and architects) (2).

³⁶⁷ Academics working on water and governance issues in Aurangabad were interviewed (2).

³⁶⁸ Majority of the data available on Aurangabad was in regional language.

³⁶⁹ Most of the sub-national/state level offices were closed, and the city bureaucrats were occupied with COVID 19 duties in the city. Also, the curfew curtailed travel to Aurangabad and Mumbai in Maharashtra.

4.4.1. About the city

Aurangabad³⁷⁰, one of the 10 million-plus cities in Maharashtra³⁷¹ is located in the semi-arid³⁷² (JICA, 2012; AMC, 2013) and drought-prone (Deekshit, 2015) region of Marathwada in Maharashtra state. It is also the economic hub³⁷³ of Marathwada region as well as its largest city (SPA, 2017).

Like in the case of Rajkot, Aurangabad city is governed by a municipal corporation. As per the Maharashtra Municipal Corporation Act, 1949 the Aurangabad Municipal Corporation (AMC) is responsible for the provision and maintenance of the city's civic infrastructure (water supply and sanitation, housing, transport, waste management etc.), and administration. Like other municipal corporations' the AMC comprises of the legislative (elected body of councillors, who are members of the Standing Committee and General body, headed by a mayor), and administrative branch (headed by the Commissioner and comprising of various departments mentioned above) (see fig. 13 in annexure). The Municipal Commissioner sets the development priorities for the city. City bureaucrats are involved in formulating policy proposals and tender contracts. The political arm of the urban local body (Mayor and standing committee members) adopts policy proposals through resolutions or orders along with sanctioning of municipal budgets for policy execution. The urban local is the main stakeholder involved in water supply management.

4.4.2. Water challenges

Water availability has been a major challenge for Aurangabad. Apart from climatic factors demographic³⁷⁴ factors have compounded the city's water woes. Apart from uncertainty over future availability of water, the city's water challenges include insufficient local water supply, an

³⁷⁰ The city has a population of 1.2 million (Census, 2011) and an area of 138.50 sq.kms (square kilometres) (SPA, 2017) (see table 17 in annexure).

³⁷¹ The other million plus cities of Maharashtra include Mumbai, Thane, Kalyan-Dombivli, Vasai-Virar, and Navi-Mumbai (all part of the Greater Mumbai Urban Agglomeration) Pune, Pimpri-Chinchwad (both forming the Greater Pune Urban Agglomeration), Nashik and Nagpur.

³⁷² The city experiences an average annual rainfall of 725 mm (millimeters) (JICA, 2012; AMC, 2013).

³⁷³ Aurangabad, the largest city in the predominantly rural Marathwada region, is the industrial (food, textile, automobile) and tourism capital of Maharashtra (AMC, 2013; SPA, 2017).

The city is the headquarter of Aurangabad district (GoI, 2013) as well as the headquarter of the larger Aurangabad division (comprising of eight districts) (AMC, 2005).

³⁷⁴ Since the 1990's, the city's population has almost tripled (see table 17 in annexure).

inadequate and unequal distribution network within the city³⁷⁵, high share of Non-Revenue Water³⁷⁶, and high energy consumption costs³⁷⁷ (JICA, 2012).

Furthermore, like most other Indian cities, service delivery in Aurangabad was also impeded by grossly inadequate financial and technical capacities. For instance, in the case of Aurangabad, the water works department lacked the technical capacity to effectively design policy proposals for water adaptation and mitigation instruments. Additionally, the urban local body was unable to establish linkages between existing development goals and climate action. The city government was unable to pursue programmatic water adaptation and mitigation instruments- all of which caused severe water insecurities in the city.

4.4.3. Water supply governance

The city has been supported by the Jayakwadi and Harsool dams (SPA, 2017) (see table 18 in annexure), and formerly by underground water canals, Neher-e-ambari³⁷⁸ (Dhule et al., 2019). Water tankers, both private and public, had been deployed to meet growing needs in areas with no supply or poor municipal supply, especially during summers (Deekshit, 2015). Given that majority of the land was occupied by residential users, they were the main water consumers in the city (Dhule et al., 2019). Presently, Aurangabad receives water for 45 minutes once in five or six days, and the annual water tax for residential users is INR 4500 (one of the highest in Maharashtra).

Since 1998 the AMC's water works department³⁷⁹, has been responsible for the provision of drinking water and the management of distribution networks (including treatment plants within

³⁷⁵ The city continues to rely on old water supply schemes and systems to provide water to an increasing population. Existing systems are inadequate and inefficient, leading to higher energy consumption (due to water being pumped against gravity and aged, energy-intensive systems), water loss (leakage in pipelines), and contamination (mixing of waste water with drinking water). Not all parts of the city are connected to the municipal distribution network, leading to reliance on borewells, and water tankers (JICA, 2012).

³⁷⁶ As mentioned in the previous chapters, NRW loss includes unaccounted water consumptions and losses as compared to input volume (Jang, 2018).

³⁷⁷ The water pumped from Jayakwadi dam, located 45-50 kms away and 180 metres lower than the city, requires surplus energy to pump water against gravity. The AMC spends approximately INR 50 crore every year on water supply (SPA, 2017).

³⁷⁸ Literally meaning 'rock-cut canal', this 16th-century water network utilised groundwater to provide for the city.

³⁷⁹ The water works department reports to the executive head, the Municipal Commissioner. Administrative zones (nine) of the city is supervised by a city engineer who is in charge of the overall infrastructure development. The executive engineer water supply oversees the management of water supply for the entire city, and is supported by deputy engineers. Each deputy engineer manages three administrative zones and are supported by assistant/sectional/junior engineers and sub-overseers (see fig. 17 in annexure). Furthermore, the city government works with close to 500 lineman/valve operators (patrollers).

city limits) (AMC, 2013). Until 1997, the state/sub-national parastatal agency for water supply, Maharashtra Jeevan Pradhikaran (MJP) was in charge of designing and implementing water supply schemes for the city. However, after the 74th Constitutional Amendment Act (CAA) 1992, the responsibility for the city's water supply schemes was handed over to the municipal corporation. Furthermore, according to the Indian constitution water is a state/sub-national subject, and so the sub-national/state government has been responsible for ensuring bulk water supply to cities.

4.4.4. Regional politics

As is seen in Rajkot, there are multiple political parties at the local level (Shiv Sena, Bharatiya Janata Party (BJP), Indian National Congress (INC), Nationalist Congress Party (NCP), and All India Majlis-e-Ittehadul Muslimeen (AIMIM)). However, since the 1990s (except for a few years) the Shiv Sena (sometimes in alliance with the BJP) has been in power in the city. Like the case of Rajkot, a party competition cannot explain Aurangabad's water resilience trajectory (refer to introduction chapter for details). Furthermore, the city is the economic and political hub of the Marathwada region. Eight of the 36 districts of Maharashtra fall in the Marathwada region, accounting for 46 out of the 288 seats in Maharashtra's legislative assembly.

At the sub-national/state level, since the 1990s the INC has been in power, often supported by NCP and Shiv Sena (except in 1995-98 and 2014-18 when Shiv Sena and BJP were in power). The city has had strong political representation at the sub-national and union level (e.g., Dr. Rafiq Zakaria, Mr. Chandrakant Kahire, Mr. Imtiyaz Ali), which aided local efforts (as is seen in the case of Rajkot).

4.5. Aurangabad's water adaptation trajectory

This section discusses Aurangabad's water adaptation instruments (that address existing development deficits and cope with climate impacts) implemented between 1990 till 2020 to improve the city's water security. Some of Aurangabad's water challenges include inadequate water availability and supply, high non-revenue water loss, and declining groundwater levels. Despite rising water needs, the city failed to improve its water security.

The city tried to introduce new policy instruments to achieve the overarching policy goal, water supply to all. Broadly the adaptation³⁸⁰ measures include a) water augmentation instruments (e.g., water supply scheme) to improve water availability, and b) conservation (e.g., controlling non-revenue water loss, strengthening water distribution system, conserving rainwater) instruments to improve water supply. However, the city government lacked the capacity to effectively implement these instruments. Furthermore, unlike Rajkot, the city has not taken any serious efforts to combat the impacts of climate change. There is a general lack of awareness within the city government about climate issues. Additionally, the city government failed to acknowledge climate adaptation potential of existing and planned policy instruments. Interviews with various current and former city bureaucrats suggest that, “*addressing climate concerns were not prioritized by the urban local body*”. In which case, it was expected that climate goals were not mainstreamed with local developmental objectives.

This section discusses Aurangabad’s water adaptation policy instruments and the associated bureaucratic puzzling and political powering strategies. The section will explain how there was a lack of ideational evolution within the city government over water adaptation instruments, due to inadequate bureaucratic puzzling and skewed political powering. The bureaucracy was fragmented and embedded particularistic, whereas beliefs held by the political executives favoured clientelism. As a result, the city government lacked the capacity to overcome clientelism and effectively pursue water adaptation instruments.

a. Augmentation policy instrument: new water supply scheme

This policy instrument was introduced by the sub-national government, with no involvement of the city government, to improve the city’s water availability. In 1992, the sub-national government’s parastatal agency, Maharashtra Jeevan Pradhikaran (MJP), introduced a new policy instrument to augment the city’s water supply. The water supply scheme, new Jayakwadi scheme³⁸¹, involved the installation of a new water supply pipeline. In fact, all water supply schemes of Aurangabad had been designed and executed by the sub-national government’s parastatal agency, as the city government lacked the (technical and financial) capacity to do so. This new water supply scheme soon fell short to provide for the city’s

³⁸⁰ The instruments implemented had an adaptation co-benefit such as reduced vulnerability and improved adaptive capacity & resilience.

³⁸¹ The old Jayakwadi scheme provided 56 MLD (Million Litres per Day) to Aurangabad; with the new pipeline this would increase by 100 MLD.

growing needs. Furthermore, associated adaptation co-benefits were unacknowledged by the urban local body.

Puzzling over the new water supply scheme

Sub-national government officials collectively puzzled over Aurangabad's rising water needs. Following which, a policy proposal was formulated to introduce a new water supply scheme to improve the city's water availability. The sub-national government's parastatal agency engaged with experts, that is the Maharashtra government (Ministry of Water Supply), to review the feasibility of the proposed policy instrument. The proposed water supply scheme was to be implemented by the parastatal agency on behalf of the city government³⁸².

The city government was not involved in pursuing the augmentation policy instrument. Aurangabad's city bureaucrats, more aware of local issues, did not participate in the above policy deliberations. Additionally, the then Commissioner did not adequately prioritise the water sector or motivate city bureaucrats to pursue new instruments.

Powering over the new water supply scheme

The policy proposal along with budgetary allocations to execute the new water supply scheme were reviewed and approved by the sub-national government. Support of the Maharashtra government ensured implementation of the scheme. This support helped neutralise opposition from neighbouring villages and towns, who felt their water supply would reduce. Additionally, clientelistic practices (e.g., promotion of politically affiliated contractors) were controlled as the parastatal agency was insulated by the sub-national government from any form of interference. A political activist stated that, "*the scheme was effectively executed as it was managed by Maharashtra Jeevan Pradhikaran and not the city government*". The AMC political executives had no role to play as the scheme was facilitated entirely by the sub-national government.

The sub-national government's parastatal agency autonomously pursued the policy instrument to improve the city's water availability, without being influenced by vested interest groups.

³⁸² The operation and maintenance of all water supply schemes was handed over to the AMC by MJP in 1997-98. This was attributed to the change in India's governance architecture, whereby power was devolved to the ULBs after the 74th CAA. As per an interview with a retired senior official from MJP, these water supply schemes were energy intensive, especially the Jayakwadi schemes, which were increasingly difficult for the MJP to manage (accountable to the Government of Maharashtra).

Backing of the sub-national government helped overcome regional level opposition and control clientelistic practices. However, after a few years of the implementation the new water supply scheme was insufficient to meet the city's needs. This could be attributed to the absence of the city level bureaucrats, who are more aware of the ground realities, in the puzzling process. Furthermore, the adaptation potential of this instrument was not recognized by the city government nor by the parastatal agency.

a. Conservation policy instrument: controlling non-revenue water loss

The city government introduced a policy instrument to control the non-revenue water loss, which would improve the city's water supply. In the late 1990s, the urban local body introduced its first regularization scheme, *Abhay yojana*³⁸³, to voluntarily regularize illegal water connections (AMC, 2002). The urban local body relaunches the scheme whenever the city faced water shortages, typically during the summer months. However, the scheme was reported to be far from effective. Despite, successive attempts to regularize illegal connections, the city's NRW loss continues to be high (~ 50 per cent). Interviews with AMC officials and non-state stakeholders (e.g., activists, and civil society members), suggest that the city currently has over 130,000 illegal water connections. City bureaucrats of the water works department stated that, "*from the inception of the regularization scheme, the AMC has only regularized about 7000-8000 illegal connections*". Apart from the regularization scheme the AMC has not introduced any other instrument (e.g., upgrading water distribution pipeline, monitoring bulk water flow) to control its NRW loss (as is seen in Rajkot). Adaptation potential associated with the regularization scheme has not been acknowledged by the city government.

Puzzling over non-revenue water loss

Aurangabad had a significant number of unauthorized water connections, leading to high NRW loss (50 percent) and financial deficit³⁸⁴- leading to water insecurities. Puzzling within a fragmented bureaucracy was inadequate. The first policy proposal was formulated independently by a senior bureaucrat of the water works department, without any involvement

³⁸³ The scheme was executed through regularization camps. The water works department set up camps in municipal buildings throughout the city to encourage citizens to voluntarily legalise illegal connections. The corporation excused the water tax for previous years, and charged a regularization fee depending on the size of the water connection, and time period of regularization (see table 20 in annexure). Moreover, if citizens were caught with illegal connections after the scheme period an official water theft complaint would be lodged against the citizens.

³⁸⁴ A high NRW loss created an imbalance between capital expenditure and revenue income with respect to water.

of junior level bureaucrats who were responsible for policy execution and more aware of ground realities. The main objective of proposing the instrument was to improve municipal finances and not to improve service delivery. Moreover, household level surveys conducted to identify illegal connections were often outsourced to private actors (less accountable to report correct numbers), with little involvement of city bureaucrats. A former AMC Commissioner felt that, *“the corporation following a strict household level survey, should have stricter enforcement rules to disincentivize water thefts”*. Additionally, respective Municipal Commissioners did not prioritise the instrument, and were not actively involved (e.g., monitor progress) in furthering it. A former AMC Municipal Commissioner stated that, *“the role of the Municipal Commissioner as an administrative head is important in pursuing policy measures by motivating bureaucrats, and convincing councillors”*, which was lacking while implementing the regularization schemes. Successive Commissioners continued to rollout the regularization scheme as per need without adequately encouraging city officials to pursue the scheme.

Moreover, there was no learning from previous experiences or new information. Despite serious problems with the previous schemes (e.g., policy problems poorly identified, weak enforcement mechanisms) leading to low success rates, the bureaucrats did not re-examine their approach (e.g., scheme not modified to include stricter penalties, norms of acquiring water connections not simplified). The bureaucracy also did not engage with domain experts to calibrate its efforts. For instance, the bureaucrats did not involve field agents³⁸⁵ (linemen/valve-men) to identify illegal water connections. Furthermore, meagre efforts (e.g., one announcement made in the local newspaper before introducing the measure) were made to popularize the instrument among citizens.

Powering over non-revenue water loss

Powering strategies with respect to this policy instrument were skewed. The mayor's office adopted the weakly formulated policy proposal; resolutions were passed to execute the scheme. However, political support in non-technical ways was missing. The political executives failed to convince relevant stakeholders to support policy execution. For instance, local councillors were not mobilized to support the measure and sensitise citizens in their wards. A former AMC Commissioner felt that, *“the AMC needs to overcome the policy paralysis by thoroughly*

³⁸⁵ They hold information about leakages and pressure in pipelines and duration of water supply.

convincing its elected representatives to gain their total support". In fact, local politicians used political pressure to excuse certain areas/wards during regularization drives or excuse penalty for water theft. AMC bureaucrats from the water works department stated that, "*local councillors safeguarded their vote banks by allowing water thefts in their wards*". Often, the councillors worked with field agents to ensure more water to their wards or hide existing illegal connections during regularization drives. Citizens lacked the incentive to regularize illegal connections, especially because of irregular water supply and high water tariffs. Additionally, the Mayor's office was unable to mobilise the politically powerful private water taker lobby; the scheme was opposed by this lobby as it influenced their business. A political activist stated that, "*the private water tanker lobby truncated the Abhay yojana (regularisation scheme) by promising better quality and regular water supply to citizens*". The rising private water tanker lobby continues to work closely with local councillors to provide water across the city.

Political interference, especially during implementation of the regularisation scheme was a major setback. Consequently, the city bureaucrats lacked the motivation and insulation to execute the scheme, and were easily captured by powerful social forces. A deputy engineer of the water works department stated that, "*the regularization scheme is a dangerous measure-one of my colleagues was assaulted by citizens during the regularization drive*". The urban local body did not take any serious measures (e.g., involve the police) to protect their city bureaucrats, especially during the execution phase. As a result, city bureaucrats were reluctant to effectively execute the instrument.

The AMC did not show any learning from previous (policy) experiences nor did it engage with experts to improvise the policy instrument. The city government exhibited embedded particularistic characteristics as it was mediated by powerful vested interest groups (e.g., local councillors and private water tanker lobby). In the absence of effective bureaucratic puzzling and skewed powering strategies there was no evolution of ideas within the urban local. Consequently, clientelistic policies were pursued, whereby some benefitted at the cost of others, leading to continued high levels of NRW loss.

b. Conservation policy instrument: rainwater harvesting systems

The sub-national government introduced a policy instrument, with no involvement of the city government, to harvest rainwater to strengthen the city's water supply. In 2005, rainwater

harvesting systems were made mandatory in Aurangabad by modifying the development control regulations. The government of Maharashtra amended the common development control regulations, which were applicable to Aurangabad's building bye laws (see box 7 in annexure). The new regulations mandate the implementation of rainwater harvesting systems in new buildings, without which a completion certificate will not be issued. Despite backing of the sub-national government, the city government has been unable to execute the instrument effectively. Furthermore, the city government failed to recognize the adaptation potential associated with this instrument.

Puzzling over rainwater harvesting systems

With respect to rainwater harvesting systems, the sub-national government officials were actively involved in designing the policy proposal. The puzzling process involved bureaucrats of the Maharashtra government's Urban Development Department (UDD), who identified the (policy) problem of deteriorating groundwater levels. Following which, a proposal was formulated directing³⁸⁶ planning/ development authorities to mandate implementation of rainwater harvesting systems. The sub-national government also proposed a set of guidelines to execute the instrument (e.g., technical requirements, provision of incentives through property tax rebate). City governments were responsible to implement the instrument.

Unlike Rajkot, the measure was facilitated by the sub-national government and not the city government. Aurangabad's city bureaucrats, especially of the town planning department, did not participate in policy formulation process. Furthermore, the bureaucracy did not set a precedent for the city (e.g., no rainwater harvesting systems were installed on public buildings). Additionally, no efforts were made to popularize the instrument among citizens (e.g., no awareness workshops or campaigns). The city government also did not engage with experts (citizen association group- builders and architects) to promote the uptake of this instrument.

Powering over rainwater harvesting systems

The policy instrument was incorporated into the city's building bye laws because it was designed and supported by the Maharashtra government. Following which, a resolution (AMC, 2005a) was passed by the mayor's office to implement the instrument. However, unlike Rajkot,

³⁸⁶ The Urban Development Department, Maharashtra Government issued a set of directions (reference no: TPB 432001/2133/CR-230/01/UD-11, dated March 2005) to modify section 37 of Maharashtra Regional and Town Planning Act, 1966, to make provisions of including rainwater harvesting systems prevalent development control regulations.

the political arm of the AMC did not actively pursue the instrument. Despite considerable water insecurities, the city bureaucrats were not encouraged to mobilise the sub-national government to modify the building bye laws. Similarly, the bureaucrats were not pushed to organize awareness campaigns to sensitise citizens about the instrument. In fact, citizen association group members, especially builders and architects, were not invited to discuss their concerns about the instrument or provided any training to improve uptake. Furthermore, Aurangabad's political executives did not engage with the sub-national government with respect to amendments in the common development control regulations. Local councillors were not mobilized to promote the instrument in their respective wards. It must be noted that, this instrument was only adopted by the city government because it was recommended by the sub-national government.

The policy instrument was included in the city's building bye laws due to puzzling and powering at the sub-national level. The city government did not build on its ground water management tradition to promote rainwater harvesting systems. In the absence of bureaucratic puzzling and political powering at the city level there was no evolution of ideas within the AMC. Consequently, the city has not been able to effectively execute the instrument. Builders temporarily install rainwater harvesting systems to acquire building completion certificates. Members of the local civil society stated that, "*the city's groundwater levels will continue to decline as rainwater harvesting systems are mandated on paper and not in practice*". Such rent seeking activities have resulted in further decline of ground water tables.

c. Conservation policy instrument: augmenting supply and upgrading distribution system

From 2005 onwards, several attempts were made by the AMC to strengthen the city's water supply distribution system to improve the water supply. Existing water supply schemes (refer to table 18 in annexure) and water distribution networks were inadequate to meet growing needs. The AMC proposed an all-inclusive policy instrument, the parallel water supply scheme, comprising of a range of policy instruments such as a) augmenting the water supply (e.g., a new water supply scheme, that is install a new bulk water pipeline), and b) upgrading the existing water distribution system (e.g., improve water storage and treatment capacity and distribution pipelines).

The urban local body's attempts (between 2005 to 2011) of strengthening the water distribution system and introducing a new water supply scheme (under the all-inclusive policy instrument) are divided into three phases. The range of instruments proposed as part of the all-inclusive parallel water supply scheme are connected in a path dependent manner. The first phase (2005), involving a new water supply scheme and partial upgradation of the water distribution system, was to be financed by the city government. The failure of this approach resulted in the AMC relying on domestic schemes to support policy instruments. The second phase (2005-09), involving the same instruments as above, was proposed under the centrally sponsored Urban Infrastructure Development Schemes for Small and Medium Towns³⁸⁷ (UIDSSMT) (AMC, 2009a, 2011a, and 2016), a sub-mission of the 2005 Jawaharlal Nehru National Urban Renewal Mission (JNNURM) supporting towns. The AMC was unable to channelize resources under a centrally sponsored scheme, which lead them to partner with a private agency to execute instruments. The final phase (2009-2016), involving a new water supply scheme and complete upgradation of the water distribution system (known as the *Samantar yojana* or the parallel water supply scheme³⁸⁸- an all-inclusive scheme), was to be executed under the central government's India Infrastructure Project Development Fund (IIPDF) Public-Private Partnership (PPP) scheme³⁸⁹. However, the city government was unable to transcend clientelistic and rent-seeking practices and failed to execute the policy instrument. The urban local body failed to acknowledge the adaptation potential associated with the above instrument.

Phase one (2005): puzzling

In the first phase, the AMC attempted to improve the city's water supply on its own, that is using municipal finances. The puzzling process involved city bureaucrats of the water works department who deliberated over inadequate water supply (AMC, 2005b) and rising water demands. Following a water audit and financial assessment, facilitated by a technical consultant appointed by the sub-national government (Deekshit, 2015), a policy proposal was formulated to introduce new policy instruments. The policy instruments included a new water

³⁸⁷ UIDSSMT was introduced by the Ministry of Urban Development (MoUD) in 2015. The UIDSSMT component, targeted cities and towns with a population above 100,000, and aided infrastructure development. The project cost was shared between the central (80 percent), state (10 percent), and city governments (10 percent) (GoM, 2017a).

³⁸⁸ The project aimed to build another pipeline alongside the existing one to supplement the existing water supply scheme.

³⁸⁹ The city gained domestic and international recognition for implementing the mega water supply scheme on PPP basis.

Aurangabad's PPP water supply project was declared the PPP project of the year 2011 by the Planning Commission, Government of India.

supply scheme (new Jayakwadi scheme³⁹⁰), that is a new bulk water pipeline, along with partial upgradation of the water distribution system³⁹¹. The bureaucrats formulated a tender proposal to identify a private contractor to execute the instrument (AMC, 2006a).

Phase one (2005): powering

The policy proposal was adopted (resolution passed) by the political arm of the city government (AMC, 2011b). However, political support was not extended in non-technical aspects. Senior politicians interfered with the tender process (e.g., private agency, Kirloskar³⁹², refused to meet financial demands set by the political executives). Interviews with several retired city bureaucrats, political activists and media personnel suggest that, “*AMC political executives wanted high and direct monetary gains from the measure, which were refused by the private agency*”. As a result, the urban local body was unable to finalise the contract with the technical bidder, leading to dissolving of the measure. An AMC elected representative stated that, “*a senior politician pressurized the urban local body to terminate the measure*”. In 2005, the policy instrument fell through due to strong rent-seeking practices promoted by the political class in Aurangabad.

Phase two (2005-09): puzzling

Following the above experience, the urban local body planned to upgrade the water supply system under a domestic scheme. Considering financial inadequacies at the city level, the AMC proposed to pursue instruments (new water supply scheme and partially upgrading the water supply scheme) under a centrally sponsored scheme. Puzzling strategies within a fragmented bureaucracy involved select senior bureaucrats who proposed the reinvigoration of the same policy proposal. The then Commissioner also did not adequately prioritise the water sector nor encourage city bureaucrats to pursue measures.

Unlike Rajkot, puzzling strategies in Aurangabad were inadequate. Like all centrally sponsored schemes, the urban local body had to prepare detailed project reports to convince the sub-national and national governments to support policy instruments. However, the city bureaucrats did not adhere to the scheme protocols (estimated implementation cost was much higher than

³⁹⁰ This would entail laying down another bulk water transmission pipeline to source raw/ untreated water from the dam to the city.

³⁹¹ As per the AMC’s General Body meeting held in June 2006 (subject: 273/1), it was decided that apart from a parallel water supply scheme, it is important to upgrade the water supply distribution systems.

³⁹² Kirloskar, a reputed company known for its infrastructure projects, was finalized as the lowest technical bidder.

the scope of the UIDSSMT³⁹³ scheme), leading to significant delays (three years) in project approval. The city's policy proposal was approved by the central government in 2009 (AMC, 2016).

Phase two (2005-09): powering

With respect to powering strategies, the political executives adopted the policy idea of pursuing the instrument under the central government scheme as it involved minimal investment from the urban local body. However, political support was again missing in non-technical manner. The city bureaucrats were inadequately mobilized to follow up the project appraisals with the sub-national and national government (seen in Rajkot). Furthermore, bureaucrats lacked the support to channelize funds to implement instruments. In fact, the bureaucrats were encouraged by the political class to re-calculate budget requirements³⁹⁴ and demand for more funds from the central government to compensate for delays (three years to approve the proposal). Despite financial aid provided by the central and sub-national government, the policy instruments were not executed. Pecuniary interests of the bureaucratic-political nexus impeded policy execution.

Phase three (2009-2011): puzzling

In the third phase, the AMC proposed to partner with a private agency to upgrade its water distribution system, as it failed to do so on its own (phase one) and with the support of the central government (phase two). In 2009, the city proposed to augment the water supply (new water supply scheme, that is install a bulk water pipeline³⁹⁵) and strengthen the entire water distribution system³⁹⁶ (see table 21 in annexure) under Public Private Partnership³⁹⁷.

The AMC worked as a fragmented unit. Puzzling over the policy proposal was limited to select city bureaucrats of the water works department, with some assistance provided by the sub-national government (Maharashtra government's PPP cell). The then Commissioner was not actively involved in monitoring policy deliberations and proposal formulation. Furthermore,

³⁹³ There were appraisal delays as the proposed financial requirement of the policy instruments, which was very high for interventions implemented under the UIDSSMT scheme. The Government of Maharashtra finally agreed to provide a grant (INR 75.82 Crore) for the escalated cost of the intervention (AMC, 2016).

³⁹⁴ This was calculated as per District Schedule Rate (DSR) for the 2008-09 baseline.

³⁹⁵ AMC planned to build a new bulk water pipeline (from Jayakwadi dam to Nakshatrawadi water treatment plant), and refurbish existing bulk water transmission pipelines (e.g. pipeline from Harsool dam) under the parallel pipeline project in order to improve the city's water supply (JICA, 2012).

³⁹⁶ This included constructing water storage reservoirs and treatment plants, reducing non-revenue water loss, improving piped water access and metered supply (24*7), and improving pumping machinery (JICA, 2012).

³⁹⁷ Under PPP, a private agency was expected to implement the proposed mega water supply scheme, along with tax collection, management of existing water supply distribution and its operations and maintenance for 20 years.

the bureaucracy outsourced the task of preparing technical feasibility reports and reviewing tender documents to Credit Rating and Infrastructure Services India Limited³⁹⁸ (CRISIL), with no involvement of city bureaucrats.

Additionally, the bureaucracy exhibited embedded particularistic characteristics. The city bureaucrats engaged with selective consultants, leading to the promotion of selective ideas and interests. For instance, city bureaucrats approached the Maharashtra Jeevan Pradhikaran to only provide some financial assistance (review budgetary allocations), when the agency was known for its technical capacity to design and execute water supply instruments. A senior retired MJP official stated that, “*the AMC only shared financial reports with MJP, who could have technically reviewed the proposed measures*”. In fact, the proposal was reviewed by a private consultant, Unity consultant private limited (AMC, 2008) (without a formal contract), which was lenient with its reviews. Various state (retired AMC officials) and non-state (activists) stakeholders stated that, “*the AMC chose to work with specific private consultants (e.g.) to further monetary interests of few*”. Furthermore, the bureaucracy, under the influence of powerful social actors (senior politicians), proposed to privatize the provision of water supply and water tax collection; thereby defying the Bombay Municipal Corporation Act³⁹⁹, 1949.

Consequently, there was a lack of systematic puzzling. For instance, provisions for new water supply systems were made when existing instruments⁴⁰⁰ were underutilized. Similarly, a significantly higher implementation cost (nearly double the cost of the previous estimate⁴⁰¹) was proposed by the city bureaucrats to execute the instrument. Several members of a civil society (including retired bureaucrats of the AMC and MJP) stated that, “*the cost of the new*

³⁹⁸ A tripartite agreement was signed between AMC, CRISIL and the central government on behalf of IIPDF (AMC, 2016). CRISIL acted as a transaction advisor for the AMC on the PPP project. CRISIL also formulated the Special Purpose Vehicle (SPV), Aurangabad City Water Utility Company Limited (ACWUCL), to implement the project (Deekshit, 2015). ACWUCL was responsible for designing and maintaining interventions, and collect water tax from water users (JICA, 2012).

³⁹⁹ As per the Act, provision of drinking water and tax collection from citizens was the responsibility of the municipal corporation, and could not be privatized (PIL, 2015).

⁴⁰⁰ The new water supply scheme did not account for existing water supply schemes which were not used to their full capacity. For instance, MJP made provisions in the water supply schemes to cater to increased demands (e.g. existing water supply systems like pump house, water treatment & filtration plant, and intake chambers were built for 200 MLD water but only 100MLD was used; also, land was acquired for building new water treatment plant (Diwan, 2015).

⁴⁰¹ The AMC modified its water supply scheme to not only include the new water supply scheme from Jayakwadi dam (bulk water transmission pipeline), but also improve the entire city’s water supply distribution network (100 per cent coverage as opposed to partial coverage).

Also, due to the delay in acquiring project approval from the central government and the price escalations, the cost of implementing the project escalated as per the District Schedule Rate (DSR) for 2008-09 (792.20 Crore) as opposed to the former 2005-06 rates (359.67 Crore) (AMC, 2009b).

parallel water supply scheme was unnecessarily estimated higher than required". On account of these budgetary requirements, the city bureaucrats, backed by the Maharashtra government's PPP cell, proposed to implement all policy instruments on PPP basis, and not in a phased manner. Furthermore, the bureaucrats did not make provisions to pilot test policy execution under PPP, which was then a new approach in India.

Phase three (2009-2016): powering

Aurangabad's political executives backed the policy proposal to execute instruments under PPP basis (AMC, 2009a), under the influence of a powerful political class. City bureaucrats were encouraged to mobilise the national government (Department of Economic Affairs⁴⁰² (DEA)) to approve their policy proposal under PPP. Unlike Rajkot, powering strategies in Aurangabad backed clientelistic and rent-seeking practices. For instance, senior politicians interfered with the tender process⁴⁰³ and finalised an ill-reputed⁴⁰⁴ private agency⁴⁰⁵ to execute policy instrument. Various local activists stated that, "*a senior politician (then Member of Parliament) pressurized the AMC to work with SPML company (whose owner was a friend)*". Additionally, efforts of senior bureaucrats to terminate the PPP water supply intervention were hindered by the political class. For instance, in 2015⁴⁰⁶, the then Commissioner initiated a detailed review, supported by the Maharashtra Jeevan Pradhikaran⁴⁰⁷, highlighting technical and financial issues of PPP water supply scheme (e.g., acquiring project approvals⁴⁰⁸,

⁴⁰² It must be noted that, PPP was promoted by the central government, especially in capital intensive sectors such as urban development and infrastructure development (e.g. under JNNURM). The DEA under the India Infrastructure Project Development Fund (IIPDF) was working with the Asian Development Bank (ADB) to develop PPP in India.

ADB and CRISIL assisted the urban local body in implementing the scheme on PPP basis.

⁴⁰³ As per the government tender rules, the ULB must finalise a contractor from a minimum of three proposals. However, the AMC received only two tender proposals and finalised a private contractor from the two, thereby flouting tender rules. Additionally, although the agreement was signed between AMC and the private agency, there were more than one private agency involved in the execution of the project, thereby violating tender rules.

⁴⁰⁴ The private agency was blacklisted by the Jal Nigam, Government of Uttar Pradesh, and the city of Latur (in Maharashtra) for its poor performance with respect to policy execution and rent-seeking activities (Diwan, 2015).

⁴⁰⁵ Subhash Projects and Marketing Limited (SPML) & consortium (including National Water and Sewerage Corporation (NWSC) and VA tech Wabag Ltd.), were finalised to execute the policy measure (AMC, 2011b; AMC, 2016).

⁴⁰⁶ Members of a citizen's action committee, *Nagrik Kruti Samiti*, convinced, through a series of meetings, the then Municipal Commissioner (also a hydraulic engineer), to closely review the implementation of the new water supply.

This group comprised of non-state stakeholders (activists, bankers, citizen association group members, media personnel) and retired state officials (AMC and MJP), who closely monitored the workings of Aurangabad's PPP parallel water supply scheme.

⁴⁰⁷ The Commissioner and the MJP chief engineer, who shared a good rapport with each other, collectively worked on evaluating the scheme.

⁴⁰⁸ Approval delays (e.g. sanctioning the water supply scheme under PPP, modifying water bye laws) from the state government with respect Aurangabad's water supply project contributed to significant delays in initiating the instrument (AMC, 2016).

mismanaged tender norms⁴⁰⁹, non-fulfilment of project milestones⁴¹⁰, mismanaged financial model⁴¹¹ etc.). However, these efforts were hindered as the Commissioner was transferred. The subsequent Municipal Commissioner (2016) supported the petition against the PPP water supply scheme by providing a detailed report supporting the PIL filed in the Bombay High court against the all-inclusive policy instrument. Additionally, the Commissioner mobilized the mayor's office to terminate the contract with the private agency (as per the 2016 AMC General Body resolution 474 (AMC, 2016)), and re-municipalise water supply distribution. A retired AMC bureaucrat stated that, *"the Commissioner pushed the mayor's office to terminate the PPP scheme when the senior politician supporting this measure was away from the city"*. Following which, senior politicians pushed the sub-national government to transfer the Commissioner. A local activist and retired AMC bureaucrat felt that, *"political pressure was used to transfer the two Commissioners who petitioned against the PPP water supply scheme"*. The city bureaucrats lacked the political support required for policy execution. As a result, the city bureaucrats were unable to hold the (politically affiliated) private agency accountable for policy execution. For instance, several notices (sent in 2012, 2013, 2015, 2016 etc.) issued to

On the other hand, the private agency failed to acquire technical approval on the project concept, drawings and structural design.

Furthermore, agreement rules were violated by the private agency as it did not acquire approval of the AMC and independent engineers before finalizing vendors, and procuring material, thus lacked quality inspection.

⁴⁰⁹ The AMC appointed a technical consultant, Unity consultant private limited, Pune, in 2008 to assist with formulating the project proposal without following tender norms (no tender contract between the AMC and the consultant).

Furthermore, as highlighted by the *Nagrik Kruti* committee, the AMC's decision of finalizing a private agency from two as opposed to three draft tender receipts was inconsistent with the Maharashtra Municipal Accounts Code (2010) tender norms (AMC, 2016).

Although the AMC signed an agreement with SPML, the private agency included other private agencies (e.g. Kakade Infrastructure Private limited) to execute the project.

⁴¹⁰ Despite the support (technical and financial) of the AMC, the concessionaire failed to a) construct planned water storage and filtration tanks, b) lay adequate bulk water transmission and water supply distribution pipelines, c) reinstate roads after construction of pipelines, d) reduce unaccounted water, and e) regularize illegal water connections (AMC, 2016).

Also, the water supply was deteriorating both in terms of quality and quantity making it difficult to justify installment of water meters (AMC, 2016).

The delay in initiating the intervention was partly attributed to a dispute among the private agencies (SPML, NWSC and Va Tech Wabag Ltd.), which was settled in the Aurangabad district court in 2013 (AMC, 2016).

⁴¹¹ The Concessionaire, SPML, had not acquired financial closure and hence failed to acquire financial aid in the form of loan from the bank to invest in the project. Furthermore, since a financial closure report was not submitted to the AMC, there was no clarity on the financial model of the company (AMC, 2016).

Also, the private company had not invested its share, and only relied on government funds to execute the project. Moreover, the private agency included unnecessary (e.g. pre-operative) expenses in the project cost (AMC, 2016). And privatizing and commercializing (water tax) water supply, which is a public utility, was not in the interest of the public. Thus, the urban local body felt that, the financial model was profitable to the company at the cost of the citizens and the AMC, and was increasingly becoming a financial burden.

pressurize the private agency (due to poor policy execution⁴¹² and deteriorating water supply⁴¹³ (refer to table 19 in annexure)) were ignored. Similarly, the urban local body also did not intervene with the workings of the private agency, especially when water supply was commercialized⁴¹⁴. Citizen concerns expressed in the local media and petitions (to the AMC, Maharashtra government, and Mumbai High court) against the PPP scheme failed to mobilise the city government to take strict action. Members of a civil society organization stated that, “*the PPP water supply scheme was used as a rent-seeking opportunity by bureaucrats and politicians*”. Thus, puzzling strategies failed in the absence of strong powering strategies.

Aurangabad’s city government lacked the capacity to transcend clientelism and control rent-seeking activities and effectively upgrade the city’s water distribution network (three failed attempts). This lack of capacity is attributed to the lack of ideational evolution within the urban local body. The city’s bureaucracy was fragmented and embedded particularistic. Additionally, there was no learning from previous policy failures. Consequently, bureaucratic puzzling within the AMC resulted in poorly defined policy solutions, that served the interests of few powerful actors. This was coupled by skewed political powering that favoured clientelistic and rent-seeking practices. The bureaucratic-political nexus was driven by pecuniary interests. For instance, despite re-municipalization of water supply, the city government failed to lower the water tariff; residential users taxed INR 4500, highest in Maharashtra, for disproportionate and irregular water supply (water supplied once in five or six days in some parts of the city). Therefore, the city’s water supply continues to be irregular and insufficient.

Given AMC’s policy failures, the sub-national government plans to implement the all-inclusive policy instrument, comprising of augmenting the water supply and upgrading the water distribution system. In 2019, the Maharashtra government (Urban Development Department and the Maharashtra Jeevan Pradhikaran) proposed to improvise AMC’s policy proposals and

⁴¹² Despite receiving a grant from both the central and state government, disbursed through the AMC, there was little evidence of the implementation of the water supply scheme (AMC, 2016).

⁴¹³ After the handing over of distribution of water supply to the private agency, the water supplied was irregular, impure, and insufficient. Additionally, the maintenance of water pipelines was unsatisfactory (AMC, 2016).

⁴¹⁴ As per the AMC’s General Body Resolution 554, dated 18th August 2009, the water tax was to be increased by 25 per cent every three years. However, in reality the water tax increased by 10 per cent every year. Despite a delay in the project work, the city’s water tax increased from INR 1800 in 2012 to INR 3350 in 2015 (residential usage) (Diwan, 2015) (see table 22 in annexure).

Additionally, civil society members stated that, “*the private agency, despite provisions in the grant for installing water meters, was charging citizens for installing water meters at a cost (INR 10,000-12,000) which was significantly higher than the market price (INR 1200)*”.

implement instruments⁴¹⁵ on behalf of the city government. Results of the water supply scheme are yet to be seen, as there have been significant delays in acquiring policy approvals. Several activists felt that these delays could be due to interference of powerful social forces.

Aurangabad's water adaptation instruments introduced broadly focused on a) augmenting (e.g., new water supply scheme), and b) conserving (e.g., rainwater harvesting systems, regularizing illegal connections, strengthening the water distribution system) water supply. These instruments were facilitated either by the city or sub-national government. However, policy instruments were ineffectively executed by the city government, leading to severe water insecurities. Additionally, the city government was unable to introduce new policy instruments. Consequently, there was no policy change in Aurangabad. Furthermore, the urban local body also failed to acknowledge climate adaptation co-benefits associated with existing policy instruments. Additionally, the city did not institutionalize a climate action plan (as is seen in Rajkot). Thus, Aurangabad has been pursuing a climate regressive paradigm, involving rising water insecurities (irregular water supply and high-water tariffs) and no climate action.

The city government in Aurangabad lacked the capacity to pursue water adaptation instruments, in the presence of strong social forces. This lack of state capacity is attributed to the absence of ideational evolution within the city government. Unlike Rajkot, bureaucratic puzzling was inadequate and political powering was skewed in Aurangabad, leading to no ideational churning within the urban local body.

Bureaucratic puzzling was influenced by the administrative tradition which was defined by a fragmented and embedded particularistic bureaucracy (mediated by vested interest groups). For instance, city bureaucrats did not participate in policy deliberations facilitated by the sub-national government or the parastatal agency, that is the Maharashtra Jeevan Pradhikaran. Puzzling involving city bureaucrats was limited to senior bureaucrats (not a collaborative process as is seen in Rajkot). Additionally, respective Commissioners did not prioritise the water sector nor did they actively participate in policy formulation and execution. Due to poorly defined policy proposals, city bureaucrats found it challenging to convince the central government to support policy instruments. Similarly, city bureaucrats did not participate in

⁴¹⁵ The estimated cost of the new water supply scheme is INR 1680 Crore, which would be funded by the Government of Maharashtra (80 per cent) and the AMC (10 per cent).

review processes (e.g., assessing technical feasibility of proposals), which was outsourced to private consultants. Furthermore, strict reviews of policy proposals were circumvented by engaging with select experts; this helped further specific interests.

Puzzling strategies were also influenced by the lack of learning from past experiences and new information. City bureaucrats did not improvise policy proposals despite poor performance of previous policies (e.g., regularization scheme). Similarly, the bureaucracy did not engage with domain experts (e.g., field agents, parastatal agency officials) to review policy proposals to avoid strict scrutiny.

Consequently, bureaucratic puzzling strategies in Aurangabad were inept (e.g., domestic programme guidelines not adhered to, no provisions for pilot testing instruments, privatizing water distribution and tax collection, several policy instruments merged under one instrument, new instruments were proposed when existing ones were under-utilized). Furthermore, due to previous policy failures the bureaucracy was unable to appeal to the central government to acquire support under new schemes and programmes (e.g., Atal Mission for Rejuvenation and Urban Transformation⁴¹⁶ (AMRUT) 2015; Smart Cities Mission, 2015). Various stakeholders (corporators and retired AMC and MJP bureaucrats) felt that, “*the central government was unsure of the AMC’s ability to execute schemes and so were wary of backing their measures*”. Political powering was influenced by the political beliefs (clientelistic in nature) held by Aurangabad’s political executives. Policy ideas promoted by the city (e.g., regularizing illegal connections, parallel water supply scheme) and sub-national (e.g., mandating rainwater harvesting systems, new Jayakwadi water supply scheme) government were adopted by the mayor’s office in Aurangabad. However, political support was missing in non-technical ways. Aurangabad’s political executives did not mobilise relevant stakeholders (e.g., citizens, local councillors, citizen association group members and the sub-national government) to support policy instruments. Additionally, city bureaucrats lacked the insulation and motivation from the mayor’s office to effectively execute water adaptation instruments.

As a result, the political class interfered with the policy approval and execution process (e.g., schemes were diverted to or truncated in certain areas, tender processes were mediated to

⁴¹⁶ AMRUT was, the second iteration of the centrally sponsored JNNURM scheme, launched by Government of India, through the Ministry of Housing and Urban Affairs (MoHUA) (previously MoUD). The mission prioritises water supply & sewerage projects.

promote certain private agencies or acquire sizeable contracts). Rent-seeking tendencies promoted by powerful social actors, especially monetary gains, hindered programmatic policy choices. The bureaucracy was unable to adequately channelize domestic policies⁴¹⁷ to further policy instruments, due to the presence of powerful social forces.

Unlike Rajkot, the water sector has not been adequately prioritized by Aurangabad's urban local body. Therefore, Aurangabad's climate regressive paradigm is explained by the lack of (state) capacity to transcend clientelism and effectively further water adaptation instruments.

4.6. Aurangabad's water mitigation trajectory

This section traces Aurangabad's water mitigation trajectory from the 1990s till 2020. Typically, water mitigation measures involve reducing Green House Gas (GHG) emissions through energy efficiency & conservation and use of alternative energy sources (e.g., solar, wind, thermal etc.). Aurangabad's water sector consumes a considerable amount of electricity⁴¹⁸ leading to high municipal expenditure. Yet the AMC has not introduced any water mitigation instruments (especially as compared to Rajkot).

From the 1990s, only one water mitigation policy instrument (solar water heating system mandated as building bye laws) has been introduced by sub-national government to reduce municipal energy consumption. However, the city government has not effectively executed the instrument. In fact, the mitigation potential of key sectors including electricity, transport, housing remain underexplored. Furthermore, there seems to be a general lack of understanding within the city government- like most Indian cities- about the mitigation potential associated (reduced GHG emissions and energy efficiency) with existing and planned instruments. Moreover, as mentioned previously climate concerns were not acknowledged or incorporated into Aurangabad's municipal agenda. In fact, climate action was not a priority for the urban local body in Aurangabad. With respect to policy change, there was no change as the city government was unable to pursue water mitigation instruments.

⁴¹⁷ In 2009-10 the urban local body was only able to upgrade one of its water distributions pipelines under the state/sub-national sponsored scheme, the Sujal Nirmal Abhiyan.

⁴¹⁸ City bureaucrats from the AMC water works department stated that the water sector consumes approximately 40-50 per cent of the electricity.

The following section discusses Aurangabad's water mitigation policy instrument and the associated process of bureaucratic puzzling and political powering. The section shows that, in the absence of ideational evolution the state at the local level lacked the capacity to transcend clientelism and effectively pursue water mitigation instruments. The fragmented and embedded particularistic bureaucracy could not puzzle over mitigation instruments. Additionally, there was no learning from previous experiences (e.g., high energy consumption) and new information (e.g., alternative energy sources). Furthermore, powering strategies were skewed in favor of clientelistic and rent-seeking practices. In fact, the bureaucratic-political nexus was driven by material interests and were not concerned about improving service delivery through mitigation instruments. As a result, the city's water insecurities escalated over time due to prevailing clientelistic and rent-seeking practices.

a. Energy conservation policy instrument: solar water heating system (2016)

The sub-national government introduced a policy instrument to reduce energy consumption. In 2016, the Government of Maharashtra (Urban Development department) revised the common development control regulations, which were applicable to Aurangabad's building bye laws. This policy instrument was in line with the central government's environmental norms⁴¹⁹. As per the amendments, implementation of solar water heating systems is mandatory for all new building in order to acquire a completion certificate (see box 8 annexure). The city government has been unable to further this instrument, despite support of the Maharashtra government. Mitigation potential of this instrument has been unacknowledged by the urban local body.

Puzzling over solar water harvesting systems

Solar water heating systems were facilitated by the sub-national government. Bureaucrats of the Maharashtra government's Urban Development department deliberated over high municipal energy consumption levels. Following which, a policy proposal was formulated to incorporate solar water heating systems into the city's building bye laws. Implementation guidelines (e.g., provision of property tax rebates, technical requirements) for urban planning/development authorities were also provided by the sub-national government.

⁴¹⁹ The Ministry of Environment, Forest and Climate Change (MoEFCC) encouraged all sub-national governments to integrate the uptake of green norms and environmental safeguards in building plans (GoM, 2017b). This motivated the Maharashtra government to further environmental norms.

Unlike Rajkot, Aurangabad's city government did not actively pursue the instrument. The city bureaucrats were not involved in policy deliberations facilitated by the sub-national government. The then Commissioner did not encourage city bureaucrats of the town planning department to promote the instrument. After modifications in Aurangabad's building bye laws, the bureaucracy did not conduct any awareness drives for citizens nor did it engage with experts to deliberate over policy execution (e.g., feasibility assessment). Additionally, the city bureaucrats did not propose the installation of solar water heating systems on public buildings, which would have served as standard for policy uptake.

Powering over solar water harvesting systems

The policy proposal was only adopted by the urban local as it was facilitated by the sub-national government. However, local political executives did not support in non-technical ways. For instance, the city bureaucrats were not encouraged to follow up amendments with the sub-national government nor to conduct city level awareness campaigns to popularize the instrument. An architect working with the municipal corporation felt that, "*the uptake of solar water heating systems will improve if the AMC actively promoted it (e.g., awareness programmes)*". Similarly, local councillors were not mobilized to popularize solar water heating systems in their wards. Furthermore, citizen association group members (builders and architects) were not given an opportunity to express their concerns about the policy instrument nor provided any training to ensure effective execution.

Puzzling and powering at the sub-national level ensured incorporation of solar water heating systems in Aurangabad's building bye laws. Consequently, the AMC was forced to adopt the policy instrument. However, the instrument has not been effectively promoted by the urban local body. Solar water heating systems would be temporarily installed on buildings to acquire the completion certificates. This was attributed to the lack of ideational churning within the AMC- as bureaucratic puzzling and political powering was missing at the local level.

Missed opportunities

Aurangabad's city government failed to identify and introduce water mitigation instruments (e.g., upgrade water pumping machinery). This can be attributed to inadequate bureaucratic puzzling within a fragmented and embedded particularistic bureaucracy, which did not learn from past policies and new information. City bureaucrats were unable to identify and

channelize central government schemes and programmes to pursue mitigation instruments. For instance, the city bureaucrats did not adequately utilize the Ministry of New and Renewable Energy's⁴²⁰ (MNRE) Solar City programme to assess Aurangabad's renewable energy potential, increase awareness and formulate detailed emissions inventory. Recommendations of the solar city master plan⁴²¹, formulated by a consultant (Darashaw), were never executed and the plan was permanently shelved by the bureaucracy. In fact, the director of a solar manufacturing company in Aurangabad stated that, *"the plan was not representative of the city, as it was copied from Surat's master plan without adopting it to the needs of Aurangabad"*.

Similarly, bureaucrats of the waterworks department were unable to mobilise the central government to upgrade its old water pumping machinery⁴²² under the 2015 Atal Mission for Rejuvenation and Urban Transformation (AMRUT). The central government was unwilling to collaborate with Aurangabad's ULB due to its former experience (e.g., inability to utilize central government funds to execute instruments, legal issues⁴²³ associated with the PPP water supply scheme). Another example is the underutilization of the 2015 Smart Cities Mission to install solar photovoltaic (PV) cells on public buildings to reduce municipal energy consumption. However, the bureaucracy installed only one solar PV cell on the AMC building, which has not been utilized. The survey conducted to identify the solar energy potential of all municipal sectors did not translate into any policy instruments promoting solar energy.

Furthermore, the bureaucracy was unable to upgrade its water pumping machinery due to the failure of the all-inclusive policy instrument, that is the parallel water supply scheme (discussed in detail in the adaptation section). Additionally, city bureaucrats were not encouraged by respective Commissioners to assess and upgrade the city's water pumping machinery. As a result, city officials of the waterworks department did not assess energy consumption of the

⁴²⁰ The Scheme launched during the 11th Five Year Plan (2007-2012) by MNRE aimed to support 60 Indian cities/towns, with population between 0.5- 50 lakh, to develop as solar/ green cities. The aim was to reduce dependence on conventional energy by 10 per cent in five years by promoting renewable energy and energy efficiency (MNRE, 2014).

⁴²¹ The master plan only broadly assessed the energy consumption patterns of the city (e.g. residential, municipal, industrial etc.), and recommended some measures to reduce energy consumption.

⁴²² Existing water pumping machinery, which had been supporting the city's water supply schemes for almost 26 years, that is since 1976 and 1992, were worn out and increasingly energy inefficient requiring regular maintenance and repairs- causing unsatisfactory performance and expensive for the urban local body (AMC, 2006b).

⁴²³ There was a judicial battle involving the private actor, and the city government due to the malpractices associated with the PPP water supply intervention- the central government intervened to back the urban local body.

water sector (e.g., regular energy audits). The few audits (in 2005-06, 2014-15) conducted did not mobilise the bureaucracy to upgrade the old and inefficient water pumping machinery.

Inadequate bureaucratic puzzling was coupled with skewed political powering. The political executives were driven by material interests leading to rent-seeking activities. For instance, political executives were more interested in material gains associated with solar energy related instruments, as opposed to improving energy and water security. A former consultant of the AMC stated that, “*the political class wanted to know how will they benefit in terms of monetary gain from solar related interventions*”. Furthermore, the bureaucrats lacked political support to pursue water mitigation instruments (e.g., assess efficiency of and upgrade water pumping machinery).

Aurangabad’s water sector consumes a surplus amount of energy⁴²⁴. As compared to Rajkot, the city has not taken any water mitigation instruments to improve energy efficiency and reduce GHG emissions. Although the sub-national government facilitated mandatory implementation of solar water heating systems to reduce energy consumption, the AMC did not further the instrument effectively. The city government also did not propose or pursue water mitigation instruments. Additionally, mitigation potential of existing and planned instruments remains unacknowledged in the case of Aurangabad.

In the absence of effective bureaucratic puzzling and strong powering strategies thinking within the city government did not change in favour of mitigation instruments. Bureaucratic puzzling strategies within the AMC with respect to mitigation instruments were missing. For instance, city bureaucrats either did not participate in puzzling strategies facilitated by the sub-national government or failed to puzzle over policy failures and identify water mitigation instruments. Additionally, the bureaucracy was unable to engage with domain experts to learn about new mitigation instruments, nor could it identify and channelize competitive central government funding to pursue instruments. Respective Municipal Commissioners also did not adequately prioritise water issues and encourage bureaucrats to pursue mitigation instruments.

⁴²⁴ Surplus energy is spent on lifting bulk/raw water against gravity. Additionally, energy is spent on treating the raw water and distribution.

Powering strategies in Aurangabad favoured rent-seeking activities. The political executives did not back the bureaucrats to pursue instruments (e.g., follow up modification of building bye laws with the sub-national government, mobilise the national government to support local efforts). Similarly, relevant stakeholders (local councillors and citizen association group members) were not mobilized to support solar water heating systems. Additionally, efforts to popularize the instrument across the city were not encouraged by the mayor's office. The political class was driven by material interests and not by citizen needs. Thus, the city government in Aurangabad lacked the capacity to effectively further water mitigation instruments that would have improved energy and water security for all.

4.7. Conclusion

Aurangabad, like most Indian cities, has been experiencing rapid urbanization and industrialization and a myriad of governance challenges (e.g. inadequate technical, financial and decision-making capacity, rent-seeking activities, lack of climate awareness and urban climate institutions & policies). The city government is pursuing a climate regressive paradigm (severe water insecurity and no climate action) as it has been unable to overcome governance challenges, especially clientelism and rent-seeking activities.

This chapter traced the city's water adaptation and mitigation instruments (from 1990 till 2020) to understand its climate regressive paradigm. The city's water adaptation instruments focused on a) augmenting (e.g. new water supply scheme), and b) conserving (e.g. mandating rainwater harvesting systems, regularizing illegal connections, strengthening water distribution system) the city's water supply. Aurangabad's water mitigation instruments prioritized conserving municipal energy (e.g. solar water heating systems). However, the city has been unable to effectively execute water adaptation and mitigation instruments.

Unlike Rajkot, the city lacked the capacity to address its governance challenges and execute instruments. The lack of (state) capacity is attributed to the absence of ideational churning within the city government. Ideas evolve due to the process of bureaucratic puzzling and political powering within the city government, which was missing in Aurangabad.

Bureaucratic puzzling was influenced by the administrative tradition (a fragmented and embedded particularistic bureaucracy) and no learning from previous experiences and new

information. The bureaucracy often did not engage with relevant technical experts or engaged with select experts to further their interests without much scrutiny. Policy formulation was not a collective process- city bureaucrats did not participate in puzzling strategies facilitated by sub-national government or the process was monopolized by select senior bureaucrats. Additionally, respective Commissioners had not adequately prioritised water issues nor motivated city bureaucrats to pursue instruments effectively. Powerful vested interest groups would mediate the process of policy formulation to further their interests.

As a result, the bureaucracy was unable to identify and channelize domestic schemes and programmes to pursue policy instruments (seen in Rajkot). The policy proposals formulated were inept, involving no learning from previous policy failures. Furthermore, climate adaptation and mitigation potential were not recognized by the bureaucracy.

Powering strategies were influenced by clientelistic beliefs held by Aurangabad's political executives. Proposed policy ideas were adopted by the city political executives either because it was backed by the sub-national government or served the interests of powerful social actors. However, political support was missing in non-technical aspects (e.g., relevant stakeholders not mobilized to further instruments, bureaucrats lacked insulation and motivation to execute measures). Consequently, political pressure was used to interfere with policy execution (e.g. tender processes manipulated to acquire sizeable contracts or promote certain actors, schemes directed towards or away from certain areas/wards). The political class in Aurangabad was driven by material interests, which is reflected in the policy choices. The lack of strong powering strategies backing puzzling strategies was a major roadblock for executing policy instruments. Powering strategies often disrupted puzzling strategies, leading to disproportionate and insufficient water supply.

The lack of state capacity nudged the city towards a climate regressive paradigm, that serves the interest of powerful social actors. The city government was unable to introduce new policy instruments and effectively execute those introduced by the sub-national government. Unlike Rajkot, there is no policy change in the case of Aurangabad. Thus, the case of Aurangabad reflects the situation of most other Indian cities that lack the capacity and commitment to achieve water resilience.

Chapter Five

5. Water resilience: Aurangabad versus Rajkot

5.1. Introduction

This dissertation seeks to explain why comparable Indian cities vary overtime in terms of the policy paradigms pursued. The two cities studied, Rajkot in Gujarat and Aurangabad in Maharashtra, face similar governance challenges (institutional, technical, financial, jurisdictional, and clientelism) that impede effective delivery of municipal water supply. Yet Rajkot emerged as a water secure and climate conscious city, while Aurangabad's water insecurities escalated over time.

Among a range of theories such as state, society and state-society theories, the study finds that a state centric approach is most relevant for explaining the variation in performance of the two cities. More specifically, improved state capacity leads to improved water security and climate action. The ability of the state at the local level to pursue its stated objectives is attributed to ideational evolution within the state (endogenous factors). Thinking within the state at the local level (observed in Rajkot and not in Aurangabad) evolved due to the combination of bureaucratic puzzling and political powering. Bureaucratic puzzling is influenced by administrative tradition (cohesive and embedded autonomous bureaucracy vs fragmented and embedded particularistic bureaucracy) and social learning (learning from past policies and new information vs no learning from past experiences). Powering strategies are influenced by political beliefs (clientelism vs programmatic policies). Ideational evolution within the state creates a bureaucratic-political rationality favoring programmatic policies. A synergised bureaucratic-political rationality improved the ability of the state at the local level to effectively execute policies by overcoming governance challenges such as clientelism. Therefore, improved state capacity was an outcome of ideational evolution that helps explain improved water security and promotion of climate action in this comparative design.

The study traces Rajkot and Aurangabad's water adaptation and mitigation instruments introduced between 1990 till 2020. Rajkot's urban local body was able to improve its capacity to pursue programmatic water adaptation and mitigation instruments despite the presence of powerful social forces. However, Aurangabad's city government lacked the ability to overcome governance challenges and continued to pursue clientelistic policies.

The conclusion chapter discusses why Rajkot and Aurangabad differ in terms of their policy paradigms by emphasizing the importance of ideas within the state at the local level. Rajkot is pursuing a climate friendly paradigm, whereas Aurangabad's policy paradigm is climate regressive. The next section compares the two cities with respect to their policy paradigms. This is followed by a brief discussion on conjectures explaining the variation in policy paradigms. These conjectures are substantiated by discussing some of the common water adaptation and mitigation policy instruments introduced by the two cities. The chapter concludes with findings from the thesis that show how ideas within the state at the local level led to a climate friendly paradigm, by transcending governance challenges. Findings from the thesis can serve as a roadmap for future analysis on other cities, especially in the global South facing similar issues.

Aurangabad, like most Indian cities, has been experiencing rapid urbanization and industrialization and a myriad of governance challenges (e.g., inadequate technical, financial and decision-making capacity, rent-seeking activities, lack of climate awareness and urban climate institutions & policies). The city government is pursuing a climate regressive paradigm (severe water insecurity and no climate action) as it has been unable to overcome governance challenges, especially clientelism and rent-seeking activities.

This chapter traced the city's water adaptation and mitigation instruments (from 1990 till 2020) to understand its climate regressive paradigm. The city's water adaptation instruments focused on a) augmenting (e.g., new water supply scheme), and b) conserving (e.g., mandating rainwater harvesting systems, regularizing illegal connections, strengthening water distribution system) the city's water supply. Aurangabad's water mitigation instruments prioritized conserving municipal energy (e.g., solar water heating systems). However, the city has been unable to effectively execute water adaptation and mitigation instruments.

Unlike Rajkot, the city lacked the capacity to address its governance challenges and execute instruments. The lack of (state) capacity is attributed to the absence of ideational churning within the city government. Ideas evolve due to the process of bureaucratic puzzling and political powering within the city government, which was missing in Aurangabad.

Bureaucratic puzzling was influenced by the administrative tradition (a fragmented and embedded particularistic bureaucracy) and no learning from previous experiences and new information. The bureaucracy often did not engage with relevant technical experts or engaged with select experts to further their interests without much scrutiny. Policy formulation was not a collective process- city bureaucrats did not participate in puzzling strategies facilitated by sub-national government or the process was monopolized by select senior bureaucrats. Additionally, respective Commissioners had not adequately prioritised water issues nor motivated city bureaucrats to pursue instruments effectively. Powerful vested interest groups would mediate the process of policy formulation to further their interests.

As a result, the bureaucracy was unable to identify and channelize domestic schemes and programmes to pursue policy instruments (seen in Rajkot). The policy proposals formulated were inept, involving no learning from previous policy failures. Furthermore, climate adaptation and mitigation potential were not recognized by the bureaucracy.

Powering strategies were influenced by clientelistic beliefs held by Aurangabad's political executives. Proposed policy ideas were adopted by the city's political executives either because it was backed by the sub-national government or served the interests of powerful social actors. However, political support was missing in non-technical aspects (e.g., relevant stakeholders not mobilized to further instruments, bureaucrats lacked insulation and motivation to execute measures). Consequently, political pressure was used to interfere with policy execution (e.g., tender processes manipulated to acquire sizeable contracts or promote certain actors, schemes directed towards or away from certain areas/wards). The political class in Aurangabad was driven by rent-seeking propensities, which is reflected in the policy choices. The lack of strong powering strategies backing puzzling strategies was a major roadblock for executing policy instruments. Powering strategies often disrupted puzzling strategies, leading to disproportionate and insufficient water supply.

The lack of state capacity, due to technical ineptitude and no political support, nudged the city towards a climate regressive paradigm, that serves the interest of powerful social actors. The city government was unable to introduce new policy instruments and effectively execute those introduced by the sub-national government. Unlike Rajkot, there is no policy change in the case of Aurangabad. Thus, the case of Aurangabad reflects the situation of most other Indian cities that lack the capacity and commitment to achieve water resilience.

5.2. Comparative analysis: Aurangabad vs Rajkot

This section discusses the variation in policy paradigms pursued by the comparable cities studied here. The two cities, Rajkot and Aurangabad, are geographically discrete yet fairly similar⁴²⁵ on several variables (see details in introductory chapter). Additionally, the two cities operate under a similar central governance framework and experience similar urban governance challenges (lack of technical and financial capacity, and decision-making authority). Furthermore, service delivery is impeded by clientelism. With respect to the urban water sector clientelistic practices include local politicians supporting water thefts and private water tanker lobby, and manipulating policy execution. Additionally, climate concerns are not reflected in municipal agendas, nor is the Indian urban climate governance framework very evolved.

Despite similarities, the cities vary drastically in the way their policy paradigms have evolved overtime. Rajkot is pursuing a climate friendly paradigm (improved water security and climate action), whereas Aurangabad has a climate regressive paradigm (water insecurities and no climate action) (see table 3 below).

Table 3: Climate friendly vs regressive paradigm

Indicator (as of 2020)	Climate friendly paradigm	Climate regressive paradigm
Municipal water supply	Daily for 20 minutes	Once in five or six days for 45 minutes
Water tax (in INR) for domestic users	840	4500
Climate co-benefits	Adaptation and mitigation potential acknowledged	Adaptation and mitigation potential not acknowledged
Climate action plan	Climate resilient city action plan	No climate action plan

Rajkot was able to improve its water security through daily provision, increased coverage and quantity of water supplied (see table 23 in annexure). Water insecurity worsened in Aurangabad (see table 24 in annexure). As of 2020, the two cities perform differently in terms of provisioning municipal water supply to their respective citizens. Rajkot is able to provide regular municipal water, whereas Aurangabad's water supply is highly irregular. The (residential) water tax charged by the two cities also varies significantly. Despite lower service

⁴²⁵ The cities have similar demographic (million plus cities), geographic (arid or semi-arid, and land locked), climatic (scanty rainfall) characteristics, and land use patterns (increased built up area and decline green cover and water reservoirs). The cities belong to two regions/states with comparable socio-economic and service delivery indicators.

Additionally, the cities have similar regional level politics (see details in Rajkot adaptation and Aurangabad chapters).

provision levels, the water tariff in Aurangabad is five times higher than Rajkot. The two cities also vary with respect to data management- Aurangabad performs poorly as compared to Rajkot (compare table 1 vs 2 in annexure).

This variation in policy paradigms observed over time is attributed to the ability of respective city governments to control clientelism and introduce policy instruments. From the 1990s, Rajkot's urban local body implemented a relatively large number of water adaptation and mitigation policy instruments (see table 5 below), without altering the policy paradigm, to improve its water security. The city was driven by the overarching policy goal of improving water supply for all, which remained consistent over the years. Furthermore, climate concerns were incorporated under the existing paradigm. Climate issues received considerable attention in Rajkot, even though India still has not institutionalized an urban climate policy to guide cities. Firstly, the city took necessary steps⁴²⁶ to pursue climate actions. Subsequently, the city implemented a range of climate specific measures across different sectors (e.g., transport, housing, electricity, and water etc.). Secondly, the adaptation (e.g., reduced vulnerability and improved resilience) and mitigation (e.g., energy efficiency and emission reduction) potential of existing and planned (developmental) policy instruments was acknowledged. Thirdly, the city furthered its climate commitment by voluntarily ratifying a climate action plan⁴²⁷, which would guide future actions. Additionally, there is considerable awareness on climate issues within the city government⁴²⁸ including the bureaucratic and political arm. Rajkot has won several awards and gained domestic and international recognition for its climate efforts (see table 5 below).

⁴²⁶ Cities need to take some initial steps that help identify solutions. For instance, vulnerable sectors requiring immediate attention were identified through a detailed vulnerability assessment of the city (e.g. water was identified as a vulnerable sector).

Similarly, Green House Gas (GHG) emissions contribution of each sector were calculated for the city; this helped prioritise climate measures.

⁴²⁷ In 2019, a climate resilient city action plan was consolidated and institutionalized without any pressure from the state/sub-national or central government.

⁴²⁸ Municipal bureaucrats, particularly city and deputy engineers working across sectors (e.g., water, electricity, housing, transport etc.), actively participated in climate specific capacity building activities (e.g., workshops, seminars, project meetings- see table 25 in annexure), and designed policy proposals furthering climate measures. In addition, respective Municipal Commissioners' occasionally accompanied bureaucrats and participated in climate workshops, and also encouraged bureaucrats to pursue climate action.

Similarly, the political executives, especially the city Mayors', not only supported climate related policy proposals, but also represented the city at climate forums (e.g., Mayor member of the Global Covenant of Mayors for Climate and Energy).

In contrast, in the case of Aurangabad relatively fewer policy instruments were introduced (by the sub-national government) and were poorly executed to control clientelism and improve water security. As a result, Aurangabad's water insecurities escalated over time. With respect to climate awareness and action, the city poses a stark contrast to Rajkot. Firstly, Aurangabad has not taken any initial steps⁴²⁹ (e.g., conducting vulnerability assessment, formulating an emissions inventory) that can guide climate action. Consequently, the city's efforts⁴³⁰ to combat the impacts of climate change are negligible as compared to Rajkot. Secondly, climate co-benefits (adaptation and mitigation) associated with existing and planned instruments are unknown and hence remain unacknowledged. Thirdly, climate concerns were not included in the city's municipal agenda. Finally, the city government, including the city bureaucrats and political executives⁴³¹, are unaware of climate issues and do not seem interested in pursuing climate action. In fact, climate concerns were absent from the general thinking of the ULB.

5.3. Causal explanation

This section discusses the causal mechanism to explain the variation in policy paradigms of Rajkot (climate friendly paradigm with improved water security and climate action) and Aurangabad (climate regressive paradigm with water insecurities and no climate action). Rajkot was able to implement new policy instruments under the existing policy paradigm, that is to control clientelism and improve water security, whereas Aurangabad was unable to do so. There was a consolidation and change within the existing paradigm, especially in the case of Rajkot. This variation in policy paradigm is attributed to the capacity of the city government to effectively implement programmatic (adaptation and mitigation) instruments by addressing governance challenges. The study argues that, improved state capacity is explained by the evolution of ideas within the city government. Ideas within the city government evolved due to the combined effect of bureaucratic puzzling and political powering. Transition in state

⁴²⁹ A detailed plan (e.g., the solar city master plan as part of the Ministry of New and Renewable Energy's solar city programme launched in 2008) was formulated for the city, which comprised of energy consumption patterns and potential energy reduction measures. However, the plan was not representative of the city or its unique needs, as it was replicated from another city's (Surat) master plan without customising it to the local setting and requirements.

⁴³⁰ An illustrative example is the case of promoting solar energy. Although a solar photovoltaic (PV) panel was installed on the municipal building on a pilot basis, it wasn't maintained regularly nor was it replicated in other public buildings across the city. The city pursued these instruments symbolically because they were mandated either by the state/sub-national and/or central government.

⁴³¹ Unlike Rajkot, the city bureaucrats in Aurangabad have not participated in climate specific capacity building activities, nor were climate related policy proposals formulated. In addition, neither the Municipal Commissioners' nor the political executives actively furthered climate measures. Unlike Rajkot, the bureaucratic political nexus in Aurangabad did not take any effort to further climate measures.

thinking created a bureaucratic-political rationality favoring programmatic policies. Bureaucratic puzzling strategies are influenced by the administrative tradition and social learning (see table 4 below). The administrative tradition is determined by the type of bureaucracy. A cohesive bureaucracy can be embedded within the society yet autonomous from vested interest groups. Learning (from past policies and new information) within such a bureaucracy leads to programmatic policy choices. In contrast, a fragmented bureaucracy can engage with the society but is unable to execute its authority due to powerful social actors-embedded particularistic. Such a bureaucracy does not learn from previous policies and pushes for clientelistic policies.

Political powering strategies are influenced by political beliefs (clientelism vs programmatic instruments) (see table 4 below). Moreover, the political beliefs may vary from the bureaucratic beliefs, whereby the political rationality has more power in influencing decision-making processes. Programmatic policies can be pursued only when bureaucratic and political rationality are in alignment.

Table 4: Variation in influencing factors

Influencing factors	Rajkot	Aurangabad
Administrative tradition: type of bureaucracy	Cohesive embedded autonomous promoting programmatic policies	Fragmented embedded particularistic promoting clientelistic policies
Social learning	Learning from previous policies and new information	No learning from previous policies and new information
Political belief	Programmatic policies favoured	Clientelistic policies favoured

Rajkot

In the case of Rajkot, thinking within the State at the local level changed over time- thereby moving towards a climate friendly paradigm with improved water security and promotion of climate action. Ideational churning within the city government improved its capacity to overcome or neutralize opposing forces, and effectively implement new policy instruments involving programmatic benefits. The process of bureaucratic puzzling accompanied by strong political powering within the urban local body resulted in ideational evolution. The bureaucracy was embedded autonomous and worked as a cohesive unit to control clientelism and improve water security. Additionally, policy formulation was an outcome of learning (city bureaucrats and domain experts⁴³²) from past experiences, which involved identifying the

⁴³² The city government engaged with domain experts (e.g. members of water works committee and citizen association groups, academic partners, and civil societies) to access new information.

nature of the problem (why old policies failed). Bureaucratic puzzling involved collective deliberations among city bureaucrats (e.g., water works and town planning department), and occasionally the Commissioner. This process resulted in defining the nature of policy problems (e.g., lack of local water source, inadequate municipal distribution system, high non-revenue water loss, high water consumption level). Following which, a range of programmatic policy proposals were proposed (e.g., augmenting water supply, conserving water supply and monitoring water consumption) by the bureaucrats to systematically address its water challenges. In Rajkot, new policy instruments were introduced incrementally depending on the availability of resources, as opposed to incorporating all instruments under an all-inclusive policy instrument as was seen in Aurangabad. This reflects the gradual and path dependent evolution of ideas within the city government to introduce instruments that built on previous policies to address prevalent problems.

Bureaucratic policy ideas were strongly backed by the political executives, both during the planning and execution phase. Beliefs held by the political executives favoured programmatic policies over clientelistic ones. Consequently, programmatic policy proposals were adopted (through resolutions mandating implementation) by the mayor's office. Additionally, political support was provided in non-technical ways such as mobilising relevant stakeholders (e.g., local councillors, citizens, citizen association members, sub-national government officials) and insulating city bureaucrats from vested interests. Strong political support helped implement policy ideas.

The combination of bureaucratic puzzling and political powering changed thinking within the city government. Consequently, a synergised bureaucratic-political rationality emerged in favour of programmatic adaptation and mitigation policy instruments. The city government was able to build its capacity to transcend governance challenges and effectively execute instruments. Therefore, improved state capacity was a result of the evolution of ideas within the city government in Rajkot.

Aurangabad

On the other hand, the city government in Aurangabad lacked the capacity to overcome governance challenges, especially clientelism and rent seeking activities, leading to continued water insecurities. In addition, the urban local body had not factored in climate concerns or

pursued climate action⁴³³. The bureaucracy was embedded particularistic as it was mediated by vested interest groups. Additionally, there was no learning from previous policies and new information. In fact, learning within the bureaucracy was skewed, as the city government engaged with selective consultants, who furthered the (material) interests of few. As a result, bureaucratic puzzling was inadequate. Deliberations over a policy problem and identification of optimal solutions was limited to few senior level city bureaucrats, with no involvement of respective Commissioners. This exclusionary decision making may have dissuaded junior bureaucrats from effectively executing policies. Consequently, policy proposals designed by the city bureaucrats often did not have clearly defined problems and were clientelistic in nature. The sub-national government also designed policy instruments for the city; however, the city bureaucrats were not involved in these deliberations.

Powering strategies in Aurangabad were skewed in favour of vested interest groups. Political beliefs held by Aurangabad's political executives favoured clientelistic policies. The mayor's supported policy proposals, often under the influence of powerful social actors. For instance, local councillors and senior politicians (e.g., the local Member of Parliament) interfered with decision making processes, to further their material interests (e.g tender rules were flouted, politically affiliated contractors, builders and private agency were promoted, schemes were truncated or diverted to certain areas). Furthermore, political support in non-technical ways (e.g., mobilising relevant stakeholders and insulating bureaucrats from vested interests) was missing in Aurangabad. Consequently, programmatic policies were not pursued by the city government. Additionally, policies proposed by the sub-national government were not effectively executed by the city government.

In the absence of effective bureaucratic puzzling and strong political powering, there was no evolution of ideas within Aurangabad's urban local body. As a result, clientelistic policies were pursued by the city government. Therefore, Aurangabad's urban local body lacked the capacity to improve its water insecurities and pursue climate action. The next section will summarise some of the findings that give credence to the above-mentioned conjectures.

⁴³³ As mentioned previously, there was a serious lack of awareness on climate issues, climate co-benefits were unacknowledged, and no climate action plan was formulated and/or institutionalised by the urban local body in Aurangabad.

5.4. Similar measures different results: comparing the two cities

This section discusses water challenges and policy problems experienced by the two cities that have caused water scarcity. Additionally, select water adaptation and mitigation policy instruments introduced by both cities are discussed to explain the variation in policy paradigm and validate the above hypothesis.

The two cities, located in arid/ semi-arid regions and experiencing scanty rainfall, have witnessed water scarcity issues. Both cities faced similar water (adaptation) challenges such as inadequate municipal water supply, high NRW loss, and high-water demand. Additionally, the water sector not only had high energy consumption levels leading to high municipal expenditure, but also high emission contribution (mitigation challenges). Rajkot unlike Aurangabad⁴³⁴, lacked an adequate water source and spent considerable resources to augment water supply.

These challenges were compounded by policy problems such as opposition against new policy instruments (farmers from neighboring villages, citizen association groups and private water tanker lobby). Additionally, strong clientelistic and rent-seeking activities involving local councillors and politicians (promotion of illegal activities, manipulation of tender process and diversion and truncation of schemes) resulted in intra-city differences and severe water insecurities.

Cities can address water challenges and overcome policy problems by introducing water adaptation (to cope with climate impacts) and mitigation (to reduce climate impacts) instruments. The table illustrating Rajkot and Aurangabad's water adaptation and mitigation policy instruments is revisited below to depict the variation.

Table 5: Water adaptation and mitigation instruments: Rajkot vs Aurangabad

Aurangabad	Rajkot
Water adaptation instruments	
1. Augment and conserve water supply a. water supply scheme introduced by the sub-national government's parastatal agency b. Rainwater harvesting systems mandated by the sub-national government	1. Augment water supply a. built new water reservoirs (e.g., dams), b. redirected (irrigation) water for drinking water purposes c. increased reservoir capacity (dam height increased, desilted reservoirs, connected existing dams with an express

⁴³⁴ The Jayakwadi dam has been a reliable water source for Aurangabad city.

c. Reduce Non-Revenue Water (NRW) loss (regularisation schemes) d. Improving water distribution system (build water storage and filtration tanks, improve distribution network) and implementing an additional water supply scheme (three failed attempts)	- feeder pipeline to ensure uniform water availability in all zones) 2. Conserve water supply a. Rainwater harvesting systems mandated b. Strengthened water distribution system (built water storage and filtration tanks, strengthened existing and laid new water distribution networks) c. Reduced Non-Revenue Water (NRW) loss (institutionalised a water check team, introduced a strict regularization scheme, upgraded existing pipelines, installed the Supervisory Control and Data Acquisition (SCADA) system to monitor water flow) 3. Monitor water consumption a. metered (24*7) water supply
Water mitigation instruments	
1. Conserve municipal finances a. irregular energy audits 2. Energy conservation a. solar water heating systems mandated by the sub-national government	1. Energy conservation a. regular energy audits of water pumping machinery b. solar water heating systems mandated 2. Energy efficiency and emission reduction a. installed solar powered water treatment plant, b. upgraded water pumping machinery, c. decentralised waste water treatment plant

From the 1990s, Rajkot's urban local body has effectively implemented several water adaptation and mitigation instruments to improve its water security and reduce clientelism. On the other hand, the city government of Aurangabad failed to introduce and execute water adaptation and mitigation instruments. The few instruments that Aurangabad pursued were facilitated by the sub-national government's parastatal agency or the sub-national government itself. Additionally, the city government did not adequately execute policy instruments. The cities differ not only with respect to the policy instruments implemented, but also in their approach of designing and executing the instruments.

5.4.1. Water adaptation instruments

This section discusses comparable water adaptation instruments introduced by Rajkot and Aurangabad. Water security can be improved through water adaptation instruments that strengthen water supply by addressing existing development deficits and coping with climate impacts. It was imperative for both cities experiencing water scarcity to pursue water adaptation instruments.

Unlike Aurangabad, Rajkot introduced a range of policy instruments to improve its water supply (see table 5) and control clientelism. Aurangabad failed to implement and execute adaptation policy instruments. Additionally, adaptation potential (e.g., reduced vulnerability and improved capacity) of existing and planned developmental instruments were acknowledged by the city government in Rajkot. Such efforts were missing in the case of Aurangabad.

The comparable water adaptation instruments introduced can be broadly classified as a) water augmentation instruments including the introduction of water supply schemes, and b) conservation instruments such as mandating rainwater harvesting systems, regularizing illegal water connections, and strengthening water distribution network. However, the two cities vary in their approach of formulating and executing these instruments.

I. Augmenting (local) water supply

Rapidly urbanizing cities, especially medium sized cities with rising population along with industrial and commercial development, have high demand for water. Both Rajkot and Aurangabad have had to deal with water shortages due to increasing water needs. Additionally, the cities faced policy problems such as opposition from neighboring villages and/or clientelistic practices impeding execution of instruments.

Unlike Aurangabad city which had a steady source of water, Rajkot has had to make consistent efforts to augment its water supply, as it lacked a perennial water source. The city government effectively introduced a range of new policy instruments to augment the water supply in Rajkot, despite oppositional forces. Due to Aurangabad's rising water needs, the sub-national government introduced a water augmentation instrument on behalf of the city government. Additionally, the city government tried to augment the water supply, but failed to overcome clientelistic and rent-seeking activities. The cities not only vary in the water augmentation policy instruments introduced (see table 5 above), but also in their approach of designing and executing instruments.

a. Water supply scheme

In the face of rising water needs, cities often introduce new water supply schemes to improve local water supply. New water supply schemes were introduced by both cities. However, Rajkot introduced relatively a wider range of policy instruments as compared to Aurangabad. In Rajkot the city government was instrumental in introducing water supply schemes, whereas Aurangabad's water supply scheme was introduced by the sub-national government.

Aurangabad

Aurangabad's water augmentation instrument was introduced by the sub-national government and poorly executed by the city government. For instance, the sub-national government's parastatal agency, the Maharashtra Jeevan Pradhikaran, introduced a new water supply scheme (a water pipeline was set up to source raw/bulk water from Jayakwadi dam), with no involvement of the city government. The instrument was effectively implemented by neutralizing opposition from neighboring towns and villages because it was pursued by the sub-national government's parastatal agency. Although, this policy instrument addressed the city's water issues in the early years, it soon fell short to meet growing needs (as it drew a low quantum of water).

Since the mid-2000s, three attempts were made by the city government to augment the city's water supply (sourcing more quantum of bulk/raw water from Jayakwadi dam). The urban local body proposed to introduce the water supply augmentation instrument under an all-inclusive policy instrument. However, all attempts of introducing the all-inclusive policy instrument were unsuccessful. Bureaucratic puzzling over the policy problem and instrument was inadequate. This was attributed to a fragmented (monopolized policy planning) and embedded particularistic bureaucracy (mediated by vested interest groups), which did not learn from past policies. Furthermore, political powering often did not fully support the policy idea and were skewed in favor of powerful actors (e.g., politicians and private agency). The political class actively engaged in clientelistic and rent-seeking practices (e.g. tender process manipulated to pursue pecuniary interests of politicians, politically affiliated private agency was promoted). Powering in non-technical ways was missing (bureaucrats lacked insulation to execute policies and monitor progress, Commissioners transferred for intervening with policy execution). In the absence of bureaucratic puzzling and strong political powering there was no evolution of ideas within the city government supporting water augmentation instrument, that would have served

all citizens. The urban local body lacked the capacity to overcome clientelism and augment the city's water supply. The city was thus unable to augment its water supply, which increased water insecurities.

Rajkot

Unlike Aurangabad, all water augmentation instruments were introduced by Rajkot's city government, with some execution assistance provided by the sub-national government⁴³⁵. From the 1990s, Rajkot implemented several water augmentation policy instruments such as constructing water reservoir, re-directing irrigation water for drinking water purposes and increasing reservoir capacity. The city bureaucrats, especially from the water works department, collectively puzzled over the policy problem (e.g., lack of adequate local water source, oppositional forces) and proposed to introduce policy instruments in an incremental manner based on the availability of funds. The bureaucracy was embedded autonomous (engaged with domain experts for technical advice), and learnt from previous policy failures and new information to cohesively pursue programmatic policy instruments. Political powering backed bureaucratic puzzling. Rajkot's political executives actively adopted policy ideas. Furthermore, political support was provided in non-technical ways such as mobilizing the sub-national government to support policy instruments, which helped overcome any form of opposition (e.g., farmers protesting against re-direction of irrigation water). Similarly, local councillors were mobilized to ensure smooth execution process (manipulation of tender processes was discouraged). The combination of bureaucratic puzzling and political powering lead to evolution of ideas within the city government in favour of programmatic instruments. Consequently, the urban local body was able to improve its capacity to overcome oppositional forces and effectively execute instruments. Over the years, Rajkot has made substantive efforts to augment the city's water supply, which would serve all.

II. Conserving water

As mentioned previously, rising water needs is a serious concern for cities experiencing growing population and development. Inadequate municipal water supply was a major challenge experienced by both Rajkot and Aurangabad. Old water distribution systems, high non-revenue water loss and declining groundwater tables cumulatively lead to poor municipal

⁴³⁵ State/ sub-national government's provide assistance on large scale infrastructure projects such as constructing dams, due to poor capacity (both technical and financial) of city governments.

water supply. Furthermore, clientelistic practices (manipulating tender contracts, truncating and opposing instruments) posed a major challenge to policy execution. Both cities introduced new water conservation policy instruments such as upgrading water distribution systems, controlling non-revenue water loss and harvesting rainwater. Rajkot's city government was actively involved in executing all instruments. In the case of Aurangabad, the sub-national government facilitated implementation of a policy instrument (rainwater harvesting systems), which was not effectively pursued by the city government. Additionally, the city government in Aurangabad failed to effectively design and pursue policy instruments in the presence of powerful vested interest groups. The two cities differ not only in the number of instruments introduced (see table 5 above), but also in the way these instruments were pursued.

a. Upgrading water distribution system

Urban water security can be improved by upgrading the water distribution system. Both cities proposed to introduce new policy instruments (e.g., improving water storage and filtration capacity, and upgrading existing and laying new water distribution network) to strengthen their water supply systems. Rajkot and Aurangabad proposed to pursue these instruments with the support of the central government, that is under urban development programmes and schemes. Rajkot successfully implemented all the above-mentioned policy instruments, whereas Aurangabad was unable to do so. In fact, the Aurangabad urban local body tried different approaches to implement the instruments and still failed to upgrade its distribution system.

Rajkot

Following augmentation instruments, the urban local body from the mid-2000s prioritised upgrading its water distribution system (e.g., strengthening storage and filtration capacity, and improving existing and laying new water distribution network). The city's municipal water supply was increasingly falling short to meet growing needs. Additionally, new policy instruments were met with clientelistic practices- local councillors interfering with implementation to acquire sizeable tender contracts or further known (private) agencies. However, the city government was able to overcome this policy problem and introduce water upgradation policy instruments.

City bureaucrats of the water works department, supported by the then Commissioner, collectively puzzled over the prevalent water challenges (old water distribution system) and

proposed an incremental introduction of new policy instruments (as opposed to an all-inclusive instrument seen in Aurangabad) depending on the availability of resources. In fact, the bureaucrats proposed to pilot test⁴³⁶ instruments, especially new ones, before scaling it to the city level. Although, the bureaucracy engaged with domain experts (e.g., retired bureaucrats) to improve their technical capacity, policy planning was independent of any social pressure. Additionally, collective deliberations enabled the city bureaucrats to identify and customise domestic policies and programmes, both central and state/sub-national government, to pursue policy instruments. The city bureaucrats effectively formulated detailed reports (in-house instead of outsourcing it to external consultants) as part of the central government protocols, and acquired funds⁴³⁷. City bureaucrats used their personal networks to follow up project appraisals with the union government. The bureaucracy was embedded autonomous and worked cohesively to pursue programmatic instruments.

Bureaucratic policy ideas were actively backed by Rajkot's political executives, especially the mayor and standing committee members. Political beliefs favoured programmatic policy instruments as opposed to clientelistic ones. This led to the adoption of policy proposals in the form of several resolutions. Furthermore, the Mayor's office provided non-technical support such as mobilising local councillors to support policy execution by ensuring a smooth tender process (e.g., lowest technical bidder acquires the contract). Similarly, the Mayor or standing committee chairman would follow up project approvals with the sub-national government. Powering strategies not only insulated bureaucrats from vested interests, but also enabled them to appeal to the sub-national and national government to support their policy ideas.

The combination of bureaucratic puzzling and political powering changed thinking within the city government, thereby creating a synergised rationality supporting programmatic policy instruments. The city government continues to upgrade its water distribution network by relying⁴³⁸ on new domestic schemes and programmes.

⁴³⁶ This process allowed preliminary testing of techniques on a small scale, and left some scope for improvement.

⁴³⁷ Rajkot was able to secure funding under the union government's Jawaharlal Nehru National Urban Renewal Mission's (JNNURM) sub-mission, Urban Infrastructure and Governance (UIG), targeting infrastructure development in cities.

⁴³⁸ The city has a positive reputation with the central and sub-national government of effectively utilizing resources to pursue instruments.

Furthermore, the urban local body is able to build on past experiences of formulating detailed project reports to acquire funds from the central government.

Aurangabad

Like Rajkot, Aurangabad's urban local body tried to strengthen its water distribution system from the mid-2000s, as the municipal water supply was inadequate. Apart from upgradation of water distribution system, the city government also proposed to augment the water supply under an all-inclusive policy instrument. New policy instruments provided an opportunity for the political class to engage in clientelistic and rent-seeking practices (manipulated policy execution and further pecuniary interests). The city government failed to upgrade its water distribution network, due to the presence of powerful social forces.

Policy proposal formulation was monopolised by senior bureaucrats, with no involvement of other bureaucrats of the water works department who had experience and knowledge of ground realities of executing instruments. The bureaucracy proposed to implement an all-inclusive policy instrument instead of the incremental approach undertaken by Rajkot. Learning from previous policy failures was missing in Aurangabad. Policy instruments were often executed without conducting any pilot study (e.g., privatizing municipal water supply and upgrading the city's water distribution network), despite past experiences (e.g., failure to improve public transport under public private partnership). The bureaucracy engaged with experts who promoted select ideas and interests. Furthermore, the city bureaucrats were unable to identify relevant⁴³⁹ domestic programmes and schemes to pursue policy instruments. Additionally, the bureaucrats took three years to mobilise the central government to support their policy instrument⁴⁴⁰, as they had failed to adhere to the scheme selection criteria (estimated implementation cost was much higher than the budget limit set for the scheme). The bureaucracy was fragmented in terms of policy planning and embedded particularistic as vested interest groups mediated the planning process.

Political powering strategies in Aurangabad were skewed in favour of powerful social actors. The initial policy proposal of strengthening the water distribution system was not supported by the mayor's office (implementing agency, Kirloskar, refused to meet pecuniary interest of Aurangabad's political class). Furthermore, political support was not provided in non-technical

⁴³⁹ Initially, the city government tried to acquire support under JNNURM's sub-mission, the Urban Infrastructure and Governance (UIG), prioritizing cities, to install an additional bulk water pipeline but was unsuccessful. The city bureaucrats overlooked an important qualifying criteria of the UIG sub-mission- the city did not meet the population criteria of being a one million plus city.

⁴⁴⁰ The city government tried to avail support under JNNURM's sub-mission focusing on towns, that is the Urban Infrastructure Development Schemes for Small and Medium Towns (UIDSSMT).

ways. Powerful vested interest groups mediated policy execution in Aurangabad. For instance, local councillors manipulated the tendering process (e.g., politically affiliated contractors tried to acquire sizeable implementation contracts). Similarly, existing funds acquired under central government schemes were not utilised to implement proposed policy instruments, and instead served material interests of the political class. In fact, the urban local body demanded for more funds from the central government to implement instruments⁴⁴¹. Similarly, policy execution along with supply of water and tax collection was privatized- thereby defying existing norms (the Bombay Municipal Corporation Act, 1949⁴⁴²)- to meet pecuniary interests of powerful social forces. The bureaucracy lacked the insulation to monitor policy execution or pressurize the private agency to ensure effective service provision⁴⁴³.

There was no evolution of ideas within the city government as bureaucratic puzzling was weak and powering strategies were skewed- leading to clientelistic propensities. The urban local body lacked the capacity to overcome clientelism, and thus failed to upgrade its water distribution system. In fact, this experience ruined future prospects of acquiring funds under other domestic schemes and programmes, especially from the central government. Given the city government's inability to pursue the instrument (over a span of 10 years), the sub-national government will now try to upgrade the city's water distribution system.

b. Rainwater harvesting systems

Depleting groundwater is a common problem in most Indian cities, especially those located in semi-arid regions. Many sub-national governments encouraged cities to promote rainwater harvesting systems to improve groundwater levels and reduce pressure on municipal supply. Implementation of rainwater harvesting systems has been mandated as part of building bye laws in both Aurangabad and Rajkot. In Rajkot the instrument was designed and executed by the city government, whereas the sub-national government facilitated the policy uptake with no involvement of the Aurangabad city government. Despite sub-optimal implementation

⁴⁴¹ Since it took the city government three years to avail funds from the central government under JNNURM's UIDSSMT sub-mission, they claimed that implementation cost escalated over the span of three years and so required additional finances.

⁴⁴² As per the act, the urban local body is responsible for providing drinking water and collecting water tax from citizens, which cannot be privatised (PIL, 2015).

⁴⁴³ It is often seen in many cities across India that instruments are implemented by private agencies, whereby the city government are actively involved in the planning and evaluation process. In the case of Rajkot, the urban local body kept a close check on private actors through penalties, which is not the case in Aurangabad.

conditions (hard sub-surface layer making it difficult to recharge groundwater), Rajkot actively pursued the instrument which led to improved ground water levels over time. However, Aurangabad city government did not promote the instrument across the city.

Aurangabad

Rainwater harvesting systems were incorporated in the city's building bye laws in 2005 to improve groundwater levels. The nexus of vested interest groups (local councillors and builders) used this instrument as a rent-seeking opportunity. Despite the sub-national government's support, the city government failed to promote the instrument.

Mandatory implementation of rainwater harvesting systems in Aurangabad was facilitated by the sub-national government, with no involvement of the city government. The town planning department officials of the Maharashtra government collectively puzzled over the deplorable conditions of groundwater across the state of Maharashtra, and proposed the mandatory implementation of rainwater harvesting systems. Since the policy instrument was proposed under the common development control regulations it was applicable to the city of Aurangabad, among other cities. Aurangabad's bureaucrats, either from the town planning or water works department, were not involved in policy deliberations or proposal formulation. Despite serious water insecurities, the urban local body made no provisions to promote the instrument. For instance, the bureaucracy did not propose to pilot the policy instrument on public buildings, which would have served as an illustrative example for the city. Similarly, no citizen awareness programmes were proposed by the city bureaucrats.

Since the proposal was introduced by the sub-national government, local political executives had to adopt it- a resolution was passed by the mayor's office. Political support was not provided in non-technical ways. For instance, the citizen association members (e.g., builders) were not given an opportunity by the political executives to express their concerns regarding the instrument. Similarly, local councillors were not mobilized to popularize this instrument among citizens in their respective wards.

In the absence of bureaucratic puzzling and political powering within the city government, there was no evolution of ideas and rationality favoring the uptake of this instrument. Consequently, rainwater harvesting systems have not been effectively implemented due to the

inability of Aurangabad's city government. Several citizens and civil society members confirmed that, "*rainwater harvesting systems are installed temporarily only to acquire completion certificates*". The city failed to improve its groundwater levels, which compounds pressure on municipal water supply.

Rajkot

Rainwater harvesting systems were incorporated in Rajkot's building bye laws in 2004. The instrument was introduced to improve groundwater levels. The introduction of the policy instrument by the city government was met with initial resistance from the builder lobby. However, the ULB was able to transcend this opposition and effectively execute the instruments.

Unlike Aurangabad, city bureaucrats from the town planning department collectively deliberated over the policy problem (depleting groundwater tables) and proposed to pilot test the policy instrument⁴⁴⁴ to assess its feasibility. The city bureaucrats engaged with experts, Science Community Centre (SCC), to pilot test the instrument, with no engagement in the policy planning process. Provisions were made by the bureaucracy to popularize the instrument among citizens (ward level meetings and awareness campaigns). Results of the pilot study helped city bureaucrats formulate the policy proposal of incorporating rainwater harvesting systems in the city's development control regulations. The bureaucracy was embedded within the society yet autonomous from social forces, and worked cohesively to pursue the instrument, which would serve all citizens.

Political beliefs held by Rajkot's political executives favoured programmatic policy instruments. The policy proposal was adopted by the mayor's office by passing a resolution, which ensured adoption of the instrument. This enabled the city bureaucrats to appeal to the sub-national government to support their policy proposal. Additionally, political support was provided in non-technical ways. For instance, local councillors were encouraged to sensitize citizens about the measure in their respective wards. Similarly, local media was used to popularize the instrument. Rajkot's political executives regularly followed up with the Gujarat town planning department to modify the city's building bye laws. The urban local body also

⁴⁴⁴ Since Rajkot city has a hard sub-surface layer, it is difficult to recharge uniformly groundwater through rainwater harvesting systems across the city.

invited experts to discuss the development control regulation amendments, which helped address concerns and convince relevant local stakeholders (e.g., citizen association groups such as builders lobby).

The combination of bureaucratic puzzling and political powering changed thinking within the city government. Consequently, a rationality emerged in favour of mandating the (programmatic) policy instrument. Citizens of Rajkot claimed that, groundwater levels have improved as water is available in bores for longer durations.

c. Controlling non-revenue water loss: the regularization scheme

Another major factor contributing to poor municipal water supply is a high non-revenue water (NRW) loss. A major cause for this loss is weak and old water distribution pipelines and water thefts. Rajkot successfully implemented several policy instruments to control the NRW loss (see table 5 above). Whereas, only one policy instrument was introduced by Aurangabad to control the NRW loss, which was poorly executed. Both cities implemented the regularization scheme, to reduce the NRW loss arising from water thefts (e.g., illegal water connections). Rajkot was able to regularize almost double the number of illegal connections (~16000 in a span of one year) as compared to Aurangabad (~8000 in 20 years).

Rajkot

Rajkot's city government introduced a regularization scheme in 2014 to control the NRW loss. Powerful social forces (local councillors and private water tanker lobby) tried to truncate the scheme, but were unsuccessful. The city government was able to overcome clientelistic practices and effectively implement the instrument.

City bureaucrats from the water works department collectively puzzled over the problem of high NRW loss, an outcome of water thefts and complicated administrative procedure of acquiring municipal water connection. A policy proposal was formulated to introduce a regularization scheme (including strict enforcement mechanisms) along with simplifying the process of acquiring water connections. The bureaucrats built on former policies and engaged with experts to design a socially relevant instrument. For instance, the water check team (set

up in 2012), comprising of bureaucrats working across different departments⁴⁴⁵, conducted a household level survey to identify households with municipal water connections. Furthermore, city bureaucrats engaged with experts to understand the ground realities better. For instance, the water works committee chairman was invited by the city bureaucrats to customize the regularization scheme to cater to the city's needs. Similarly, field agents such as valve operators⁴⁴⁶ were mobilized to help the bureaucracy identify illegal connections across the city. A cohesive and embedded autonomous bureaucracy was able to propose this instrument which was programmatic in nature.

Political beliefs favoured the programmatic policy instrument. The policy proposal of the regularization scheme was adopted (resolution passed) by the mayor's office. Additionally, political support was provided in non-technical ways. For instance, provisions were made by the mayor's office to sensitize citizens about the instrument through local media. The political executives convinced the local councillors to support the instrument by encouraging citizens from their wards to regularize illegal connections. The Rajkot police was also mobilized to assist the city bureaucrats (keeping a check on violence), especially during field visits and policy execution. Finally, the Mayor's office ensured that the city bureaucrats could effectively pursue the instrument (e.g., identify and disconnect illegal connections, confiscate water motors used to illegally pump water, and fine citizens found with illegal connections), without any interference or pressure.

Bureaucratic puzzling and political powering collectively improved thinking within Rajkot's urban local body. A synergised bureaucratic-political rationality emerged in support of the policy instrument. The city government had the capacity to overcome clientelism and effectively implement the regularization scheme.

Aurangabad

Aurangabad has been implementing the regularization scheme for almost 20 years to control the NRW loss. Like in the case of Rajkot, the nexus of vested interest group involving local

⁴⁴⁵ In order to check clientelistic practices the bureaucrats would inspect wards they were not in charge of for illegal connections, especially during the summer months. This process created a sense of accountability among bureaucrats from the water works department to ensure that the wards they were responsible for were performing well, that is with no or few illegal connections.

⁴⁴⁶ Field agents have in-depth knowledge of the pipeline network and its flaws such as leakages or points of low pressure. Their assistance is therefore, instrumental for identifying illegal water connections.

councillors and private water tanker lobby interfered with policy execution. The city government was unable to overcome clientelistic practices, and so the number of illegal connections regularized was relatively low (as compared to Rajkot).

Aurangabad's bureaucracy was fragmented and embedded particularistic. Additionally, there was no learning from previous policy experiences, nor were experts invited to improvise existing norms. For instance, field agents (valve operators) were not consulted to identify illegal connections. Similarly, despite poor performance of previous regularization schemes the city bureaucrats did not make any modifications. Consequently, bureaucratic puzzling strategies were inadequate. Policy proposal formulation was monopolized by senior bureaucrats (limited execution experience), without any deliberations with other city bureaucrats⁴⁴⁷ of the water works department. Identification of illegal water connections was outsourced to private consultants, with no involvement of city bureaucrats. Powerful social forces intervened with the policy planning process. As a result, junior bureaucrats lacked the motivation to effectively execute the instrument.

Political beliefs were more inclined towards clientelistic policies. Aurangabad's political executives backed the policy proposals by approving several resolutions. However, powering strategies were missing in non-technical ways. Few efforts were made by political executives to inform citizens about the instrument through local media. Local councillors were not adequately mobilized by the mayor's office to support the instrument by encouraging citizens to voluntarily regularise illegal connections. Additionally, city bureaucrats lacked insulation from political pressure during policy execution (e.g., inability to penalize wrong doers). In fact, political interference was tolerated by the city government (local councillors excused their wards from regularization drives). Consequently, execution was not autonomous from vested interests, and the city bureaucrats were unable to execute the scheme effectively.

In the absence of bureaucratic puzzling and strong political support, there was no evolution of ideas within city government. The ULB lacked the capacity to overcome clientelism and pursue the regularization scheme. The city continues to grapple with high NRW loss.

⁴⁴⁷ The urban local body did not tap into the experiences of junior level bureaucrats who were aware of ground realities as they were involved in executing the scheme.

5.4.2. Water mitigation instruments

This section discusses comparable water mitigation instruments introduced by Aurangabad and Rajkot. Apart from adaptation instruments, cities also pursue water mitigation instruments to achieve resilience. Water mitigation instruments aim to reduce emission contribution and improve energy efficiency of the water sector, and simultaneously improve water supply.

The water sector was a highly energy intensive sector for both Rajkot and Aurangabad. However, only Rajkot pursued a range of water mitigation instruments (see table 5), and acknowledged the mitigation potential of existing and planned instruments. Aurangabad's water mitigation instruments are negligible as compared to Rajkot. Additionally, the mitigation potential of policy instruments remained unrecognized in the case of Aurangabad.

The comparable water mitigation instruments include energy conservation instruments such as solar water heating systems and upgrading water pumping machinery. The two cities vary in formulating and executing the instruments, leading to different outcomes.

I. Energy conservation

High energy consumption is a challenge common to rapidly urbanizing cities with increasing population and demands. The water sector has been a highly energy intensive sector for both Rajkot and Aurangabad. Rajkot's city government effectively introduced energy conservation instruments such as solar water heating systems and installing energy efficient water pumping machinery. Whereas, the city government in Aurangabad was unable to introduce and execute water mitigation instruments that would have improved energy security.

a. Solar water heating systems

Most cities in India have high energy consumption levels. Solar water heating systems have been mandated as part of building bye laws in both Rajkot and Aurangabad. Cities are encouraged by respective sub-national governments to pursue this instrument to reduce dependence on municipal energy. Given the climatic conditions, using solar energy was an optimal solution for both Aurangabad and Rajkot. However, Aurangabad has not made any serious efforts to promote this instrument. On the other hand, Rajkot actively pursued solar water heating systems across the city (16000 households between 2011-12). The two cities

differ in their approach of amending their building bye laws. Rajkot's city government was actively involved in designing and executing the instrument, whereas in Aurangabad there was no involvement of the city government- instrument facilitated by the sub-national government.

Rajkot

In 2004, Rajkot mandated the implementation of solar water heating systems as part of the city's building bye laws. The instrument, introduced to reduce energy consumption, was opposed by the construction lobby. However, the urban local body was able to effectively introduce the instrument by neutralizing opposition.

City bureaucrats, from the town planning department, collectively puzzled over increasing energy consumption levels, and accordingly assessed the renewable energy potential for the city⁴⁴⁸. The bureaucracy improved its technical capacity by engaging with experts working on renewable energy⁴⁴⁹. Following which, a policy furthering solar water heating systems was proposed by the bureaucrats. In order, to ensure uptake of the instrument the bureaucrats proposed to incorporate it in the city's building bye laws. The bureaucracy also proposed to organize an awareness exhibition to inform citizens about the advantages of renewable energy. Furthermore, a property tax rebate was proposed to incentivize the uptake of this instrument. The embedded autonomous bureaucracy worked as a cohesive unit to pursue the instrument, which would benefit all citizens.

Rajkot's political executives were in favor of the programmatic policy instrument. A resolution was passed by the mayor's office supporting the adoption of solar water heating systems. Additionally, political support was provided in non-technical ways. For instance, local councillors were mobilized by the political executives to popularize the instrument in their respective wards. Similarly, citizen association members (e.g., builders and architects) were invited to discuss their concerns and also review the modifications of the building bye laws. Political support enabled city bureaucrats to appeal to the sub-national government to modify the city's building bye laws. Occasionally, the Mayor or standing committee chairman would follow up amendments in the city's development control regulations with the sub-national

⁴⁴⁸ Solar energy was ideal for the city due to geographical factors (e.g., high number of sunny days and few rainy days), and building structures (e.g. adequate roof surface for installation).

⁴⁴⁹ City bureaucrats engaged with experts involved in a knowledge exchange programme on environmental issues between Europe and Asia.

government. Following modifications in the building bye laws, the city government organized an awareness workshop to sensitize citizens about the modifications and long-term benefits associated with implementing solar water heating systems.

The combination of bureaucratic puzzling and political powering pushed the city government to pursue solar water heating systems. The urban local body had the capacity to neutralize opposition and effectively further the instrument.

Aurangabad

Solar water heating systems was mandated as part of Aurangabad's building bye laws in 2016 to reduce energy consumption. This instrument was used as a rent-seeking opportunity by social forces, that is local councillors and builders. Although the sub-national government promoted the instrument, the city government did not further it.

Unlike Rajkot, the city government was not involved in puzzling over the policy instrument. The sub-national government (Urban Development Department, Maharashtra government) proposed the modification of the common development control regulations, applicable to Aurangabad among other cities, to promote the instrument. The city government made no effort to promote the instrument. For instance, the urban local body did not assess the renewable energy potential of the city to test the feasibility of solar water heating systems. Similarly, no awareness activities were proposed by the bureaucracy to sensitize its citizenry. In fact, the bureaucracy was embedded particularistic as powerful social forces intervened in policy execution processes to pursue material interests. Additionally, there was no learning from previous policies (e.g., solar city programme).

With respect to powering strategies, the political executives passed a resolution adopting the instruments as it was proposed by the sub-national government. However, political support was missing in non-technical aspects. For instance, local councillors were not encouraged by the mayor's office to popularize the instrument in their respective wards. In fact, politically affiliated builders used political pressure to acquire building contracts and temporarily installed the instrument to acquire completion certificates. Additionally, citizen association groups were not invited by the urban local body to discuss modifications in building bye laws or address their concerns about the instrument.

Ideas within the city government did not evolve as bureaucratic puzzling was missing and political powering was skewed. Consequently, Aurangabad's city government lacked the capacity to overcome rent-seeking activities and further solar water heating systems.

b. Upgrading water pumping machinery

The water sector is a highly energy intensive sector. Old water pumps are like old cars as they can be energy intensive with high emission contribution. Cities thus need to regularly assess the energy efficiency of water pumping machinery and upgrade it to ensure effective service delivery. Rajkot has been able to upgrade the water pumping units, whereas no such effort is seen in Aurangabad.

Rajkot

The urban local body made serious efforts to assess and improve efficiency of water pumping machinery. The instrument was seen as an opportunity by local councillors to earn rents. The city government was able to transcend rent-seeking activities and upgrade the city's water pumping machinery.

The city bureaucrats of the water works and electricity department had been conducting regular energy audits to assess the efficiency levels of the prevalent water pumping machinery. Collective deliberations among the bureaucrats lead to the notion of upgrading existing machinery to improve service delivery. Keeping in mind the resource requirement, the bureaucracy proposed to channelize funds under a central government sponsored scheme (the Atal Mission for Rejuvenation and Urban Transformation). Building on former experiences⁴⁵⁰, detailed project proposals were formulated to acquire support from the sub-national and central government. The bureaucrats in collaboration with a technical consultant, Energy Efficiency Services Limited (EESL) proposed by the central government, conducted energy audits and assessed the technical feasibility of the instrument. Furthermore, depending on the availability of funds the urban local body proposed to upgrade its pumping machinery by prioritizing the most inefficient pumping units, instead of replacing all machinery in one go. The cohesive and embedded autonomous bureaucracy actively pursued this instrument, which would benefit all.

⁴⁵⁰ The urban local body had been successful in acquiring funding from previous (JNNURM) and on-going (AMRUT) urban development programmes and policies.

The mayor's office actively supported the policy idea of upgrading the city's water pumping machinery. Political support was also provided in non-technical ways. For example, local councillors were mobilized to support the instrument by ensuring a smooth tendering process. This insulated city bureaucrats from vested interests and also control rent-seeking activities, especially during policy execution (lowest technical bidder was contracted the installation work). Additionally, powering strategies enabled bureaucrats to appeal to the sub-national and national government to support their policy proposal. Furthermore, the Mayor's office would occasionally follow up project approvals with the sub-national government.

Ideas within the urban local body evolved due to the combination of bureaucratic puzzling and political powering. The city government was able to build its capacity to control rent-seeking activities and upgrade its water pumping machinery, that would serve all citizens.

Aurangabad

Water is one of the most energy and resource intensive sectors in Aurangabad. Although the city government attempted to upgrade its water pumping machinery, it failed to do so. This instrument was seen as an opportunity by powerful social forces to engage in rent-seeking activities, which the city government was unable to control.

The city bureaucrats proposed to replace all water pumping machinery under an all-inclusive policy instrument (the mega water supply scheme). The process of formulating the policy was exclusionary as it only involved select senior bureaucrats. Additionally, the bureaucrats engaged with technical consultants who promoted the interests of powerful social actors. The bureaucrats did not conduct regular energy audits to assess efficiency of the water pumping machinery. Furthermore, city bureaucrats were unable to identify and channelize resources from on-going central government sponsored schemes (due to previous experiences⁴⁵¹). The bureaucracy was embedded particularistic as it promoted the (material) interests of powerful social actors.

⁴⁵¹ The urban local body was unable to utilize funds acquired under a former central government scheme (JNNURM).

With respect to powering strategies, the political class in Aurangabad was mediated by vested interest groups and displayed clientelistic propensities. The policy idea of the all-inclusive instrument was approved by the mayor's office under the influence of local politicians. Furthermore, political support was not provided in non-technical ways. For instance, political interference was tolerated during the policy execution (tender process manipulated to promote politically affiliated contractors). Additionally, bureaucrats lacked the political support to appeal to the central government. The political class engaged in rent-seeking activities, at the cost of Aurangabad's citizens. The bureaucracy lacked insulation to monitor policy execution. Consequently, the mega water supply scheme was terminated due to serious malpractices (see details in the empirical chapter on Aurangabad); and so, the city's water pumping machinery was not upgraded.

Ineffective bureaucratic puzzling and skewed powering strategies did not foster ideational evolution within the city government. Consequently, the urban local body lacked the capacity to overcome clientelism and control rent-seeking activities to execute the instrument.

The study shows that, within a multi-level climate governance framework, the state at the local level is the main actor in improving water security and furthering climate action. Other actors such as the sub-national and national government provided financial assistance, but policy planning and execution was driven by the city governments (except in some cases for Aurangabad). Similarly, non-state actors, particularly consultants or domain experts, were involved on an ad hoc basis and worked under the direction of respective city governments'; thus, non-state actors could not play an autonomous role.

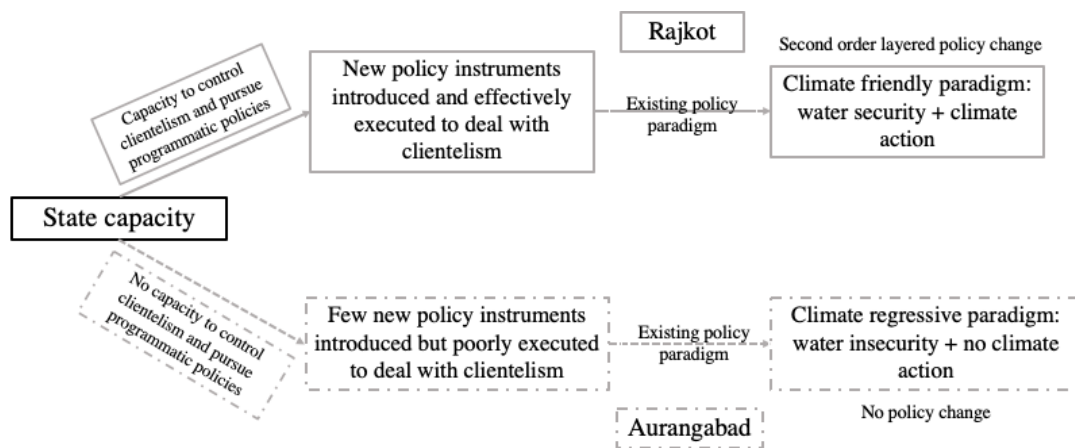
The study compares two city governments which face similar water and governance challenges and operate under the same federal governance structure. Clientelistic and rent-seeking activities hinder policy execution leading to intra-city disparity in service provision. Although the cities are fairly comparable, they differ in their policy paradigms. Rajkot is pursuing a climate friendly paradigm, whereas Aurangabad's paradigm is a climate regressive one. This variation in paradigm is explained by the capacity of the city government to overcome clientelism to implement new (adaptation and mitigation) policy instruments (see fig. 4).

Rajkot's city government was able to effectively design and execute water adaptation and mitigation policy instruments to control clientelism and improve service delivery. As a result,

the city's water security (see table 3 above) improved over time and climate measures could be pursued. In the case of Aurangabad, the few policy instruments introduced were facilitated by the sub-national government, but the city government did not further them. Moreover, the city government was unable to design and implement new policy instruments in the presence of powerful social forces. The city's water insecurities escalated (see table 3) with time and no climate action was furthered.

Since Rajkot was able to effectively implement new policy instruments it experienced a within paradigm change, that is a second order layered policy change. However, no such change is witnessed in the case of Aurangabad, as new policy instruments were not introduced or effectively executed.

Figure 4: Variation in policy paradigms



The study argues that, improved state capacity to pursue programmatic policies in the presence of social forces is explained by ideational evolution within the city government. Ideational churning is attributed to the combined influence of bureaucratic puzzling and political powering, which creates a synergised rationality in favour of programmatic policies. Thus, ideas within the state at the local level led to improved water security and climate action.

5.5. Conclusion

This section summarises the thesis by briefly discussing the introduction, theoretical and methodology chapter, followed by the empirical chapters (Rajkot and Aurangabad's water adaptation and mitigation measures). The thesis concludes by reiterating the role of the state at

the local level, working within a multi-level governance setting, in improving water security and pursuing climate action.

The introduction chapter sets the context for the dissertation. The chapter discusses the theoretical framework, alternative explanations and methodology for case selection and analysis.

Cities across the globe need to cope with growing population and industrialization, especially in the face of changing climatic patterns. Water scarcity is a manifestation of urbanization, which will only exacerbate due to climate change. Cities can become water resilient by pursuing both climate adaptation⁴⁵² and mitigation⁴⁵³ measures. However, urban climate action is impeded by multiple interconnected governance challenges such as clientelism and weak (technical, financial and institutional) capacities.

By employing a state centric approach, the study argues that the city government is the key actor in improving water security and pursuing climate action. More specifically, the capacity of the state at the local level to transcend governance barriers and introduce water adaptation and mitigation policy instruments. Improved state capacity is attributed to ideational factors (values and beliefs held by policymakers) as opposed to the traditional materialistic explanations. Thinking within the state gradually evolves due to the process of bureaucratic puzzling and political powering. Bureaucratic puzzling involved collective deliberations, among city bureaucrats (water works and town planning department) headed by the Commissioner, over a policy problem and potential solutions. As a result, policy ideas were proposed by bureaucrats in the form of clearly defined policy proposals. Puzzling strategies were influenced by the administrative tradition (cohesive embedded autonomous bureaucracy vs fragmented embedded particularistic bureaucracy) and social learning (learning from past policies and new information by engaging with domain experts vs no learning). These proposals lead to policy adoption and execution when they were backed by the local political executives, the mayor and standing committee members. Political support was also provided in non-technical ways such as insulating city bureaucrats from vested interests and mobilizing

⁴⁵² As mentioned in the introduction chapter, climate adaptation measures focus on coping/adapting with the impacts of climate change (see Fleig, Schmidt and Tosun, 2017), and building resilience for extreme events (IPCC, 2014).

⁴⁵³ Climate mitigation measures aim to combat climate change by reducing the Green House Gas (GHG) emissions (see IPCC, 2007; Matthews et al., 2014; Berry et al., 2015; Hatfield-Dodds et al., 2017).

relevant actors (e.g., citizens, local councillors, citizen association members, sub-national government) to support instruments, especially during policy execution. Political powering was influenced by the political beliefs (clientelism vs programmatic policies) held by the political executives. Programmatic policy proposals are adopted only when there is synergy between bureaucratic and political rationality. Consequently, thinking within city government changes leading to a bureaucratic-political rationality in favour of programmatic policies.

The introduction chapter also discusses a range of explanations such as a) state (e.g. bureaucratic performance and norms, embedded autonomous bureaucracy, political will/commitment), b) society (e.g. social movement and capital, dense party networks, party ideology and competition, centre-state relations), and c) state-society (e.g. transnational advocacy networks, epistemic communities) centric theories to understand effective implementation of water adaptation and mitigation instruments. Additionally, governance frameworks such as polycentricism and multiple streams framework have been applied to the cases studied here. However, all these theories serve as alternative explanations for the study. Furthermore, this chapter highlights the methodology used for case selection (structured focused comparisons), data collection (qualitative research method- elite interviews), and analysis (comparative process tracing), along with the timeline of the study (1990 till 2020).

The second chapter discusses Rajkot's water adaptation instruments that improved water security. Adaptation measures focus on coping with prevalent development deficits and impacts of climate change. Rajkot, the economic and political hub of the Saurashtra region of Gujarat, has experienced several water crises. Since the 1990s, a range of policy instruments were introduced to control clientelism and improve the city's water supply. Based on the dominant ideology driving policy instruments Rajkot's adaptation trajectory has been divided into three phases- a) water augmentation (1990-2003), b) water conservation (2004-2016), c) monitoring water consumption (2017-2020). In the first phase, instruments were introduced to augment the city's water supply (e.g., built new water reservoirs and improved capacity of existing reservoirs, redirected irrigation water for drinking water purpose), as the city lacked adequate water sources. Inadequate municipal water supply and high non-revenue water loss resulted in the introduction of water conservation instruments (e.g., strengthening water distribution network, rainwater harvesting systems, controlling non-revenue water loss). The last phase included instruments implemented in the first and second phase, along with a new instrument to monitor consumption levels (metered 24*7 water supply)- thereby managing

water demand. Additionally, a consolidated policy package, the climate action plan, was formulated which comprised of the above-mentioned policy instrument along with their adaptation potential. The plan was voluntarily institutionalized by the city government. The cumulative effect of the policy instruments lead to improved water security. The underlying ideology of the three phases shows the evolution of ideas within the city government. Furthermore, all policy instruments were incorporated under the existing policy paradigm, without altering it.

The third chapter focuses on water mitigation instruments implemented by Rajkot. Mitigation measures aim at combating the impacts of climate change by reducing emissions. The city undertook several mitigation policies instruments to improve energy efficiency and reduce emissions of the water sector. Rajkot's mitigation instruments have been categorized into two phases based on the underlying ideology- a) energy conservation phase (1990-2016), and b) energy efficiency and emission reduction phase (2017-2020). In the first phase, the instruments (e.g., energy audits, solar water heating systems) focused on conserving energy of the water sector. In the second phase, instruments (e.g., upgrading water pumping machinery, solar powered water treatment plant) were introduced to reduce emission contribution and improve energy efficiency of the water sector. Additionally, a climate action plan was formulated by consolidating the above mentioned and planned mitigation instruments. As mentioned above, this plan was institutionalized by the city government in 2019. The mitigation policy instruments introduced, under the prevalent paradigm, cumulatively improved energy and water security. As is seen in the case of Rajkot adaptation instruments, there has been an evolution of ideas within the city government with respect to mitigation instruments (reflected in the underlying ideology across the two phases).

Effective implementation of adaptation and mitigation instruments in Rajkot is attributed to the capacity of the State at the local level to overcome governance challenges like clientelism. This improved state capacity was due to the gradual and path dependent evolution of ideas within the city government. As mentioned previously, ideational churning within the urban local body was facilitated by the combination of bureaucratic puzzling and political powering. Rajkot's policies were an outcome of learning from past experiences and access to new information through engagements with domain experts. This was coupled with collective deliberations among city bureaucrats and the Commissioners to design policy proposals. Bureaucratic puzzling strategies lead to programmatic policy ideas as the bureaucracy was cohesive and

embedded autonomous even in the presence of powerful social actors. Policy proposals were adopted and executed effectively due to political powering strategies. The political executives, typically the mayor and standing committee members, not only support technical ideas, but also backed policy ideas in non-technical ways (e.g., mobilizing citizens, local councillors, citizen association members and the sub-national government; insulating bureaucrats from vested interests). Collectively puzzling and powering strategies changed thinking within the city government that engendered a bureaucratic political rationality in favour of programmatic adaptation and mitigation instruments over clientelistic ones. Thus, ideas within the city government improved its capacity to control clientelism and improve water security. Improved state capacity nudged the city towards a climate friendly paradigm.

Rajkot's adaptation and mitigation trajectories suggest that policy instruments were incorporated under the existing policy paradigm, to improve water security. New policy instruments or techniques were gradually introduced in a path dependent manner to achieve the overarching policy goal- water supply to all. This qualifies as a second order policy change (see Hall, 1993). This policy change followed a layered⁴⁵⁴ path, as new instruments were pursued under the prevailing paradigm without replacing it. With respect to water adaptation and mitigation instruments, the city government pursued disaggregated policies. Only in recent years (2018), did the city government formulate a consolidate policy package, the climate action plan, comprising of prevalent and planned adaptation and mitigation instruments. Additionally, the climate action plan was incorporated into the municipal agenda without changing existing norms. This layered second order policy change was driven by ideational churning within the city government (endogenous and structural factors), as opposed to materialistic factors. Thus, there was a within paradigm change in Rajkot.

The fourth chapter discusses Aurangabad's water adaptation and mitigation instruments from the 1990s till 2020. The city has been the economic hub of the Marathwada region in Maharashtra. Like Rajkot, Aurangabad experienced a range of water related issues leading to severe water insecurities. However, the city government was unable to implement adaptation and mitigation instruments to control clientelism and improve water security. Aurangabad's water adaptation instruments focused on augmenting and conserving water supply. Unlike

⁴⁵⁴ The first layer included disaggregated policy instruments, which transitioned to a more aggregated policy, the climate action plan- second layer.

Rajkot, fewer water adaptation instruments were introduced in Aurangabad (e.g., introducing a new water supply scheme, and mandating rainwater harvesting systems), but not adequately promoted. These instruments were facilitated by the sub-national government's parastatal agency or the sub-national government itself, with no involvement of the city government. Furthermore, the city government failed to introduce new policy instruments (strengthening the water distribution network, regularizing illegal connections). Consequently, the city's water insecurities escalated over the years.

With respect to water mitigation instruments, Aurangabad has taken negligible efforts to reduce its energy consumptions and GHG emissions, especially when compared with Rajkot. Only one water mitigation instrument (e.g., solar water heating systems) was introduced by the state/sub-national government. However, the instrument was not actively executed by the city government. The urban local body has not been concerned with energy efficiency and emission reduction. Furthermore, climate concerns have not been acknowledged (e.g., adaptation and mitigation potential), and incorporated in local decision making.

The state in Aurangabad was unable to overcome clientelistic practices and further programmatic policies. This lack of state capacity is attributed to the absence of ideational churning within the city government. The bureaucracy in Aurangabad was fragmented and embedded particularistic, as it was mediated by powerful vested interest groups. Additionally, there was no learning from policy failures, and engagements with experts was limited to a few consultants who furthered the agenda of powerful social actors. Consequently, bureaucratic puzzling strategies were inadequate and often displayed clientelistic propensities. Deliberations over policy problems and potential solutions was monopolized by a few senior level bureaucrats, and was not a collaborative process.

Furthermore, the political beliefs favoured clientelistic policies, which influenced political powering strategies. Technical ideas were often not adopted. Additionally, the political class (e.g., politicians, local councillors) was captured by vested interest groups who interfered with decision making processes, especially policy execution. Consequently, non-technical support (e.g., mobilizing local citizens, councillors, and sub-national government, and insulating city bureaucrats) was poor or missing.

There was no evolution of ideas within the city government as bureaucratic puzzling was inadequate, which was accompanied by skewed powering strategies. In fact, the bureaucratic-political rationality favoured clientelistic policies- whereby few powerful social actors benefitted at the cost of others. This nexus was driven by rent-seeking propensities, especially short-term pecuniary gains. Furthermore, unlike Rajkot, there was no change in policy as new policy instruments were not effectively executed and hence did not address water challenges. Thus, in the absence of ideational evolution Aurangabad's water insecurities increased over time with no climate action.

The fairly comparable cities are pursuing different policy paradigms. Rajkot's climate friendly paradigm is driven by improved water security and climate action. Whereas, Aurangabad's water insecurities escalated over time and the city has not pursued any climate action- a climate regressive paradigm. The variation in policy paradigms is explained by the capacity of the city government to overcome clientelism and implement adaptation and mitigation instruments. The embedded autonomous ULB in Rajkot was able to overcome its governance challenges and pursue new instruments to systematically address its water challenges. New policy instruments were introduced incrementally (depending on availability of funds) and in a path dependent manner. Additionally, climate concerns were actively pursued by the urban local body. Consequently, Rajkot was able to strengthen its water supply to meet the growing needs.

In contrast, Aurangabad's water insecurities persisted. The embedded particularistic city government was unable to design and execute programmatic policies in the presence of vested interest groups. The few instruments introduced by the sub-national government were poorly executed by the city government. Additionally, the city government was unable to overcome clientelistic and rent-seeking activities and introduce new policy instruments. Furthermore, climate concerns were not acknowledged and pursued by the city government.

A historical comparative analysis of the two water scarce cities helps to generate and validate hypothesis rather than testing and confirming a hypothesis. This study highlights the importance of the state at the local level working within a multi-level governance framework. Ideas within the city government improve the capacity to control clientelism and pursue programmatic adaptation and mitigation instruments. The state capacity and ideational framework has been underutilized in comparative politics, especially in studying micro-level phenomena. The above conjectures are based on two cities, and more work needs to be done

to understand the condition under which the state at the local level can play an important role in improving water security and simultaneously pursuing climate action.

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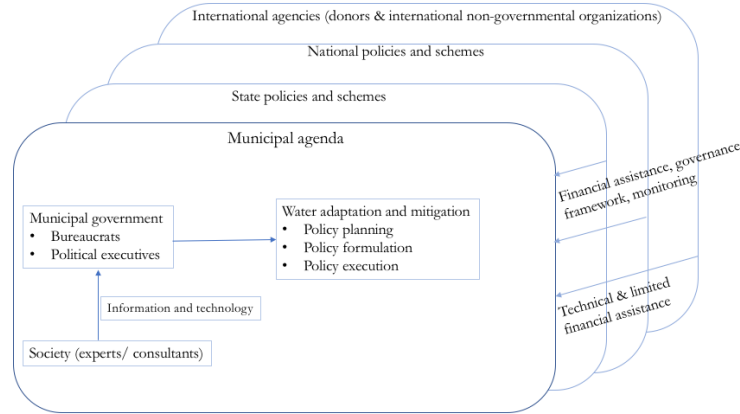
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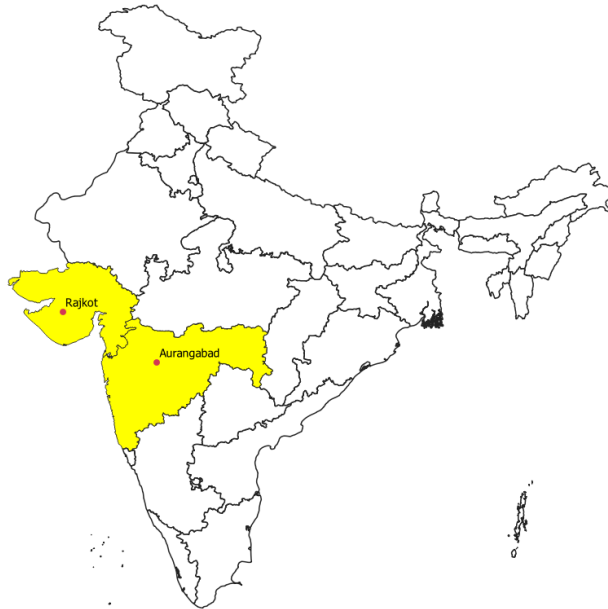
Annexures

Figure 5: Urban climate governance



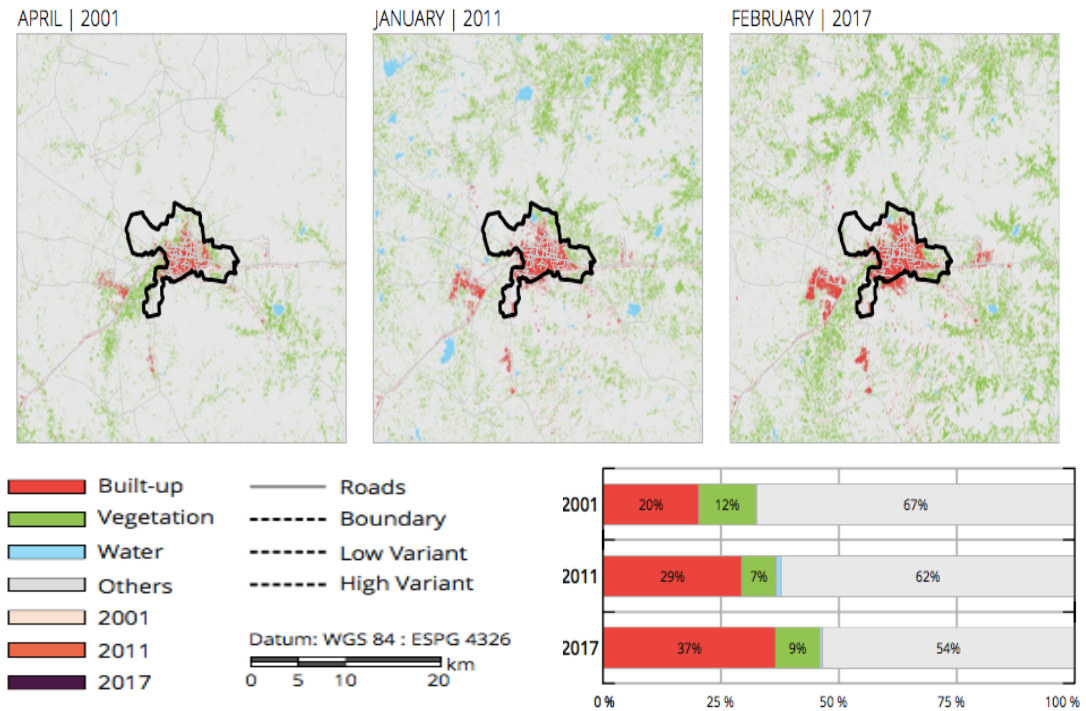
The figure illustrates the multi-level governance setting involving different state and non-state stakeholders. The study shows how the city government, especially in Rajkot, was instrumental in planning and executing water adaptation and mitigation policy instruments. In the case of Aurangabad the sub-national government was involved in planning and executing some policies, whereas the city government was unable to do so. The urban local body was aided by domain experts to access new information, and financially supported by the central and state/sub-national government. In the case of Rajkot, international donor agencies provided assistance (e.g. pilot instruments, conduct detailed study).

Figure 6: City locations: Aurangabad and Rajkot



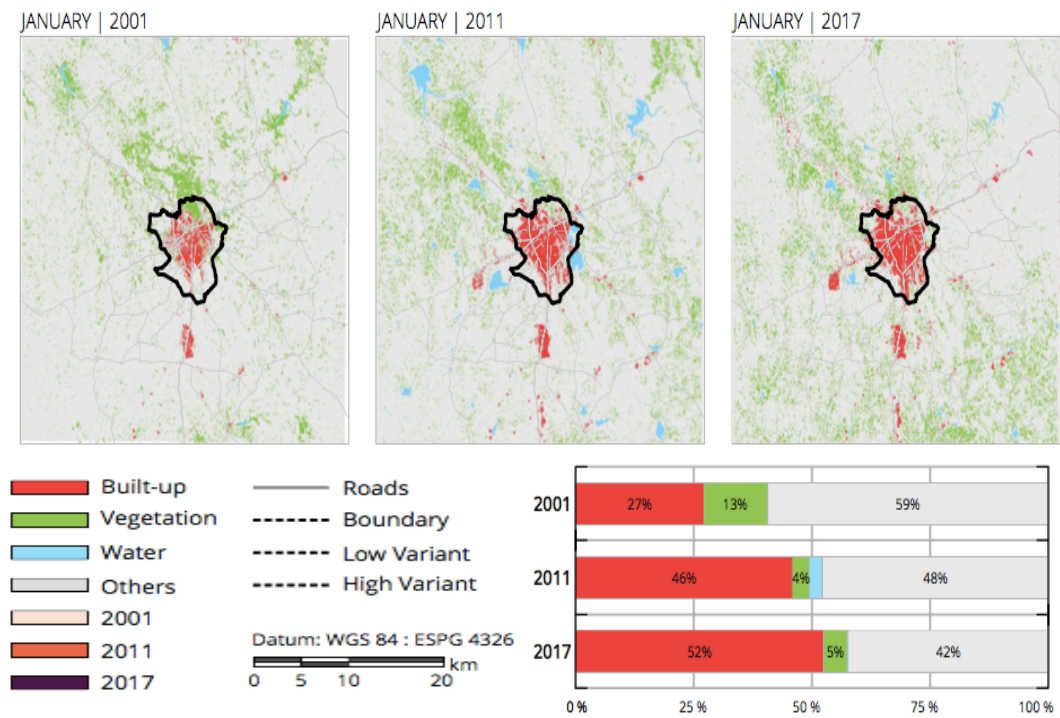
Rajkot is located in Gujarat and Aurangabad is located in Maharashtra

Figure 7: Change in Aurangabad's land-use land cover from 2001 to 2017



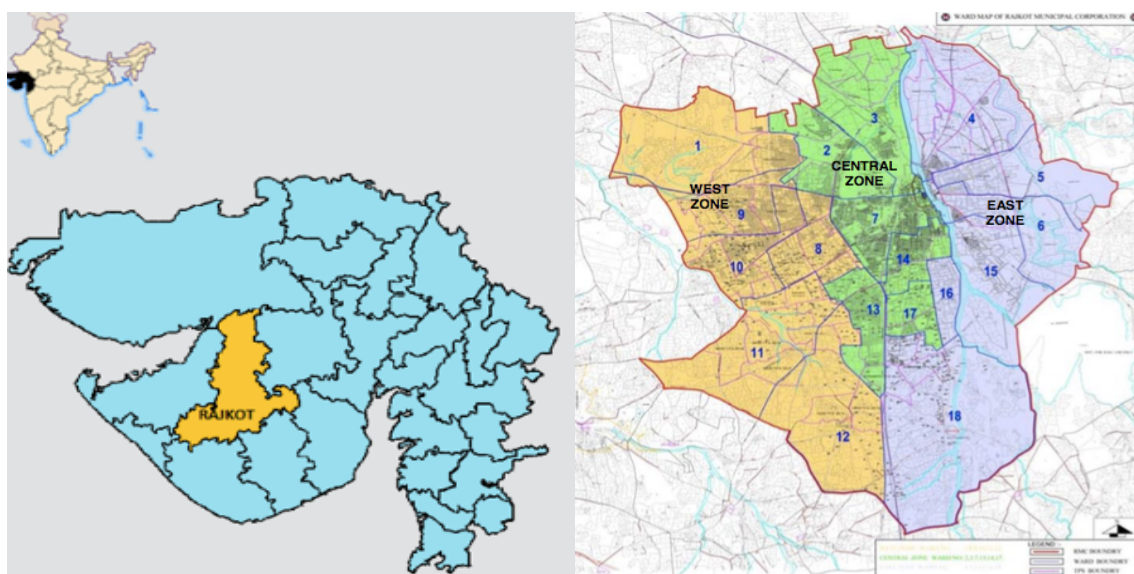
Legend: Percentage of Aurangabad's land-use change from 2001 to 2017 (Malladi et al., 2017)

Figure 8: Change in Rajkot's land-use land cover from 2001 to 2017



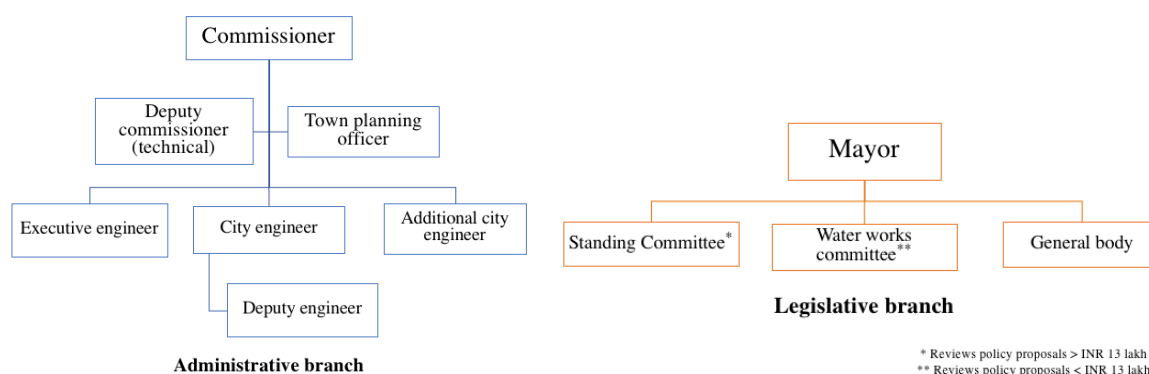
Legend: Percentage of Rajkot's land-use change from 2001 to 2017 (Malladi et al., 2017)

Figure 9: Rajkot city location & city sub-divisions



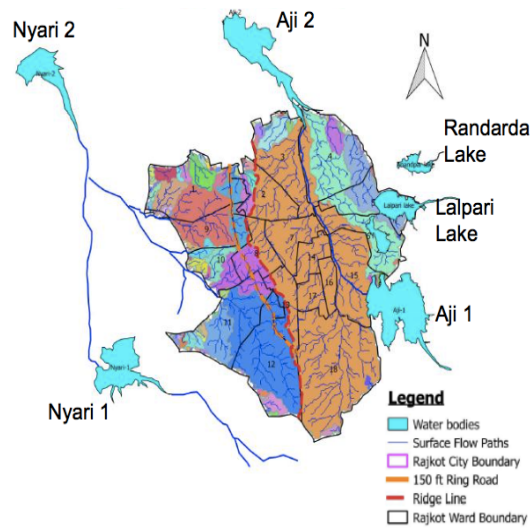
The first figure depicts the location of Gujarat state in India, and Rajkot city in Gujarat. The second figure shows the zoning in the city. The city is divided into three administrative zones (central, west, and east zone), with 18 wards. The city limits have been expanded twice (1998 and 2018⁴⁵⁵).

Figure 10: Organizational set up of the RMC



⁴⁵⁵ From 1973-1997 the city area was 69 sq. kms, and from 1998-2018 the city limits expanded to 104.86 sq. kms. Rajkot registered as a million plus city in 2001 when the population increased due to the expansion of city limits (three villages, Nana Mava, Raiya and Mavdi, were merged in June 1998) (RMC, 2012a).

Figure 11: Local water sources of Rajkot



Source: (RMC internal presentation)
The figure depicts the local water reservoirs of the city.

Figure 12: Existing industrial land use in Rajkot

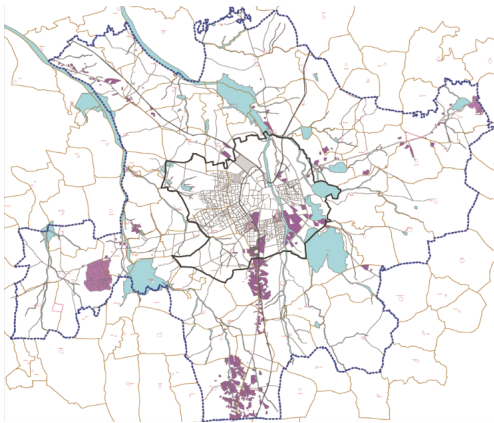
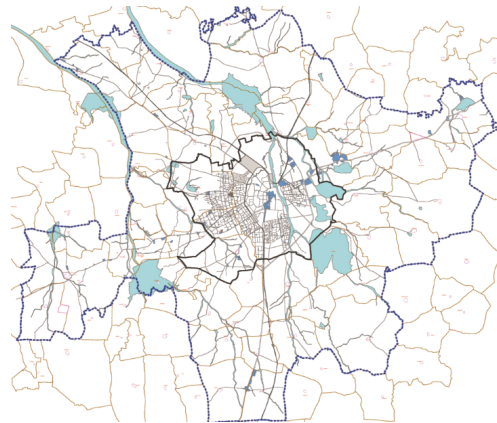
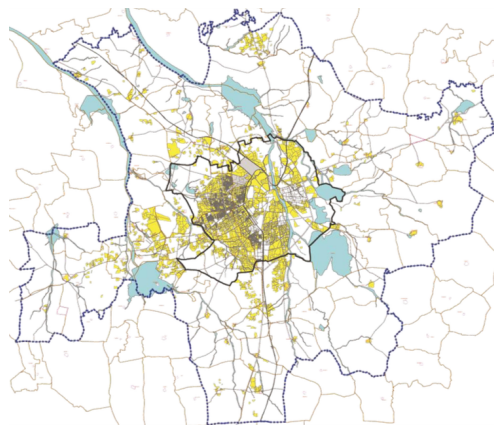


Figure 13: Existing commercial land use in Rajkot



Source: RUDA 2031

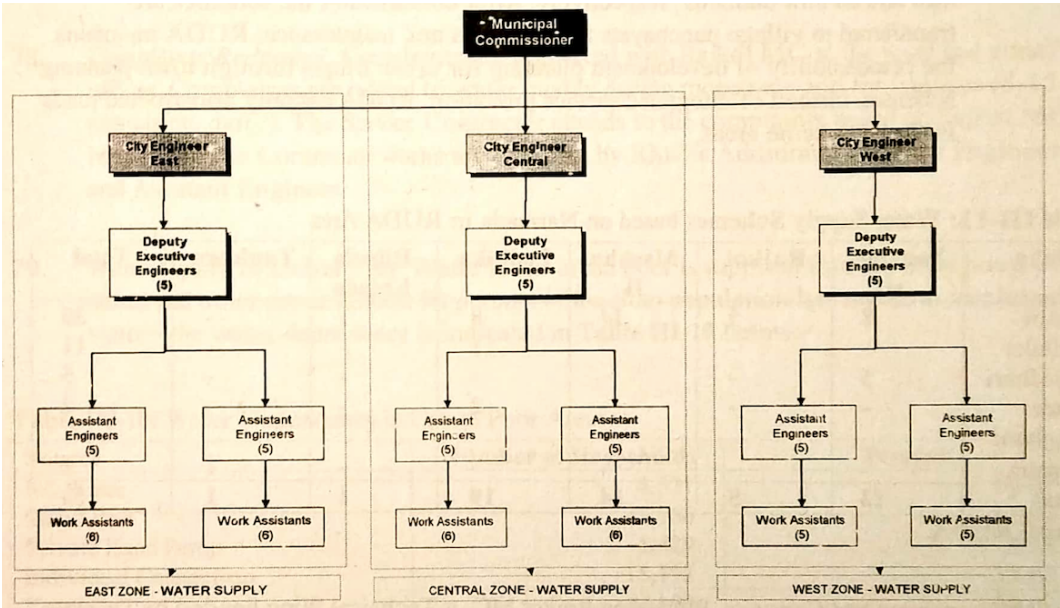
Figure 14: Existing residential land use in Rajkot



Source: RUDA 2031

The figures (8, 9, 10) highlight the current growth patterns in the city with respect to residential (marked in yellow), commercial (marked in blue) and industrial (marked in purple) land use pattern. The city's land use is predominantly used for residential purposes.

Figure 15: Organizational structure of the water works department, RMC



Source: RMC 2006

Figure 16: RMC water supply records, 1990

The image shows a 'DAILY LOG SHEET' for the 'RAJKOT MUNICIPAL CORPORATION WATER FILTRATION PLANT'. The sheet is dated 24/9/83 and is a handwritten record of water supply data. The table has 15 columns: Time, Raw water, Clear water, Sump Level, pH Raw water, pH Filtered water, Chlorine Residual, Residual Chlorine P.P.M., Alum Tank in Service, Turbine Speed, Total Alum Charged, Total Lime Charged, Total Quantity of water filtered in Gallons, Total Alum Consumed, Total Lime Consumed, and Levels in the Reservoirs (H, L, R, B, S, M). The data is recorded for 24 hours, with various handwritten notes and corrections. The bottom of the sheet is signed by the Deputy Engineer (Mech.) of the Rajkot Municipal Corporation.

Time	Raw water	Clear water	Sump Level	pH Raw water	pH Filtered water	Chlorine Residual	Residual Chlorine P.P.M.	Alum Tank in Service	Turbine Speed	Total Alum Charged	Total Lime Charged	Total Quantity of water filtered in Gallons	Total Alum Consumed	Total Lime Consumed	Levels in the Reservoirs (H, L, R, B, S, M)	Remarks
0															93 73 93 93	
1															96 96 96 96	
2															100 100 100 100	
3															100 100 100 100	
4															100 100 100 100	
5															100 100 100 100	
6															100 100 100 100	
7															100 100 100 100	
8															100 100 100 100	
9															100 100 100 100	
10															100 100 100 100	
11															100 100 100 100	
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21															100 100 100 100	
22															100 100 100 100	
23															100 100 100 100	
24															100 100 100 100	

The image shows the deplorable state of water supply records

Figure 17: Organizational set up of the AMC

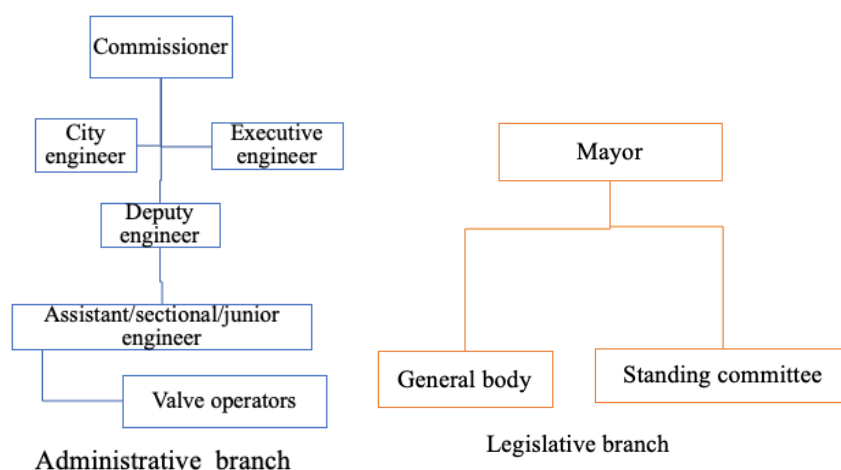


Table 6: Method of Difference

Positive case(s)	Negative case(s)	
a	a	Similarities
b	b	
c	c	
x	No x	Difference
y	Not y	

x- causal variable, y- outcome being analysed

Source: Skcopol and Somers, 1980

Table 7: Performance of Maharashtra and Gujarat on certain socio-economic & service delivery indicators

Indicators	Maharashtra	All India rank	Gujarat	All India rank
Share of urban population (per cent) (2011)	45,22	3	42,6	4
Population below poverty line (per cent) (2011-12)	9,1	10	10,1	13
Per capita Net State Domestic Product (NSDP) (constant price) 2015-6	121514	6	122502	5
NSDP value_ economic activity (base year 2011-12, constant price), 2015-16	12557,15	1	6788,84	4
Urban MPCE (2011-12)	3189	4	2581	10
Urban literacy rate (2011)	88,7	3	86,3	6
No. of hospital beds (government + Ayush) (2015-16)	174142	1	31086	8

Households (HH) with access to safe drinking water (per cent) (2011)	97,0	5	95,7	8
HH with treated pipe water (per cent) (2011)	85,7	3	68,8	10
HH with piped sewer (per cent) (2011)	60,4	2	37,8	6
HH with electricity (per cent) (2012)	99,1	14	98,9	17
HH with latrine (2011)	87,7	7	71,3	16

Sources: Census 2011, Reserve Bank of India (RBI), Ministry of Statistics and Programme Implementation (MoSPI)

Table 8: Similarities between the two cities

Indicators	Aurangabad	Rajkot
Population (in million)	1.2	1.3
Agro-climatic region	Semi-arid	Arid
Rainfall (in mm)	756	577
Major water source	Jayakwadi dam	Aji, Nyari, Bhadar, and Narmada dam
Major water users	Residential	Residential
Governing agency	Aurangabad Municipal Corporation, Maharashtra Jeevan Pradikaran	Rajkot Municipal Corporation

Source: CGWB district reports 2013 a,b

Table 9: List of stakeholders involved in Rajkot's measures

State actors	Non-state actors
Local - Rajkot Municipal Corporation (RMC) - Executive: water works department, town planning department, Deputy & Municipal Commissioner - Legislative: water works committee, standing committee, Mayor - Rajkot Urban Development Authority (RUDA)	Domestic - Non-governmental organizations (International Council for Local Environmental Initiatives (ICLEI)), - Academic institutions (Cept), - Citizen association groups (builders, architects, education) - Rajkot Chamber of Commerce - Media: radio, television, newspapers - Water tanker lobby - Private contractors
Sub-national - Climate Change Department, - Gujarat Urban Development Mission (GUDM), - Gujarat Water Supply Sewerage Board (GWSSB) - Irrigation department	International External agencies: ADB: Asian Development Bank, SDC: Swiss Agency for Development & Cooperation, and GIZ: German Development Agency
Central	

Ministry of Housing and Urban Development (MoHUA) former Ministry of Urban Development (MoUD)	
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Table 10: Rajkot's population and area in 1991, 2001 and 2011

Year	Population	Area (sq. kms)
1991	6,40,462	69
2001	9,67,476	104.85
2011	13,23,363	104.85

Source: Census 2011

Table 11: Sources of Rajkot's (raw) water supply

Source	Type of source	Year of commissioning	Distance from city (in kms)	Abstraction of raw water (million litre per day (MLD))_2006	Source capacity (MLD)_2010, 2012, 2015	Ownership
Aji I ⁴⁵⁶ + Narmada at Aji	Dam	1955-56	0	20.4	110	Irrigation department, GoG and RMC
Bhadar ⁴⁵⁷	Dam	1965	65	45	50	Irrigation department and RMC
Nyari I ⁴⁵⁸	Dam	1975-76	18	25.9	35	RMC
Lalpari and Randarda ⁴⁵⁹ (irrigation scheme)	Lakes	1955; 1983-84	0	6.81	6	RMC
Nyari II ⁴⁶⁰	Dam	1998-99	24	13.62	7.5	Irrigation department, GoG and

⁴⁵⁶ The first water supply scheme was developed in the 1950s, which continues to support the city (RMC, 2010a; RMC, 2012a). The Saurashtra government developed the Aji I water supply scheme in 1955, however this scheme was insufficient to sustain the city's growth and population.

⁴⁵⁷ From the 1990s onwards regular drawls were made from Bhadar dam. A new water supply scheme was constructed from Bhadar dam to provide Rajkot with drinking water (1988-89) (RMC, 2012). The old pipeline built during the 1973-74 crisis was replaced with a new pipeline (900mm diameter one of the largest projects in Gujarat in the 90s) to reduce the maintenance cost (Asbestos Cement (AC) pipelines were used, seven small pumping stations were operating between Bhadar dam and Rajkot city which reduced the efficiency and increased the maintenance cost).

⁴⁵⁸ In 1975 the urban local body supported by the Gujarat government developed a second water supply scheme, the Nyari I dam, to meet the increasing needs of the city.

⁴⁵⁹ From the 1980s, the city started sourcing water from local lakes, Lalpari and Randarda, which were initially reserved for irrigation.

⁴⁶⁰ Following the expansion of the city limits in 1998 the city government formulated another water supply scheme- Nyari II.

						RMC
Narmada ⁴⁶¹ at Raiyadhar water treatment plant	Canal	2003-04	6	35	35	Gujarat Water Infrastructure Limited (GWIL)

Source: RMC 2006, RMC 2012, GoG 2017, CapaCITES 2018

Table 12: Land use patterns in Rajkot city in 2001, 2011 and 2031

Land Use for RMC limit (Rajkot City)	2001		2011		2031	
	Area in hectare	Share of each category (%)	Area in hectare	Share of each category (%)	Area in hectare	Share of each category (%)
Residential	4247	40.5	5502	52.4	6228.2	59.4
Commercial	209	2	279	2.6	221.7	2.1
Industrial	628	5.9	738	7.1	635.2	6.1
Traffic & transportation	1400	13.3	1,650	15.7	NA	NA
Public and semi public	149	1.4	249	2.3	305.3	2.9
Recreational Space	123	1.2	523	4.9	517.1	4.9
Agriculture	995	9.5	800	7.6	69.3	0.7
Water bodies	236	2.3	236	2.3	236	2.3
Vacant lands	1510	14.4	-	-	-	-
Other	988	9.4	508	4.8	2,307.50	22.01

Source: CapaCITES, 2018

⁴⁶¹ From 2002-03 onwards the city was supported by the Narmada river under the state government sponsored Sardar Sarovar project (RMC, 2006). In recent years, as part of the Saurashtra- Narmada Avataran Irrigation (Sauni) yojana 2017, the city continues to be supported by the Narmada river.

Table 13: Service level information- water supply, Rajkot

Indicators	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	Unit
Coverage of water supply connections	89.4	88.79	94	90	95	98	%
Per capita supply of water	106.2	85.7	110.5	120	120	120	lpcd
Total water supply				230	230	240	ML D
Water treatment plant capacity	250	250	250	250	250	300	ML D
Extent of metering of water connections	-	-	-	-	-	-	%
Extent of non-revenue water (NRW)	36.7	34.9	35.6	25	25	28	%
Continuity of water supply				20 minutes/day	20 minutes/day	20 minutes/day	Time

Source: CapaCITIES 2018

The table depicts the water supply indicators for the last six years⁴⁶², which are indicators under the service level benchmarking initiative of the Ministry of Housing and Urban Affairs (MoHUA).

Table 14: Water scarce years and contingency measures, Rajkot

Crisis year and population	Emergency measure(s)
1973⁴⁶³-74 Population: ~ 3 lakh	•Water provided from Bhadar dam ⁴⁶⁴ (65 kms from the city)
1986-87⁴⁶⁵ Population: ~ 5 lakh	•Water transported by trains from Gandhinagar ⁴⁶⁶ (~239kms)

⁴⁶² There is little information for earlier time periods.

⁴⁶³ Rajkot acquired the status of a urban local body in 1973, and till then the city was dependent on a single drinking water source, Aji I dam. In the same year the city received only 175 mm rainfall (RMC, 2019), which is lower than the annual average of 500 mm.

⁴⁶⁴ Based on RMC's proposals the government of Gujarat through GWSSB directed water from the Bhadar dam, which is located 65 kms from the city and reserved for irrigation purposes, to Rajkot city.

⁴⁶⁵ The city received below average rainfall (275 mm in 1985, 200 mm in 1986, and 186 mm in 1987).

⁴⁶⁶ Water was transported by trains from Gandhinagar to Rajkot city.

1999-2000 ⁴⁶⁷ Population: ~ 10 lakh	•Tube-wells (120) dug in Wakaner district ⁴⁶⁸ (90 kms from the city)
2012-13 ⁴⁶⁹ Population: ~ 13 lakh	•Water drawn from Saurashtra branch canal of Narmada ⁴⁷⁰ •Borewells dug in lake (Lalpari and Randarda) beds

Source: RMC water works department ppt and author's analysis

Table 15: Rajkot's climate measures

Climate projects	Objective	Actors involved	Key outcome
Urban Low Emissions Development strategy (LEDs) project ⁴⁷¹ , 2012-2016	To support city governments ⁴⁷² transition to low emission urban development	Funder: European Commission, Implementers: UN-Habitat and ICLEI, RMC	Capacity building ⁴⁷³ , formulated a low emissions development strategy, piloted projects ⁴⁷⁴
CapaCITIES project, 2016-2019	To improve capacity of local authorities to further city level mitigation & adaptation actions	Funder: Swiss Agency for Development & Cooperation (SDC), Implementers: Consortium of South Pole Carbon Management Ltd., econcept AG ICLEI South Asia, and RMC	Updated the city's GHG emission inventory from 2011 to 2015, piloted various projects ⁴⁷⁵ , and formulated the climate action plan.
The Integrated Resource Management in Asian Cities: the	To use an integrated approach to planning and management of urban resources	Funder: German Federal Ministry of Economic Cooperation & Development (BMZ),	Provided technical assistance for planning, management and implementation of infrastructure projects (e.g.

⁴⁶⁷ The city received rainfall as low as 247 mm (in 1999). Additionally, the city limits had been expanded in 1998, whereby three villages were merged into the city, thus increasing pressure on existing resources.

⁴⁶⁸ The GWSSB, government of Gujarat, supported by the RMC conducted a survey (in surrounding villages of Rajkot) and identified Wakaner district (Jamudia village) to extract groundwater through bore wells to support the city. Approximately 120 bore wells were dug in the forest areas of the village in Wakaner district, and a 90 km long bulk water pipeline was built (in a span of three months) to supply water to the city (RMC, 2018k). The city continued to tap water from this region for almost three years after the crisis year as it received below average rainfall (325 mm in 2000, 389 in 2001, and 325 in 2002).

⁴⁶⁹ The city witnessed a water crisis due to inadequate rainfall (141mm) in the catchment area (no rainfall in Kutchh and Saurashtra leading to no inflow of water in local reservoirs.) resulting in drying up of local sources.

⁴⁷⁰ The city took several short term actions (digging borewells in lake beds, providing water by tankers, and desilting local reservoirs), and continued to rely on Narmada for drinking water.

⁴⁷¹ Influenced by priorities identified in the City Development Plan and the Low Carbon Mobility Plan (ICLEI, 2016).

⁴⁷² The projects spans across emerging economy countries (Brazil, India, Indonesia, South Africa), and Europe.

⁴⁷³ Through the project there were multiple seminars, meetings, networking and training activities (ICLEI, 2016).

⁴⁷⁴ The pilot projects included a) replacing existing streetlights (HPSV lights) with energy efficient LED lights on a few roads, b) installing solar panel on a municipal school, and c) employing a decentralized Waste Water Treatment System (DTS) plant to treat waste water being discharged into open drains. Collectively these projects resulted in an annual electricity savings of 106,629 kWh and reduced emissions by approximately 100 tCO₂e per year (ICLEI, 2016).

⁴⁷⁵ Through the project the RMC piloted projects across multiple sectors such as a) building (renewable energy for social housing), b) water (installation of solar PV on Aji water treatment plant, area based groundwater recharge), c) urban planning (ambient air quality monitoring stations), d) transport (improving ridership and sustainability of BRTs), and e) waste sectors (preparing a solid waste management plan)

urban Nexus project, 2016-2019		Implementer: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), ICLEI, UN Economic and Social Commission for Asia and the Pacific (ESCAP), and RMC	24*7 metered water supply)
District Energy Systems (DES) ⁴⁷⁶ project, 2016	To develop energy efficient systems (e.g. district cooling)	UN- Environment Programme, ICLEI and RMC	Assessed the district cooling potential for greenfield area (selected under Smart Cities Mission), the district cooling system concept was incorporated in the city's Smart City Plan
Sustainable Energy for ALL (SE4ALL) Building Efficiency Accelerator (BEA) project, 2016	To promote the adoption of building energy efficient actions	Funder: UNEP Implementer/technical assistance: World Resources Institute (WRI), ICLEI and RMC	Prepared a website, Akshay Urja, for awareness building, and formulated green building guidelines

Table 16: Energy consumption and GHG emission contribution of Rajkot's water sector

	2011-12	2012-13	2013-14	2014-15	2015-16
Energy consumption (GJ)	125,805.72	91,182.23	107,106.98	141,122.80	140,054.92
GHG emission (tonne of CO₂e)	26,964.33	20,467.89	24,060.39	31,777.98	31,710.31

Source: CapaCITIES, 2018

Table 17: Aurangabad's population growth

Year	Population
1991	573272
2001	880740
2011	1175116

Source: Census 2011

⁴⁷⁶ DES is a set up that regulates the water temperature (to produce steam, hot water or chilled water), supplied by pipes, which serves as a space heating or cooling system.

Table 18: Sources of Aurangabad's raw water supply

Source	Type of source	Year of commissioning	Distance from city (in kms)	Abstraction of raw water (MLD)_2020	Ownership
Harsul ⁴⁷⁷	Dam	1954	0	10	AMC
Jayakwadi (old scheme) ⁴⁷⁸	Dam	1976	45	56	Irrigation department
Jayakwadi (new scheme) ⁴⁷⁹	Dam	1992	45	100	Irrigation department

Source: Deekshit (2015), AMC (2011⁴⁸⁰), Dhule et al., (2019)

Table 19: Service level information- water supply, Aurangabad

Performance indicators	National level bench marks	State level bench marks	Unit	2011-12	2012-13	2013-14	2014-15	2015-16
Coverage of water supply connections	100	100	per cent	45	42	42	36	44
Per capita of water	135	135	lpcd	103	103	103	103	115.8
Extent of metering water connections	100	100	per cent	0.01	0.01	0.01	1.93	2.01
Continuity of water supply	24*7	24*7	-	Once in five-six* days				

Source: GoM, 2017a, *stakeholders' interviews

Table 20: Regularization penalty, Aurangabad

Connection size in inches	Amount to be paid within sixty days	Amount to be paid between 60 and 90 days
Rates for domestic users		
1/2 (15mm)	3,000/-	6,000/-
3/4 (20mm)	4,875/-	9,750/-
1 (25mm)	11,375/-	22,750/-
Rates for declared slums		

⁴⁷⁷ The city's first water supply scheme was developed by the Government of Maharashtra through MJP in the 1950s, which continues to support the city (Deekshit, 2015). Overtime, this scheme was insufficient to sustain the city's development and population.

⁴⁷⁸ Due to growing population and industrial development the city was experiencing water scarcity. Consequently, the MJP designed and executed a water supply scheme from Jaykwadi dam.

It emerged from stakeholders interviews with both state and non-state actors at the local level that Dr Rafiq Zakaria, elected from Aurangabad, pursued the Jayakwadi scheme, when he served as the Minister for Urban Development, Maharashtra. He was also instrumental in the development of the City and Industrial Development Corporation of Maharashtra (CIDCO) in Aurangabad.

⁴⁷⁹ The population had increased considerably in the 1980s, and the existing water supply schemes were falling short, therefore a second water supply scheme was introduced by MJP.

⁴⁸⁰ Aurangabad Municipal Corporation (2011). Standing Committee resolution number 213 (22/03/2011).

1/2 (15mm)	2,000/-	4,000/-
3/4 (20mm)	3,250/-	6,500/-
1 (25mm)	7,585/-	15,170/-
Rates for commercial establishments		
1/2 (15mm)	15,900/-	31,800/-
3/4 (20mm)	19,050/-	38,100/-
1 (25mm)	42,450/-	84,900/-

Source: AMC, 2002

Table 21: Details of mega- water supply scheme in 2005-06 and 2008-09, Aurangabad

Elements included in the intervention	Estimated cost (Rs in Crore)
2005-06 baseline cost (359.67 Crore)	
Jayakwadi dam to Nakshtrawadi Master Balance Reservoir- bulk water transmission pipeline	253.31Cr
City- transmission mains, partial distribution and water storage reservoir	106.36Cr
Total	359.67
2008-09 baseline cost (792.20 Crore)	
Jayakwadi dam to Nakshtrawadi Master Balance Reservoir- bulk water transmission pipeline	346.22 Cr
City- transmission mains, complete distribution and water storage reservoir	372.93 Cr
Install water meters and replace tap connections	73.87 Cr
Total	792.20 Cr

Table 22: Details of water tax rate in 2011 (before PPP) and 2019 (after PPP), Aurangabad

Connection size in inches	Residential per year (2011)	Residential per year (2019)	Commercial per year (2011)	Commercial per year (2019)
½	1800	4500	6500	22500
¾	2925	7250	12,000	36250
1	6825	16,950	25,000	84750
1.5	30,000	74,500	70,000	372500
2	50,000	12,41,50	1,40,000	620750
3	80,000	19,86,50	2,00,000	993250
4	1,20,000	29,800	3,00,000	14,90,000
6	2,00,000	49,66,50	4,00,000	24,83,250
8	3,00,000	74,5000	-	37,25000

Table 23: Rajkot's water supply indicators

Indicators	1991*	2001	2011-12	2016-17	2018-19
Population coverage (per cent)		68	89.4	98	100
Litres per capita (LPCD)		65	106.2	120	130
Filtration/treatment capacity (MLD)		135	250	300	300
Storage capacity (MLD)		150	220	275	300
Average drawl (MLD)		85	212	268	290
Average supply (MLD)		67	193	240	269
Tap connections (residential)		1,10,000	2,35,000	261591	273650
Annual water tax (residential) (in INR)		250	840	840	840
Continuity of water connection		20 minutes alternate day	20 minutes daily	20 minutes daily	20 minutes daily
Capital expenditure in water supply (in lakhs)		2880	5560	9450	11064

Source: Rajkot Municipal Corporation official records; CapaCITIES, 2018

*Records from 1990s are sporadic and not easily available as the urban local body had not started digitizing records. Also, most older, physical records have not been stored or have been destroyed.

Table 24: Aurangabad's water supply indicators

Indicators	1991	2001	2011-12	2015-16	2019
Population coverage (per cent)			45	44	85
Litres per capita (LPCD)			80-103	116	61
Filtration capacity (MLD)					
Storage capacity (MLD)					
Average drawl (MLD)	56	156	128	128	128
Average supply (MLD)				122-124	122-124
Tap connections (residential)			98365	1,29,161	
Annual water tax (residential) (in INR)				4500	4500
Continuity of water connection			45 minutes in 3 days	45 minutes in 5-6 days	45 minutes in 5-6 days

Source: Aurangabad Municipal Corporation official records; JICA, 2012; GoM, 2017; ASCDL, 2019; Dhule et al., 2019

Table 25: List of climate meetings and seminars attended by RMC officials in 2018-19

Time	Event	Location	Institute
20/10/18 to 27/10/18	Renewable Energy Conference	Freiburg, Germany	Swiss Development Cooperation (SDC), South Pole, International Council for Local Environmental Initiatives (ICLEI)
25/01/19	Workshop on climate change	Delhi	Ministry of Housing & Urban Affairs (MoHUA), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
30/01/19 to 31/01/19	Low carbon & Resilient City development	Delhi	SDC, South Pole, ICLEI, National Institute of Urban Affairs (NIUA)
30/08/2019	Covenant of Mayors of Gujarat for Climate and Energy	Gandhinagar	Climate Change Department, Government of Gujarat, European Union-International Urban Cooperation

Source: interviews with RMC officials

Box 1: Laws and schemes governing the city and district

Bombay Provincial Municipal Corporation (BPMC) Act, 1949

According to the BMPC Act the Rajkot Municipal Corporation is the key institution responsible for provision and management of basic services like water within its jurisdiction (RMC, 2006). The BMPC Act defines the roles and responsibilities of a municipal corporation with respect to urban planning.

Gujarat Town Planning and Urban Development (GTPUD) Act, 1976

The Act provides for the regulation of planned growth at the level of the state/sub-national level (RMC, 2006). According to the GTPUD Act the Rajkot Urban Development Authority (RUDA) is responsible for the provision of infrastructure services like water in the Development Authority area.

74th Constitutional Amendment Act (CAA), 1992

Post-independence India's first comprehensive urban reform was the 74th CAA, 1992. Through this act the Indian governance structure became a three-tiered system⁴⁸¹ of federation. This resulted in the empowerment of local governments as the act devolved functions, functionaries, and finances to ULBs. Administrative powers of land use, development planning and service delivery are devolved to local governments⁴⁸².

Box 2: General Development Control Regulations (GDCR) 2004 on rainwater harvesting

Modified building bye law mandating rainwater harvesting, 2004 (RUDA, 2004)

The GDCR of 2004 mandates conservation and harvesting rainwater in buildings (clause no. 17.21) having plinth built up area of 80 Sq.Mts. or more every such building shall be provided with required facilities and infrastructure for conservation and harvesting of rainwater.

Percolation Pits

The ground surface around the building shall have percolation pit or bore as recommended by Competent Authority covering within the building site, or bore recharge such pits shall be filled with small pebbles or brick jelly or river sand and covered with perforated concrete slabs.

Terrace water collection

The terrace may be connected to a sump or well bore through a filtering tank by PVC pipe as recommended by Competent Authority. A valve system shall be incorporated to enable the first part of the rain water collected to be discharged out to the solid if it is dirty.

Open ground

Whenever there is an open ground a portion of top soil should be removed and replaced with river sand to allow slow percolation of rainwater.

Any other methods proved to be effective in conservation and harvesting of rainwater may be adopted in each and every construction taken up.

However, in the case of existing building more than 1000 Sq.Mts. of built up area a moratorium of five years shall be given within which the above requirements of the Development Regulation shall be complied with.

⁴⁸¹ Before the enactment of this act the city governments were under the purview of the state government. The Act gives constitutional status to the municipalities.

⁴⁸² There are critics that the 74th CAA has been unsuccessful in financial devolution of power to the ULBs.

Box 3: Details about Jawaharlal Nehru National Urban Renewal Mission (JNNURM)

JNNURM had two broad components: The first component was the Infrastructure planning & governance that as the name suggests focused on improving infrastructure and governance in urban areas. The sub-mission under this scheme was called Urban Infrastructure & Governance (UIG) applicable to mega (e.g. Ahmedabad) and million plus cities (e.g. Rajkot)⁴⁸³. In addition, the second component under mission was the Basic Services for Urban Poor (BSUP) aimed at developing slums by providing shelter, basic services and other related civic amenities with a view to providing utilities to the urban poor (GoI, undated,a)- in mega and million plus cities.

Key components of the Mission include:

1. Improving and augmenting the economic and social infrastructure of cities.
2. Ensuring basic services to the urban poor including security of tenure of affordable prices.
3. Initiating a range of urban sector reforms whose primary aim is to eliminate legal, institutional and financial constraints that have impeded investment in urban infrastructure services.
4. Strengthening municipal / government and their functioning.

The financial support pattern varies for each sub-mission and the size of the urban centre.

For million plus cities like Rajkot the funding is shared between the central, state and ULB. For instance, under:

- a) UIG the share of allocation is divided into 50 per cent GoI, 20 per cent GoG, and 30 per cent ULB contribution, and
- b) BSUP the division equally shared between the central government and ULB, that is 50 percent GoI grant, and 50 per cent ULB contribution (Khan, 2014)

Reforms under JNNURM are listed below (Deekshit, 2015)

	State Level	ULB Level
Mandatory	1. Implementing the 74th CAA 2. Integration of city planning and delivery functions 3. Enactment of Public Disclosure Law 4. Enactment of Community Participation Law 5. Reform in rent control 6. Stamp Duty rationalization to 5% 7. Repeal of ULCRA	8. Adoption of modern accrual-based double entry system of accounting in ULB 9. Levy of reasonable user charges by ULBs and Parastatals with the objective that the full cost of O&M or recurring cost 10. Reform of property tax with GIS 11. Introduction of e-governance using IT applications such as GIS/ MIS for services provided by ULB and parastatals 12. Internal Earmarking of funds for BSUP 13. Provision of Basic Services to Urban Poor
Optional Reforms at ULB level		
	14. Simplification of legal and procedural frameworks for conversion of land from agricultural to non-agricultural purposes 15. Introduction of Property title certification system in ULBs 16. Revision of building by-laws –streaming the approval process 17. Introduction of computerized process of registration of land and property 18. Earmarking 20-25% developed land in housing projects for EWS/LIG 19. Revision of byelaws to make rainwater harvesting in all buildings mandatory and adoption of water conservation measures 20. Byelaws for reuse of recycled water 21. Administrative Reforms (i.e. reduction in establishment costs, not filling posts falling vacant due to retirement), and achieving specified milestones 22. Structural Reforms 23. Encouraging Public Private Partnership (PPP)	

⁴⁸³ For small towns the infrastructure sub-mission was the Urban Infrastructure Development for Small & Medium Town (UIDSSMT), and for basic services for the urban poor was the Integrated Housing and Slum Development Program (IHSDP).

Box 4: Details about Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

AMRUT focuses on improving urban infrastructure by providing basic services to all households, building amenities in cities leading to improved quality of life for all.

The purpose of AMRUT is to (GoI, 2015a):

- Ensure that every household has access to a tap with assured supply of water and sewerage connection.
- Increase the amenity value of cities by developing greenery and open spaces (e.g. parks).
- Reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling). All these outcomes are valued by citizens, particularly women, and indicators and standards have been prescribed by the Ministry of Housing and Urban Affairs (MoHUA) in the form of Service Level Benchmarks (SLBs).

The water supply component under the mission includes:

1. Improving old water supply systems, including treatment plants
2. Augmentation and rejuvenating water reservoirs for recharging groundwater and drinking water supply
3. Improving water quality problems (e.g. arsenic, fluoride), and implementing special water supply arrangement for hilly and coastal cities
4. Universal metering

Cost of implementing projects is shared between the central (33 per cent), state (37 per cent) and local (30 per cent) government.

Box 5: Modified GDCR 2004

General Development Control Regulations (GDCR) (RUDA, 2004), Modified building bye law mandating solar water heater

The bye law makes solar water heating systems a necessary part of all new buildings. The types of buildings affected by the bye-law include: a) hospitals, nursing homes, b) hostels of schools, colleges and training centres, c) hotels, lodges and guest houses, d) barracks of armed forces, paramilitary forces and police, e) community centres, banquet halls, Kalyan mandaps and buildings for similar use, f) functional buildings of railway stations and airports, such as waiting & retiring rooms, rest rooms, inspection bungalows, and catering units.

Installation of Solar Water Heating System:

(a) New Buildings: Clearance of plan for the construction of new buildings of the aforesaid categories shall only be given if they have a provision in the building design itself for an insulated pipeline from the in the building to various distribution points where hot water is required. The building must have a provision for continuous water supply to the solar water heating system. The building should also have open space on the which receives direct sun light. The load bearing capacity of the roof should atleast be 50 kg. per sqm. All new buildings of above said categories must complete installation of solar water heating systems before obtaining necessary license to commence their business.

(b) Existing Buildings: Installation of Solar Assisted Water Heating Systems in the existing building shall be made mandatory at the time to change of use to above said category provided there is a system or installation for supplying hot water.

Capacity:

The capacity of solar water heating system to be installed on the building of different categories shall be decided in consultation with the local bodies. The recommended minimum capacity shall not be less than 25 litres per day for each bathroom and kitchen subject to the condition that maximum of 50 % of the total roof area is provided with the system.

Specification:

Installation of Solar Assisted Water Heating System shall conform to BIS (Bureau of India Standards) specification IS: 12933. The solar collectors used in the system shall have the BIS certification Mark.

Auxiliary System:

Wherever hot water requirement is continuous, auxiliary, heating arrangement either with electric elements or oil of adequate capacity can be provided.

Box 6: Awards and commitments

- Commitment to reduce 14 per cent of GHG emissions by 2022-23 (as compared to 2015-16 baseline year)
- Mayors member of the Global Covenant of Mayors for Climate & Energy since 2015
- Mayor member of the Gujarat Covenant of Mayors for Climate & Energy since 2019
- Won the World Wildlife Fund (WWF) National Earth Hour Capital Award in 2015-16
- Won the WWF One Planet City Challenge award in 2018
- Won the WWF One Planet City Challenge award in 2020
- The Ministry of New and Renewable Energy (MNRE) declared Rajkot a Solar City in 2008

Box 7: Guidelines to implement rainwater harvesting in Aurangabad

Rainwater harvesting schedule, Government of Maharashtra

Rainwater harvesting in a building site includes storage or recharging into ground of rain water falling on the terrace or on any paved or unpaved surface within the building site.

I. The following systems may be adopted for harvesting the rain water drawn from terrace and the paved surface.

1. Open well of a minimum of 1 meter diameter and 6 meter in depth into which rain water may be channeled and after filtration for removing silt and floating material. The well shall be provided with ventilating covers. The water from these open well may be used for non-potable domestic purposes such as washing flushing and for watering the garden etc.
2. Rain water harvesting for recharge of ground water may be done through a bore well around which a pit of one metre width may be excavated upto a depth of atleast 3 metre and refilled with stone aggregate and sand. The filtered rain water may be channeled to the refilled pit for recharging the bore well.
3. An impervious surface/ underground storage tank of required capacity may be constructed in the setback or other open space and the rain water may be channeled to the storage tank. The storage tank shall always be provided with ventilating covers and shall have draw-off taps suitably placed so that the rain water may be drawn off for domestic, washing, gardening and such other purposes. The storage tanks shall be provided with an overflow.
4. The surplus rain water after storage may be recharged into ground through percolation pits or trenches or combination of pits and trenches. Depending on the geomorphological and topographical condition, the pits may be of the size of 120 metres width * 1.2metre length* 2 metre to 2.5 metre depth. The trenches can be of 0.6 metre width * 2 to 6 metre length * 1.5 metre to 2 metre depth. Terrace water shall be filled with filter media comprising of the following material:
 - a. 40 mm stone aggregate as bottom layer upto 50 per cent of the depth;
 - b. 20 mm stone aggregate as lower middle layer upto 20 per cent of the depth;
 - c. Coarse sand as upper middle layer upto 20 per cent of the depth;
 - d. A thin layer of fine sand as top layer;
 - e. Top 10 per cent of the pits/ trenches will be empty and a splash is to be provided in this portion in such a way that roof top water falls on the splash pad.
 - f. Brick masonry wall is to be constructed on the exposed surface of pits/ trenches and the cement mortar plastered. The depth of wall below ground shall be such that the wall prevents loose soil entering into pits/ trenches. The projection of the wall above ground shall at least be 15 cms.
 - g. Perforated concrete slabs shall be provided on the pits/trenches.
5. If the open space surrounding the building is not paved, the top layer upto a sufficient depth shall be removed and refilled with coarse sand to allow percolation of rain water into ground.

II. The terrace shall be connected to the open well/bore well/ storage tank/ recharge pit/ trench by means of HDPE/PVC pipes through filter media. A valve system shall be provided to enable the first washings from roof or terrace catchment, as they would contain undesirable dirt. The mouths of all pipes and opening shall be covered with mosquito (insect) proof wire net. For the efficient discharge of rain water, there shall be at least two rain water pipes of 100 mm diameter for a roof area of 100 square metre.

III. Rain water harvesting structures shall be sited as not to endanger the stability of building or earthwork. The structures shall be designed such that no dampness is caused in any part of the walls or foundation of the building or those of an adjacent building.

IV. The water so collected/ recharged shall as far as possible be used for non-drinking and non-cooking purpose.

When rain water in exceptional circumstances will be utilised for drinking and/ or cooking purpose, it shall be ensured that proper filter arrangement and the separate outlet for by passing the first rain- water has been provided. It will be ensured that for such use, proper disinfectants and water purification arrangements have been made.

Source: AMC, 2005a

Box 8: Guidelines to implement solar water heating systems in Aurangabad

Solar water heating systems should be made in the building for hospitals, hotels, hostels, guest houses, police men/army barracks, canteens, laboratories and research institutions, school and colleges and other institutes.

- 1) The solar water heating system should be mandatory in the hospitals and hotels, where the hot water requirement is of continuous nature. In these building the system must be provided with auxiliary backup system.
- 2) The use of solar water heating system is recommended in following type of building in Government/ Semi-Government and institutional building where the hot water requirement may not be continuous / permanent.
 - i. Guest Houses
 - ii. Police men/Army barracks
 - iii. Canteens
 - iv. Laboratory and research institutions where hot water is needed
 - v. Hostels, Schools, Colleges and other institutes
- 3) The installation of gas instantaneous water heaters or the electrical back-up in all such water heating system shall be optional depending on the nature of requirement of the hot water.
- 4) It is suggested that solar water heating system of the capacity of about 100 litres per day based on thermo-symphonic system with necessary electrical back-up be installed at residential building like hostels.
- 5) In order to facilitate the installation of solar water heating system, the new building shall have the following provisions:-
 - i) All such buildings where solar water heating systems are to be installed will have open sunny roof area available for installation of solar water heating system.
 - ii) The roof loading adopted in the design of such building should be at least 50 kg per sq.m. for the installation of solar water heating system.
 - iii) A Solar water heating system can also be integrated with the building design. These can either be put on the parapet or could be integrated with the south facing vertical wall of the building. The best inclination of the collector for regular use throughout the year is equal to the local latitude of the place. The collectors should be facing south. However, for only winter use the optimum inclinations of the collector would be (latitude + 15 degrees of the south). Even if the collectors are built in the south facing vertical wall of the building the output from such collectors during winter month is expected to be within 32 per cent output from the optimum inclined collector.
 - iv) All the new buildings to be constructed shall have an installed hot water line from the roof top and also insulated distribution pipeline to each of the points where hot water is required in the building.
 - v) The capacity of the solar water heating system to be installed on the building shall be described on the basis of the average occupancy of the building. The norms for hospitals, hotels and other functional building are given below.

Type of building	Capacity recommended- Litres per capita per day
Hospitals	100
Hotels (five star)	150
Hotels (other than five star)	100

	Hostels and other such buildings	35	
	Canteen	As required	
	Laboratory & research institutions	As required	

vi) An open area of 3 sq.m. would be required for installation of a collector which supplies about 100 litres of water per day. At least 60% of the roof area may be utilized for installation of the system.

vii) The specification for the solar water heating system laid down by the Ministry of Non-Conventional Energy Sources can be followed. Flat plate collector conforming to latest Bureau of Indian Standards should be used in all such solar water heating systems

Source: GoM, 2016