Water Provision Beyond The Private/Public Debate

A study of the water strategies of poor communities, water vendors, and the state in rapidly-changing urban India

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Acronyms and Initialisms

ADB	Asian Development Bank
BBMP	*Bruhat Bengaluru Mahanagara Palike*; Greater Bengaluru Metropolitan Government
BJP	Bharatiya Janata Party
BWSSB	Bangalore Water Supply and Sewerage Board
CBO	Community-based organization
DDA	Delhi Development Authority
DIT	Delhi Improvement Trust
FPE	Feminist political ecology
GBWASP	Greater Bangalore Water and Sanitation Project
GIDB	Gujarat Infrastructure Development Board
GoG	Government of Gujarat
GoI	Government of India
GWIL	Gujarat Water Infrastructure Limited
GWSSB	Gujarat Water Supply and Sewerage Board
IAS	Indian Administrative Service
IFI	International financial institution
INGO	International non-governmental organization
INR	Indian rupee
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KRWSSA	Karnataka Rural Water Supply and Sanitation Agency
KUWSDB	Karnataka Urban Water Supply and Drainage Board
LPCD	Litres per capita per day

LTS	Large technological system (integrating technology and policy)
MAF	Million acre-feet
MCP	Mega City Programme
MLD	Million litres per day
NBA	*Narmada Bachao Andolan*; Save the Narmada Movement
NCA	Narmada Control Agency
NGO	Non-governmental organization
NPP	Narmada Pipeline Project
NWA	Neighbourhood welfare association
PPP	Public-private partnership
RSS	*Rashtriya Swayamsevak Sangh*
SEZ	Special economic zone
SSNNL	Sardar Sarovar Narmada Nigam Limited
SSIP	Small-scale independent (water) provider
SSP	Sardar Sarovar project
SWE	Small water entrepreneur (or enterprise)
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban local body
UPE	Urban political ecology
USAID	United States Agency for International Development
USD	American dollar
WASMO	Water and Sanitation Management Organization (Gujarat state agency)
WB	World Bank
WSS	Water and sanitation services (or supply)

Abstract

This dissertation looks at the issue of water insecurity in India's small cities and peri-urban areas through a feminist political ecology framework, asking "*What do current water distribution practices in urban India tell us about how to sustainably and equitably provide water in rapidly changing or highly-informal cities?"* Using ethnographic and archival research, this dissertation contributes to our understanding of two of the most rapidly-changing and under-researched areas of the Indian waterscape. The dissertation begins by drawing on existing literature to determine how the fragmented and unequal state of water provision in urban India has come to be, identifying historical, social, and political constraints to universal water provision. Following this, three case studies present the actions and perspectives of complementary actors: users, the state, and water vendors.

The first case documents and analyses the daily experiences with and concerns about water collection of low-income residents of Mahesana, Gujarat, and highlights the importance of physical proximity and reliable timing, the role of social and physical feedback mechanisms in ensuring scarce resources are shared equally, and the gendered burden of not only collecting but also thinking about water. This is followed by a critical discussion of Gujarat's water regime and of the Narmada Pipeline Project, which uses Ferguson's image of the 'anti-politics machine' to discuss the way in which water infrastructure and the spectacle of development has helped centralize power without providing a sustainable solution to water insecurity. The final case describes the complex water economy of Weavers' Colony, Bengaluru, and examines the way class and physical location create microgeographies of access to water reliant on patronage relationships. As well, it presents the motivations and business models of small-scale water vendors and the ways that paying for water shapes the livelihoods decisions and gender roles of consumers. The dissertation concludes by calling for a commons-based approach to water provision and discusses aspects of present-day water distribution practices that are promising for equitable and sustainable water provision.

Résumé

Cette thèse examine l'enjeu de l'insécurité d'eau dans les petites villes et les régions périurbaines de l'Inde dans une perspective d'écologie politique féministe, pour répondre à la question: *« que peuvent nous apprendre les pratiques de distribution d'eau actuelles dans les villes indiennes sur comment distribuer de l'eau de manière équitable et durable dans des villes très informelles ou en grande transformation? »* Sur base d'ethnographie et de travail d'archives, cette thèse contribue à comprendre deux des parties les plus sous-étudiées du "waterscape" indien. La thèse commence par une analyse documentaire pour déterminer les origines de l'état fragmenté et inégal de l'accès à l'eau en Inde urbaine. Des contraintes historiques, sociales et politiques sont nommées. Suite à ceci, trois études de cas présentent les actions et perspectives d'acteurs complémentaires : les utilisateurs d'eau, l'état et les vendeurs d'eau.

Le premier cas décrit et analyse les expériences et préoccupations de résidents a faible revenu dans la ville de Mahesana, Gujarat, par rapport à l'eau. Sont soulignés l'importance de la proximité aux sources d'eau et de la fiabilité des horaires, le rôle de la rétroaction sociale et physique dans le partage équitable de ressources limités, et l'aspect genré de la tâche de planifier et de penser à l'eau. Ce cas est suivi par une discussion critique du régime d'eau du Gujarat et du projet de pipeline Narmada. L'image de la « machine anti-politique » (Ferguson) sert à illustrer comment l'infrastructure d'eau et le spectacle du développement a aidé à consolider le pouvoir sans fournir de solution durable à l'insécurité d'eau. Le cas final se penche sur l'économie d'eau de Weavers' Colony, Bengaluru, pour démontrer les micro-géographies d'accès à l'eau que créent la classe, l'emplacement physique et les relations de patronage. Les motivations et les pratiques des vendeurs d'eau sont aussi étudiées, ainsi que comment l'achat de l'eau affecte les budgets et les rôles de genre des acheteurs. La thèse conclut par un appel à une approche théorique qui considère l'eau comme un bien commun ainsi que par des exemples de pratiques actuelles qui sont prometteuses pour le développement de stratégies durables et équitables de distribution d'eau.

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I. Introduction

1 Why This Project?

Research on development and urbanization reveals that the unprecedented growth of the world's cities in the past half-century has been accompanied by growing urban poverty, particularly in the Global South (Annez and Linn 2010; Martine et al. 2012; UN-Habitat 2008). Lack of access to water and sanitation services is often listed as a defining characteristic of poverty, and especially of urban poverty (Mitlin 2003; Linn 2010; Wratten 1995; United Nations 2011). Unsafe water and poor sanitation cause the diarrheal diseases that are the leading reason for child mortality in low- and middle-income countries, contribute to large numbers of work-hours lost to illness and water collection, and cost poor people—especially women—dignity, safety, and well-being (Jha 2010; Bapat and Agarwal 2003; Environment and Urbanization 2003). For these reasons, halving the number of people without 'sustainable access to safe drinking water and basic sanitation' by 2015 was held up by the international community as one of the targets of the Millennium Development Goals (United Nations 2011).

In the BRIC and BASIC countries (Brazil, Russia, India, China, and South Africa), this increase in urban poverty comes alongside a rising standard of living for the booming middle class, as well as national commitments to economic growth that rely on ever-increasing consumption of natural resources and infrastructure development. The tensions between the basic needs of a growing population and the desire for rapid economic expansion play out in decisions about infrastructure such as water and sanitation. This makes infrastructure networks a critical nexus for looking at what Brenner and Theodore (2002) call the "grounded effects" of globalization and neoliberalism in the South. As aspiring 'success stories' of development, the five countries listed above can also be interesting sites for challenging dominant narratives of development, and identifying counterhegemonic

strategies and solutions that can be shared with communities in countries that aspire to follow their trajectories (Miraftab 2009).

1.1 Research Interests

My interest in urban water infrastructure comes out of a desire to better understand how urban inequality functions, combined with a concern for the ways in which human habitation interacts with the natural environment, especially in terms of resource use and sustainability. Uneven infrastructure investment across a city can be easily understood as a proxy for the prioritization, whether intentional or not, of the lives of certain residents over others'. In cities with histories of segregation and inequality, failure to remedy past inequities in service provision can further entrench spatial injustice. At the same time, the creation of such infrastructure is also often held up as one of the key roles of the state, which is presented as the only institution suited to funding and coordinating such a large and expensive project in the public interest. As neoliberal ideas become common-place around the world, infrastructure provision is increasingly being expected to pay for itself through various forms of privatization and commodification, and major debates have arisen both within and outside of the academy over public-private partnerships and the privatization of water—among other—infrastructure. Only very rarely, however, have these debates called into question the infrastructural paradigm of water provision through a single, centrally-managed network of pipes, or considered the existing coping strategies of the millions of people who fall through the cracks of the traditional water provision paradigm and find other sources of water to meet their daily needs.

Given that neither states nor their private-sector partners have been able to successfully extend adequate water provision to large parts of the world's cities, this study was motivated by my interest in finding examples of water provision by non-state, non-corporate actors that might be worth scaling up or replicating, in whole or in part. Thus I have chosen to focus on areas unserved—or severely under-served—by state water grids, with the aim of starting to fill in these blank spaces on the map; to make visible what is *present* within them instead of

solely defining them by the *absence* of piped water supply. While documenting and analyzing the processes by which residents of these areas source water, I have kept an eye out for uniquely sustainable sources of drinking water, creative technologies of water distribution, and more equitable ways of sharing scarce resources, and asked what it would take to apply those lessons more broadly.

1.2 Water And Sanitation In India

Access to water and sanitation (WSS) has become a particularly hot topic in Indian policy circles in the past five years. In July 2011, the Government of India (GoI) created a federal Ministry of Drinking Water and Sanitation (Government of India 2017). This move followed the deployment of multiple programs increasing funding for urban infrastructure including for water and sanitation. However, development funding, much like academic research, has focused mostly on India's largest cities, and as a result less is known about the water conditions in cities of one million people or less.[1] Though India's economy is booming, the water and sanitation statistics are dire: the WHO/UNICEF Joint Monitoring Programme estimates only 54 per cent of India's urban population has access to piped water in the home, while official GoI figures state that more than one-sixth of them lack any form of sanitation (Joint Monitoring Programme 2016; National Sample Survey Office 2012). Research indicates, however, that access to a tap does not in itself guarantee access to water that is adequate in either quantity or quality (Zérah 1998). As infrastructure funding in India's smaller cities is lower than in larger urban areas, connection rates are likely to be worse there than in the nation's metropolises.

Although water and sanitation are interconnected, they pose different challenges for both the policy-maker and the researcher. In this dissertation I focus predominantly on water strategies, referencing sanitation only where it assists in understanding the water situation.

1 The census of India (2011) defines any municipality of over 100,000 people as a city (also known as a Class-I town). The 2011 census recorded 465 cities, of which only 53 had populations of one million residents or more. The eight cities with populations of over four million people are designated Mega Cities (in contrast to the more widespread definition of megacities as those of ten million or more.) These cities are: Mumbai, Delhi, Bengaluru, Hyderabad, Ahmedabad, Chennai, Kolkata, and Surat.

This project's focus on water is due to a number of reasons. First, water is perhaps a less sensitive issue to address, particularly as a stranger to the people I hoped to interview. Given a limited time frame, understanding the water procurement and distribution strategies employed by marginalized urban inhabitants therefore appeared to be the more feasible goal. Second, I was particularly interested in approaches to expanding service provision that went beyond the traditional publicly- or privately-operated pipe grid: in other words, decentralized and possibly informal strategies. I found that while the technical and financial challenges posed by retrofitting dense urban areas for sewers had sparked experimentation with decentralized sanitation in the form of septic tanks or composting toilets (Hasan 2008; Katukiza et al. 2012; Narain 2012; Nath and Sengupta 2016), whether decentralized water systems can be sustainable remained an open question. Finally, given my interest in decision-making around resource conflicts, the usefulness of water to industry as well as to households meant that investigating water provisioning could reveal tensions between various communities and other actors more visibly than sanitation does.

2 Outline Of The Dissertation

In the following chapter, I describe the theoretical framework through which I approach this work, the research objectives and questions, and the methodological approach. In addition to a contextualizing review of the literature, this dissertation is made up of three related empirical research projects which approach the question of access to water in underserved areas from different perspectives, and the choice of projects as well as the methods employed for each one are discussed here. With this background established, the following chapters report on each of the research projects in turn.

Chapter Three expands on this introduction and situates the discussion of contemporary urban Indian water dynamics in its historical and hydrological context. Drawing on a range of historical and political science literature, I describe the key historical, social, and political dimensions that contribute to India's fragmented and uneven distribution of water infrastructure today. At the same time, I discuss the contemporary policy context and recent

trends in urban politics that affect planning for urban water infrastructure. This narrative overview of the existing literature provides the necessary background for understanding the following chapters, including gaps needing further research.

Chapter Four aims to answer the question, “what strategies are employed by residents in smaller cities to access water in the absence of household water taps?” It presents an ethnographic, on-the-ground perspective on residents’ practices and experiences in several slums and poor neighbourhoods in Mahesana, Gujarat. This qualitative study serves as a counterweight to the quantitative (census or National Sample Survey) data typically used in policy-making, and as an addition to the body of scholarship on urban water practices in India that focuses almost entirely on metropolitan contexts such as Delhi or Mumbai.

Zooming out from the Mahesana case study, Chapter Five chronicles the evolution of Gujarat’s state water regime over the last 20 years, specifically tracing the discourse used to promote the Narmada Canal and Pipeline, the changes to state water governance institutions under Chief Minister Narendra Modi, and the effects of and responses to these transformations. It aims to better understand the state’s role in creating or responding to the situations described in Chapter Four, while also offering insight into the culture of decision-making affecting infrastructure planning for India's cities more broadly. Although this is only one state project, a careful analysis of it reveals some of the underlying tensions between state interests and the needs and priorities identified by poor water users.

Finally, Chapter Six contrasts the almost entirely non-monetized water scenario in Mahesana, and the large-scale state intervention in Chapter Five, with a look at the complex economy of small-scale water vending in Weavers’ Colony, a peri-urban community in Bengaluru (formerly Bangalore). Although widely documented in other contexts, water vending has so far been understudied in the literature on urban India. This chapter helps to remedy that lack, and explores whether the commodification of water and water-related labour has mostly beneficial or negative effects in a low-income area unserved by municipal

infrastructure. The chapter concludes with observations on spatial and material constraints to market-based water distribution and directions for further research on this topic.

In Chapter Seven, I examine the perspectives offered by each research project with regard to answering the research questions elaborated in Chapter Two, as well as what can be learned about equitable and sustainable urban water provision by reading these three studies together. Building on the conclusions of each chapter, I highlight shortcomings in contemporary thinking on water policy in India and describe potential policy interventions that would capitalize on the most successful strategies employed by residents and water vendors. Finally, I discuss what remains to be studied, and what the case studies in this dissertation contribute to emerging theory on urban water systems in the Indian subcontinent.

Although the people I interviewed for this study work hard and employ endless creativity to provide for themselves and their families, my hopes that they would demonstrate easily scalable examples of sustainable water provision solutions went largely unrealized. Instead, what I found confirmed that where water is seen as a scarce commodity and purchasing power is highly unequal, water sources are over-exploited, access is conditional on both the whim of powerful patrons and the unrewarded work of women, and state initiatives to rectify the shortage are politically motivated and based on poor analyses of the problem. By developing a better understanding of the flaws in the present situation and the ways in which people navigate them, I nonetheless hope that I have been able to illuminate some directions for action that will be sustainable, as well as areas requiring further research in order to develop more equitable approaches to water distribution in the long term.

II. Approach and Methodology

> I generally find issues of poverty, opportunity, and global development to be over-theorized and under-reported. And it seemed to me that in India, as in the U.S., some of the experts most ready to describe how lower-income people are faring weren't spending much time with those people.
> (Boo n.d.)

In order to lay the groundwork for the chapters which will follow, I will first present the methodological approach taken in this dissertation. The chapter begins by introducing the challenges of writing on water and then some key insights from the political ecology and science and technology studies (STS) literatures. This theoretical framework is followed by a discussion of the gaps and directions for research identified by scholars working on the topic of urban water in India, which contributes to the choice of methodological approach described in the following section, which itself in turn drives the selection of case studies and the methods used, both described in the chapter's concluding pages.

1 Theorizing Water Infrastructure

Water is at once an environmental resource, an economic and a public good, a material flow, and a socially- and culturally-significant necessity of life. Its distribution and movement is governed by hydrology and environmental cycles as well as by economic and political considerations, social forces, and its own physical and material properties. While this complexity is part of what makes water an interesting site of research, it also means that studying flows of water—particularly in urban areas, which have their own complexities to contend with—requires a conceptual framework capable of integrating these multiple factors and their intersections in a meaningful way. One approach to the study of urban environmental flows, including water, can be found in the field of urban political ecology.

1.1 Political Ecology

Urban political ecologists build upon the work of critical urban theory, while maintaining an emphasis on the importance of ecological factors to all aspects of urban life (Brenner 2009; Keil 2005; Swyngedouw and Heynen 2003; Zimmer 2010). Breaking down the nearly-axiomatic division between nature and culture, urban political ecology (UPE) recognizes that the urban environment is simultaneously produced by both environmental and socio-political processes in a mutually constitutive, or dialectical, process. Thus while engineers or economists may treat water distribution as a purely technical question, for urban political ecologists "interventions in the organization of the hydrological cycle are always political in character" (Swyngedouw 2009, 57).

Political ecology work on water uses the framework of a "waterscape" (Swyngedouw 1999; see also Karpouzoglou and Vij 2017) to capture the complexity of the terrain at the junction of the physical and the social.[2] Mehta and Karpouzoglou (2015, 160) further describe waterscapes as the "intertwined dialectics of the material and non-material, shaping access and distribution to water." These non-material forces include flows of capital and political influence, policy, rhetoric, and the asymmetrical power relations shaping the social landscape of a city, while the material forces in a (peri-)urban environment are both human-made and ecological. Research on these topics therefore requires positioning the subject of study in relation to flows of capital and power, physical and political geographies, as well as social relations and the physical-chemical-ecological forces that direct flows of water outside of human intervention.[3] Swyngedouw (1996, 70) uses the term "socio-nature" to describe the hybrid or cyborg-like quality of this environment, noting that "the 'world' is a historical-geographical process of perpetual metabolism in which 'social' and 'natural' processes combine in an historical-geographical 'production process of socio-nature,' whose outcome

2 I have opted to use the waterscape framework (instead of regime, network, or other applicable concepts) in order to capture the way in which flows of water—while shaped by various actors and forces—are experienced by users as part of the social and physical geography which surrounds them, and contact between actors impacting water flows is often buffered by time and space.

3 Wachsmuth (2012) makes the important distinction between political ecology's engagement with actual metabolic flows as a topic of study and earlier use of metabolic flows as a metaphor for urban systems.

(historical nature) embodies chemical, physical, social, economic, political and cultural processes in highly contradictory but inseparable manners."

An essential element of a political ecology framework is therefore the understanding that experiences of "socio-nature" are dependent on one's place in relation to axes of oppression or social exclusion. Where traditional political ecology (urban or otherwise) privileges class as an analytical lens, the emerging field of feminist political ecology (FPE) takes gender and embodiment as particular sites of study. Given the fact that both material practices and discursive connotations pertaining to water are often gendered, and almost always connected to the body, water is a rich topic for feminist political ecological inquiry (Buechler and Hanson 2015). For example, Truelove (2011, 146) explains that the gendered impacts of water collection practices range from "effects of unequal labour … and illnesses associated with [contamination], to the gendering of particular bodies and spaces" as the material and non-material engage in a dialectical process of meaning-making. At the same time, feminist political ecology has followed other strands of feminist research which recognize that feminism need not confine its analysis of power and embodiment to gender alone, but in fact must contend with questions of class, caste, dis/ability, race, and indigeneity (Braun 2015; Hayman 2015). As a result, feminist political ecology overlaps with other frameworks such as environmental justice (Bullard 1994) and intersectionality (Crenshaw 1991).[4]

1.2 Technology Studies

While political ecology is particularly interested in the way that socio-political and physical-environmental factors affect each other and shape experiences of socio-nature, the field of science and technology studies (STS) has tended to look at ways in which material technologies of water distribution (infrastructures) serve political purposes. Emerging from

4 The framework of environmental justice was developed in the US to describe how socially and economically marginalized people—especially people of colour, in the US context—are disproportionately exposed to environmental hazards. The core concept of intersectionality is that the issues facing people who experience marginalization or oppression on multiple fronts are qualitatively and quantitatively different from those of people who experience only one of those forms of oppression. E.g. the experiences or needs of a poor woman cannot be extrapolated from those of a middle-class woman and a poor man.

the study of engineering and the history of science, science and technology studies recognizes technology—of which infrastructure is a type—as both being shaped by social forces and in turn structuring social and political realities (Pinch and Bijker 1984; Winner 1978). Thus, for Winner (1978, 323), "politics becomes an active encounter with the specific forms and processes contained in technology."

One of the major contributions of STS in recent decades has been the development of Actor-Network Theory, an effort to explain how science and technology impact the world by manufacturing order (Latour 1987, 2005). Actor-Network Theory is best understood as a methodological approach which describes material-semiotic networks (*réseaux*) of human and non-human actants in order to understand the structuring of society. Although Actor-Network theory has spread beyond STS, Latour's work can be considered among the most influential contributions in STS (Martin, Nightingale, and Yegros-Yegros 2012). STS has also experienced its own feminist—and increasingly postcolonial feminist—turn, which engages with questions of gendered subjectivities in science and engineering, the role of science in 'making' gender, and more fundamentally with unmaking the boundaries between the human and un-human (Bauchspies and Bellacasa 2009; Haraway 1988, 2013; S. Harding 2009; Schnabel 2014). Although the two fields of political ecology and technology studies emerge from distinct disciplines and have followed different trajectories, in recent years there have been increasing calls for synthesis between them, recognizing the related nature of the questions they raise and the approaches they have developed (Monstadt 2009).

In her study of water in Tijuana, Mexico, Meehan (2014) characterizes water infrastructure as a "tool" and a "wellspring" of state power. She urges geographers to go beyond thinking about infrastructure as the "material manifestation of socio-ecological processes and power relations" to integrate an object-oriented epistemology (Meehan 2014, 223). What this means is acknowledging that an object's capacity for effect is inherent to itself, rather than to its user. Objects such as infrastructure are thus both "tools" and "brokers" of power, not just embodying state power but playing an active role in its

reproduction and contestation. Meehan further notes that water is not only channelled by other objects but can be seen as an object itself, suggesting a two-level research agenda that looks at both water and the infrastructure that contains and transports it as "power-full" objects (see also Bakker 2010).[5]

Likewise, Gopakumar (2014) uses a synthesis of political ecology and STS concepts to analyze water supply partnerships in Bengaluru, Karnataka. He builds on Bakker's (2003b) description of the multiple and fragmented sites of water provision in Southern cities as "archipelagos", suggesting that while these spaces of formal water service can be seen as relatively stable Large Technological Systems—LTS, designating an integrated system of technology and policy (Hughes 1987)—the "tendrils" of informal water provision that surround and penetrate them are best understood as experimental and contingent. As the state attempts to integrate these 'tendrils' into the formal water utility through the use of partnerships, it is constrained by the nature of the existing LTS: the combative and self-reliant socio-technological history of these informal areas resists easy integration into the desired "good consumer" norms and frameworks of the water utility. Understanding technological systems as shaped by—and shaping—the social groups who use them adds another dimension to our understanding of the politics of urban service provision, similarly to Meehan's (2014) call for the recognition of objects' role in power-brokering.

1.3 Water Poverty, Scarcity, And Insecurity

In addition to the question of how to contend with the multiple dimensions of water flows, the nature—and naming—of water shortages is a much-debated topic. Several approaches to understanding water shortages have emerged, theorizing and classifying stress and scarcity in different ways. While "water poverty" is emerging as a popular term in the development literature, with attempts to formalize a "water poverty indicator" (e.g. Cullis and Regan 2004; Sullivan et al. 2003), water scarcity, water stress, and water (in)security are

5 Compare this with the focus by Swyngedouw (2009) and other political ecologists on infrastructure as a *product* of political decisions.

also in common usage elsewhere. This section provides a quick overview of these key terms and approaches.

While the term "water scarcity" is often used (Graham, Desai, and McFarlane 2013; N. Mehta 2012a; Sultana 2011), it is not clearly defined. Zérah (1998, 286) distinguishes between "water resource scarcity" and the scarcity experienced by residents due to mismanagement, while Biswas-Tortajada (2014) refers to "absolute" and "relative" scarcity. As defined by Falkenmark et al. (1989) in what is known as the Falkenmark Index, the terms "water scarcity" and "water stress" typically refer to physical scarcity due to drought, aridity or over-exploitation. They are applied to larger jurisdictions—regions or countries—rather than households, and indicate certain levels of habitability and conduciveness to plant growth. Despite the apparent straightforwardness of the term, its ambiguity poses problems for the researcher, such as the risk of conflating individual deprivation due to socio-political factors with hydrological scarcity.

In their commentary on the challenges of developing a water poverty indicator, Molle and Mollinga (2003) identify five types of water use—to meet (1) drinking, (2) domestic, (3) food security, (4) economic, and (5) environmental needs—and five types of constraints—(1) physical, (2) economic, (3) managerial, (4) institutional, and (5) political. Combined, these lead to 25 distinct classifications of scarcity such as, for example, the economic scarcity of drinking water (U_1S_2) when a poor household cannot afford to pay for it, or managerial scarcity of water for food security (U_3S_3) when irrigation infrastructure is ill-maintained. Molle and Mollinga argue that collapsing all of these cases into a single indicator erases vital distinctions, and that focusing on how water poor a community or country is—as opposed to examining the reasons why it has come to be that way—provides an impetus for poorly-targeted action rather than well-rooted analysis (see also Rijsberman 2006). Applied more narrowly, however, water poverty may still be a useful concept. Allen et al. (2006b, 343) use the term to draw links between water scarcity and poverty, describing the peri-urban water poor as lacking "sufficient water and adequate sanitation facilities to meet their needs [and]

almost invariably forced to spend a significant proportion of their income on water." They point to geographical distance between a household and a water point; the number of people sharing a source; and the regularity, sufficiency, affordability, quality, and safety of the water as factors shaping water poverty. Water poverty is thus not limited to a lack of water, but includes water-related hardship and the extent to which obtaining water has a negative impact on quality of life.

More recently, Cook and Bakker (2012) point to the rise of water security as a concept in many fields, used with a variety of meanings. While the term emerged in conflict and disaster literature as a parallel to other types of security, the authors suggest that the growing popularity of the term outside of crisis situations parallels a global re-conception of responsibility for water access and supply: a move from supply- to demand-side approaches to understanding water provision and the associated reforms away from centralized provision and toward greater local or community participation. One of the more useful definitions of water security for the social sciences is "access to sufficient safe and affordable water to satisfy [one's] needs for drinking, washing, and livelihood" (Cook and Bakker 2012, 97) although Rijsberman (2006) notes that household water use is only a small part of a society's larger water security or insecurity, and as we shall see what constitutes "access" is a highly contested issue. The concept of water security is also concerned with water-related hazards, including flooding and the water needed for ecological or environmental functions. Water insecurity may therefore be a concept better suited to describing a quantitative issue (which may or may not be geographically wide-spread), while water poverty describes a more holistic appreciation of a household's water circumstances.

Given these contested and multiple definitions, I find it useful to define the terms used in this dissertation with greater clarity. Although the term "scarcity" was used by my interview participants in a variety of ways, where I use *water scarcity*, I am refering to resource scarcity at the scale of a city or larger region, whether natural, caused by over-exploitation, or imposed by administrative or political decisions. For households and neighbourhoods, I use

water insecurity to describe uncertain, precarious or excessively limited water supply and *water poverty* to describe the larger condition of economic hardship, health risks, and social exclusion linked to poor water access. These three concepts can be understood as causally related: water scarcity can be a cause of water insecurity, which can be one factor of water poverty.

2 Methodological Approach

2.1 Gaps Identified In The Literature

Several scholars working on water insecurity in India have pointed to the need for more research that documents the experiences and expressed needs of water poor people living in urban and peri-urban areas (Bapat and Agarwal 2003; Boo 2012; L. Mehta and Karpouzoglou 2015; Rakodi 2000). These authors point to the prevalence of policy-making that relies on the quantitative measurement of service levels rather than qualitative understandings of the daily challenges and preferences of residents with inadequate water access. While the amount of qualitative research on water inequality in India has grown significantly since the early 2000s, much of it seeks to situate water inequality within local and global political trends and is not necessarily oriented toward policy or other service provision interventions, or is not centred on the voices of under-served residents. There therefore remains an unfulfilled need for research that not only diagnoses the factors leading to unequal water distribution but also explores potential solutions based in the experiences of water poor residents of Indian cities, particularly beyond the country's major metropolises.

The identification of this gap in the literature aligns with calls from feminist geographers to deconstruct the idea of a singular "community" delineated along class or geographical lines, particularly the assumption that all people within a community receive the same level of service or experience water poverty in the same way (Bakker 2008; O'Reilly 2010; Truelove 2011). While research on urban water inequality in India has given a fair amount of attention to the exclusion of entire areas based on income, religion, or caste, and the unequal

burden faced by women within under-served areas, the importance of other intra-community divisions in shaping any given household's water access remains a neglected topic of study. At the same time, it is important to address such inequalities holistically and avoid a myopic focus that situates the problem of marginalization within the marginalized person. For example, much writing on women and water has sought to address women's water burdens without including men (and specifically men's reluctance to take up domestic chores even in the face of women's increasing participation in wage work) an approach that "tends to feminize responsibility in ways that burden women even more, sideline men further and neglect 'strategic gender interests' in favour of 'practical gender needs'" (Chant 2013, 23; see also O'Reilly 2010). In other words, treating unequal water burdens as a "women's issue"—rather than a gender inequality issue—leads to stopgap solutions that may alleviate women's burdens in this one area but do not challenge restrictive gender roles, and may even reinforce them by taking them for granted.

A third gap in the literature on water in urban India is created by the over-representation of Bengaluru, Chennai, Delhi, Mumbai, and Pune in studies on the topic. Echoing Robinson's (2002) call for research and theory-building from "ordinary" cities, there has been a recent push for greater recognition of small and medium-sized cities in the development literature (Annez and Linn 2010; Denis, Mukhopadhyay, and Zérah 2012; Satterthwaite 2006), particularly as the latest Indian census has demonstrated significant growth in these brackets (A. Kundu 2011b). For Véron (2010), the issues faced by these cities are not just due to neglect. Instead, he argues that small developing cities face a "triple challenge": they experience both (1) harms due to development (including resource overuse and pollution), and (2) harms due to underdevelopment (lack of infrastructure or underemployment) while (3) having disproportionately fewer financial and human resources to deal with either set of problems. With this in mind, Véron indicates that the environmental concerns of small cities tend to align with the so-called "brown" agenda—which is focused on pollution and other local concerns—while India's state and national-level environmental discourse favours the "green" agenda, including such issues as conservation and climate

change (see also the discussion of class-based focuses on the ‘green’ or ‘brown’ agendas in Truelove and Mawdsley 2011). With their different aims, fewer resources, and less-developed NGO sector, small cities are likely experiencing neoliberalism and urban reforms quite differently from larger ones. Along with Denis, Mukhopadhyay, and Zérah (2012), Véron (2010) calls on urban scholars to employ fieldwork-based case studies to urgently capture the unique circumstances of India's varied small cities.

Not only is rural-urban migration and natural population increase expanding the populations of existing cities in India, though perhaps less frenetically than in previous decades; people appear to be urbanizing 'in place' as large villages turn into small towns or urban sprawl incorporates peri-urban settlements into larger agglomerations (A. Kundu 2011a). Particularly in peri-urban regions, many people are living in conditions that are neither strictly rural or strictly urban, and face different challenges, water sources, and forms of social organization than more-centrally located urban residents (Allen, Dávila, and Hofmann 2006a; Angueletou-Marteau 2010; L. Mehta and Karpouzoglou 2015; Ranganathan 2014b). Meanwhile, Shaw (2013) notes both increased inequality and increased private-sector investment in small and medium cities, even as they are neglected by public investment and scholarly research. Together, small cities and peri-urban towns and villages represent some of India’s most rapidly-changing and least-resourced places, where research on sustainable infrastructure provision is critically needed.

2.2 Methodological Principles

In response to these identified gaps in the literature and the approaches to water research outlined above, a few principles can be identified that guide the research in this dissertation. First, given the dire nature of the issue under study, it must contribute to action as well as theory. In other words, the research must be policy-relevant and should be accessible to decision-makers, activists, and other actors. Second, it should centre the voices and experiences of those affected by the issue, responding to the first gap identified in the literature. Given what we know about the uneven coverage of non-metropolitan areas and the

particular hardships faced by poor and otherwise marginalized people, it should focus on these areas and demographics, while creating space for a nuanced understanding of intra-community inequality. This agenda can therefore be described as one of feminist research, not only due to the important gendered component of experiences of water insecurity, but more importantly because of the concern the feminist geography literature has demonstrated for multiple forms of inequality and for the situated nature of knowledge (see, e.g. McDowell 1993; Valentine 2007). Finally, the research must engage with the political, physical, social, and ecological dimensions of the waterscape in order to do justice to the multi-faceted nature of water. We can therefore describe this overall approach as one of policy-relevant feminist political ecology.

Rocheleau (2008) makes several recommendations for making political ecology research useful to policy. She argues that research that serves policy aims typically responds to five criteria (Rocheleau 2008, 718):

1. Multiple methods, objectives, actors and audiences:
   Critical explanation
   Practical analysis and problem-solving
   Testing and framing of policy
2. Integration of social and biophysical analysis of power relations and environment:
   Mixed methods
   Integrated analysis
3. Multi-scale analysis:
   International, national, regional, local, household;
   Policy, practices, effects
4. Empirical observation and data gathering at household and local level
5. Chains of explanation combining structure and agency.

Rocheleau suggests that while political ecology is by nature engaged in some of these objectives—such as the mix of social and biophysical analysis—feminist methods further contribute to this project through their attention to the situated nature of knowledge and the introduction of an additional scale of analysis within the household (see also McDowell 1992).

Expanding on what it means to do feminist urban research that engages with power and material inequality, Parker (2016) makes a case for research that is *partial*, *relational*, *material,* and *intersectional*. She documents conducting participant observation and long-form interviews with participants deliberately chosen to represent a variety of subject positions in order to capture the way their *intersectional* (Crenshaw 1991) positions along various axes of oppression shape their experiences and the opportunities available to them. At the same time, she recognizes that it is not possible to address a limitless number of structural oppression vectors in a single study, and describes the way in which her choice of case study impacted which differences emerged as more significant. Similarly, she argues that feminist urban research must necessarily be *partial* (Haraway 1988; S. G. Harding 1991), challenging the presumed universality of experience that much research on cities falls prey to. This should not, however, prevent feminist urban research from being *material* (Fincher 2007), tracing causes and systems that are reproduced elsewhere and have implications beyond the site of research. Finally, she suggests that *relationality*—highlighting similarities between different scales, times, and places—is a common feature of feminist and urban research that allows for deeper analysis and a better understanding of how systems of power such as capitalism, patriarchy, and heteronormativity pervade urban politics at all levels (Gilmore 2007; Naples 2003).

These recent contributions to the methodological literature suggest a research design based on in-depth case studies at several scales, using methods chosen to draw out and highlight a variety of viewpoints and relationships in each setting. The following section discusses the choice of case studies and explains the methods employed in each case. Detailed discussions of each case can be found in subsequent chapters.

3 Research Objectives And Questions

As we will see in the following chapter, India's urban population is growing rapidly and placing increasing demands on infrastructure and resources. Smaller cities and peri-urban areas, in particular, are feeling the mismatch between this population growth and the ability

of centralized water provision—whether public or private—to meet demand. At the same time, research in metropolitan India demonstrates that people without piped water connections do obtain water through other sources, including local groundwater and surface water sources, water tankers, bottled water vendors, and other informal transactions, some of which are likely to be preferable to others (Zérah 2000; Truelove 2011; Angueletou-Marteau 2010; Bapat and Agarwal 2003). Research elsewhere suggests small water enterprises (SWEs) may be particularly responsive to many of the challenges facing Indian cities, including low cost recovery for utilities and the difficulty of installing permanent infrastructure land without legal tenure (Opryszko et al. 2009).

In this context, my research objectives in this dissertation are threefold: first, to gain a better understanding of the water strategies employed by people in small cities and peri-urban areas of India; second, to examine what possibilities (or obstacles) exist for expanding or replicating these strategies with a view to creating a more universal and sustainable network of coverage; and third, to make a contribution to broader theory building on the role of various actors in providing "public goods" in general—and water in particular—within the context of neoliberalism and a worldwide retreat of the welfare state.

These objectives entail a series of nested research questions, beginning with the question guiding the entirety of the project: *What do current water distribution practices in urban India tell us about how to sustainably and equitably provide water in rapidly changing or highly-informal cities?* This overarching query can be further broken down into research questions looking at each of the major actor types in the water sector, following Bakker's (2003a) graphing of the sector on the axes of public-private control and artisanal-industrial scale (see Figure 1). Leaving aside large-scale private providers (i.e. multinational corporations), the pros and cons of which have been widely debated in the Indian context and elsewhere, this leaves us with actors in three quadrants: *residents* themselves in the top left (artisanal/community), *small-scale water vendors* (artisanal/corporate), and *the state* in the form of public utilities (industrial/community). These actors can be investigated through the

following four questions:

(1) what strategies to access water are employed by residents in rapidly-changing urban contexts (second-tier cities and peri-urban areas)?
(2) what role do small-scale water vendors, 'micro-utilities', and other informal water suppliers play?
(3) how are state decisions made regarding municipal water and how responsive are they to the dynamics identified in questions one and two?
(4) And, given the above, what role(s) should the state and other actors play in order to ensure sustainable and equitable water provision in rapidly changing or highly-informal cities?

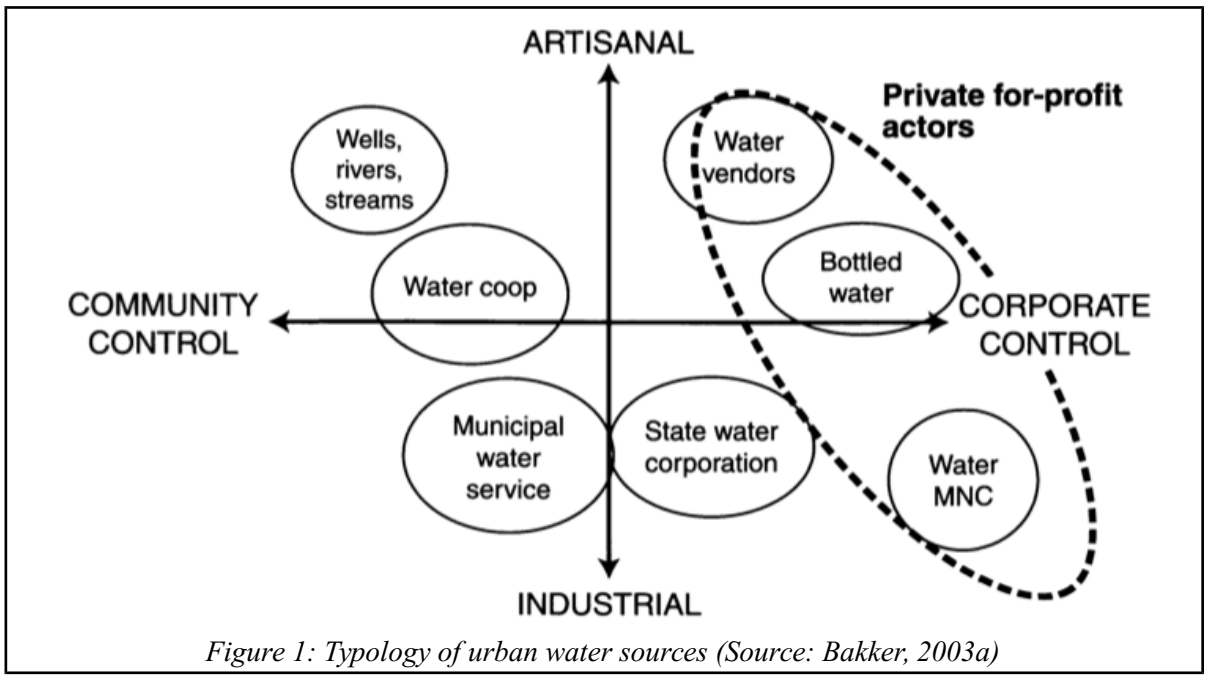


Figure 1: Typology of urban water sources (Source: Bakker, 2003a)

In order to answer these questions I conducted three distinct but interconnected research projects over the course of 2013-2015, the results of which are presented in this dissertation. Here I will briefly introduce each study, and a full description of the methodology and choice of case studies will be given in the following section. The findings from each study—and their implications for the research questions above—will then be discussed in subsequent chapters.

Before embarking on any fieldwork, however, I conducted a thorough review of the

literature on water and sanitation provision in the Indian subcontinent and Indian urban governance reforms. These literature reviews are put into conversation with each other in Chapter Three through the use of three "vignettes" capturing key developments in water infrastructure in the three most-studied Indian cities. Although this study does not directly respond to any one of the research questions, it plays a vital role by documenting some of the solutions that have already been tried and the forces shaping India's fragmented waterscape today.

The first empirical research project, which responds to research question one, investigates the daily water practices of low-income residents in Mahesana, a small city in the Indian state of Gujarat. Through ethnographic fieldwork over the course of several months, I sought to document not only where and how residents without home water connections source water, but also what factors contribute to their choice to use one source rather than another; whether practices and experiences of water insecurity vary within the category of "urban poor" according to such factors as gender, central or peri-urban geographical location, caste, ethnicity or religion, socioeconomic status, age, or ability; and what residents identify as their needs and the priority issues to be resolved.

The second project, also in Gujarat, tracks the state's creation of a massive state-wide drinking water grid over the past fifteen years, examining both the processes by which decisions about water infrastructure have been made and the narratives that have been used to promote these decisions. Drawing on newspaper coverage, independent monitoring, and my own brief interviews with decision-makers, the study examines how successful the grid and related projects have been in providing a sustainable and equitable source of drinking water for the state's urban residents, and to what extent this state enterprise responds to the realities identified in the previous research project, above.

The final research project was developed in response to the discovery that water vending was almost unheard-of among interview participants in Mahesana. Nonetheless, water

Map 1: Research sites in context of major roads and cities

vending was identified by colleagues and key informants as being prevalent across India, and water tanker trucks or bottle delivery vehicles are a common sight in all of the urban areas I visited, Mahesana included. In order to fully address question two, therefore, I interviewed residents and water sellers in a peri-urban community in Bengaluru, Karnataka, where

previous research had found that water vending was widespread (V. Mehta et al. 2013). This last study aims to determine what drives consumer choices between water vendors, how competitive water prices are, whether competition leads to a higher quality of service, and how profitable water vending is for the informal providers themselves.

4 Research Design

The approach outlined above consists of case studies at several scales, each focused on different actors. Given India's federal structure and the differences in governance climate and policy implementation in each state, two states were chosen as complementary case studies (on the differences between water regimes in India's states, see Gopakumar 2011).[6] The two states selected, Gujarat and Karnataka, are often held up as notable for their early adoption of governance and infrastructure reform and their economic growth (Mahadevia 2011). As a result, they make good critical case studies of the development approaches gaining traction in India—and by extension in countries that look to India as an example. While the states of Gujarat and Karnataka occupy somewhat similar positions in India's political economy—or did until the election of a Prime Minister from Gujarat—these two states also have major cultural, political, and hydrological differences, and each case therefore brings out different lessons within this dissertation.

Approaches to case study research in the social sciences vary tremendously; Aandahl (2010) summarizes the typologies identified by key theorists in a table reproduced here as Table One. While case study research often uses multiple cases in order to evaluate how replicable findings are, or a single emblematic case to stand in for a whole, cases can also be treated as intrinsically interesting or revelatory of previously unknown material. In this way a single case (or several) can contribute to knowledge on its (or their) own, and a disciplinary literature that is rich with case studies presents a complex and nuanced body of knowledge

6 My initial plan called for studies of water user experiences in each state and then a comparative study of policy-making in both states, but this proved to be overly ambitious, particularly as my research in Gujarat uncovered the absence of a formal state water policy that could be easily compared to those in Karnataka. The research design presented here therefore represents what emerged as a research agenda after several months in the field in Ahmedabad and Mahesana.

Table 1: Types of cases found in Bryman (2004), Creswell (1998), Flyvbjerg (2003), and Yin (2003). Adapted from Aandahl (2010).

Type of case	Purpose	Listed by
Intrinsic	Of interest in itself	Creswell
Instrumental	Used instrumentally to illustrate a particular issue	Creswell
Extreme/deviant/unique	Studied because of its intrinsic interest	Flyvbjerg, Bryman, Yin
Maximum variation (two or more very different cases)	Give "information about the significance of various circumstances for case process and outcome"	Flyvbjerg (:426)
Critical	Confirm, extend, or challenge a preconceived theory	Flyvbjerg, Bryman, Yin
Paradigmatic	"Develop a metaphor or establish a school for the domain that the case concerns."	Flyvbjerg (:426)
Revelatory	Give information on an issue previously inaccessible to analysis	Bryman, Yin
Exemplifying	Provide a suitable context for answering certain research questions	Bryman
Representative/typical	Gain knowledge about typical or commonplace situations	Yin
Longitudinal	Give information about how things change over time in the same case	Yin

(Flyvbjerg 2006). This is the approach that has been taken in this dissertation, emphasizing depth and richness of description over breadth or representativeness (for a discussion of a similar approach, see Badami and Iyer 2006). This research design is well-suited to the feminist urban research approach outlined above (Parker 2016) as it reveals relationships, motivations, and particularities of experience that might otherwise go unnoticed.

While the choice of cases has been directed by the focus of this dissertation (i.e. non-

metropolitan urban areas in economically-successful, 'reform-oriented' states), I approach each one with the aim of understanding the particular site of study in depth rather than seeing it purely as an exemplar of the larger category it belongs to. At the same time, insights from each case suggest directions for future larger-scale research projects and useful ways of thinking about these issues. These insights are highlighted at the end of each chapter, as well as in the conclusions in Chapter Seven.

Preliminary scoping interviews were conducted with researchers and civil society actors in Delhi, Bengaluru, and Ahmedabad in October 2011 in order to determine topics of interest for further research, the feasibility of my proposed research agenda, and the siting of potential case studies. I was offered institutional affiliation at CEPT University in Ahmedabad (in the Centre for Urban Equity) and at the Indian Institute of Management—Bangalore (in the Centre for Public Policy), which greatly facilitated my research. The city of Mahesana was identified as a fruitful site of inquiry in Gujarat for several reasons: it is a large enough city to face urban challenges yet small enough to be consistently under-studied and ignored by state investment; also, it had recently received funding for water infrastructure reforms from the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) and yet was still experiencing water insecurity in many places. In addition, CEPT researchers could assist me with some introductions and the identification of study areas.

I began nine months of fieldwork in Gujarat in February 2013, which allowed me to witness the parched summer, monsoon, and post-monsoon seasons—each of particular interest to a water researcher. This time allowed me to intensively study Gujarati and improve my Hindi, to engage with students and scholars from around India, and to familiarize myself with the landscape of Indian politics. I followed my time in Gujarat with six weeks of preliminary research in Bengaluru in late 2013, which laid the groundwork for ethnographic fieldwork in peri-urban Bengaluru in January and February 2015. The details of each study are described in brief below.

4.1 Mahesana

The study in Mahesana aimed to answer the first research question: 'what strategies to access water are employed by residents in rapidly-changing contexts' (specifically small cities)? I therefore focused my data collection on low-income areas without reliable, in-home water sources. Two local informants were instrumental in identifying areas for research. The first, to whom I was introduced by scholars at CEPT, was a local resident and employee of an anti-poverty NGO who had worked on a previous research project in low-income areas of Mahesana. The second, unexpected, contributor was a long-time auto-rickshaw driver who was hired to drive the research team around the city. Chosen from among the drivers at the bus stand for his willingness to work long days and familiarity with the entire breadth of Mahesana, he developed a keen interest in the project and was able to suggest several potential research sites based on his knowledge of the city. Finally, interviewed residents in each locality were asked to suggest any similarly water-scarce locations they knew of. Ultimately five distinct areas of Mahesana were identified in which residents were predominantly poor and water insecurity was a major issue. Although this likely does not represent the totality of the city's low-income areas, care was taken to ensure that the areas surveyed did represent both central and peri-urban areas, in order to capture a diversity of experiences.

Data for this study was collected in three ways: through direct observation, household interviews following a standardized questionnaire (see Appendix B), and seven focus group discussions exclusively for women (see Appendix C). The questionnaire was developed based on themes emerging from a review of similar research on water in India (Bapat and Agarwal 2003; N. Mehta 2012b; Truelove 2011; Zérah 2000, 1998) and translated into Gujarati with the help of my Gujarati teacher, Dr Archana Patel. It was pilot tested with five households in Mahesana, after which edits were made for clarity and to better accommodate the types of answers respondents tended to give. Participants were asked about their household composition and income, where and how they collected water, how much water they collected, their preferences between different water sources, how they dealt with water

shortages or bad water, impacts of water collection on women's ability to work, and experiences with collective action and petitions to the government. In order to avoid imposing on respondents' hospitality, questionnaires were administered in the semi-public space in front of respondents' homes. As a result, neighbours and passers-by routinely chimed in, despite instructions that each interview should concern only one household. The discussions that ensued were typically lively and wide-ranging, and were recorded and transcribed to enrich the questionnaire data.

In line with Parker's (2016) recommendations for ensuring the intersectionality of urban research, participants were identified by a modified snowball sampling technique: respondents were asked to suggest individuals or clusters of households within the neighbourhood whose water practices or situation would differ most from their own (e.g. those of a different caste or socioeconomic status). Before participating in the interview process, potential respondents were prescreened by asking whether they had a reliable city-provided home water tap, and residents who answered 'yes' were not surveyed. This pre-screening did not exclude all residents with in-home connections: several residents with informal home water connections ended up being included in the survey and the focus group discussions, either because they considered their connections unreliable, because they were connected informally, or due to the lack of a formal prescreening process of the focus groups. The arrival of a foreign researcher was a significant event in each community: word quickly spread, and at least one curious householder would volunteer to begin the interview process.

The purpose of this study was not to establish a statistically significant or representative sample but rather to document a wide diversity of experiences; as a result, data collection in each area stopped when new households were largely repeating existing information or when no new households agreed to be interviewed. Focus groups were also held later in the year in order to flesh out the findings from the questionnaire. Rakodi (2000) suggests focus group discussions as a particularly appropriate method for collecting qualitative data for water policy research, due to their capacity to bring out shared experiences through an iterative and

collective process. While focus groups had initially been meant to supplement the questionnaire by eliciting comparisons between households using similar water collection strategies and collecting more experiential or narrative responses than the questionnaire format allowed for, in the end the way that respondents engaged with the questionnaire made that purpose of the focus group discussions mostly redundant. A gender gap had been identified with the household surveys, however, as male heads of household typically felt much more comfortable speaking in public than did women, even when women in the household were responsible for most of the water collection. To compensate for that gap, the focus groups were kept as a research tool but altered to include only women.

Each focus group included seven to ten women, who were recruited simply by having a volunteer notify all women in the community of the time and location of the discussion—typically a central common area in the neighbourhood. The focus group discussions were facilitated by a young woman who had experience conducting focus groups in the NGO sector, and concentrated on the themes of gendered divisions of labour, water collection approaches, concerns about water, and collective organizing. While the initial phase of questionnaires and participant observation had been conducted immediately preceding the onset of the monsoon at the hottest and driest point of the summer, the focus group discussions were conducted post-monsoon, therefore offering an opportunity to check how much seasonal variation impacted the water insecurity experienced by respondents and the water sources available to them. Additionally, the difference in what was shared in focus group discussions versus mixed-gender interviews revealed subtleties of gender roles that would not have been apparent in either method alone.

All discussions were conducted in Gujarati, which I only speak at a beginner-intermediate level. I was therefore assisted by translators at each phase of the research: my Gujarati professor, Dr Archana Patel, assisted with the translation of the written questionnaire, while Kalrav Shah (a male university student in Ahmedabad) administered the questionnaires and Tejal Patel (a member of the Centre for Urban Equity staff with several

years' experience in the NGO and social research sectors) facilitated the focus groups. Audio recordings were translated and transcribed by Tulsi Patel and Aarohi Shah, both native Gujarati speakers and recent graduates of English-language universities in North America. The transcribed questionnaire/interviews and focus groups were then coded by hand and analyzed to bring out three types of data: (1) sources of water used, including details of what the process entailed, (2) decision-making between sources (value judgments, frequency of use, etc.), and (3) reported efforts to change the situation, obstacles to change, or feelings about individual or collective action to make change. Coding involved a first reading to identify the types of water source used as well as recurring themes in discussions. Once these reference points were established, I read through the transcribed interviews again looking for where there was agreement or disagreement and highlighting the diversity of experiences with similar water sources, as well as roughly quantifying common versus uncommon sentiments. As much as possible, quotations that emblematized particular concerns or experiences or conveyed the thought processes I saw reflected in the interviews were excerpted and anonymized to include in the chapter.

Finally, where numerical data was available from the questionnaires (i.e. income, household size, and water consumption), that data was extracted and subjected to basic analysis to determine minimum and maximum values as well as means. To determine water consumption values, the volume of typical buckets and other traditional water containers was measured in order to provide an estimated conversion from residents' responses—expressed in terms of whatever vessels they could fill—into litres. Where possible, values were calculated for drinking water, non-drinking uses, and total water consumption. These figures are discussed in Chapter Four.

4.2 Gujarat State

The second project, in answer to question three ('how are state decisions made regarding municipal water and how responsive are they to the dynamics identified in questions one and two?') initially aimed to document and analyze decision-making processes around the state-

level water policy that my scoping interviews had suggested was forthcoming in 2012. However, initial interviews with bureaucrats in 2013 revealed that such a policy had never been adopted or even seriously considered, and instead pointed me to two mega-projects that make up the state's approach to water provision. These are the Narmada Pipeline Project (a state-wide grid which was mostly complete at the time of fieldwork) and the Kalpasar dam, which is still in the planning stage. I opted to focus on the Narmada Pipeline Project, since it is intended to supply drinking water to the majority of Gujarat's population and can be seen as representative of the state's *de facto* water policy. Obtaining interviews with officials proved to be difficult for a number of reasons. For one, past and ongoing controversies over the Narmada dam made officials wary of saying too much, especially to a foreign researcher who lacked the necessary local connections to facilitate introductions. With limited time to divide between two research projects in Gujarat—and between my home base in Ahmedabad and my research sites in Mahesana—I was unable to dedicate a significant amount of time to developing my own relationships of trust within the capital city of Gandhinagar. As a result, I was only able to conduct three interviews with state officials, despite approaching multiple people within each of the five agencies involved in the project.

Although the interviews I was able to conduct provided useful insights into the workings of Gujarat's bureaucracies, they were far from sufficient to trace the decision-making processes that engendered Gujarat's contemporary waterscape. Neither was I able to obtain planning documents, meeting minutes or other primary sources from my contacts within government. Instead, I predominantly relied on a variety of publicly-available reports, promotional material, and secondary sources to understand the project. For news coverage, I conducted a search of the online archives of Ahmedabad editions of the Times of India, Economic Times, DNA India, and the Indian Express for articles containing the terms "Narmada" or "Sardar Sarovar" between January 1st, 2000 and December 31st, 2015. I conducted similar searches of the library catalogues of the CEPT University, the Indian Institute of Management—Bangalore, and McGill University in order to locate published material pertaining to the project. Finally, I used the websites of the relevant state agencies as

primary sources.

The corpus assembled for this study was analyzed in two ways. From an institutional history perspective, it provided facts about the project's development, stated objectives, successes or failures, changes to the project's scope, and sometimes the actors who advocated for or against such changes. From a discourse analysis perspective, the documents were analyzed for what they explicitly stated as rationales for the project as well as what they implied—either by inclusion or by omission—about institutional norms and priorities (Miller 1994; Phillips and Hardy 2002). The process of analysis and theorizing was iterative: a first reading raised initial impressions that guided a search for explanatory frameworks, which were then rejected or confirmed and expanded upon in second and third readings of the source material.

4.3 Weavers' Colony

The final research project was carried out in Weavers' Colony, peri-urban Bengaluru, Karnataka, in January and February of 2015. The choice of a peri-urban location in a different state was intended to provide a broader perspective on the water challenges faced in India's urban and urbanizing areas, and to gauge the applicability of findings from Mahesana to other contexts. Given that the Mahesana study had found extremely limited examples of purchasing and selling water, the location of the Karnataka case study was specifically selected for showcasing multiple types of water vending, as well as for its socioeconomic class and its recent administrative transformation from a self-governed village into an area under the jurisdiction of the metropolitan government. This study therefore extends research question one ('what strategies to access water are employed by residents in rapidly-changing urban contexts?') to peri-urban environments and specifically responds to question two ('what role do small-scale water vendors, "micro-utilities", and other informal water suppliers play?') Once again, the case is not meant to be representative but is rather meant to document the successes and challenges of a variety of approaches to water distribution and acquisition.

The site in Karnataka had been surveyed for a previous study of water use (V. K. Mehta et al. 2014; V. Mehta et al. 2013), which had used census enumeration data to generate a random sample of homes. Although I was unable to access the census data, I was granted permission to use the sampling data from the previous study, allowing me to approach previous respondents and ask if they would be interested in participating in a related study and thus providing a randomly-sampled body of initial participants. These participants were once again asked to identify additional potential participants who differed from them, as well as any water vendors they purchased water from if they felt comfortable doing so. The study ultimately included 67 interviews with residents at home, and nine interviews with water vendors serving the area, either at their homes or places of work. I also interviewed three officials within various levels of the municipal utility, and further requested interviews with state and local elected officials or their staff, to which I received no response. As I do not speak Kannada, interviews were conducted by a team of experienced research assistants from the Public and Social Research Centre, Bengaluru, and the recorded interviews transcribed and translated.

Learning from the fact that respondents in Mahesana were at their most informative when not constrained by a strict questionnaire, the interviews in Weavers' Colony were loosely structured around several questions. The transcribed interviews were therefore read twice: first to identify the sources of water used as well as themes and repeated ideas emerging from the interviews, and then to code them according to the identified themes and concerns. Digital content analysis software (Quirkos) was used to rank the prevalence of the various water sources as well as the relative strength of associations between, for example, tenancy status or length of occupancy and experiences of conflict. As in Mahesana, quotations that summed up a theme particularly well were excerpted for inclusion in the chapter (Chapter Six).

Although I visited each of my research sites repeatedly and observed many of these water practices in person, my own experiences as a university-based visiting scholar differed

widely from those of my interview subjects. My role here is to amplify and situate their experiences and knowledges, and I have used anonymized quotes where possible to aid in that goal. Lastly, it is essential to acknowledge the dynamics of power at play when a white, middle-class, Canada-based researcher studies and subsequently represents the experiences of marginalized people in post-colonial India. It would be irresponsible to write on issues of power and marginalization without recognizing that this unequal relationship, and the unspoken assumptions of both interviewees and researchers, are also part of this work. I have attempted to make those assumptions explicit where possible, but the very nature of research across cultural and power divides means that they may not always be visible to the researcher, the reader, or even the participant (Rose 1997).

III. Creating the Contemporary Urban Indian Waterscape

1 Introduction

According to India's latest census, just over 31 per cent of the country's population lived in cities in 2011, up from 28 per cent in 2001 (Census of India 2011b). Existing cities continue to grow through migration and natural increase; however, much of the growth of the last decade occurred through the urbanization of formerly rural areas, including in peri-urban regions (Bhagat 2011). While the national rate of urbanization in India is not high by global standards, urbanization and urban growth are unevenly distributed across the country, concentrated in the South and West of the subcontinent and around the Delhi capital region. Thus even as large swathes of the country remain rural, cities like Bengaluru have grown by nearly 50 per cent in one decade (D. Kundu 2013).

Across India, cities' ability to provide water equitably—or even adequately—across the board is constrained by colonial legacies of segregated planning, rapid and unplanned urban growth, limited access to finance capital, incomplete devolution of power from state to urban local bodies, and hydrological resource limitations (not necessarily in that order). While the 2012 National Sample Survey found that 77 per cent of Indian households classified as urban have a source of water at home, the WHO/UNICEF Joint Monitoring Programme estimate (2009-2015) was that only 54 per cent of urban Indians have a home water connection (National Sample Survey Office 2012; Joint Monitoring Programme 2016). With no official statistics on pressure, timing, or quality, there is no way to tell how many of these households have adequate connections and how many are inadequate or defunct. At the same time, as municipal hydraulic infrastructure is concentrated in the urban core the number of households without a source of water at home is substantially higher in peri-urban areas, especially in areas with lower incomes. Even in areas where water service is available and reliable, round-the-clock water pressure is not provided in any Indian city except in a few

isolated and short-lived pilot projects (see Anand 2011). Instead, residents typically collect water at designated times and store it in sumps, rooftop tanks, or other water vessels until it is needed.

In addition, there is wide variation both within and across cities, with water supply ranging from less than two to sixteen or even twenty hours per day depending on location (National Sample Survey Office 2012). There is also a great deal of variation in urban residents' proximity to a piped water source, the legality or criminalization of their water practices, the reliability and frequency of their water supply, their level of water pressure, and the quality of the water they get (Bapat and Agarwal 2003; Zérah 2000). This fragmented and unequal access is dictated by class, caste, and gender, as well as by ability, age, and legal citizenship or tenancy status (Anand 2012; Bapat and Agarwal 2003; Gandy 2008; Graham, Desai, and McFarlane 2013; N. Mehta 2012b; Ranganathan 2010).

This chapter aims to provide an overview of how this landscape of fragmented water access has come to be, using the stories of three major cities to illustrate prominent themes in planning and policy over the past 150 years that have influenced the present state of water infrastructure in urban India. Following a brief introduction to India's geography and hydrological patterns, I draw on existing studies of water and urbanization in India to describe major points in the evolution of urban water service in Mumbai, Delhi, and Bengaluru: the three metropolitan centres that have been most heavily discussed in the literature on water, sanitation, and urbanization in the Indian context.[7] While the snapshots in this paper are pieced together from studies that each had their own thematic preoccupations and methodologies, these somewhat disparate and incomplete vignettes nonetheless serve to illustrate how common themes are experienced and made material in several different contexts. The penultimate section fleshes out the historical, social, and political themes raised by these cases, delving into issues such as the legacies of colonialism and the elite capture of colonial infrastructure, the rise of neoliberalism and new middle class politics, as well as the

7 Incidentally, these are also India's three largest megacities, boasting metropolitan populations of 18.4 million, 16.3 million, and 8.5 million respectively in 2011 (Census of India 2011).

gendered and caste-based distribution of scarce water resources at infrastructure endpoints.

2 India's Waterscape In Context

The following section illustrates the history and ongoing construction of urban India's fragmented and unequal water and sanitation networks through the experiences of three cities. While the focus is on social and political factors, water is at its core a natural resource, and the political and social context is necessarily shaped by the physical distribution and ecological cycles within which it exists. Let us therefore begin with an overview of India's hydrology.

2.1 Physical Geography

The Indian subcontinent contains a range of climates, topographies, and natural resources, in addition to its cultural diversity. Bisected by the Tropic of Cancer, India's climate is largely tropical: although the mountainous regions in the north experience significant snowfall, they also protect the rest of the subcontinent from colder weather patterns. Since the areas discussed in this dissertation all lie well below the Himalayas, this discussion of the country's water resources and climate will focus on its subtropical and tropical regions. At its most basic, we can divide the country into a northern region whose rivers are largely fed by melting glaciers in the Himalayas, and a southern peninsula whose rivers are essentially rain-fed. The vast majority of the subcontinent's rainfall comes in the form of seasonal monsoons: the Southwest monsoon covering most of India from June to September, and the Northeast monsoon providing rain to the country's eastern coast from October to December. Annual rainfall ranges from less than 20cm in the Thar desert to more than 200 cm in north-eastern and south-western India. What is important is not only the total amount of annual rainfall but its distribution. India's climate can be generally understood as being made up of four seasons: a cool, dry winter from January to March; a scorching summer in April and May with temperatures reaching well over 40°C, growing increasingly humid in June with the approach of the monsoon; the rainy season, or monsoon, which begins in the south in mid-June and ends in the North in early September; and a 'post-

monsoon' period that, in eastern India, brings the Northeast monsoon. For the majority of the country, the year's rainfall therefore comes entirely between June and September, and the water received in this period must be carefully stewarded to last until the following year.

India has historically been a largely rural society, and remains 69 per cent rural today (Census of India 2011b). Precolonial India relied on a wide variety of infrastructure to store and distribute water for irrigation and household consumption, including artificial lakes and tanks, shallow wells and elaborate irrigation systems of canals and floodgates (R. D'Souza 2006; Hardiman 2002). Rivers have also long played an essential role in India's waterscape, reflected by the fact that many of the subcontinent's great rivers are seen as divine beings in Hindu scriptures. Until the industrial revolution reached India in the late 19th century, technological constraints largely limited water consumption to the amount of water that could be captured from rainwater or extracted from shallow, rain-replenished aquifers. The introduction of powerful digging and pumping technology in the 20th century allowed Indians to tap new water resources. Industrialization, the push toward water-intensive cash crop agriculture prompted by the 'Green Revolution', and increasing water consumption in urban areas, have combined to deplete groundwater resources across much of the country. Meanwhile, many traditional rainwater collection techniques in rural areas have been abandoned in favour of using water from dams or borewells, while the rising value of urban real estate has led to widespread paving-over of tanks, ponds, and other urban water-retention features (Agarwal and Narain 1997; Das 2011). Poorly-regulated industry along with India's sanitation crisis have led to the pollution of surface water sources, making many rivers in urban areas unsuitable for drinking or other use. Meanwhile, the country's successful guinea worm eradication programs, which began in the 1950s and 1960s, destroyed or blocked off many open water sources—including ponds, tanks, and step-wells—in which the parasite might be propagated (S Vishwanath, personal communication).

2.2 Policy

Under the Indian constitution water has historically been the purview of state

governments. Nonetheless, the Centre[8] can and does direct state-level policy through financial incentives. National-level policy-making has typically come in the form of funding schemes designed to promote the priorities outlined in the Centre's Five Year Plan; states (or now municipalities) then apply for funding on a project basis. Since 1994, urban water supply has officially been made the responsibility of individual Urban Local Bodies (ULBs; municipal or metropolitan governments), although the Centre continues to play an important role in directing investment. At the same time, despite the devolution of responsibility on paper, state authorities generally maintain control over the funding of smaller ULBs, and many water-related agencies operate at the state level, all of which creates a complicated web of decision-makers for any water infrastructure project. Despite the involvement of larger-scale actors, cities remain a useful unit of analysis as their individual histories and geographies lead to varying trajectories and policy outcomes.

3 A History In Three Vignettes

The following section looks at three cases illustrating the historical and ongoing construction of urban India's fragmented and unequal water and sanitation networks. The selection of three large metropolitan areas reflects the unfortunate bias of the existing literature on water and sanitation in India, which has largely ignored non-metropolitan urban settings. It also reflects a policy environment in which public works have been oriented towards serving the agricultural economy or metropolitan centres of industry and trade, often to the neglect of small and medium cities and peri-urban areas. While Mumbai, Delhi, and Bengaluru all exist in the same national policy context, they have each evolved in response to distinct local pressures and each illustrate varied concerns.

3.1 Mumbai

As a coastal island city, Mumbai faces challenges not only in terms of the distribution of water and sanitation but also in terms of acquiring freshwater in the first place. Although the

8 India is a federal republic, and the division of responsibilities between the Government of India (often called the Centre or Union government) and the governments of 29 states and 7 union territories is outlined in the constitution.

islands that make up the city were occupied and ruled by several successive kingdoms from the third century BCE to the 17th century CE—including the Portuguese who gave the city its former name of Bombay—the establishment of the English East India Company's headquarters in the city in the late 1600s was to have a particularly lasting effect. As British dominion over the area coalesced in the 19th century, the colonial authorities transformed the bay with a massive sea wall and several land reclamation projects that turned the original seven islands into a single landmass and increased the habitable area significantly. This massive investment in civil engineering works was a reflection of Bombay's expanding economic and political importance in British India. At the same time, these developments spurred rapid population growth which led to worsening living conditions and put a strain on already-limited freshwater supplies, particularly during the summer months. A commission was struck in 1845 to examine potential solutions, culminating in the creation of a dam at Vihar, north of the city, and British India's first municipal piped water scheme in 1860. However, as Gandy (2008) notes, in-home taps remained the province of rich households, with poorer sectors of the city depending on public taps for their water. This stratification of service was, of course, not unique to India. In fact, it is only in its continued existence that this two-tiered service is distinguished from similar systems in the European capitals of the time.

As Bombay grew from 300,000 inhabitants in 1820 to two million roughly a century later, multiple successive water projects struggled to keep up with the pace of population growth. There are a multiplicity of factors leading to Mumbai's large number of unserved households, which have all been exacerbated by the speed of the city's growth. At the time of Independence, overcrowding was at record highs and a slum population was emerging, with documents from the time recording conditions of 400-500 people sharing a single tap (Gandy 2008). The city's overcrowding has only grown more extreme since, with the 2011 census identifying over five million slum- and pavement-dwellers in Mumbai: more than two-thirds of the city's population and roughly 40 per cent of the population of the metropolitan area (Census of India 2016; Lewis 2011). Although the census definition of a slum is not solely

based on access to water or other infrastructure, census data indicates that water insecurity is disproportionately common in areas considered slums.[9]

Gandy (2008, 117) describes Mumbai's condition as follows:

> whilst most downtown districts receive water for at least short periods every day there are outlying parts of the city that remain largely unconnected to the city's water distribution network. ... The spatial interstices of the city's water infrastructure form ribbons of extreme deprivation that connect some of the poorest communities in the city. The situation is most acute at the urban fringe in districts such as Bhayandar, Mira Road, and Thane, where rapid growth has not been accompanied by adequate improvements in basic infrastructure.

This picture of deprivation is contrasted with Mumbai's historical and contemporary position as an economic hub for the nation. From the 19th century textile mills to the service-oriented 'global city' of today, Mumbai's economic engines have attracted migration and investment simultaneously. Perhaps because of this history, it has also long been the site of both labour organizing and middle class cosmopolitanism (Fernandes 2004).

In the wake of the closing of much of the city's industry as well as the creation of a program of economic liberalization beginning in the 1990s, Mumbai's class divide is widening, impacting both the political and the physical geography of the city (e.g. through the creation of gated communities, malls, and flyovers separating rich from poor). Gandy (2008) and Bapat and Agarwal (2003) point to the rise of patronage-based politics in parties like the ruling Shiv Sena, which has benefited from under-served communities trading votes for the promise of services. These promises are not always carried out, however, and even when they are, they may be fulfilled through irregular (illegal) connections that are left un-serviced and soon deteriorate (see also Anand 2012). In fact, Gandy (2008) describes growing collusion between criminal elements, the 'water mafia' controlling water tankers that

9 India's census defines slums as "compact area[s] of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities", as well as any areas officially 'notified' as slums by local authorities, who may use different criteria (Primary Census Abstract for Slum, 2011, Office of the Registrar General & Census Commissioner, India).

provide water in under-served areas, and corrupt politicians.

Meanwhile, Fernandes (2004) describes another sort of politics that she sees emerging in an increasingly gentrified Mumbai. This “politics of forgetting”, as she calls it, is exemplified in the widely cited vision of Mumbai as an upcoming Singapore- or Shanghai-style 'global city', and a media and policy discourse in which poor people are ignored or vilified (this is equally true of Delhi: see Bhan 2009; N. Mehta 2012b; Truelove and Mawdsley 2011). The only Mumbai that matters, in this world view, is that of the new, globally engaged middle class that is increasingly characterized by individualism, exclusion, and antagonism toward pro-poor policies. This outlook has combined with a sense of scarcity and a growing emphasis on sectarian politics in a few notable ways. Anand (2012) describes the transformation of Mumbai’s poor Muslims into “abject residents” through the profiling of their neighbourhoods as dangerous and unprofitable, and the ensuing neglect of their municipal water connections. He writes (2012, 489):

> Over the last two decades, Premnagar’s residents have been steadily ‘disconnected’ from formally accessing water via the city’s municipal system. As Ferguson points out, to be disconnected is different from being unconnected (Ferguson, 1999). It is an active process through which subjects are pushed down, or cast out of social and political systems they could once access and claim. … Premnagar’s residents are instead compelled to make surreptitious connections or use ‘dirty water’.

While areas like Premnagar are neglected until they have no choice but to rely on illegal connections, the city’s water shortages are then blamed on these same connections framed as criminal water theft. Bhan (2009, 141) describes a recent cultural shift toward “representations of the poor as economically unviable, environmentally harmful and criminal,” in contrast to the emerging middle-class values of “hygiene, environment, progress and growth-centric government, market participation, planning and order, aesthetics, notions of a ‘world class city’ and leisure.” Taken to its extreme, this contrast is visible in the way that police raids of illegal water pipes are portrayed on newspaper front pages in the same vein as revelations of underground terrorist cells and arms caches (Graham, Desai, and

McFarlane 2013).

The “politics of forgetting” and this new middle class vision of Mumbai are not without their opponents. Poor and working-class residents of metropolitan Mumbai are actively demanding inclusion in water and sanitation systems through a variety of tactics and strategies. From riots and blockades of roads and rail lines in opposition to service cuts (Gandy 2008) to the work of NGOs such as SPARC and Mahila Milan that organize slum-dwellers to build and operate community toilets and demand improved water supply (Bapat and Agarwal 2003; Burra, Patel, and Kerr 2003), such activism has secured significant legal recognition for slum-dwellers. In 2000, an agreement was reached between the municipality and activist groups from poor communities to increase the security of tenure and the level of services available for people who have resided in Mumbai's slums since before 1995 (Gandy 2008). This agreement was subsequently extended to cover residents who can prove their presence before the year 2000, but it still excludes recent migrants as well as those lacking adequate documentation (McFarlane 2013). As McFarlane (2013) notes, the water insecurity experienced by ordinary Mumbaikers cannot be addressed independently from the reality of the city’s overall water scarcity, which in turn is tied to rural and peri-urban over-exploitation of water and, more importantly, to the political decision-making that values the profits generated by a soft-drink bottling plant over the living conditions of poor people.

3.2 Delhi

India’s capital, Delhi, is sometimes described as being made up of seven distinct cities built upon the same site. It has been the capital of various kingdoms and empires for thousands of years, culminating most recently in the medieval Mughal empire, the British Raj, and modern-day India. The Mughal capital of Shahjahanabad, which came to be known as Old Delhi, was an elaborate walled city built alongside the Yamuna river in the 17th century. Although the East India Company had established a base in Old Delhi, after the Indian Rebellion of 1857 Delhi was considered too volatile and the British seat of power was temporarily moved to Calcutta. The British eventually returned to a newly built capital in

Delhi in 1911.

Following the 1857 Rebellion and the 1896 outbreak of the bubonic plague, the colonial plan for New Delhi was to segregate British settlers from the perceived native 'threat'—both in terms of biological contagion and of armed insurrection—and bring modern British city-planning to British India while at the same time displaying the power of the British Raj. Edwin Lutyens' design was a garden city physically separated from Old Delhi by parade grounds, as well as functionally segregated by the hierarchical practices and social norms that governed British India. New Delhi's wide, well-drained arterials were part of a network of improved waterworks and covered sewers modelled on the infrastructure emerging in Britain in the late 19th century (Mann 2007). These improvements stopped, however, before reaching the old city which contained the majority of the native population. Ironically, the construction of New Delhi depended on an influx of temporary labourers unaccounted for in Lutyens' vision, who had to find space for themselves in the unserved parts of the metropolis. Chaplin (2011) notes that Delhi grew from 210,000 in 1901 to 700,000 in 1941, a trend that was to continue throughout the latter half of the century—and to this day. As the old city grew increasingly crowded, it remained unserved by modern infrastructure.

In response to this unmanageable growth, the Delhi Improvement Trust (DIT) was created in 1936 to clear slums and unsanitary housing as well as to resettle the residents into better conditions (Mann 2007). Chaplin (2006, 41) writes that Delhi's middle class in the early part of the 20th century was one of the few that expressed frustration with the unequal distribution of infrastructure that was rampant across India, and “consistently criticised the colonial government for institutionalising such a system that used their taxes to ‘beautify the colonial enclaves while largely neglecting the native city’.” Nonetheless, in the single decade of its operation the DIT mostly constructed middle-class houses in the new suburbs of Daryaganj and Karol Bagh and proposed slum clearances that were never sanctioned due to their lack of provision for resettlement. Ultimately, only approximately 300 relatively wealthy families were able to move out of Old Delhi due to the efforts of the DIT, a number

absurdly far below what would have been needed to keep up with the pressures created by depression-era rural-urban migration in addition to the natural population increase of those already living in the city.

After Independence, in 1957, the work of the DIT was picked up by the Delhi Development Authority (DDA), which was the first of a series of development authorities to be set up across the country. The tasks of the DDA included creating and implementing a master plan for the city (Truelove 2011). Following contemporary planning wisdom, the DDA's first plan aimed to decentralize the metropolis in order to 'decongest' it. Chaplin (2011) argues, however, that the DDA's policy of acquiring peripheral land for future development—ongoing to the present day—has not created more sanitary living conditions, but rather has moved the overcrowding to peripheral areas that are more difficult to serve with centralized infrastructure. Truelove (2011) reports that despite a relatively well-supplied water system, Delhi's water infrastructure is so unreliable that even some elite neighbourhoods get under two hours of running water per day, and less powerful communities receive fewer than that.

Efforts to ameliorate the situation have unfortunately reproduced many problematic patterns. A report of the Expert Group on the Commercialisation of Infrastructure Projects in 1996 (cited in Asthana 2009) found, perhaps unsurprisingly, that the problems affecting Delhi's water system—in their estimation, low cost recovery and high costs of production—could be solved by privatization. The ensuing trend toward greater private sector participation in Delhi's water supply has been met by massive protests locally and—as when the Sonia Vihar project allegedly threatened to privatize water from the sacred Ganges river in the early 2000s—across the country (Asthana 2009; Shiva 2002). In addition to the religious and moral objections to water privatization in general, and to the privatization of the Ganges in particular, the development of a new privately-managed water treatment plant at Sonia Vihar raised serious concerns about the allocation of public funds for private profit as well as the unequal distribution of services. Two provisions of the Sonia Vihar project were

roundly challenged by activists: first, that the contract with French multinational Ondeo Degremont obliged the city of Delhi to guarantee the availability of municipal funds as needed without limits, which led to a seven- to tenfold tariff hike in preparation for the project; and second, that the location of the new water plant ensured the project would largely serve the wealthier suburbs of Delhi rather than those areas where need was greatest (Asthana 2009). A third provision of the Sonia Vihar project, which would have used the water made available by the new plant for a pilot project in providing round-the-clock water service, was eventually halted as a result of public protest; it, too, would have favoured wealthy neighbourhoods at the expense of poor and working-class parts of the city.

The objections to Delhi's proposed water privatization scheme echo similar concerns raised about privatization projects elsewhere in India and globally. In order to make a capital-intensive and minimally profitable sector appealing to private investment, governments often agree to terms that displace risk and losses onto municipal bodies or allow private providers to cherry-pick only profitable areas to operate in (Castro 2008; Coelho, Kamath, and Vijayabaskar 2013; Miraftab 2004). In the discussion of Bengaluru below, we will see how the same logic driving the attempted privatization of Delhi's water system has led to different types of projects in a different setting.

3.3 Bengaluru

Bengaluru, known as the 'Silicon Valley of India', faces many of the same tensions as Mumbai between the ideal of a 'world-class' modern city and the reality of rapid growth and rampant poverty. Bengaluru (formerly Bangalore) is one of the country's fastest-growing cities, with the majority of the city's exponential growth occurring in peri-urban areas (V. Mehta et al. 2013; Ranganathan 2014b). Many of the homes in these areas are middle- and upper-class residences whose development has simply outpaced the legal expansion of the city. These peripheral homes are not connected to the municipal piped water system: location is the foremost determinant of access to the city's fragmented water and sanitation infrastructure, regardless of class. Wealth, social status, and connections do, however, make a

large difference in whether these illegal developments can expect to eventually be regularized, and in the strategies different residents may have recourse to in order to cope with their lack of water connections (Ranganathan 2010).

Located on the Deccan Plateau, Bengaluru is not sited directly on or near any surface water source. Before the British took control of the city in 1791, an elaborate network of lakes, tanks, and canals captured, stored, and distributed rain water and the water disbursed by the seasonal Arkavathi river. The establishment of the British Cantonment in the early 19th century—and subsequently of a railway connection in 1864—increased the city's urban population, while traditional infrastructure maintenance practices were disrupted in the absence of the political structures that had previously sustained them. The political division between the British-governed Cantonment and the old city or *pettah*, which remained nominally under the rule of the Mysore dynasty, exacerbated the pattern of segregated infrastructure construction that characterized city planning in British India.

In 1896, Bengaluru's first piped water scheme brought water from the Arkavathi river into the city, and the reservoir system on the Arkavathi was expanded to increase capacity in 1933. In the 1970s, as the Arkavathi became insufficient, the city turned to the Cauvery River —over 90 km away—for the remainder of its water needs. Following expansions to the Cauvery-based pumping and storage infrastructure in the 1980s, 1990s, and 2000s, the latest expansion (described below) will bring Bengaluru's consumption of river water to the maximum allowed by interstate law (Ranganathan, Kamath, and Baindur 2009). While the city's water utility, the Bangalore Water Supply and Sewerage Board (BWSSB), also supplies roughly 70 million litres per day (MLD) of groundwater from borewells, the demand for water is growing more rapidly than can sustainably be met by the water table without some form of recharge (V. Mehta et al. 2013; Narain 2012). Studies conducted before the latest expansion of the water grid found that the fastest-growing and most populous wards of Bengaluru were receiving almost none of the utility's water (Narain 2012). Across the metropolitan area, the studies revealed that the amount of water sourced from private

borewells and water tankers (which bring water from unknown sources including peri-urban farms or other parts of the water grid) was up to 30 per cent as much as that officially provided by the BWSSB (Narain 2012). Interestingly, however, Mehta et al. (2013) note that while the water table at the city's unserved outer margins is rapidly falling, in the city centre lower reliance on groundwater combined with leakage from water and sewer lines has resulted in a *rising* water table.

In 2002, the municipal government stopped paying BWSSB for the distribution of water through public taps,[10] leading BWSSB to launch initiatives to turn the city's slum-dwellers and non-paying water users into paying customers. Gopakumar (2011) describes the functioning of the BWSSB's Social Development Unit (SDU), tasked with facilitating the interactions between slum-dwellers—through representative NGOs—and BWSSB. In his case study of one slum participating in the program, he finds that the interaction was mutually beneficial. He writes (2011, 93): "[the NGO] and the community depended on the SDU for energizing (hitherto closed) channels for making the BWSSB engineers accountable, while the SDU depended on [the NGO] for a streamlined project implementation". At the same time, the success of this partnership relied heavily on the ability of the SDU to obtain the NGO's trust, the NGO's ability to gain the community's trust, as well as the SDU's ability to affect the functioning of other branches of the BWSSB. My own interviews with BWSSB staff and NGO workers in Bengaluru revealed the head of the SDU to be a well-liked and dynamic woman who was uncommonly well-suited to the role she occupied. It is uncertain whether a similar project implemented by a different person would have been equally successful.

Recently, controversy has arisen over the Greater Bangalore Water and Sanitation Project (GBWASP), an ambitious project to build pumping, storage, and distribution infrastructure to maximize the amount of water sourced from the Cauvery River and to expand service to

10 BWSSB is a not-for-profit/not-for-loss state corporation which operates independently from the municipal government. It is distinct from the state level agencies set up to assist in providing water to rural areas (KRWSSA) and non-Bengaluru urban areas (KUWSDB).

several peripheral areas of greater Bengaluru (Ranganathan, Kamath, and Baindur 2009). The Cauvery River is contested across municipal and state lines; an interstate tribunal has granted the state of Karnataka use-rights to 1,450 MLD of river water, all of which is now claimed by Bengaluru at the expense of villages and towns closer to the river. Like most contemporary reform-oriented infrastructure development projects in India, the GBWASP was planned to be commercially profitable, or 'bankable'. In fact, since the late 1990s the state government in Karnataka—spurred by reduced allocations from the central government to the states; limited municipal capacity to provide infrastructure in-house; and the growing interest of the World Bank, USAID, and the Asian Development Bank in funding these sorts of projects—has pioneered reforms in urban infrastructure planning which are now being echoed across the country (Baindur and Kamath 2009). In 2003, the state adopted an Urban Drinking Water Policy that "argues for full cost pricing of water and the introduction of PSP [private-sector participation] in the longer term, and encourages 'preparatory work' for PSP–such as fostering a culture of commercialization–in the shorter term" (Ranganathan, Kamath, and Baindur 2009, 53).

The funding model of the GBWASP goes beyond the typical reform project, however, in that it has relied not only on bonds, loans, and grants to fund the capital outlay, but also on ‘beneficiary capital contributions’, which were required—with penalties for late payment—from all households in the project area, whether they planned to obtain a water connection or not. Ranganathan, Kamath, and Baindur (2009) suggest that up to 50 per cent of the project cost could be borne directly by residents. Meanwhile, because of the delay between payment and construction, these households are still paying for their daily water costs from water tankers or other informal suppliers on top of the capital contribution. The delay has been significant, with the utility's 2008 plan for service provision sent back to the drawing board in 2013 due to concerns about its feasibility (Deccan Chronicle 2013b). Three factors are responsible for this delay: first, the cost of laying pipe through the chaotic layout of peripheral developments is far greater than planned for; second, the increased allocation of water was quickly used up to meet demand in the core city, leaving little to none for its

intended users; and third, population growth in the periphery has already outstripped what the project had planned for in 2009 (see also V. Mehta et al. 2013). As resources turn out to be too limited for the full project, preference is being given to areas where cost recovery is likely to be higher: richer areas, as well as those where laying pipe is cheaper because they adhere more closely to grid patterns and building codes (Ranganathan, Kamath, and Baindur 2009). Meanwhile, many areas remain in a state of limbo.

Not only is the requirement to make capital contributions to future water while continuing to pay daily coping costs an egregious cost burden on the targeted households, it also sets a precedent for making future grid expansions inaccessible to majority-poor areas for whom this double expense is bound to be prohibitive. Additionally, the practice of beneficiary contributions raises concerns with regard to spatial equity since charging only the new users for capital costs unjustly privileges residents of the core who have inherited infrastructure they will never be charged for. Thus, unequal colonial planning practices have lasting legacies that are reinforced by modern-day infrastructure development mechanisms.

At the same time, the way that any mandate for citizen participation has been interpreted in purely economic terms, with minimal information sharing let alone consultation or democratic accountability, is echoed in Coelho, Kamath and Vijaybaskar's (2011) study on the participation of citizens and stakeholders in infrastructure development and management decisions in Tamil Nadu. They find that the perceived need to 'fast-track' development, couched in terms of assuring India's place in the world economy, has led to consultation and participation processes that bypass ordinary citizens entirely—and especially poor people—instead relying on a rotating cast of close-knit consultants, experts, and NGO representatives to stand in for marginalized communities in closed-door meetings. Concurrent mandates for private-sector involvement mean that it is nearly inevitable that private sector interests are given more of a hearing than community needs. In fact, Baindur (2013, 145) writes (emphasis mine):

> The complicated system of Technical Advisory Group (TAG), Project

> Management Units (PMU), Project Montoring Consultants (PMC) and Independent Review and Monitoring Agency (IRMA) reveal that the private sector has almost completely taken over the entire process of project preparation, design, contract-monitoring, construction management *and even independent review and monitoring*, leaving citizens and elected representatives completely disempowered by the infrastructure development process.

Even in the relatively successful SDU example, we see that interactions between slum-dwellers and BWSSB were mediated first through an NGO and then through SDU. Meanwhile, as part of Bengaluru's growing emphasis on 'e-governance', middle-class citizens can lodge complaints or apply for connections directly from their computer or smartphone (BWSSB 2016).

4 Discussion

4.1 Historical Forces

The legacy of colonial planning is one of the key factors that Chaplin (2011) and Mann (2007) highlight for leading to inadequate sanitation services in contemporary urban India. Two events in India's colonial history, touched upon in the Delhi vignette above, are particularly important for our purposes: the 1857 Rebellion (or Mutiny), which rattled the foundations of British rule in India and led to the collapse of the East India Company, and the Bubonic plague epidemic that swept across India from 1896 to 1921, killing roughly 10 million people. Together, these events were used by the Crown, which took over from the East India Company, to justify the widespread development of segregated cities in British India and the creation of independent 'improvement trusts' intended to bring the best of British town planning—especially with regard to sanitation and public health—to the colonies.

In 1863, the Royal Commission on the Sanitary State of the Army in India, established in response to the Mutiny, ordered the application of new British sanitation standards—wide streets, piped water, and sewers—across British Indian settlements in order to improve the

effectiveness of British troops who were plagued by illness. Military cantonments and Civil Lines (British civilian quarters) were built according to these principles, with cities sharply segregated into 'indigenous' and 'European' sections to protect European residents from the perceived dual threats of insurgency and contagion (Mann 2007). Wide open spaces such as parade grounds were often used to separate the native areas—which often did become overcrowded and disease-prone, though not by choice—from the British developments, and these physical distinctions have largely remained in cities today.

Slum demolition was another tool used both to military ends—as in the case of large areas of Lucknow that were destroyed to ostensibly protect the British Raj—and in the name of new (sanitary) development and beautification. Following British planning practices in the early 20th century, the challenges of urban poverty were dealt with by clearing tenements and redeveloping impoverished areas, improving service provision but typically gentrifying the populations in the process. Although in principle resettlement of affected populations was to be part of the planning, Chaplin (2011) and Fernandes (2004) note that this facet was largely ignored both by colonial improvement trusts and, later, by the post-Independence development authorities that succeeded them. Thus schemes to improve poor areas in fact worsened urban poverty by forcing poor people out of their homes and into ever more crowded and under-served slums. As the reach of service infrastructure expanded, it did not necessarily span across social strata.

Despite the importance to colonial authorities of keeping British troops healthy and Indian cities manageable, few resources were available for urban improvement and infrastructure. Two factors were responsible for this state of affairs: first, urban improvement beyond a very limited point was not a profitable endeavour for the British government, for which the colonies were primarily profit-making ventures; and second, taxes were increasingly becoming a contentious issue between the British rulers and the Indian population, and it was politically risky to raise taxes too high for public works which primarily benefited the British settlements (Gandy 2008).

Things did not change much when municipal governments were nationalized in 1919 after the Montagu-Chelmsford reforms.[11] For Viceroy Ripon (1882, quoted in Chaplin 2011, 35) municipal self-government was primarily "an instrument of political and popular education" for the Western-educated Indian middle classes. In line with this view of municipal government as a civilizing pass-time rather than an institution of governance, municipal governments were chronically underfunded and lacked both independence and support. City improvement trusts continued to be operated by colonial authorities, although the responsibility for maintaining the infrastructure they built fell to these underfunded municipal governments. This pattern of separation of responsibilities continues to be a toxic element of Indian urban governance today.

Even if local government had retained control of the improvement trusts, these governments still predominantly served a small elite, though a larger one than before the 1919 reforms. In Kanpur, for example, enfranchised residents made up roughly eight per cent of the population (Chaplin 2011). Thus, the interests of the upper and upper-middle classes dominated municipal government, with tax reduction and the imposition of licensing fees on hawkers and 'encroachers' ranking high on the agenda. In Delhi and elsewhere, the 1920s and 1930s were marked by rural-urban migration due to rural depression. With the national urban population growing 30 per cent over the course of the 1930s, significant investment in infrastructure would have been necessary to keep up with the population growth, let alone improve the state of coverage. Meanwhile those excluded from services had little political recourse, as the ratepayers—the only people with access to most municipal services—were also the only residents to have voting rights. Finally, Chaplin (1999) argues that the independence struggle understandably drew strong politicians away from urban issues and to the national stage, leaving few local champions for the urban improvements that were needed in the pre-Independence era, and the lack of which has left legacies into the present-day.

11 These reforms, inscribed in the Government of India Act 1919, included an expansion of the franchise and the handing over of a significant number of responsibilities to elected or semi-elected bodies. In part, this included replacing appointed governors of urban areas with elected bodies.

Independence did not immediately free up resources for urban infrastructure development. In fact, the first few Five Year Plans show a disproportionate rural bias (Shaw 1996). Furthermore, despite the constitutional responsibility of state governments to take on urban development, it has been primarily the national Ministry of Urban Development and the Planning Commission that have directed urban policy. As described above, the Centre's Five Year Plans set priorities for the country's development, with national schemes providing funding to states for projects in line with those priorities. Although urban governance in India changed little from Independence to the mid-1990s, economic factors have shaped both urban poverty and the way infrastructure development has occurred. An emphasis on industrialization in the 1950s and 1960s, driven by the development theory of the time, directed urban investment toward a few metropolitan areas seen as potential economic drivers (Chakravorty 1996).

The fifth Five Year Plan (1974-78) was the first to name the improvement of urban services as an objective, though it was significantly underfunded (Chaplin 2011). Funding increased in the following decade, but remained less than adequate to keep up with urban population growth, which has hovered between 30 per cent and 46 per cent each decade since the 1960s. In response to the unequal development produced by previous policies, the 1970s and early 1980s saw the development of 'urban bias theory', which argued that it was necessary to cut back funding to urban areas and improve rural development in order to staunch the flow of migration. International development agencies acting in India and the various levels of Indian government themselves adopted these strategies (Chaplin 2011). However, other pressures were also at work that made these strategies ineffective. Migration from eastern India and Bangladesh into Delhi and Kolkata, as well as from depressed rural areas into cities around the country, continued to push the national urban population up.

By the mid-1980s, in keeping with the trend toward increasing liberalization of the economy and the economic shift toward service industries, the seventh Five Year Plan (1985-90) directed infrastructure funding toward facilitating service-oriented investment and

development. Notably, it was also at this time that the first attempts to revise the structure of urban governance were introduced, which eventually became part of a project of streamlining and liberalizing infrastructure development. In recent years, although concern with urban infrastructure has become a significantly more important part of Central government's policy since the ninth Five Year Plan (i.e. in the 1990s) in part because of increased economic capacity to deal with it, this spending is ironically coupled with a new focus on private-sector investment and NGO-based service provision (Coelho, Kamath, and Vijayabaskar 2013; Gopakumar 2011).

In 1992, the 74th Amendment to the Indian Constitution, known as the *Nagar Palika* (municipal government) Act, required states to devolve a number of responsibilities to urban local bodies including the responsibility for local water provision (Mahadevia 2011; Shaw 1996). The Act also provides for elected local governments in all towns, cities, and metropolises—some of which had previously been governed by state appointees—and the reservation of seats in these elected governments for women and other traditionally disenfranchised groups. The 73rd Constitutional Amendment established similar provisions for elected village *panchayats* in rural areas.

While the Nagar Palika Act applies to all municipalities, funding for urban development has continued to focus on metropolitan development, beginning with the Mega City Programme (MCP) that was launched in 1993 (Chakravorty 1996). The goal of the MCP was to improve infrastructure in Bengaluru, Chennai, Hyderabad, Kolkata, and Mumbai, cities that were seen as important to regional planning. Non-metropolitan areas were and remain generally ignored, benefiting neither from rural subsidies nor from projects like the MCP (Chakravorty, 1996; Mahadevia, 2006). At the same time, special purpose vehicles and parastatal authorities at the state level (the descendants of the colonial city improvement trusts) often continue to play a more important role than elected municipal bodies (Adarkar 2008; Gopakumar 2011; Mahadevia 2011).

The MCP inaugurated a new funding model in which grants were replaced by a mix of seed money from the centre, loans from financial institutions, and state funds. This approach has been echoed in the 11th Five Year Plan (2007-12)—which determined that INR 540 million (US$9.8 million) was needed to supply universal water coverage in urban areas, but predicted that 60 per cent of that funding would need to come from non-governmental sources—and in the Jawaharlal Nehru National Urban Renewal Mission—launched in 2007 to consolidate and reform infrastructure investment schemes, including the MCP, that had been scattered across several ministries. The Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT), which was added to JNNURM to bring development to non-metropolitan cities, has been widely criticized for providing a disproportionately limited amount of funding compared to that available to larger cities under JNNURM (Kamath and Zachariah 2015; D. Kundu 2014; Raman et al. 2015). Although the scheme that replaced JNNURM in 2015—the Atal Mission for Rejuvenation and Urban Transformation (AMRUT)—is too new to have been fully evaluated, it appears to continue JNNURM's bias toward large, "world-class" infrastructure projects. The concurrent Smart City Mission, which intends to construct 109 "smart" (high-tech) cities around the country, makes abundantly clear where federal priorities lie (Datta 2015b, 2015a; Ministry of Urban Development 2015; Pradhan and Mehrotra 2014).

4.2 Contemporary Political Forces

In addition to the legacies left by historical policies and actions, the present-day water situation in India is shaped by a contemporary political climate that begins with the deregulation of the Indian economy under then-Prime Minister P. V. Narasimha Rao and then-Finance Minister Manmohan Singh (Corbridge and Harriss 2000; R. Mukherji 2008). Scholars point to a number of elements that frame contemporary water politics in India: the liberalization of the economy and the resultant introduction of private-sector and market considerations into infrastructure planning and development, the rise of a new middle class politics and the dominance of the middle class on the political stage, the emergence of individualized patronage politics, and the growth of NGOs and organizations of the urban

poor as well as other advocacy groups.

The liberalization of the Indian economy—begun in the 1970s in response to concerns about inflation and the later balance of payments crisis—reached its full incarnation in the early 1990s with the implementation of the ninth Five Year Plan. The subsequent Indian approach to infrastructure development echoes the priorities of the World Bank and other international financial institutions. For example, the operation of public service infrastructure as a for-profit—or at least not-for-loss—enterprise, accompanied by private-sector participation and what Chaplin (2011, 63) describes as "the 'offloading' of state responsibilities for the provision of basic services onto NGOs, which are seen to be more flexible and able to cope with innovation than state bureaucracies, and closer to the grassroots." In fact, the separation of public services from the responsibilities of the state has been presented as a project of depoliticization, as the world of politics becomes tarnished in the public eye (for more on this, see Chhotray 2007). Hansen (quoted in Fernandes 2004, 2426) explains: "From the 1960s onward, the public construction of politics [in India] has increasingly been transformed towards that of an 'immoral vocation,' a site of unprincipled pragmatism, corruption, nepotism and greed—in brief, as the profane antithesis to the sublime qualities of the cultural realm." The private sector, on the other hand, is portrayed as efficient, accountable (through market pressures), and apolitical.

Consequently, the emphasis in policy-making has shifted towards securing external funding by making municipalities and their infrastructure projects 'credit-worthy', and by bringing in private-sector partners to provide expertise, capital, and to increase efficiency (USAID FIRE-D 2011) However, this emphasis on efficiency and returns-on-investment can lead to the neglect of other considerations, such as equity, and the exploitative contracts often demanded by foreign corporations can obligate municipalities to raise funds beyond what is politically feasible or economically prudent (Asthana 2009; Ranganathan, Kamath, and Baindur 2009). The desire to sanitize the 'messy' world of politics, accompanied by a shift away from redistribution and equity as primary considerations, is also characteristic of the

emergent 'new' middle class (Benjamin 2000; Fernandes 2004; Gandy 2008). This is not a trend unique to India: Harvey (2006) writes that the principal accomplishment of neoliberalism is the restoration of class power. It is therefore unsurprising that we find India's liberalizing policies accompanied by a political discourse that increasingly centres the (upper) middle class.

Although my emphasis is on water, it is relevant to highlight Chaplin's (1999) observation that historical developments in India have permitted India's contemporary middle classes to ignore the issues of sanitation in a way that was not possible for the middle classes of Western Europe when similar issues were raised in the late 19th century. The availability of modern medicine and home filtration systems, as well as the spatial segregation of many Indian cities, have turned water shortages, infrequent supply, and other infrastructure problems into mere inconveniences for India's middle classes rather than life-threatening concerns. As a result, while even the appearance of highly communicable diseases get immediate attention, such as the suspected outbreak of bubonic plague in Surat in 1994[12], endemic diseases of urban poverty—dysentery, diarrhea, and malaria—are politically unpopular to address, as their presence no longer poses a significant threat to the urban elite (Chaplin 1999; Deodhar, Yemul, and Banerjee 1998).

Another aspect that contributes to the middle class capture of the political sector—and of most public infrastructure—has been the weakness and fragmentation of organized labour and class-based movements of the urban poor since the attacks on them during the Emergency of 1975-77 (Gandy 2008; Harriss 2006). With party politics increasingly organized along regional or sectarian lines, there are no obvious avenues for righting historical class-based injustices (Fernandes 2004).[13] Meanwhile, in Fernandes' (2004, 2415) discussion of the discursive shift to a middle class-oriented political culture, she writes that:

12 While cases of bubonic plague were reported and the threat was believed to be real at the time, later analysis revealed that the original cases were almost certainly misdiagnosed (Deodhar et al, 1998).

13 Recent gains through Public Interest Litigation suggest the courts may play a role, although such litigation is still dependent on movement-based organizing (Rajamani, 2007).

“While state socialist ideologies tended to depict workers or rural villagers as the archetypical citizens and objects of development in the early decades in post-colonial India, main-stream national political discourses increasingly depict the middle classes as the representative citizens of liberalising India”. Uneven and market-driven investments in infrastructure are thus justified through the invocation of a model 'consumer-citizen', to use the term preferred by some civil society organizations, who is exemplified by the new middle class—'new' in the sense that their defining character is novel, linked to new possibilities opened up by liberalization, and not necessarily that their socioeconomic status was recently achieved.

The rise of the new middle class, in addition to representing a discursive trend toward a culture of individualism and consumerism, manifests in the growing role of civil society organizations and the marginalization of traditional political processes (Harriss 2006). Civil society activism, generally self-interested or in defence of pet causes, is not only a predominantly middle class pursuit but can in fact be considered constitutive of the middle class identity (Harriss 2006; Mawdsley 2004). Meanwhile, as we have seen, both electoral politics and political movements are increasingly seen as tarnished realms.

The shift from an era of nominal middle class support of pro-poor policies to a growing embrace of individualism is paralleled by the decline of the Congress Party, the emergence of narrower identity-based politics, and the increasing use of the political process to secure public goods for private interests (Chaplin 2011; Fernandes 2004). The national government has increasingly become the site of regional political contestations, with sectarian and caste-based parties making up a significant proportion of most state, and even municipal, polities. At the local levels, the resulting coalition or single-term governments are often uninterested in or incapable of long-term planning for a broader public good. At the same time, India’s powerful federal civil service, the Indian Administrative Service (IAS), is meant to ensure continuity and consistency across the country, independent from local political accountability. In practice, however, state control over officers’ assignments and promotions

means that the most successful bureaucrats follow political priorities closely, while a recent emphasis on engineering qualifications over liberal arts education in IAS recruits means that India is increasingly being governed by technocrats rather than well-rounded civil servants (Mitra 2010; Radin 2007).

4.3 Civil Society And Occupancy Urbanism

In the absence of collectively planned infrastructure development, stop-gap solutions and special favours are often distributed either by parties in pre-election votes-for-services arrangements, or by local politicians using their discretionary funds (Bapat and Agarwal 2003; Ranganathan, Kamath, and Baindur 2009). These allocations may be decided based on caste or religious affiliation, personal relationships, or party support. Their legality and, relatedly, the amount of maintenance available after installation, is variable. Nonetheless, for many social groups—from middle class residents in under-served peri-urban colonies to slum-dwellers for whom votes are a more accessible currency than money—individual arrangements are often more likely to secure basic services than working for systemic change.

Alongside this type of patronage politics, the proliferation of service-provision organizations has been tremendously important in reshaping the relationship between state and citizens. Gandy (2008) highlights the connections between the growth of these NGOs—or service-oriented community-based organizations—and the neoliberal retreat of the state from service provision. This is, again, a trend that is echoed around the world. Though the rationale of social accountability is often used to justify policies giving civil society organizations greater responsibility in infrastructure provision, Gandy urges caution, as their embeddedness in social networks does not make NGOs and CBOs inherently more accountable. In fact, these organizations can both reinforce existing power structures and/or simply fall apart and fail to deliver after circumstances change or when leaders step down (Carolini 2012).

Neighbourhood or community organizing has flourished both in poor neighbourhoods and in middle class ones, often with opposing interests (Mawdsley 2004). Pro-poor advocacy organizations such as the above-mentioned SPARC and Mahila Milan in Mumbai typically rely on funding from INGOs and international donors, and may operate in three different spheres: one-on-one negotiations with local officials and representatives as we saw with the SDU, direct service provision as in the case of SPARC, and political advocacy for larger-scale policy changes (Burra, Patel, and Kerr 2003). Middle class neighbourhood welfare associations (NWAs) similarly engage in all three sorts of activism, though their funding for service provision is more likely to be generated locally through service fees, and the goals of their advocacy may be actively anti-poor (Mawdsley 2004). In fact, Benjamin (2008, 721) points out that middle-class NGOs often actively oppose the type of vote-bank politics that poor communities use to obtain services, pushing "to shift political debate on essential issues of water and enhancing de-facto land tenures into disciplined 'public consultations' where these actions are portrayed as 'illegal interventions' to be policed by 'reform initiatives' and participation by 'legitimate citizens'."

Thus despite the appearance of civil society organizations in both middle class and poor communities, Harriss (2006) argues that civil society is deeply stratified and that organizing plays out differently across class lines. His research shows that poor people in urban India are more likely to turn to collective action to address problems than their counterparts in Brazil, for example, but that this predilection for collective action is not reflected in the creation of organizations. Instead, for poor people in India access to the state is predominantly brokered through political parties or patrons (Edelman and Mitra 2006). Middle class citizens, in contrast, are more likely to approach state institutions directly or through legal action, and to do so individually rather than as a group. For Harriss and others, these dynamics are representative of a dichotomy between 'citizens' and 'denizens' that shapes class dynamics in India. He argues that while middle class Indians can engage in 'citizen participation' efforts through civil society organizations in partnership with the state, the relationship of poor people to the state is largely as 'populations' to be managed. Thus, the political relationship

of poor communities to the state is either combative or supplicant, and generally pursued collectively. Coelho, Kamath, and Vijaybaskar (2013; 2011) point out that the voice of poor people in stakeholder meetings is increasingly represented by middle class consultants and NGO activists, while poor people themselves, and their grassroots organizations, are excluded from such forums. Organizations of the middle class do not face exclusion of the same degree.

It is important to note, however, that successful access to land and public services does not only come through state intervention. Benjamin (2008) argues for an 'occupancy urbanism' that recognizes that the claiming of space—e.g. by inhabiting it—is a political act and an often effective way of obtaining access to public services. He notes (2008, 722) that these acts of claiming space engage a 'lower' level of bureaucracy than that at which real estate deals and planning decisions are made, explaining that North Mumbai settlements on Forest Department land "were supported by lower level party workers and astute middle level municipal bureaucrats. Together this 'system' drew on the resources of a prominent member of parliament to allocate municipal funds to extend individual water and sanitary pipelines—which in effect strengthened their *de-facto* tenure." In fact, he notes that squatters engage in varied and nuanced forms of contestation to establish their right to the city, of which vote-bank politics are an important but not exclusive part.

4.4 Social Forces

Finally, contemporary access to water infrastructure in Indian cities is shaped by social dimensions including attitudes around class, caste, and gender. Even in cases of equal physical accessibility to water sources, people of different castes or genders will have different experiences of access, including disproportionate physical or mental hardship, or limited ability to actually make use of the infrastructure (Bapat and Agarwal, 2003; Truelove, 2011). Thus Truelove (2011) argues that social or socio-spatial inequalities produce differential access to water and sanitation infrastructure, while these same inequalities are simultaneously produced and reproduced by the effects of unequal infrastructure access. With

the dominant narrative scripting water problems as global in nature and given to universal technocratic solutions, it is especially important to not ignore the everyday and interpersonal dimensions of water conflicts, she argues.

The construction of the new middle class discussed above is based on the exclusion or 'forgetting' of lower classes, a process which is both discursive and spatial (Bhan 2009; Chaplin 2011; Fernandes 2004). Fernandes (2004) situates the spatial segregation characteristic of new middle class politics within a history of attacks on the spaces of the urban poor stretching from slum clearances during the State of Emergency declared by Indira Gandhi (1975-77), through the mass deportation of people identified as illegal Bangladeshi immigrants from Delhi's slums and *bastis* under Operation Pushback in 1992, and on to the present-day (see also Ramachandran 2003). Where contemporary exclusion of poor people differs from previous attacks on slums and low-income areas is in the pretense that poor people, or at least the lower middle and working classes, can pull their way up into the ranks of the middle class, leading to contempt for those who are seen as responsible for their own lack of success. Others have argued that urban poverty has been "aestheticized": reduced "to its built environment, one characterized by poverty, filth and fragility … [and] consumed as an image: flat, without history, without structure and emptied of those who live within it" (Bhan 2009, 139–40; see also Benjamin 2000). Thus urban poverty is treated as an inconvenience and an eyesore, rather than a politically and historically-constructed reality for millions of citizens. These outlooks are of course not entirely new, but the increasing weight they carry in the public sphere has implications for the political feasibility of pro-poor policies such as publicly subsidized water and sanitation infrastructure or the regularization of irregular connections.

The aspirations of this new middle class are not unique to India. In their discussion of the urban geographies of 'actual existing neoliberalism' worldwide, Brenner and Theodore (2002, 352) argue that the process of neoliberalisation has "entailed a dramatic intensification of coercive, disciplinary forms of state intervention in order to impose market rule upon all

aspects of social life." Because capitalist expansion and transformation is inherently bound up with the production of space, this intensification manifests in part through the "creative destruction" of urban spaces, resulting in both free enterprise zones and gentrification. As income inequality or conscious class separation increases, numerous scholars have pointed to the growth of gated communities and sanitized arenas of conspicuous consumption as characteristic of neoliberalism (Brenner and Theodore 2002; Harvey 2006; Sassen 1996).

Sassen (1996), however, notes that the creation of "urban glamour zones" is contrasted with the creation of "urban war zones." In other words, cities are becoming not only more gentrified under neoliberal processes, but also more fragmented. In India, these global patterns intersect with historical patterns of caste-based discrimination and ideas of spiritual pollution, as well as anti-Muslim sentiment stoked by Hindu nationalism and the global 'war on terror.' Though little literature exists documenting specifically caste-based discrimination in water access, Gandy (2008, 110) notes that: "In many apartment blocks taps are separated by caste or religion and in times of shortage lower castes are routinely 'shooed away from their taps'." Similarly, the policies and practices of "spatial purification" (Fernandes 2004) that primarily target very poor people are inflected along caste lines because of historical prejudice and the association of lower castes with unclean activities (scavenging, etc.) Harriss (2006) highlights the ongoing and significant overlap between caste background and class identity, noting that caste is still a notable barrier to entry in many middle-class professions, including the archetypal new middle class field of information technology. Anand (2012) points to the fact that Muslim neighbourhoods in Mumbai are provided with a lower level of service than non-Muslim areas of similar economic standing, a fact which aligns with Jaffrelot's (2012) observation that unlike most minority groups in India, who benefit from some form of affirmative action, India's Muslim population has experienced downward social mobility and ghettoisation over the past several decades.

Bhan (2009) describes poor residents of Indian cities as simultaneously hyper-visible and invisible—targeted because of what they are seen to symbolize yet unseen as individuals and

political actors. For example, poor and lower caste people considered to be 'trespassing' in the province of the middle class or using illegal connections are increasingly criminalized, as narratives about water theft are used to explain the substantial water losses experienced in cities instead of grappling with deeper issues of distribution or crumbling infrastructure (Graham, Desai, and McFarlane 2013; Truelove 2011; Truelove and Mawdsley 2011). Such incursions into middle class neighbourhoods are, however, necessary for poor people without water connections who are forced to beg or purchase water from households or businesses with tap connections. The willingness of middle class residents and businesses to 'shoo' poor people away or call the police makes water gathering a dangerous practice for poor people and lower-caste people (Bapat and Agarwal 2003; N. Mehta 2012b). Additionally, the time spent on navigating hostile territory, the burden of fines or criminal charges, and even the potential of physical harm sustained by water seekers contributes to lost income and increased vulnerability and marginalization for the very people who are marginalized to begin with.

These dynamics have disproportionate material impacts on people who are doubly or triply marginalized by a combination of poverty and religion, caste, disability, or especially gender. Although norms differ according to class and culture, women in India are traditionally seen as responsible for securing and controlling the use of household water supplies (O'Reilly 2010). Truelove (2011) notes that not only do women bear the brunt of the physical labour and psychological effects (humiliation, abuse) of gathering water, they are also typically the ones responsible for stretching scarce amounts of water to meet household needs such as washing, cleaning, bathing children, and cooking. Nonexistent or inadequate sanitation facilities also affect women more harshly, as they cannot relieve themselves in the open but must wait for the cover of darkness or use crowded or unsanitary facilities (Bapat and Agarwal 2003). In either case, women venturing out alone often face sexual harassment or abuse. Interviews with women in slums in Mumbai, Pune, and Delhi reveal that women often have to make difficult decisions between paid labour and waiting for water to arrive, whether it is delivered by unreliable pipes or water tankers (Bapat and Agarwal 2003; Zérah

2000). In other cases, women engaged in domestic work put up with unfair labour conditions in order to be able to beg water from employers. In many cases, the effects of limited access to infrastructure are physically harmful: from the heavy labour of seeking and carrying water over long distances, to the deprivation endured to save water for family members or to reduce trips to the latrine, and even sometimes resulting in death for those women fetching water from steep and slippery embankments. These difficulties reduce women's opportunities for advancement, as well as their quality of life and arguably their experiences of citizenship (Holston 1999). Poor women, and other very poor people, are therefore embedded in a vicious cycle of exclusion.

Lastly, the relationship between urban and rural water use is often contentious, though poorly documented (Asthana 2009; Gandy 2008). While the growing demand for water in cities takes water away from surrounding rural areas, contributing to migration pressures, temporary migrant workers in cities are among the least likely to have access to infrastructure (Gandy 2008). Although tribunals are responsible for deciding the distribution of riparian water between states that share a river basin, the division of surface water *within* any state is contingent on political priorities.[14] Groundwater rights, on the other hand, are typically tied to surface land title, and rural landowners' willingness to sell water to urbanites—sometimes at the cost of giving up farming—is another factor shaping the availability and price of urban water.

5 Conclusions

Much of what defines access to water and sanitation infrastructure in urban India today reflects global trends: urban fragmentation, increasing class inequalities, the privatization of space, as well as the growth of civil society and private-sector responsibilities in basic service provision and the focus on the 'bankability' of infrastructure projects rather than their equity impacts. As facets of the neoliberal agenda promoted by the World Bank and other international financial institutions and donor governments, these trends can be dated back to

14 In Karnataka, for example, the entirety of the state's allocation of water from the Cauvery River has been diverted to serve Bengaluru.

the Structural Adjustment Program adopted by India in the 1990s, and have been sustained in large part by the close relationship of the Indian state with international donors and its reliance on foreign capital to sustain economic growth. But global trends are also influenced by the local histories they come into contact with, not least in a post-colonial country such as India.

Colonial policies and practices themselves have left a significant legacy on India's cities, both in terms of physical infrastructure and its distribution and in terms of the administrative systems and planning approaches that remained in place without significant changes until the past two decades. Post-Independence India has by most measures achieved a great deal of change in the past seven decades. Nonetheless, the limitations that Indian cities have inherited have only been exacerbated by uncontrolled urban growth, national and state-level neglect of urban development priorities, and most recently, a fantasy of a "shining" India that sees metropolises as playgrounds for India's upper classes and international business interests at the cost of smaller cities and of the poor.[15] Since Independence, the emphasis on expanding existing grid infrastructure on a cost-recovery basis continues and even entrenches the spatial inequalities introduced by colonial planners.

If citizenship can be defined, in part, as the ability to access and use public space (Holston 1999), in urban India it is qualified by gender, class, and caste, among other factors. These factors have affected historical and contemporary decisions about urban planning, and they continue to shape bodily experiences of the city, the impact of which affect individuals' and communities' chances of success and even survival. The unfair water and sanitation challenges faced by women and girls, and the exclusion of poor people from public space and public narratives, all point to a problem with access to basic services that runs far deeper than the debates on public and private involvement in infrastructure development would suggest.

Since the liberalization of India's economy in the 1990s, the provision of public services

15 "India Shining" was the slogan of a 2004 advertising campaign that portrayed India as a high-tech, prosperous, and globally competitive destination country (see Wyatt 2007).

has become increasingly removed from the domain of politics and mass mobilization even as that sphere becomes seen as tarnished. While public-private partnerships are presented as providing accountability and better services to ‘consumer-citizens’, encounters between low-income residents and water utilities are increasingly mediated through NGOs. Large swathes of the urban landscape are more or less deliberately forgotten as India remakes its image into one of world-class amenities—for the privileged.

The examples described above reveal access to basic infrastructure, opportunities for political engagement, and participation in public life to be intrinsically connected. In response to what Truelove (2011, 147) describes as the "re-establishment of exclusionary citizenship as just and good", it is essential to examine these multiple processes in concert, and to recognize that solutions for improving access to water and sanitation infrastructure must not simply aim to provide more of it—although that is necessary—but also to address the social and political contexts through which it is delivered. With the weight of historical inequalities, social norms, and a rising politics of exclusion to contend with, resolving urban India's fractured access to infrastructure requires more than simply increased funding and technical fixes.

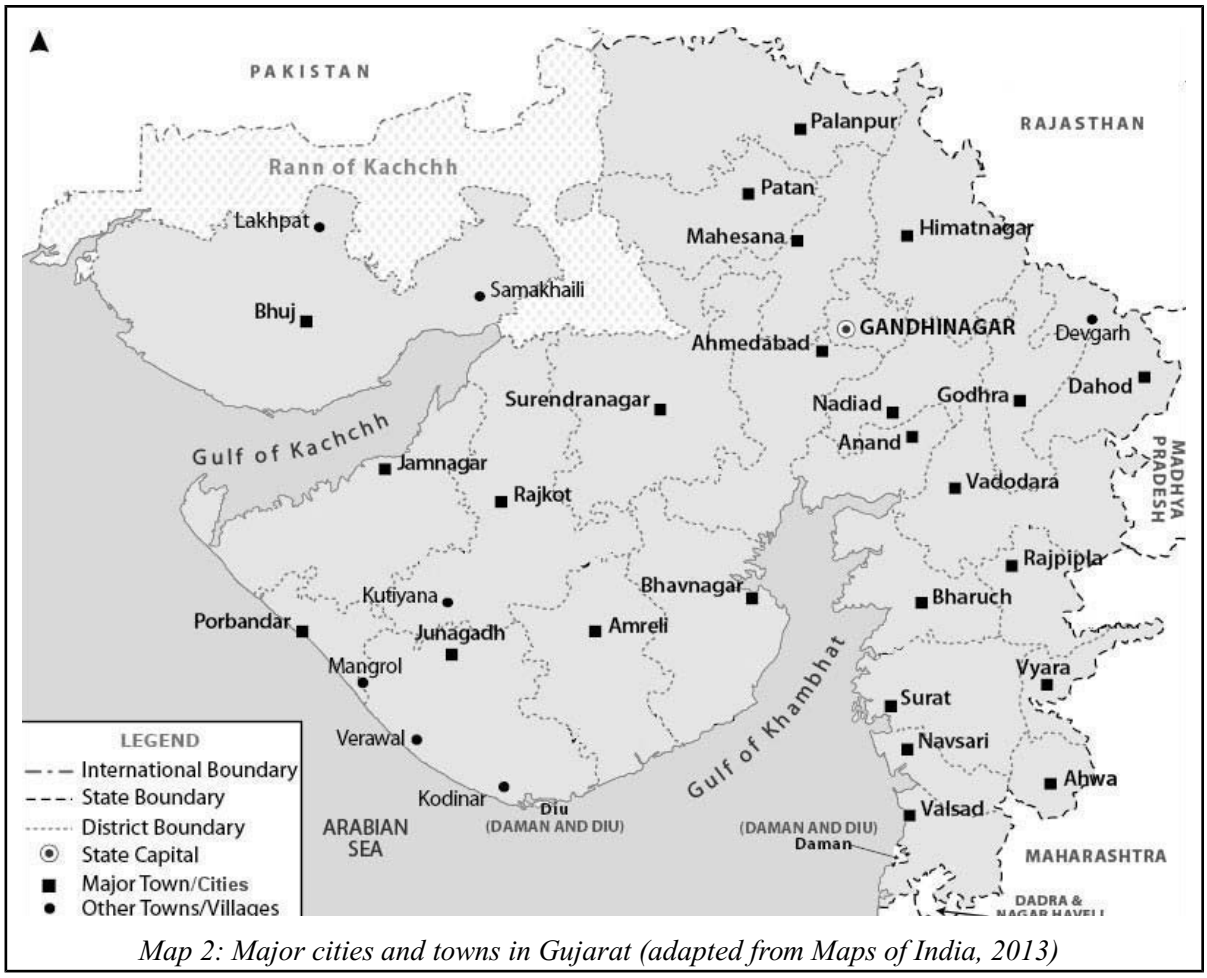
The next three chapters of this dissertation will examine what this fragmented and uneven waterscape looks like from the ground, particularly in the neglected contexts of smaller cities and peri-urban areas. While this kind of close-up look at just a few communities’ water access is an essential addition to scholarly work on the topic, it is also important to understand it in context. Mahesana’s limited infrastructure and bureaucratic capacity, discussed in Chapter Four, must be understood in the context of historic and present-day neglect of smaller cities, while the exclusion of Weavers’ Colony from municipal supply, discussed in Chapter Six, exists in relation to Bengaluru’s historically segregated infrastructure and the various schemes that have been since deployed to expand it. This overview of the development of India’s waterscape, though necessarily brief and incomplete, is therefore critical to understanding the work presented in the rest of this volume.

IV. Urban Water Poverty in Mahesana

1 Introduction

More than ten years ago, Meera Bapat and Indu Agarwal's "Our Needs, Our Priorities" (2003) first presented the water- and sanitation-related experiences of residents of Indian slums in their own words in an academic journal. Today, it remains one of only a handful of scholarly works on India's urban water challenges to discuss the qualitative day-to-day experience of being a poor or low-income water user, alongside works by Truelove (2011), Mehta (2012b), Graham, Desai, and Macfarlane (2013), and Ranganathan (2014b). This chapter aims to update and enrich that literature by looking at the conditions of low-income residents in a small, second-tier city, contrasting with the emphasis on megacities (especially Delhi and Mumbai) in the literature so far.

The study described in this chapter documents the daily practices of water collection employed by poor and working-class people without reliable household water connections in the city of Mahesana, Gujarat, as well as their priorities and preferences for water supply. This sort of "thick description" (Geertz 1973) fleshes out the experience of water poverty in a small Indian city, and can suggest viable solutions to address problems of water scarcity and water insecurity in India and elsewhere. This chapter begins with a portrait of Mahesana's history and demographics in order to provide a context for the research presented later. Following that introduction is a description of the research process, and the five areas in which fieldwork was conducted. The bulk of the chapter then presents the experiences of residents in three different types of communities as well as broader findings on water source preference, the effects of water poverty, and gender dynamics. Finally, I conclude by highlighting lessons that can be learned from the case described here, and directions for future research and action.



Map 2: Major cities and towns in Gujarat (adapted from Maps of India, 2013)

2 The Mahesana Context

2.1 Location And History

Mahesana (also spelled Mehsana) is a city of 189,215 people (Census of India 2011a) located in the Indian state of Gujarat, approximately 75 km north of Ahmedabad, the state's largest metropolis. Regular bus and rail service link Ahmedabad to Mahesana, as well as Mahesana to other cities in Gujarat and Rajasthan.[16] Mahesana city is the seat and major urban centre of Mahesana district, housing roughly nine per cent of the district's total population (and 35 per cent of the district's urban population, with the rest divided between nine smaller towns). Mahesana is the 13th largest urban agglomeration in the state, but its

16 The trip from Ahmedabad to Mahesana takes between ninety minutes and three hours depending on time of day and mode of travel.

political importance is somewhat increased by its proximity to both Ahmedabad and the state capital of Gandhinagar, and its location on a major highway running from Ahmedabad north to Rajasthan—now part of the Delhi-Mumbai Industrial Corridor.

North Gujarat, where Mahesana is located, is a semi-arid region that receives an average of 400 to 800 mm of rainfall per year. The area around Mahesana city has traditionally been agricultural and grazing land, and continues to produce dairy and cash crops today. Hardiman (1998) indicates that the Solanki dynasty, which ruled the Patan kingdom in what is now North Gujarat from 941 to 1215 CE, maintained a system of rain- and river-fed reservoirs (*talavs)* that were used for direct irrigation and contributed to groundwater recharge, keeping the water table relatively high and accessible through human- or bullock-powered wells. The end of this dynasty brought with it the decline of these tanks and the eventual collapse of the water table. Subsequently, the Mughal rulers of the 16th to 18th centuries favoured the construction of elaborate stepwells (*vav*) to serve cities and trade routes. These structures acted as rainwater reservoirs, communal wells, and shade-cooled spaces to gather (see Figure 2). Hardiman reports that villages of the period were typically provided with large masonry reservoirs shaded with trees, to serve a similar purpose. While technological constraints had previously kept water consumption below what could be recharged by rainfall each year, the late 19th and early 20th centuries brought British tax policies that incentivized well-digging and irrigation, along with steam-powered borewell technology that made groundwater exploitation possible at a rate never seen before. Since the electrification of rural Gujarat in the second half of the 20th century, the over-exploitation of groundwater has become increasingly pronounced, leading to scarcity across much of Gujarat as well as fluoride or arsenic poisoning in several areas. In Mahesana district, a study by the Columbia Water Center indicates that water levels in test wells have been dropping by an average of nine feet each year and up to 20 feet per year in some areas (Narula et al. 2011, 6).

Until 2009, Mahesana's municipal water grid was supplied by a series of borewells operated by the city. In 2009, the city was connected to a state-wide water grid and Narmada

Figure 2: Adalaj vav, a stepwell near Ahmedabad.
The rectangular reservoir once fed by well- and rainwater is visible in the background.

river water was supplied (for a critical discussion of this project see the next chapter). The residents interviewed in this study did not reveal any significant improvement in service quality in relation to that change in source, and although some suggested that Narmada water was cleaner than the previous well water, others reported that they had preferred the well water for taste and reliability.[17] In any case, whether linked to the switch to Narmada water, population expansion, or falling water tables, most of the people interviewed who relied on taps connected to the municipal grid had noticed a reduction in water pressure over the past four years (i.e. since 2009). Despite several attempts, I was unable to secure an interview with Mahesana's Chief Engineer or any of his staff, as the city had been unable to fill any of the vacancies in his department and he was consequently profoundly overworked.[18]

2.2 Demographics

Though Mahesana city has roots dating back several centuries, it has experienced a major population boom in recent years: gross population increased 35 per cent between the 2001 and 2011 census.[19] Mahesana's location on a major trade route and emerging investment corridor has contributed to both prosperity and speculation: improved roads make the commute between Mahesana and Ahmedabad relatively easy for those with their own vehicle, and the highway entering Mahesana is full of billboards advertising newly-built subdivisions of luxury condominiums. Although one might assume that these socio-political factors make Mahesana a better-serviced municipality than other cities of similar size, according to a state-wide performance assessment Mahesana's water utility performs slightly below average in its size class (Performance Assessment Project 2016a). It is therefore safe to presume that the living conditions of residents in under-served areas of Mahesana are not dramatically different from those in similar areas of other small Gujarati cities.

17 According to some respondents borewell water, which has a different taste, is still provided through city pipes around once a month, presumably when the supply of Narmada water is inadequate.

18 Although these are technically city employees, the relatively hodge-podge devolution of powers following the 74th Constitutional Amendment (Nagar Palika Act) means that the selection of bureaucrats remains a state responsibility. As a result many of Mahesana's key mid-level positions were unfilled when I conducted my fieldwork, including all of the Chief Engineer's immediate subordinates (see also Mahadevia 2011).

19 Note that because of changes in the way urban areas were counted between the 2001 and 2011 censuses mean, actual growth may be slightly smaller than this figure (Kundu 2011).

As is common across India, water connections in Mahesana are not metered. Instead, those connected to the municipal water grid are charged an annual water tax calculated based on property size and estimated water consumption. The municipality has also installed public standpipes to serve several areas without household connections, including some of the areas included in this study. In addition to the city and individual water users, the actors involved in water distribution in Mahesana include private water tanker trucks, plumbers who install makeshift (typically illegal) connections, and institutions (e.g. the railway station) that have their own well and pump.[20]

Official figures from the 2011 census indicate that for 36 per cent of slum households across the state of Gujarat, their primary source of drinking water was located outside the premises of their homes, with 10.5 per cent of them having to travel more than 500 meters to reach their primary water source.[21] Public or communal standpipes provided by the municipality (known as common taps) were the most commonly named primary source, followed by tube- or borewells. Nonetheless, given that census figures only account for a single source of water per household and do not reveal the reliability or adequacy of said source, such numbers are inadequate for fully understanding resident's water insecurity. Additionally, census figures tell us little to nothing about the labour required to access these sources or the inconvenience of their timing, location, and flow capacity. The research described in the following sections is therefore meant to supplement census data and similarly quantitative studies by discussing the qualitative aspects of low-income residents' experiences with water supply.

20 Although local phone records and interviews with Ahmedabad-based NGOs indicate that there are several NGOs in Mahesana focusing on education and women's micro-finance, none of the communities I visited used NGO-provided water infrastructure or indeed had any meaningful contact with WSS-related NGOs.

21 The 2011 Census definition of slums is "A compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities" (Census of India 2011). Although the census water source figures are only disaggregated for recognized slum areas, all but one of the areas covered by this study, despite limited or no services, were not listed as slums in 2011. These figures are thus taken as a very rough estimate.

Map 3: Satellite image of Mahesana showing study areas, major roads, and railway station

3 Methods

This chapter describes findings from an ethnographic study conducted in Mahesana between June and October 2013, focusing on low-income areas without in-home municipal water connections.[22] With the assistance of two local informants and the input of interviewees in each subsequent neighbourhood, five distinct areas of Mahesana were identified in which residents were predominantly poor and water insecurity was a major issue. Although this may not represent the totality of the city's low-income areas, care was taken to ensure that the areas were geographically diverse in order to represent a wide variety of experiences. While the participants in this study are marginalized and experience inadequate access to water, it is important to recognize that they nonetheless do not include the poorest of the poor, such as pavement dwellers and squatters. Indeed, all of the communities surveyed had been in place for at least one generation, often more, and the findings of this study can primarily be understood to apply to well-established but under-served poor and working class neighbourhoods, not necessarily transient populations.

The details of the research methods are described in Chapter Two. To summarize, the study included 37 in-depth household interviews guided by a standardized questionnaire, as well as eight focus group discussions with women in each community (see appendices). The survey covered household composition, income, where water was collected from (including how often and what the process involved), how much water was used, how respondents dealt with issues such as poor water quality or time management, and what their experiences were of individual, collective, and/or government action in response to problems with water supply. I also spent time in each community observing water collection practices. (Colour photographs following this chapter depict the areas in the study.) As discussed in Chapter Two, the purpose of this study was not to depict a representative sample of the community but rather to present an in-depth portrayal of a diversity of experiences of and responses to water poverty. Despite the structured survey, discussions were often chaotic, with residents

22 The study did end up including one area with informal, unreliable home water connections. Also, the municipally-connected area of Valmiki Nagar figured prominently in conversations with residents of the unconnected half of the neighbourhood, although residents of the formal area were not surveyed directly.

skipping between questions and family members or neighbours chiming in. As a result, not every household answered every question, and numbers, where they appear, are included for illustrative purposes rather than statistical significance.

Before discussing the findings, however, a few caveats are in order. Many respondents first assumed that the study was being conducted on behalf of the government or an NGO. Although all research participants were informed that participation in the study would not directly lead to changes in government policy or NGO intervention, comments in several interviews suggest that at least some respondents held out hope for some sort of intervention by the research team. It is therefore possible that respondents overemphasized the hardships they faced in the hopes of obtaining help or refrained from discussion of illegal activities or criticism of government actors out of fear of reprisals. Nonetheless, the consistency of responses across interviews and focus groups suggests that such distortions, if present, are limited in scope. Another consistent element of bias was the predominance of male voices in group discussions. In response to this bias, focus group discussions were held with women to assess their experiences separately, as described above. The findings reported here therefore represent a mix of experiences filtered through various research tools, which may each have elicited different responses. Finally, the words reproduced here are *ex post facto* translations of the original, likely losing some nuance in the process.

Two recent FPE studies in the Indian subcontinent deeply inform the present study. In her work on water access in Dhaka, Bangladesh, Sultana (2011) makes the important contribution that the often gendered work of acquiring water has not only physical dimensions but emotional ones as well. She describes how access to water is contingent on land ownership, kinship relationships, socio-spatial proximity to water sources, as well as other factors, and how access is (re-)negotiated through emotional and physical labour, adherence to rules of behaviour, and restrictions on the amount and purpose of water collected by women. Sultana's interview subjects, all women, discuss "suffering from" and "suffering for" water, as they navigate conflict, humiliation, physical hardship and moral

quandaries in order to secure water for their families, who often do not appreciate the emotional energy invested in the task. Sultana's respondents add to this list the emotional labour of thinking about (and often worrying about) where to obtain water; "making nice" and maintaining relationships with neighbours, family members or employers; and enduring abuse from other users of shared water sources or from police. Sultana further reports that the unreliability of water access at any one source forces over 40 per cent of her respondents to cultivate two or more sources of water, for example by striving to keep an employer happy in exchange for a few buckets of water to take home while also carefully maintaining a relationship with an abusive relative who owns a borewell.

In a similar vein, Truelove (2011) recounts how the bodies of low-income women in resettlement colonies outside of Delhi become sites where class is spatially delineated as the terms of access to water are negotiated and renegotiated through monetary exchange and experiences of violence. She reveals that where government tankers regularly fail to provide their scheduled service, access to water is governed by a "variety of gendered and classed micropolitical networks" between slum-dwellers, officials, tanker drivers and various middle-class actors, in which slum-dwellers, particularly women, navigate a precarious balance between those who have power over them (Truelove, 2011, p. 149). Truelove notes that the burden of making up for the retreat of the neoliberal state from service delivery disproportionately falls on women, while poor women are simultaneously criminalized by discourses of water scarcity that place the blame for system-wide failure on everyday extra-legal practices including water theft, irregular connections, and petty bribery (see also Mehta, 2012b).

3.1 The Study Areas

The five areas of Mahesana covered by the study (roughly ordered from central to peri-urban) are Magpara/Goga Para, Dela Colony, Dhobighat, Padusan, and Valmikinagar (see Map 3 and the colour plates following this chapter). The most centrally-located areas, Magpara and Goga Para, are adjacent settlements along the Ahmedabad-Palanpur highway,

not far from the city's central railway station. Together, these areas contain several distinct districts with varying levels of amenities, including both city-provided public taps and jury-rigged (illegal) individual house connections, some of which provide water and others which have run dry. Residents appear to have legal tenure: most people are connected to electricity and are assessed the city water tax. Across the train tracks and near city limits, Valmikinagar is a community of roughly 300 families split into two distinct halves. While one side of the access road features matching, well-built homes laid out on raised foundations in a grid-like pattern, the low-lying land on the other side is scattered with homesteads built of varying materials that reportedly flood every year during the monsoon (see colour plates). This study exclusively focused on the conditions on the informal side of the road, as residents of the formal bungalows did not experience significant water problems. Extending outside city limits, the Dela Colony area is a series of caste-based clusters (known as Patelvaas, Rabarivaas, etc, after the name of each caste) along a central path that begins at the base of a municipal water tank. Despite their proximity to each other, the level of service varies significantly from cluster to cluster, with higher-caste clusters located closer to the tank at the South end and more likely to have water than those farther away.

To the southeast, Dhobighat is a rambling informal settlement around a pond (*talav*) located near the outskirts of the city along a well-travelled road. The area lacks electricity and drainage, and two public taps along the road serve an estimated 500-1000 households. Nearby Padusan (or Paduhan in the local pronunciation) is the only area in this survey that was recognized as a slum in the 2011 census and is perhaps the largest area in the study. The area also lacks electricity, although a drain was under construction at the time of fieldwork.

Although only Padusan is a census-listed slum, all of the areas surveyed in fact have similar socioeconomic indicators. All of the residents interviewed belong to minority groups[23], and although the quality of construction and surrounding environment varied, all of

23 The vast majority of residents interviewed belonged to the Vaghri and Thakor castes, which are listed by the Government of India as "other backward classes" (OBCs, i.e. socially and economically disadvantaged groups other than Scheduled Castes—also called Dalits—and Scheduled Tribes—also called Adivasis.) The remaining residents were Dalit, Muslim, or belonged to other OBCs.

the households live in one- or two-room *kaccha* or *semi-pukka* houses (that is, made partially or entirely of impermanent materials as opposed to concrete or brick). Men largely work as day labourers, masons and vegetable-sellers while women who do wage labour typically clean neighbouring bungalows or package spice mixes at home, with daily wages for both men and women ranging from INR 30 to INR 100 (US$0.45 to $1.50). Reported monthly household incomes can be as low as INR 1000 (US$15) to as high as INR 6000 (roughly US$100) depending on employment type and family size, placing all interviewed residents firmly at or below the World Bank-calculated poverty threshold of US$1.25 per capita per day (Ravaillon 2010).[24] Fluctuating daily wages and the impacts of living hand-to-mouth mean that few respondents could give firm estimates of their budget when asked. In the words of one particularly destitute woman: "We have no income per se. What we earn every day is what we eat." These estimates are nonetheless supported by the fact that at least three out of four households interviewed held Below Poverty Line (BPL) ration cards, indicating a household income of under INR 100,000 (US$1,500) per year.[25]

Most households in the study areas are made up of joint families—older parents with their sons, unmarried daughters, daughters-in-law, and grandchildren—and range from three to nine people. Whether women work outside the home seems to depend largely on caste and community norms. Interestingly, while the vast majority of household interviews indicated that women were not working outside the home, in segregated focus groups between half and two-thirds of the women participants mentioned engaging in some sort of income-earning work when they could. Nonetheless, even employed women typically earn less than men and are able to engage in income-earning activities less regularly, as we will see, so households are largely dependent on the incomes of male wage-earners. Other demographic indicators

24 The US$1.25/day threshold is calculated at 2011 purchasing power parity based on data from the world's 15 poorest countries, which no longer include India. The World Bank's PovCalNet suggests a line of US$1.90/day for middle-income countries. A reasonable poverty line for India today likely lies somewhere in between the two. The GoI calculates poverty based on per capita consumption, which is not immediately comparable.

25 These cards entitle their holders to means-tested government food-subsidy programs, although several respondents complained that their local ration shops were under-stocked or empty.

include the fact that most (roughly three-quarters) of households surveyed have electricity connections (either legally or illegally), and an approximately equal number have a mobile phone in the family. No one owns a motor vehicle, although two men reported working as autorickshaw drivers, which they rented (see S. E. Harding et al. 2016 on the autorickshaw economy). Finally, only one household reported having a bathroom; some households use public toilets at the railway station and other public facilities but many have no such option available to them. Although it was not feasible to carry out a study on both water and sanitation, it is clear that lack of adequate sanitation in these areas is also an issue that bears additional research and action.

4 Routine Water Practices

The neighbourhoods surveyed can be divided into three categories according to their water infrastructure: those with no local source of water, those with one or more shared sources, and those with individual household connections. Apart from Valmikinagar, where topography appears to be the primary consideration for siting homes, most of the areas surveyed are arranged into either straight lanes or clusters around a central open space. Most households' water sourcing strategies are largely uniform across each lane or cluster, with the exception of those in areas with household taps (see below). Drawing extensively on quotes from household interviews, the following pages present experiences typical of residents in each of these three types of communities, followed by more general findings.

4.1 'No Source' Communities

Residents of Goga Para, with no shared water source in their community, rely on the goodwill of nearby shopkeepers and residents down the road for the bulk of their water. Water in the relatively better-served area down the road flows for roughly 30 minutes twice a day, and "they let us take what's left once they're done taking what they need", in the words of one resident. The process of walking down the road, waiting, and carrying water back takes three-quarters of an hour at best, and can be fruitless if water is too scarce to share. In addition to begging water from the shops or neighbours in the morning and evening, various

Goga Para residents reported making at least one or two trips per week to a mosque that reliably distributed water at seven a.m. and five p.m. Despite the greater reliability of water at the mosque, the distance (roughly one kilometre each way) makes it a less appealing source, only used as a backup when closer options fail. Interestingly, although Goga Para residents are predominantly Hindu, none of them made mention of religion with regard to using the mosque as a source of water.

In contrast to the total lack of water infrastructure faced by these residents, others who nominally have water connections experience water insecurity when their taps fail. For example, one woman in Magpara described the common tap near her house as "bone dry… only there for show," and suggested that illegal connections upstream from them had depleted the water flow in the pipe until they barely got a trickle. "You get one *matli* [a small clay water pot] of water every three days. You can barely wash your face with it," explained her neighbour. Consequently, residents of this area fetch water from the railway station roughly one kilometre away. One of them described the process as follows:

> "We must go at two p.m.; we only get water at this time. [You only get] about ten to fifteen minutes at most when it's your turn, else you don't even get it for ten minutes. If we get two buckets [of water] then we can shower—it's been ten days since we last bathed; you wouldn't even feel like looking at the people because most are unshowered due to lack of water. It's *nali* [drain] water, for bathing. If someone is watering their yard and is kind, they will let us get drinking water."

While this woman expressed caution, noting that someone she knew had been beaten up by the police for stealing water, other neighbours are more defiant. "They don't let us fill up, but we do it anyway," said one man. "The tap is closed [from the] outside but works inside and goes to the gutter. We draw water from that gutter and use it for bathing." Others had more luck, reporting that when a line of five or six people had formed they might be allowed to collect drinking water from the tap. "The railway is uncertain," summed up one woman. "If the *saheb* [the station attendant] lets us get water then we do."

Authority figures are not the only source of conflict around water sources. Describing a

public tap near a temple that is used by both Goga Para and Magpara residents, a woman from Goga Para explained, “The water only comes around one hour in the morning and one hour in the evening. There are a lot of squabbles over it.” Sources like this one, which provide a limited amount of water but do not have an equally circumscribed user-base or a designated caretaker, can easily spark tensions when women collecting from them feel that someone else has acted unfairly. Several residents explained that there is an informal limit of two to three buckets of water per person at most public water sources. Women who do not seem to be handing over the tap quickly enough can have the tap physically grabbed away from them or be pushed out of the way.

In general, for residents without local sources of water providing for their families’ water needs means scrambling for the leftovers of those with better access to water. This tends to be a solitary pursuit: although the general strategies are similar across the board, women go alone or with other members of their household to places they are in the habit of going to. This leads to a certain level of variation in the quality of households’ access to water, as seen above, depending on the number of (female) household members available to fetch water, and in some cases their ability to be assertive or persuasive. Within the areas I surveyed, caste does not appear to be a distinguishing factor in terms of the difficulty residents reported experiencing when accessing water outside their community; this may very well speak more to the general homogeneity of these communities than to the absence of caste-based discrimination at water sources in Mahesana.

4.2 ‘Shared Source’ Communities

The communities of Dhobighat and Padusan have common taps provided by the municipality. In Padusan, the taps provide water at designated times in the morning and evening for between 30 and 60 minutes each depending on location. These taps are informally reserved for the use of roughly ten households each, located within easy walking distance, and many of these clusters have developed strategies for ensuring that water is distributed fairly and with minimal difficulty.

"We have a system with the neighbours; we all take turns so there is no line. But sometimes we don't get water if someone else has gone before us," explained one woman. The neighbours typically line up their water vessels (e.g. two per household) so that they can simply be filled sequentially when water starts to run. Someone, often a child, is delegated to watch the vessels and fill them when the water begins to flow. At the taps where water runs for close to an hour, the number of vessels per household is calculated to ensure everyone gets an equal amount. At one tap with less abundant flow, however, the women sharing the tap have opted to divide the water between only eight households per day, rotating the line-up order so that the two households that have to fetch water from elsewhere are not always the same. Those who do have to venture farther afield for water face many of the same challenges as the residents of no-source areas.

At Dhobighat, there are only two common taps for the community of roughly 500 households, located at opposite ends of the settlement. As a result, women cannot simply line up their vessels next to the tap but must walk up to ten minutes to the tap and then stand in line to collect water. In order to ensure some level of fairness, the women only allow each other to fill one vessel at a time, forcing them to come back around if they want more. This means that the process of walking to the tap, standing in line repeatedly, and then walking home can easily take two hours every morning. Although the time and effort involved in collecting water from these more distant taps is considerably greater than that required at the taps in Magpara, it is still a more reliable system than begging water from neighbours and shop owners. Because the water sources are specifically meant for residents of Dhobighat, there is no risk of arrest for water theft, nor is access dependent on the goodwill of others.

At the same time, when asked about sources outside the neighbourhood such as temples or businesses, residents in Dhobighat explained that no one in the surrounding areas would let them fetch water from them. One man stated "Every colony [neighbourhood] comes here to get water, even the Patels," adding that "they only come to our area to get water; we don't go to theirs." While the residents of Dhobighat belong to various Other Backwards Castes,

Patels are considered a higher caste (Basu 2009) and most neighbourhoods around Dhobighat are middle-class. These relative socioeconomic positions, wherein the Patels not only have more social power but may see the Dhobighat residents as inherently inferior due to caste, serve to explain why Dhobighat residents are excluded from the water taps of surrounding neighbourhoods while those neighbours impinge on their supply without penalty.

4.3 Communities With Household Connections

Two surveyed areas, Valmikinagar and one lane in Goga Para, have individual household connections. In Valmikinagar, residents in the formal and informal areas are connected to the same water main, with the formal area located upstream of (as well as physically higher than) the informal area. Residents downstream complained of water insecurity, blaming the motorized pumps used by residents of the formal area for the reduced water pressure. "We don't have any motors. If you run motors, you have to pay large [electricity] bills. We just save the water when we get less," explained one focus group participant. Residents who cannot afford motorized pumps do not typically complain to their neighbours or ask them to stop, however. "It's everyone's problem, it's not just the upper area people's", stated another woman in the focus group, pointing out the underlying issue of water scarcity. Unfortunately, this vision of the issue as a shared problem does not translate into collective action. Asked about appealing to the city for better service, one woman responded, "you see, it only works if people get together." Her neighbour added, "But people don't get together. They won't even step up for the water issue," referring to what she saw as the more serious problem of monsoon-based flooding that has led to property damage, forced evacuation, and even drowning in the past.

A similar lack of collective consciousness was apparent in Goga Para, where the residents of a lane of *semi-pukka* houses with household connections had installed hand pumps to make up for the limited water pressure in the pipes.[26] In response to prescreening questions

26 According to one resident, these were not government-sanctioned connections to the water main but rather informal connections that people had arranged for themselves from the nearby school and other sources.

about whether their water connections were satisfactory or not, residents informed the survey team that no one in the area had a water problem except for the house at the end of the line. A later focus group with women in the area indicated that women in this lane do indeed face water-related hardships due to the labour involved in pumping and the shortage of water despite the help of the pumps. Even so, the issues of the household at the end of the line were treated as distinct from those of the rest of the area. The residents at the end of the line explained that while they had always experienced a relative shortage of water due to their location, it had gotten worse in recent years: since their neighbours installed hand-pumps, they get no water at all in their tap and have to fetch it from outside the neighbourhood. Significantly, this household is headed by a widow who has a lower income than her neighbours and would not have been able to afford the INR 2–300 (US$4-5) that a hand-pump cost even if it could improve her situation. For the same reason she is unable to pay to share a water tanker delivery, which is the solution her neighbours resort to when the pumps fail to produce enough water. We can see from these examples that as water sources are individualized—"enclosed", to use the language of the commons (Hardin 1968)—differences in physical location and class appear to become more important determinants of access.

4.4 Quantity

Survey respondents were not only asked about the locations from which they gathered water, but also how much they collected and how long they stored it. Their responses indicated that very few respondents are able to store water longer than 24 hours. Most residents simply fill all of their available containers (buckets, water jugs, traditional water pots, and plastic bottles) with water, sometimes refilling them over the course of the day if necessary depending on how much storage capacity they have. Most households will have used all of their water by the end of the day. At most, they will set aside a small pot or large bottle for drinking in case of bad water or other problems the following day. Better-equipped households may pour the water into a barrel, which holds perhaps 200 litres, or even a plastic water tank that might hold 500 or 800 litres (see colour plates). Apart from those who reported using these tanks to store rainwater for household chores, few households are ever

able to entirely fill their tanks. Nonetheless, this arrangement allows for some separation of water according to use. As one Magpara man described, “We have a [20 litre] bottle and a tank. But we never manage to fill the tank because they don’t give us enough water. The bottle is separate and this [the tank] is for washing clothes, bathing, etc.” Such separation ensures that less essential household uses do not encroach on water reserved for drinking.

Accurate measures of water consumption were difficult to come by since residents mostly measured their water collection in terms of vessels of various and unspecified sizes. Nonetheless, by approximating some standardized volumes for each type of vessel we can estimate a range of 150 litres to 300 litres per household per day (equalling 10-75 litres per capita per day). A typical Padusan resident reported using “about six, eight, up to ten buckets a day. We use more water than most houses around here,” he added, referring to an uncle’s use of water in his prayer practice. Since their household is only made up of three members, this assessment of their relative water consumption may not be true. Prayers notwithstanding, the most important factor driving residents’ water consumption is their ability to collect it. Households with functioning taps nearby, more family members who can help to collect water, and/or fewer scheduling restrictions and demands on their time tend to use more water regardless of family size. Since most households fail to reach the threshold of 70 litres per

Table 2: Reported water consumption in Mahesana surveys

HH members			Income	Daily water consumption	approx.	
Total	Adults	Child.	(INR)	Containers	(litres)	lpcd
4	2	2	3000	Roughly 15 buckets	300	75
3	2	1	1000	Roughly 10 buckets	200	67
6	4	2	-	2 barrels	400	67
3	3	0	-	One barrel if there’s enough water to fill it	165	55
4	4	0	400	1 barrel + 2 matala (clay drinking water pots)	200	50
4	4	0	3000	1 barrel (filled twice) + 2 matala for drinking	200	50
5	2	3	5000	1 barrel	200	40
8	8	0	-	A variety of small containers	170	34
7	5	2	-		200	29
6	4	2	3000		150	25
8	6	2	1250		200	25
5	2	3	3550	Four or five 20-litre bottles + three matala	120	24
9	4	5	-	Roughly 10 buckets	200	22
7	7	0	3500		110	16
6	6	0	5000	Two 20-litre bottles	40	7
6	6	0	3600	2-3 matala for drinking + bathing water “if we get it”		

capita per day (LPCD) deemed the minimum required for a healthy life by the World Health Organization (Howard and Bartram 2003), it is clear that the amount of water collected is determined far more by supply than by demand.

4.5 Source Preferences

One of the purposes of the questionnaire used in interviews (Appendix B) was to determine what drove residents' preferences for one water source over another. Asked to rank a variety of factors (price, quality, proximity, timing) in order of importance, however, most interviewees had trouble. This suggests that although households rely on or have available to them a number of different sources, the choice between them is rarely treated as a conscious decision. Residents' descriptions of their routines do not suggest active daily decision-making between one source and another, but rather a process of working down an implicitly ranked list of sources until they either get enough water, run out of time, or run out of options. It is therefore possible to deduce a certain set of priorities from the order in which respondents ranked water sources.

Price is a critical factor in choosing water sources, although not paying for water is taken so much for granted that the cost of water rarely came up in interviews until respondents were questioned about it. The suggestion they might pay for water was often met with incredulity. One Magpara woman flatly stated, "We can barely feed the family from the money we make, how can we afford to buy water?" Another quipped: "we simply do not have the financial capacity to buy water. If we had the means, wouldn't we be going out and buying bottles of *Bisleri* [an Indian bottled water brand]?" In fact, small shops I visited in Valmikinagar and Padusan stocked neither bottled water nor the one-rupee sachets of water that are common throughout India, suggesting there is no market for even the cheapest form of packaged water.

There are, however, two interesting exceptions to the general trend of refusing to spend money on water. While household interviews across the board were categorical about not

buying water, the women's focus groups in Padusan (where women worked packaging spice mixes from home) and Goga Para (where women worked as cleaners) revealed that when water shortages prevent women from working they occasionally order a water tanker to share among several households so that they can get back to work. The distinguishing features of these two areas seem to be that not only do most women have relatively steady sources of income, but neighbours within a lane or cluster have water and income situations which are similar enough to their neighbours' that they are willing and able to pay for water at the same time and in similar amounts. Alone, none of them could afford the INR 200-300 (US$3-$4.50) that the full tanker delivery reportedly costs.

Among free sources of water, the second-most important consideration is proximity. Across the board, residents referred to more distant sources as back-up options they resorted to only when closer sources were inadequate or unavailable. Except for a few fruit and vegetable sellers in Magpara who use their rolling carts to carry water from more-distant sources (see colour plates), all of the respondents regularly carry water home by hand, typically in buckets or in vessels balanced on their heads. A typical load might involve carrying a 15-litre bucket in one hand while balancing a 20-litre container on one's head, for a load of over 35 kilograms. Thus even travelling a small distance for water represents a strenuous physical effort. Additionally, as there is a limit to the amount of water that can be carried at one time, a longer distance to and from the source may reduce the number of trips that can be made, ultimately limiting the amount of water that can be collected even from sources without specific cut-off times.

Scheduling constraints also lead women to write off certain sources, either because timing conflicts force a choice between two sources or in order to work around other responsibilities such as food preparation, housework, and paid work. Each of these three considerations—price, timing, and distance—is to some extent dependent on the others. For example, many of the more distant sources that residents reported using are available at all times, or at least more flexible times, so that they are the only sources left when women have

finished with closer sources that have limited timetables.

Finally, the one variable that was not mentioned as a reason for choosing or avoiding a water source was water quality. Most sources were described as providing clean water, though residents only evaluate cleanliness by sight or smell—and often do not have time to do even that in the rush to collect from a limited flow of water. Even water that is clearly dirty is not discarded. Those with slightly larger storage capacities at home try to keep back a jug or two of clean water at the end of the day for drinking in case the following day's supply is dirty and only suited to cooking and washing up. Most respondents simply use whatever they get, however, sometimes filtering it through a doubled layer of cloth or letting it stand to get rid of sediment. No one reported boiling their water or otherwise treating it. When asked about illness, responses were mixed. Many respondents did not blame the drinking water and instead pointed to their lack of drainage as an issue. Others did mention waterborne illnesses but felt there was nothing they could do. While standing water and inadequate disposal of wastewater and solid waste are certainly significant issues, these answers also suggest both a lack of widespread knowledge about hygiene and disease prevention, and a lack of resources with which to implement such practices.

4.6 Gender

As the descriptions above suggest, the vast majority of water collection is done by women and children, especially girls. In most cases the division of labour is absolute, with men not contributing to water collection at all. Even in the few households where water collection is not seen exclusively as women's work, the fact that men predominantly engage in wage work outside the home means that they are less available to do water-related labour.

As discussed above, the transportation of the estimated 150-300 litres each household reported using each day represents a tremendous physical task. Households typically have between one and three—most commonly two—adult women to share this labour, in addition to any children not in school. It is therefore not uncommon for one woman to be responsible

for carrying 100 kilograms of water every day over distances of 500 metres or up to one kilometre. In Padusan, focus group participants enumerated their physical aches and pains:

> Woman 1: "My back has started hurting from carrying all this water back and forth."
> Woman 2: "Our poor little girls have aches in their back and waist from carrying all the water. They have to go wait for water, work all day and also carry that water. … The girls fetch water instead of studying."
> …
> Woman 3: "Of course we get tired. My legs hurt and I can't walk much, but what can one do. Who's going to do it for us? I have four sons and daughters-in-law but we live separately."

Women in Magpara also rely on their children when water insecurity is particularly bad. "Our little kids carry the *deghda* [metal water pot] and come with us to get water," said one. Her neighbour elaborated: "They [the children] take the day off from school when there is no water. They help us get water all day."

Regardless of who fetches the water, the mental (Walzer 1996) and emotional (N. James 1989) labour of water acquisition is performed by women. This includes the work of evaluating how much water is needed, keeping track of where water can be found, planning to acquire it, figuring out how to make do when it is lacking or inadequate, and managing expectations on the part of other household members. As discussed above, the time and effort involved in acquiring water often exists in a delicate balance with other household responsibilities including childcare and food preparation as well as wage work within or outside the home, and meeting these various needs in a timely manner requires careful scheduling and keeping track of several unpredictable variables. The work of developing and enforcing communal sharing mechanisms is an often-invisible aspect of the effort women put into acquiring water, as is the work of making nice with neighbours, shopkeepers and other gatekeepers of access to water sources (see also Sultana 2011). A woman in Dhobighat described the humiliation of going to the neighbouring areas when water in their common tap runs dry: "We have to beg for just one *bedhu* [a small water pot, typically one to five litres]. They ask what the problem is at home. They sometimes even say no."

Women who work outside the home face scheduling difficulties and loss of income due to the difficulty of acquiring water. “We can’t go out for work without the water,” stated a Magpara focus group participant. “We have to wait until we’re done dealing with the water before we go so we get delayed, obviously. If we got more water, then we could quickly fill it up and go to work. Now, we have to work one or two bungalows and come back to fetch more water.” Wage work is not the only activity that is delayed by the need to gather water. “All our work depends on water,” explained a woman in Dela Colony. “I wake up at five a.m. to go and get water.” In Magpara, the focus group continued:

> Woman 1: “It’s almost afternoon by the time you’re done collecting. It takes sometimes two hours, sometimes half a day.”
> Woman 2: “You can’t do even housework without water.”
> Woman 1: “Yes, you can’t really do any chores until you have water. If you have to go out then—”
> Woman 2: “—then it’s a problem too without water. You have to think about how you’re going to have water for the family if you’re going out.”

Several women reported thinking about water constantly. As many sources are only available for a few minutes as early as six or seven a.m., and others are only available in the afternoon or early evening, collecting water can easily be a full-day preoccupation. When women are unable to acquire the necessary water for daily needs, household tensions often rise, with women reporting “impatience”, “frustration”, and “quarrels” at home. Several women even reported cases of verbal and physical abuse against themselves or their neighbours when water ran out. The following exchange from a Padusan focus group illustrates how gendered division of labour and water-related domestic violence are intertwined:

> Interviewer: “Does this situation ever lead to squabbles for water?”
> Woman 1: “Yes.”
> Interviewer: “What kind of fights?”
> Woman 1: “One woman says she’s getting late and everyone starts yelling about their problems, too.”
> Interviewer: “Does the water situation ever lead to quarrels within the family?”
> Women: “Yes, yes” [nodding all around]
> Woman 2: “If someone doesn’t get to shower they pick up the washing

paddle."

Woman 1: "Yes, it leads to physical fights."

Woman 3: "Some men are like that."

Woman 4: "Everyone wants to shower daily. And we can't make do without water."

Interviewer: "So are you only responsible for getting water or do the men help out as well?"

Woman 2: "No, only the women."

Woman 3: "Our men do hard labour. They have to pull a cart all day and then they don't have the energy to fetch water. What can you do if you have to work? They leave at eight a.m. and come back around eight at night."

Earlier in the interview, these same women had talked about their spice mix packing work, and pointed out that fetching water reduced their daily income by roughly 40 per cent from the INR 120 (US $1.80) they could earn at peak productivity. They had also complained about the physical toll that fetching water took on their bodies, as quoted above. This discussion therefore hints at the way in which men's earnings and physical labour are systematically given greater importance than women's, even by women themselves. This distortion potentially affects not only women's physical health, but also household income and even the household's ability to acquire sufficient water. This devaluation of women's labour is also shaped by class, culture, and available job opportunities, as we will see in Chapter Six.

Finally, the perception of water as women's work reportedly creates impediments to collective organizing for better circumstances. In Goga Para, women felt that going to government offices with a collective demand for improved infrastructure was something that could only be done with the assent of the traditional neighbourhood council, made up of men. The men, however, did not experience the water issues as pressing since they were not responsible for the work of collecting it. The following exchange from a focus group encapsulates the issue:

Woman 1: "Who is going to rally the troops to file a complaint? The men don't care. They say the women will figure it out."

Woman 2: "If the men paid attention to our needs, we wouldn't have so many

problems in our lives."

Woman 3: "They say you have to somehow get water—that's how the men are these days. And when it's time to vote, they'll try to convince the women to go vote. I'm simply not going to vote for anyone, because they're not doing anything to fix the water problem."

These findings about gender echo Sultana's (2011) findings on women's emotional and physical labour around water collection in Dhaka, Bangladesh. While the disproportionate labour of women with regard to water collection is not a new observation, the difference between the information collected in women's focus group discussions and in the general household interviews is a strong reminder of the importance of including women's voices and accounting for gendered differences of perception when doing research on water issues. Specifically, the emergence of the prevalence of women's paid labour in focus group discussions reveals how women's time is not seen as having monetary value within the household (see also A. J. James et al. 2002). Similarly, focus groups revealed that circumstances that appeared fairly straightforward in household interviews in fact involved hard labour, challenging decisions about scheduling, emotional labour, and financial trade-offs such as ordering a tanker in order to earn more income. The importance of focus group discussions with women does not negate the value of household interviews including men; in fact, it is in part the comparison of the two that generates useful insights.

Finally, while water-related labour is one site where gender inequality is apparent and through which it is reinforced, gender inequality is culturally pervasive and not solely produced by water collection practices. Working in a similar cultural context in Rajasthan, O'Reilly (2006) analyses how a typical project seeking to "modernize" women's water practices relied on essentialized ideas of the relationship between women and water, and treated women more as objects to be transformed than as active subjects with agency in their own lives, further entrenching sexist norms. Researchers and policymakers must instead find ways to recognize and address gender inequality in water practices that acknowledge the fact that these practices are produced by the interplay of cultural beliefs about gender roles, community and family norms, and economic realities, and are constantly being renegotiated

by individuals of all genders.

4.7 Organizing And Demands

The final questions on the household interview questionnaire had to do with actions taken to improve the water situation, either through collective action or appeals to authority. In general, people's responses suggested that very little concrete action had been taken. Many respondents have given up on asking for assistance after seeing no attention paid to their needs. For example, one Padusan man explained: "We used to have a really hard time when we moved here; there were no taps. Then we placed requests and got the application processed [one tap was built]. That was 28 years ago; there has been no work on this since then." His neighbour added, "They only come around to collect votes now." A respondent in Goga Para had a similar experience: "The government employees have never been here for anything but our votes so how are we going to ask for anything?"

While very few residents reported having lodged formal complaints or made formal requests for service, many more had stories of broken promises or failed expectations. "They said they would give us gutter lines and a water tap in every house," said a Magpara woman, and yet "they haven't followed through on either promise." References to an undifferentiated "them" or to "government employees" were common; while some residents had gone to complain in the local ward office and others had spoken to the valve man responsible for pipe maintenance (typical practices also documented by N. Mehta 2012b, in Delhi), most residents did not have a clear idea of who had made the promises they referred to or to whom they should address a complaint. Additionally, several respondents felt that they did not have time to organize a collective appeal or, as discussed above, that they did not have the support of the community as a whole and, consequently, the legitimacy to make a demand that would be heard.

Among those who had taken formal steps to improve their situation were two men in Goga Para who stated that they had repeatedly made official requests for water connections,

but had never received one. As no one else in the area has a legal water connection, it is unclear whether they are actually eligible for a connection even once a formal request has been made. This indicates a widespread shortage of information about residents' rights and what they can reasonably expect, alongside the lack of clarity about decision-making and redress channels described above.

Nonetheless, while the majority of respondents seemed fairly resigned to their water situation and did not expect major changes, in areas without drainage residents were more adamant about the need for government action. A Magpara man explained: "[the government] said they would fix [the tap] but nothing has happened yet. They haven't given us gutters either. If we throw the used water out here, it could lead to diseases, mosquitoes and other things. We need a gutter facility." In addition, improperly disposing of waste water could lead to tensions with neighbours. "People fight with us if we use the roadside," explained another respondent. "We'd be in deep trouble even if we got a tap because we need a gutter line to take care of the water that is released. If we throw the water on the road, then the public will come to our house to beat us up." While residents are able to piece together their water supply from various sources in areas around them, water disposal poses immediate health risks and requires localized intervention on a scale they cannot carry out on their own. Nonetheless, the issues of not knowing who to ask, not having capacity to mobilize, and not trusting the government to take action all remain.

5 Lessons From The Mahesana Case Study

The diversity of experiences documented in this chapter highlights the fact that water insecurity and compensation strategies (Zérah 2000) can look quite different in response to variation in geographic and social location, available infrastructure, and community dynamics. This study reinforces the need for interventions in water provision to consider not only quantitative data but qualitative thick description of specific water-scarce environments. The findings discussed above also suggest several directions for future research as well as factors to consider for policy design and other interventions. This section describes these

three lessons and concludes by discussing how they relate to existing research.

The fact that many of the surveyed households experience water insecurity due to inadequate or non-existent water flow rather than a total lack of infrastructure highlights the role of poor design and management in creating water insecurity and water poverty. The problem is not simply that poor residents are not connected to the grid; instead, the water pressure in municipal water pipes serving low-income areas is typically so low that it resembles a gravity-fed system. Dela Colony experiences a clear decrease in water pressure in communal pipes according to topography, and in Valmikinagar residents have to dig pits below their taps in order to be able to lower the pipes enough for water to flow. This limited pressure is exacerbated by illegal connections and by richer residents' use of pumps to increase water flow from their taps. Due to a lack of municipal capacity and of political will, these drains on municipal water infrastructure are neither removed nor compensated for in the engineering department's allocation of water to various areas. Mahesana as a whole, however, does not experience this shortage of water: respondents were able to obtain water from sources in areas which do, in fact, have adequate pressure. Thus the issue is one of spatial distribution rather than absolute scarcity. It is also worth noting that the cost of an official water connection is prohibitive even for many residents who are eligible, which is likely a contributing factor to the prevalence of illegal connections.

Another key lesson from this study is the importance of social and physical feedback mechanisms for ensuring the equitable division of scarce water resources. Neighbourhoods that rely on shared public sources have developed a collective understanding of how much water can be collected and ways of enforcing equitable distribution. As the available water in public spaces is visible to all, traditional values of hospitality and a shared understanding of the importance of water dictate that no one be denied the water they need. Although we have seen that where wealthier households feel ownership over water sources they may deny or place barriers to poorer residents' access to them, in low-income communities with shared water sources and in no-source communities residents will frequently borrow water from

each other when in need. Several respondents rhetorically stated, “who would deny someone water?” Household connections, in contrast, obscure the amount of water available as well as each family’s consumption. Small differences in geographic placement, and larger differences in terms of ability to afford a connection or a pump, then translate into large differences in access to water. Inequality among neighbours is exacerbated through the use of private household connections that turn water scarcity into an individual problem.

Intra-community inequality, in turn, hampers collective action on the issue. Whether in the case of residents with pumps dismissing their downstream neighbours’ water insecurity as unrelated to them or the case of men dismissing water collection as women’s work, when the issue is perceived as affecting only part of the community residents feel that they have no basis of legitimacy or common purpose from which to advocate for change. This is a significant point, since two widely accepted tenets in the water provision literature are that individual household water connections are the ideal model and that it is empowering for women to be made responsible for decision-making around water. The findings of this study, however, suggest that each of these policies would in fact contribute to marginalizing the most vulnerable residents of communities like those described here. These concerns will be discussed at greater length in Chapter Seven.

Finally, this study highlights a significant shortage of information across Mahesana’s water-insecure neighbourhoods regarding the quality of their water and the risks that unclean water entails, basic hygiene practices, and to whom they could address complaints or demands. Three major contributing factors can be identified. First, the widespread—though far from universal—functional illiteracy in the study areas, no doubt exacerbated by keeping children back from school to aid in the collection of water. Second, the relative absence of civil society organizations—whether women’s self-help groups, labour unions, or other mutual aid societies—that might spread information and provide a starting point for collective action around water and sanitation concerns. Third, limited government capacity combined with a lack of political will to prioritize service to these areas. Without considering

these factors, none of which are specific to water, policy and infrastructure interventions are not likely to provide sustainable solutions to the water insecurity described above.

This chapter has provided a snapshot of what water poverty looks like for poor residents of a small Indian city, as well as some of the obstacles to addressing it. In Chapter Five, I will look at the Government of Gujarat's water policy since the 1990s and how it has failed to effectively address these challenges. As we will see, the emphasis has been on increasing supply rather than addressing unequal distribution or barriers to access. By examining the political motivations that have led to the adoption of the current policies, we can begin to understand how situations such as those described in Mahesana have persisted despite widespread awareness of a water scarcity crisis.

A Magpara lane (above), and a trickling public tap outside Goga Para (below).

Above, a line of water vessels at a communal tap. Below, a sign outside Padusan advertises “all types of tap and pipe fitting work”, beside a non-functional public tap.

Valmiki Nagar's *pukka* area (above), and sunken, flood-prone *kaccha* area (below).

Above, a plastic water storage tank. Below, a women's focus group beside the pit dug to lower a water pipe and improve water pressure.

V. The Narmada Drinking Water Pipeline and Dreams of Development[27]

1 Introduction

In 2000, the Government of Gujarat (GoG) set out to construct a state-wide water grid to connect 75 per cent of the state's approximately 60 million urban and rural residents to drinking water sourced from the Sardar Sarovar dam on the river Narmada (Sardar Sarovar Narmada Nigam Ltd. 2016). This has been the Government of Gujarat's primary response to the issue of water scarcity for domestic and industrial use, replacing local small schemes (both dam- and groundwater-based) across the state. The project represents a massive undertaking—it is billed as the largest drinking water project in the world—and is a striking departure from the original plan for the Sardar Sarovar dam, which was intended as a source of supplementary irrigation for drought-prone regions (Aandahl 2010; Fisher 1995; Hirway and Goswami 2008). This chapter describes the promotion and implementation of the Narmada pipeline project, in order to situate Mahesana's poor water consumers (discussed in the previous chapter) in a wider context and elucidate the gap between the lived experiences of poor water consumers and state drinking water provision strategies. Following Ferguson (1990), I look beyond the question of how well the project has performed, and examine the functioning of the discursive-bureaucratic "machine" of which it is a product, analyze how the accompanying changes to state water governance institutions fit into the "Gujarat Model of Development" promoted across India by the GoG, and look at who is and is not served by this type of massive supply-driven response to water scarcity.

In order to fulfill these several objectives, I look at Government of Gujarat (GoG) publications on water policy and the pipeline project, scholarly publications by state officials involved in the project, and a survey of English-language local newspaper coverage of the

27 A modified version of this chapter was published in *Water Alternatives* under the title "Nation-building, industrialisation, and spectacle: Political functions of Gujarat's Narmada pipeline project" (Luxion 2017).

project between 2000 and 2015.[28] My own interviews with civil society observers (academics and activists) and state bureaucrats in 2011 and 2013 served to guide my thinking—although, since I was unable to obtain more than cursory interviews with staff in the relevant government agencies, I have relied on the written sources when possible. Finally, I looked to two independent evaluations—one on the project's rural impacts and one on urban drinking water infrastructure in Gujarat—for more information about the success or failure of the project (Hirway and Goswami 2008; Performance Assessment Project 2016b; Pravah 2009; Urban Management Centre 2014). Unfortunately, my requests to access master planning documents were stonewalled, leaving me reliant on secondary sources.

I begin by giving additional background on Gujarat's political history, particularly focusing on the economic liberalization of the 1990s. I subsequently describe the current political-economic climate of Gujarat, starting with what is known as the "Gujarat model of development". I also discuss the influence of Narendra Modi, who was until recently the state's Chief Minister and is today the Indian Prime Minister, and who has claimed responsibility for Gujarat's economic and developmental successes. I situate the state's recent politics within neoliberal globalization, but argue that understanding the state's approach to water governance and infrastructure requires seeing Gujarat as an aspiring developmental state that aims to emulate a Singapore-style development trajectory (see Section Three).

Following this exposition I turn to look at the project itself: its current scope as well as its history, the ways in which it is described by both advocates and detractors, and some analyses of its effectiveness to date. In order to better understand the project, I then describe

28 The Government of Gujarat publications consulted include *Gujarat Jal-Disha 2010* (GWIL), *Blueprint for Infrastructure Gujarat 2020* (GIDB), *Building Partnerships and Working Together* (WASMO), as well as the contents of the websites of the Gujarat Infrastructure Development Board, Gujarat Water Infrastructure Limited, Gujarat Water Service and Sanitation Board, Sardar Sarovar Narmada Nigam Ltd, and Water and Sanitation Management Organization. Academic publications by government officials include articles by Andrea Biswas-Tortajada (WASMO), Jay Narayan Vyas (Minister for Narmada and Major Irrigation Projects), and Rajiv K Gupta (SSNNL).

For news coverage, I conducted a search of the online archives of Ahmedabad editions of the Times of India, Economic Times, DNA India, and the Indian Express for articles containing the terms Narmada or Sardar Sarovar between January 1st, 2000 and December 31st, 2015.

the symbiotic relationship between technocratic hydrological interventions and nation-building, tying together historical examples from the Indian subcontinent and the ways in which the Sardar Sarovar dam and Narmada pipeline project have been instrumentalized in Gujarati politics. Finally, I use Ferguson's (1990) image of development as an "anti-politics machine" to analyze the political implications of the development push in Gujarat and conclude with some thoughts on the implications of these findings in Gujarat and elsewhere. I argue that the success—or lack thereof—of infrastructure mega-projects as a political tool is not intrinsically tied to their ability to achieve their technical and social objectives. Instead, in a context of rising ethno-nationalism and anxiety over resource scarcity, infrastructural castles in the air may well yield political gains that outweigh, for a time, the real-world costs they incur. In Gujarat, as we have seen, this approach to water provision has not reaped benefits for poor water users like those interviewed in Mahesana, although it has arguably contributed to Mr Modi's tenure as Gujarat's longest-serving Chief Minister.

2 History And Context

Before we look at the Narmada pipeline project itself, shedding light on the historical background of Gujarat will prove useful. The regions making up the state of Gujarat are historically diverse and well-connected to other parts of the subcontinent and Indian Ocean. Located along the coast and adjacent to modern-day Pakistan, Gujarat has a long tradition of trade and migration (Ibrahim 2007). The area has long had not only Hindu, Muslim and Jain communities but also Jewish and Parsi (Zoroastrian) ones. Over time, different regions have come under the rule of various local rulers or invading forces, creating a complex historical/cultural patchwork of political power. After the British East India Company conquered the Maratha empire—which had itself taken control of territory in present-day Gujarat in the early 18th century—the region was broken down into a mix of princely states and areas under the direct administration of the Bombay Presidency or other British officials. At Independence, the Bombay Presidency was merged with the princely states under the Baroda, Western India and Gujarat Agency, forming Bombay State (Yagnik and Sheth 2005).

2.1 Independence and the Creation of Gujarat

The rise of ethno-linguistic statehood movements post-Independence highlighted tensions between Marathi-speakers in the southern part of Bombay State and the Gujarati-speakers in the north (Yagnik and Sheth 2005). The *Mahagujarat*[29] movement for the creation of a Gujarati state grew throughout the 1950s, culminating with the separation of Bombay State into Gujarat and Maharashtra in 1960. An important part of the Mahagujarat movement was the construction, at least on paper, of a unified Gujarat out of four distinct regions which have little historical or cultural basis of unity (Simpson and Kapadia 2010), namely south/central Gujarat, North Gujarat, Saurashtra (which includes and is sometimes referred to as Kathiawar or Kathiawad), and Kutch (also spelled Kachchh).[30] This was largely an endeavour of middle- and upper-class Hindus and Jains in the south/central cities of Ahmedabad, Vadodara (Baroda), and Surat, and the image of essential Gujarati identity that they fashioned was unsurprisingly in their image (Bobbio 2012; Simpson 2013). The placement of the state's new capital, Gandhinagar, has only reinforced the role of south Gujarat as the cultural and political heartland of Gujarat as a whole.

The state of Gujarat is to a great extent still involved in a project of nation-building today. Saurashtra and Kutch, in particular, are both geographically and culturally quite distinct from central Gujarat (see Map 2 for a map of Gujarat's regions). In fact, Post-Independence Kutch and Saurashtra entered the union as separate states (Kutch State and the United State of Kathiawar, later Saurashtra), and were only combined with Bombay State in 1956. Saurashtra is a coastal peninsula, largely divided from the mainland by the Gulf of Khambat to the southeast and the desert-like Little Rann of Kutch to the North. Kutch is even more isolated: between the Gulf of Kutch to the south, the Ranns (salt-marshes) to the east and the Thar desert to the north, Kutch was functionally an island until a rail link across the Rann was established in the early 20th century (Ibrahim 2007). In contrast to the rest of Gujarat, where distinct but mutually intelligible dialects of Gujarati are spoken, residents of Kutch have

29 Literally 'great Gujarat.'

30 See also Ibrahim (2007) on Gujarat's historical multiculturalism.

traditionally spoken Kutchi, although that is changing with the expansion of state institutions and Gujarati cultural influences into Kutch (Simpson 2013). Water scarcity in both Kutch and Saurashtra has been a major argument in favour of the drinking water pipeline project; we will see below how the Narmada pipeline project works to assimilate minority regions into a political and economic agenda driven by dominant central/south Gujarat interests.

2.2 Liberalization And Structural Reforms

The 1990s brought a sea change in Gujarat's governance practices and structures, beginning with the adoption of a program of reforms mandated by India's central government in the wake of the country's balance of payments crisis in the late 1980s. Although these reforms were supported by international financial institutions and fall very much in line with the economic model and financial regime known as the Washington Consensus, it would be inaccurate to describe them as purely externally imposed. At the national level, in fact, Kirk (2012) argues that India's relationship to World Bank, and the model of development that the Bank represents, has long been more symbiotic than servile as India's elite leverages the country's position as an indispensable client for the Bank in order to influence policy and secure agreeable terms. Thus unlike certain other structural adjustment programs, the liberalization policies implemented in 1991 were largely the brainchild of a faction of the Indian political/economic elite (Corbridge and Harriss 2000).

In Gujarat, where the industrial collapse of the 1980s had gutted the state's cotton mills, the Centre's New Industrial Policy was adopted with gusto by the newly-elected Bharatiya Janata Party (BJP), and began to take on its own ethno-nationalist flavour (Bobbio 2012; Hirway 2000). Bobbio (2012) describes how ideas that were spreading nationally and internationally, such as the promise of 'trickle down' economic growth and the image of modernity as technological progress, were combined in Gujarat with a narrative of Gujaratis as an industrious and business-savvy community, uniquely suited to modernity and development. At the same time, the Asian Development Bank chose Gujarat as a test case for state-level loans and structural adjustment programs, noting the "reform orientation" of the

state's leadership (Asian Development Bank 2004). These reforms aimed at "supporting the GoG in augmenting domestic resource mobilization, improving the allocation and efficiency of the public sector, and reducing GoG's role in commercial activities while promoting market-oriented policies to enhance private sector participation in infrastructure development" (Asian Development Bank 2004, 8). Among other projects, this included streamlining and privatizing state-owned enterprises, especially in the electrical sector, and developing the Gujarat Infrastructure Development Board (GIDB), which promotes public-private partnerships and 'bankable' projects that will pay for themselves through debt financing and user fees. As we will see, the GIDB has come to play a central role in the GoG's approach to infrastructure development and service provision.

2.3 Gujarat In The New Millennium

The early 2000s were a tumultuous time for the state of Gujarat. Following lower-than-average rainfall in the 1999 monsoon, summer 2000 was marked by a profound drought that led to riots and a political crisis as the state government maintained their ignorance of the issue until it was far too late (South Asia Network on Dams, Rivers and People 2000).[31] In January 2001, a fierce earthquake struck Kutch, killing tens of thousands of people and leaving the district's infrastructure and housing stock devastated. The earthquake and the reconstruction efforts that followed had a dramatic impact on the state, not least of which was the appointment of BJP strategist Narendra Modi in October 2001 to replace then-Chief Minister Keshubhai Patel, whose alleged poor management of the disaster cost him his position in the party leadership (Jaffrelot 2008; Pathak 2001).

Mr Modi's charisma, political acumen, and mobilization skills honed as an organizer for the Rashtriya Swayamsevak Sangh (RSS) won him re-election to the position three times,

31 Gujarat's year consists of three seasons: a dry winter with average temperatures between 12°C and 30°C, followed by temperatures up to 40°C in the summer months of April, May, and early June. The period from late June to early October essentially provides the entirety of the year's rainfall, so careful planning is required to avoid shortfalls in the hottest part of the year. Although the 2000 drought was immediately precipitated by a weak monsoon, the extent of the drought—in which water reserves were reportedly at a 100-year low—was much worse than a single bad year could account for and revealed the extent to which local groundwater had been over-exploited and dam maintenance neglected (SANDRP, 2000).

and he served as Chief Minister until his election as Prime Minister of India in 2014.[32] It is therefore almost entirely under his leadership that Gujarat's drinking water pipeline grid was developed. Although the Sardar Sarovar Project was historically supported by all of Gujarat's major political parties, under Mr Modi the pipeline project—and by extension the dam—have been increasingly associated with the BJP and even with Mr Modi as an individual.

The influx of post-disaster aid and construction projects beginning in 2001 also accelerated the adoption of a new development approach mediated by GIDB and the new Gujarat State Disaster Management Authority, which was established in partnership with international finance agencies in order to handle the reconstruction process (Simpson 2013). With the help of the Dutch government, the water sector was also restructured, creating a patchwork of agencies and Special Purpose Vehicles that will be further described below (Water and Sanitation Management Organisation, n.d.). Together, these transformations to Gujarat's bureaucracy set the stage for how the Narmada pipeline project would be implemented.

If the earthquake in 2001 cemented the restructuring of the state's governance structures, it also was an opportunity for the Hindu right-wing to further entrench itself in the politics and identity of the state. Religious institutions with proselytizing missions, BJP leaders from within and outside the state, and other branches of the *Sangh Parivar* (see footnote 30) took on important charitable roles in the reconstruction process, securing greater influence among supporters and beneficiaries and often redesigning the areas in which they operated to favour those whose views aligned with their own (Simpson 2013). I highlight this because we will see echoes in the way the Narmada Pipeline Project has used a developmental crisis as justification for a redistribution of resources that favours politically-favoured demographics (Klein 2007). Communalism continued to rise, eventually leading to brutal anti-Muslim

32 The *Hindutva* movement aims to 'restore' Hindus and Hinduism to what is seen as their rightful glory and powerful positions in India and the world. Central to this movement is the Rashtriya Swayamsevak Sangh (RSS), a Hindu nationalist volunteer service and paramilitary organization of which Mr Modi is a *pracharak* (roughly, a missionary). The RSS is surrounded by a family of organizations (the Sangh Parivar), of which the Bharatiya Janata Party (BJP) was established as the political wing.

pogroms in 2002, and later that year a chief ministerial election that saw Mr Modi elected on a platform conflating Gujarati and Hindu identities (Bobbio 2012; Jaffrelot 2008).

The blatant identitarian politics that had allowed the BJP to consolidate its position locally did not go over so well nationally and internationally, however, and in 2003, the creation of the Vibrant Gujarat investors' summit marked a deliberate shift in political discourse, increasingly focusing on economic development and 'good governance.' Bobbio (2012, 667) writes, "Modi projected himself as a model of the Gujarati ethos, making business a pivotal element of his political image. In doing so, he projected himself as a leader with strong roots in the local community and culture, but at the same time strongly committed to leading the state's economy in the global market." At the same time as Mr Modi has sold his strong local support to foreign investors as a sign of stability and business-friendliness, he has presented his support among international investors as an example of his strength as an advocate for Gujarat and Gujaratis, making engagement with global capitalism an essential part of the narrative of Gujarati identity that he represents.

Figure 3: Vibrant Gujarat Startup Summit website (November 2016)

The BJP's post-2002 image of Gujarat revived the notion of a Gujarati cultural proclivity for entrepreneurialism, combining the values and signifiers of urban, middle-class Hindu and Jain culture concretized by the *Mahagujarat* movement as representing Gujarati identity with markers of contemporary globalization such as high technology and Western-style consumerism (Bobbio 2012; Ibrahim 2007). The GIDB (2009, 27) writes:

> Gujarat stands far ahead of other states of India in the availability of quality physical, industrial and social Infrastructure [sic]. Gujarat's achievements and the entrepreneurial spirit of Gujaratis enable them to think bigger and aim higher. There is a conviction that Gujarat should be benchmarking itself to the developed countries of the world and is working towards GDP growth in excess of 11 percent [per year] in the coming years to bridge the gap.

The following section discusses the contemporary context in more depth, and how the pipeline grid fits within it.

3 The Political Context In Gujarat

The program of policy interventions, governance reforms and development projects characteristic of the Gujarat state government in recent years—including the Narmada pipeline—has come to be known as the "Gujarat model of development." While liberalization in Gujarat began with the adoption of centrally-mandated reforms, the Gujarat model has set itself apart even within modern India (A. Dholakia and Dholakia 2015). Advocates of the model attribute to these policies the state's higher GDP per capita, faster GDP growth, and greater rate of industrialization than India as a whole (Economist 2015). The purpose of this section is not to fully evaluate the merits or lacunae of the Gujarat model, but rather to understand the ideological and political framework underlying the construction of the Narmada pipeline project.

3.1 Features Of The Gujarat Model Of Development

The Economist's (2015) succinct primer on Gujarat's economy points to an "emphasis on basic infrastructure [as] a hallmark of the Gujarat Model." This translates into a focus on expanding and streamlining the transportation, electricity, and water sectors. Under the

Gujarat Model, large-scale physical infrastructure—such as improved highways—is considered essential to facilitating economic growth (especially in the form of outside investment in industry) while also serving as visible symbols of the state's modernity and "world-class" status (Gujarat Infrastructure Development Board 2009; M. Desai and Roy 2016). Quoting an analyst with the IDFC Institute, Mumbai, the Economist (2015) writes: "Mr Modi's biggest feats were tangible, says Mr Abraham, the kind of improvements that migrant workers tend to notice, and report back to their relatives." As described above, the image of the state as modern and high-tech is also carefully cultivated and promulgated at home and abroad, most notably through the biennial "Vibrant Gujarat" investors' summits (Bobbio 2012). Water pipelines fit neatly into this vision, allowing the government to ensure ample water for industry and the amenities of 'modern' life, while serving as a visible embodiment of state power in the service of development.

Building and expanding on the historically strong role of trade and industry in Gujarat's economy, under BJP leadership the state has actively sought out foreign direct investment and aggressively marketed itself as forward-looking and business-friendly. Jaffrelot (2015b) writes of Narendra Modi's chief ministership that "CEOs like him because he runs the state like a CEO." Mr Modi is known for concentrating executive power, which has allowed for even more precisely directed control over economic planning in a state that has actively guided the economy since before liberalization (see below). Sud's (2009) case study of the establishment of a cement manufacturing plant in Kutch highlights the way in which cabinet ministries act as brokers for individual corporate investments, selectively dismantling or ignoring regulatory barriers in order to promote desired development. She describes a variety of tactics ranging from steamrolling parliamentary opposition to simply neglecting to inform corporations of pertinent environmental regulations, concluding that the contemporary Gujarati state actively supports corporations at three different levels: by generating the ideologies that legitimate the corporation's operations, by negotiating and politicking on behalf of the corporation, and by actively dissipating resistance both in the public sphere and within the halls of government.

3.2 Personality And Politics

The Gujarat model and its adherents' claims of economic and social development success have been widely criticized. This criticism is based on three major arguments: first, that the condition of Gujarat's economy is largely due to pre-existing factors such as geography and trade history rather than recent economic policy interventions; second, that any recent economic gains are unequally distributed and have not alleviated poverty to the extent claimed; and third, that the model relies on exploiting land and resources in a way that is unsustainable and even, in some cases, unlawful (Sud 2009; Hirway 2013; R. Dholakia 2014; Jaffrelot 2015b). Regardless of the Gujarat Model's economic soundness, however, it has undeniably been politically successful. Not only was Mr Modi the longest-standing Chief Minister in Gujarat's history, but the BJP swept the 2014 federal elections largely on the strength of his commitment to bringing Gujarat's development to the rest of the country (Jaffrelot 2015a).

Indeed, the Gujarat Model cannot be divorced from the cult of personality surrounding the former Chief Minister. His name has in fact become sort of a shorthand for the model, which is sometimes referred to as "Modi-nomics" or "NaMo-nomics" (Economist 2015). As Chief Minister, Mr Modi's image was omnipresent on billboards and newspaper covers, cultivating a sense that "Modi is Gujarat and Gujarat is Modi" (Jaffrelot 2015b, 14). His brand combines staunchly Hindu signifiers and the trappings of upper-caste society with an emphasis on his humble beginnings, personal initiative, and absolute dedication to his work. The branding has been extremely effective even among those who have been neglected by his development agenda: one woman I interviewed who was suffering from a lack of water in her slum told me that "Narendra Modi is a good person" even as she added, "but he doesn't care about poor people." Desai and Roy (2016) describe the prevalence of similarly ambivalent endorsements among working-class and lower-middle-class Gujaratis who are drawn to the BJP and Mr Modi by communal identity and aspirational class values, despite sometimes contradictory material interests.

In an analysis of Mr Modi's electoral success in Gujarat, Jaffrelot (2008) characterizes "Modi-tva" as based on a combination of Hindutva, extreme personalization of power, and a managerial style of governance. Within the government and his party, the man is known for centralizing power: preferring to work only with people of whose loyalty he is certain and ostracizing those who threaten his vision (Verniers 2015). He has been referred to as a "one-man cabinet"; as Chief Minister he allocated himself up to 14 ministerial portfolios, including the Narmada and Kalpasar projects as well as the Industries, Ports, Home, and Information ministries, among others (Express News Service 2012; A. Patel 2013). The tendency toward the centralization of power—and its investiture in a single charismatic figure—are notable, not the least for the impact they have had on infrastructure and policy design. At the same time, it is important to recognize that Mr Modi's rise has benefited the BJP as a party and the coalition of interests they represent at both a state and at a national level, and to understand his governance style as a strategy of the modern BJP rather than purely the actions of an individual.

3.3 Gujarat As A Developmental State

The Gujarat model of development is a product of economic globalization, and as we saw at the beginning of this section proponents of the model have tended to employ outward-looking rhetoric that situates Gujarat in an international space—alongside, e.g., Shanghai and Manila—and contrasts the state with the "backward" rest of the country (M. Desai and Roy 2016). In their description of the Gujarati "miracle", Dholakia and Dholakia (2015, 227) explicitly state, "In economic transformation, Gujarat looks more like China than the average of India." The predominance of examples from countries such as Singapore, Korea, and Malaysia in aspirational Government of Gujarat documents is no coincidence; it is these economic success stories that Gujarat aims to emulate (Gujarat Infrastructure Development Board 2009). Although the Gujarat Model is clearly embedded in and influenced by global neoliberal ideology, Brenner and Theodore (2002) accurately note that an understanding of "actually existing" neoliberalism must account for contextually-specific variation across jurisdictions with different inherited regulatory frameworks and cultures. In this light, it is

useful to see contemporary Gujarat not as a generic reflection of global neoliberal priorities, but as a developmental state that has shifted from the inward-focused developmental priorities of the post-independence era to an emphasis on leveraging deregulated trade and international investment to increase local gross domestic product (GDP).

The concept of the developmental state was coined to describe the state-led economic development seen in Japan in the latter half of the 20th century as well as other emerging East Asian economies (Johnson 1982; Leftwich 1995). Contrasting both state socialism and free-market capitalism, the developmental state is defined by state direction of a capitalist economy—typically through investment, coordination with the private sector, and targeted incentives. Johnson (1999, 38) identifies four features of the Japanese-style developmental state:

(1) an elite bureaucracy whose duties are to identify industries to be developed and strategies to develop them, and to monitor competition in these sectors to promote their health and success;
(2) "a political system in which the bureaucracy is given sufficient scope to take initiative and operate effectively. This means … that the legislative and judicial branches of government must be restricted to 'safety valve' functions";
(3) "market-conforming forms of state intervention in the economy" including tax incentives, venues for discussion and coordination between business leaders and bureaucrats, and "extensive reliance on public corporations, particularly the mixed public-private variety"; and
(4) a vertically-integrated and relatively independent organization to serve as a hub for industrial policy, such as Japan's MITI.

Each developmental state is different, but these four pillars are typically present in one form or another.

Sinha (2003) notes that although state intervention in the economy at India's national level is generally regarded as a failure, Gujarat has long exhibited classic characteristics of a

developmental state. She highlights that even in 1978, when public sector development was at its peak, Gujarat's economy was weighted much more heavily toward the private sector and especially the joint (public-private) sector than that of states with similar histories. In fact, in order to attract private sector investment under the central government's system of tightly-controlled business licenses, Gujarat's political and bureaucratic elites developed channels of information to keep track of applications to central regulatory agencies and optimize the chance of success for Gujarat-based industries. Sinha (2003, 471) writes:

> Gujarat, by ad hoc experimentation, designed institutional mechanisms to collect industrial information and then disseminated it to industrial entrepreneurs. In its effort to ensure investment flow from Bombay, Calcutta, and East Africa in the 1960s and 1970s, it generated databases of the potential entrepreneurs and [created] a specialized body, iNDEXTb (Industrial Extension Bureau), to collect data and information. Even more significant, in an explicit effort to develop sectoral leadership, for example, in chemicals in the 1960s and in electronics in the 1990s, iNDEXTb and other industrial agencies collected industry-related information about many sectors.

The liberalization of national-level economic policies has not necessarily translated into equivalent policies at the state level, but rather opened up space for states to direct their own economies. Indeed, iNDEXTb occupies a prominent place in Gujarat's political landscape: the board organizes the Vibrant Gujarat summits described above, and works closely with GIDB to develop special industrial regions (SIRs) and other industrial areas. The GIDB places officers in other branches of the bureaucracy in order to assure its functioning as an integrated whole with a united vision (interview with GIDB officer, 7 August 2013). The former head of the state corporation in charge of the Sardar Sarovar Dam expresses this vision of the state's role as follows (Gupta 2001, 57): "the … planner [should adopt] as his/her broad objective the formulation of projects and programmes that provide for development and use of … resources … which will contribute to maximization of national welfare. The fundamental basis for choice between the alternative courses of action must be economic efficiency."

The following section will discuss the Narmada pipeline project as one example of this approach of using state power, in the name of development, to improve conditions for industry and export-oriented agriculture. At the same time, as we saw in the previous chapter, state interventions in water provision have not improved water access for poor Mahesana residents. We will therefore return to the question of which interests have been served by the reform of water infrastructure in Gujarat in Section Five.

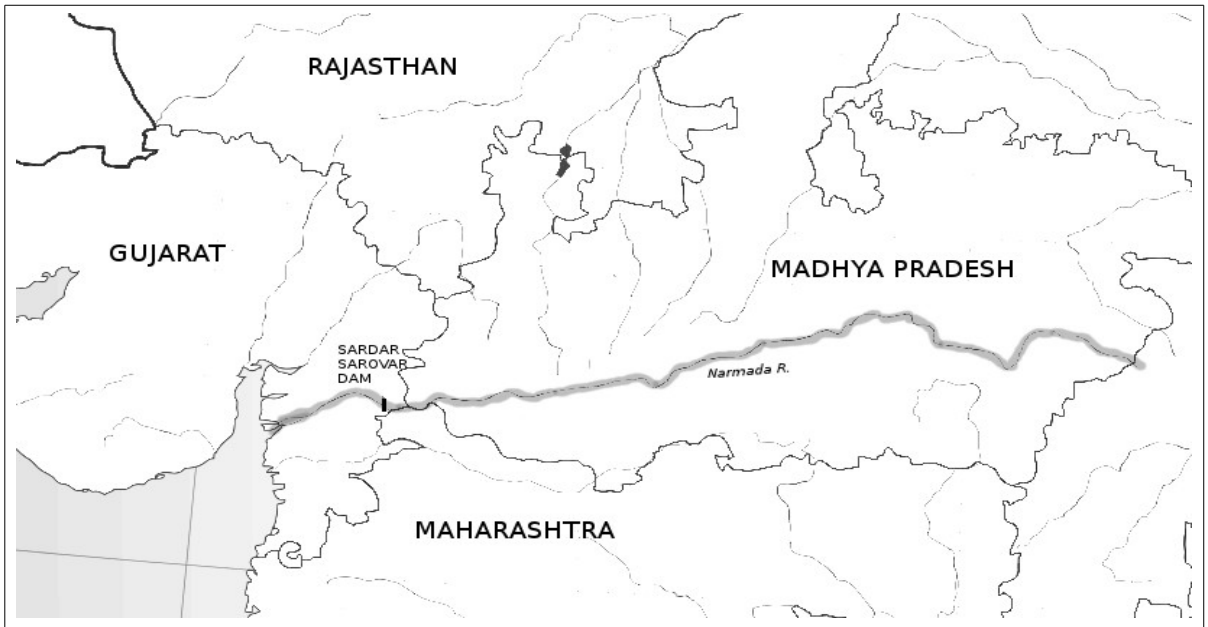
4 The Narmada Pipeline Project

The Sardar Sarovar Canal Based Drinking Water Supply Project, also known as the Narmada Pipeline Project, aims to provide water from the Sardar Sarovar dam on the river Narmada to nearly 10,000 villages and 100-odd cities and towns across the state, a feat it will

Table 3: Key Dates for the Sardar Sarovar Dam

1948	Government of India establishes committee to examine several dam projects for the Narmada.
Mar 1960	Bombay State is split into two new states: Gujarat and Maharashtra.
1965	Khosla committee plan for the Narmada endorsed by Gujarat; rejected by Maharashtra and Madhya Pradesh.
Jul 1968	Gujarat demands that the inter-state water dispute be resolved by a tribunal.
1979-80	Final decision of the Narmada Water Disputes Tribunal establishes Narmada Control Authority (NCA)
Apr 1987	Construction begins on Sardar Sarovar (SSP).
1989	Protests mount; several groups opposing SSP form *Narmada Bachao Andolan* (NBA).
Jun 1992	Report of the World Bank-ordered Independent Review ('Morse Report').
Mar 1993	Government of India cancels World Bank loan.
Feb 1994	Gujarat High Court stops work on the dam; NBA lodges petition with Supreme Court.
Feb 1999	Supreme court allows construction to 85 metres.
Mar 2001	Supreme court rules construction may continue upon NCA approval for every 5 metre increase.
May 2002	NCA gives approval to build to 95 metres.
May 2003	NCA approval to raise height to 100 metres.
Mar 2004	NCA approval to raise height to 110.64 metres.
Mar 2006	NCA approval to raise height to 121.92 metres.
Jun 2014	Approval to install radial gates, raising height to 138.7 metres.

Sources: Cullet, 2007; Mohan & Dave 2014



Map 4: Narmada River, Sardar Sarovar dam and surrounding states

accomplish by adding 2,700 km of pipeline to a branched canal network simultaneously constructed to serve irrigation purposes (Sardar Sarovar Narmada Nigam Ltd. 2016). At the time of writing, roughly 70 per cent of the pipes were reported to have been installed. While the Sardar Sarovar dam and associated infrastructure has been under construction since the 1980s, the drinking water component is a relatively recent addition. The dam itself and the irrigation components of the scheme have been studied at length elsewhere, so while some discussion will be necessary to provide context, these elements are not the focus of the present study.[33]

4.1 The Sardar Sarovar Dam

Discussions about capturing the waters of the Narmada river for 'productive' use date back to the British colonial period, although concrete planning for dams (including what is now known as the Sardar Sarovar project, or SSP) began around 1960, coinciding with the

33 Readers who are interested in more background are encouraged to read the excellent collections of essays on the dam project edited by Fisher (1995) and Drèze, Samson and Singh (1997) as well as recent dissertations by Dwivedi (2006) and Aandahl (2010). The working paper series of the Tata International Water Management Institute has also consistently featured interesting discussion of the effectiveness and implementation of the project's irrigation component (e.g. Hirway, 2005; Shah et al., 2011).

creation of present-day Gujarat (G. Ferguson and Sinnott 1969; Drèze, Samson, and Singh 1997). The SSP is neither the first nor the largest dam to be built in post-Independence India, but it has become perhaps the most controversial as campaigns to stop the eviction of farmers and *Adivasis*[34] from the Narmada valley transformed into a movement with international resonance opposing large dams in general and the entire model of development they were seen to stand for (D. D'Souza 2002; Shiva 2002; Dwivedi 2006). Locally, the movement highlighted major oversights in terms of environmental impact assessment and the implementation and design of resettlement policies, contributing to the World Bank's decision to order an independent inquiry into the project in 1992 and the Government of India's subsequent decision to refuse further funding from the Bank rather than face sanctions (Cullet 2007). A counter-movement in Gujarat in the 1980s and 1990s linked Hindu Gujarati identity with support of the dam. Mehta (2010, 514) describes how the leading NGOs engaged traditions such as *garbas* to create an emotive connection to the dam and a sense of entitlement to Narmada water. She writes:

> support for the dam became the litmus test for 'loyalty' to Gujarat and opposition to it, the ultimate act of disloyalty. [The movement's] tropes of collective pride and suffering built on earlier ideas of regional consciousness, such as K.M. Munshi's concept of Gujarati asmita or pride while also going beyond them to specify a distinct vision of the ideal Gujarati polity.

As the Narmada River traverses several states (Map 4), construction of the dam involves authorities at all levels of government. Allocation of Narmada river water between the co-riparian states was decided by the federal Narmada Water Disputes Tribunal in 1979, which established the Narmada Control Authority (NCA) to implement the tribunal's decision and oversee conflicts in the ongoing development of the valley. Although the Sardar Sarovar is intended as a joint project of the states of Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan, the dam is located within the state of Gujarat and administered by Sardar Sarovar Narmada Nigam Ltd (SSNNL), a Government of Gujarat corporation. Following public interest litigation brought against the dam's construction, in 1999 the Indian Supreme Court

34 Indigenous people, also known in India as "tribals."

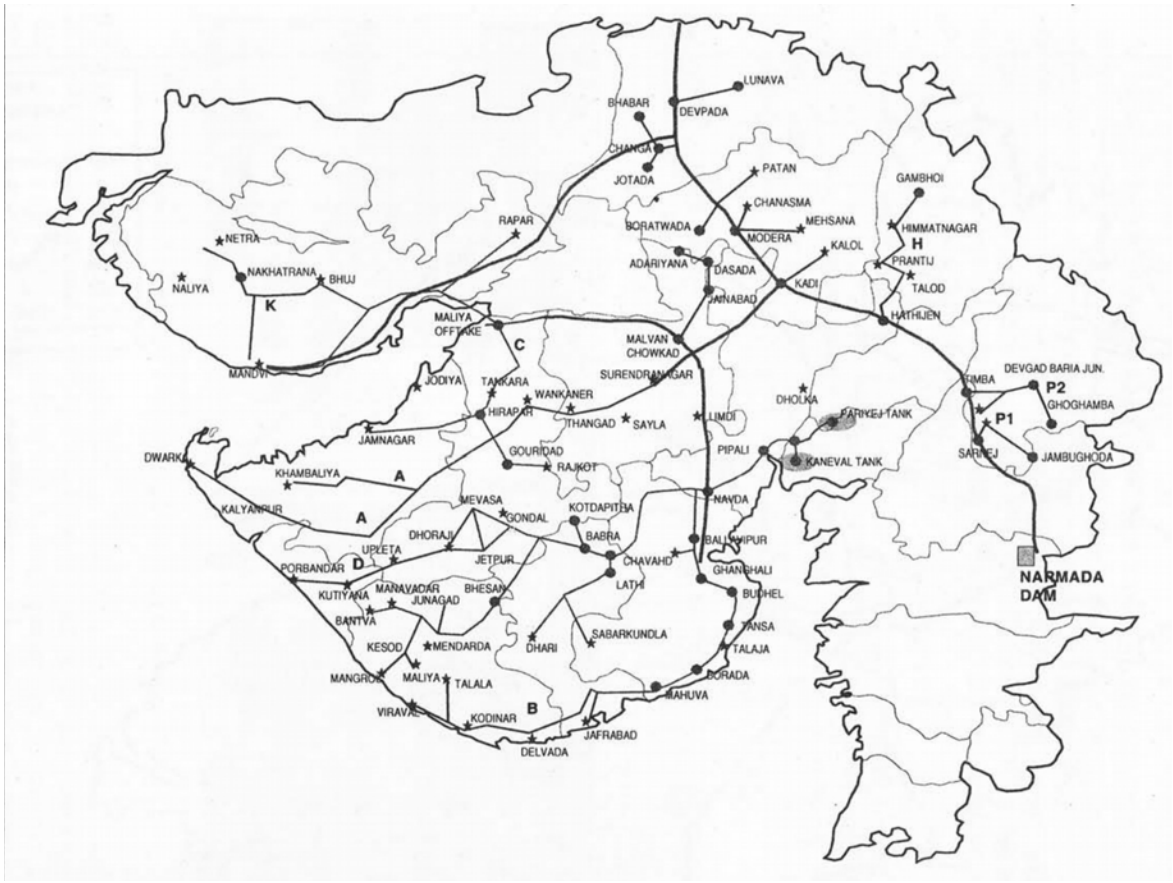
ordered SSNNL to obtain permission from the NCA for each five metre increment of additional height before construction, to be granted only once the Authority was satisfied that resettlement and environmental remediation works related to the previous increment had been completed. Responsibility for these tasks crossed state borders, leading to tensions between states and sometimes-acrimonious delays. Due to an appeal of the decision, it was not until 2001 that construction was able to proceed above 85 metres (see Table 2).

Following the combination of public pressure, legal challenges, inter-state disputes and funding shortfalls that slowed construction, the dam finally began providing hydro-electricity and water in 2002 and was inaugurated at its 'final' height of 121 metres on December 31, 2006. Since then, the Chief Minister has led efforts alongside the SSNNL to get approval for the installation of gates that would raise the effective height of the dam to 138.7 metres, arguing that this increase is necessary in order to extend the reach of Narmada water to the farthest sections of the irrigation canal system. This authorization was granted in 2014, days after Mr Modi became Prime Minister of India. The ongoing struggle over the dam provides the backdrop against which the Narmada Pipeline Project is planned and executed.

4.2 The Drinking Water Grid

The Narmada Water Disputes Tribunal (NWDT) decision in 1979 allocated to Gujarat 32 per cent of the Narmada River's water, or an estimated nine million acre-feet (MAF) per year (Narmada Water Disputes Tribunal 1979). Although the wording of the tribunal decision deliberately allows for variation in yearly flow, the GoG documents I studied universally presented the figure of 9 million acre-feet (MAF) as a fixed amount.[35] Initial plans for that water provided solely for the irrigation of a large command area through an extensive canal system, but a state-level planning process in 1990 allocated 0.9 MAF (roughly 3,000 million litres per day or MLD) for drinking water to water-scarce villages in Kutch, Saurashtra, and northern Gujarat (Aandahl 2010). The drinking water plan was vastly revised in the early 2000s to direct water through pipelines integrated into a state-wide grid (see Map 5). The

35 In units more usually used for drinking water, 9 MAF/year is roughly 30,000 million litres per day.



Map 5: 2003 plan for the Narmada Pipeline Project (Reproduced in Pravah 2009)

pipelines are also meant to carry an additional 700 MLD for industrial use, bringing the combined non-agricultural uses up to roughly 13 per cent of the NWDT award to Gujarat (Gujarat Infrastructure Development Board 2009).

Today, water flows from the Sardar Sarovar dam at Navagam into the Narmada canal, from which it is pumped into pipelines at several pumping stations across the state, ultimately connecting to existing city and village supply schemes. The organizational landscape of the project is more complex: while planning for water and sanitation at a state level is the responsibility of the Gujarat Water Supply and Sewerage Board (GWSSB), the responsibility for constructing, operating, and maintaining the heavy infrastructure is divided between two state corporations—the aforementioned SSNNL for the dam and Gujarat Water

Infrastructure Ltd (GWIL) for the canal and pipeline—which then contract private sector companies to carry out the construction and maintenance of various branches of the project. Water provided by the pipeline is sold by GWSSB to the municipal corporations and to the Water and Sanitation Management Organisation (WASMO), a Government of Gujarat special purpose vehicle and registered charity that is responsible for supporting villages in providing and managing drinking water and sanitation, e.g. through the formation of *pani samitis* (village water committees). While the WASMO website describes it as reflecting "a shift from the supply-driven government-owned systems to decentralised demand-driven, community- owned water supply systems" (Water and Sanitation Management Organisation 2016), the organisation's 2015 promotional brochure acknowledges that the organisation was formed to "augment" the pipeline grid by "creat[ing] the infrastructure requisite for taking drinking water up to individual villages or village clusters ... Then, the responsibility of maintaining, strengthening and sustaining that last-mile infrastructure is handed over to the respective communities" (Water and Sanitation Management Organisation 2015, 4–5).

The fragmentation of Gujarat's water planning and provision bodies is explained in official documents as a response to the 73rd amendment to the Indian constitution, passed in 1992, which established elected governing bodies at the village level (*gram panchayats*) and devolved a number of responsibilities from the state to the local level, including the responsibility for water provision (Water and Sanitation Management Organisation 2016). Although this is no doubt part of the explanation, Gujarat's contemporary water governance institutions date only from 2000 or 2002 (ten years after the passage of the Constitutional Amendment) and can be traced back to the structural reforms described in Section Two. As the WASMO quote above suggests, the physical pipeline and the governance reforms can be seen as part of a single development project or approach, which is how I will treat them here. I will also touch on two other projects that are related to this re-imagining of Gujarat's physical and political water infrastructure: the ongoing efforts on the part of the Government of Gujarat to raise the allowed height of the Sardar Sarovar dam, and the construction of an enormous statue of famed Gujarati statesman Vallabbhai Patel (known as the "Statue of

Unity") at the base of the dam, a copy of which is being installed in the capital city, Gandhinagar. Together these elements point to the way in which the functions—both practical and symbolic—of the dam and its waters are being renegotiated since the advent of the "Gujarat model" at the turn of the millennium.[36]

The perceived need for a drinking water component to the SSP can be traced to the transformation of Gujarat's hydrology between the initial planning stages of the dam and the present-day. As a semi-arid to arid region, Gujarat has traditionally relied on wells, monsoon-fed tanks and ponds, and seasonal rivers for its water needs (Hardiman 1998). As was mentioned in Chapter Four, reliance on human- or ox-power to dig and draw water from wells effectively limited groundwater exploitation to amounts that could be replenished seasonally through natural processes. As rural Gujarat was electrified in the 1980s and 1990s at advantageous rates for farmers, groundwater exploitation skyrocketed, leading to dangerously depleted levels across many parts of the state (Gupta 2002; Hirway 2005). Until recently, electricity for farms is billed at a flat rate based on the size of motor used (and not the amount of water pumped), creating an incentive for farmers to pump water in excess of their needs and resell it or to switch to water-intensive cash crops.[37] Efforts to change the billing structure have been met with resistance from a powerful farm lobby (A. Mukherji 2006), although the *Jyotigram Yojana* electrification scheme has now begun rationing electricity to farms in order to reduce the exploitation of groundwater with electric motors (T. Shah et al. 2008). Fluoride and arsenic contamination, salinity ingress, and simple lack of water are thus real and growing issues for many of the state's residents, and the Government of Gujarat has opted to treat these almost exclusively as problems of supply rather than

36 The Statue of Unity is but one example of many that could be used to illustrate the use of spectacle in Gujarat's developmental politics (another being the Sabarmati waterfront revitalisation in Ahmedabad, see Mathur 2012). I have chosen to focus on the statue as it particularly clearly illustrates the way in which the spectacle of development can be put to work for an individual or faction within government—in contrast to the role of the 'anti-politics machine' in entrenching state power more generally.

37 While planners of the canal network initially thought farmers would prefer river water to groundwater, the reverse appears to be true. As a result, it has proved difficult to secure cooperation from landowners for the construction of canals or to collect enough in usage fees to recoup the costs of construction, and there has been some interest in using the canal to recharge aquifers instead (Aandahl, 2010; Ranade & Kumar, 2004).

taking the drastic steps that would be necessary to reduce demand to sustainable levels.

4.3 Imagining The Grid

Environmental groups have argued that the main lesson of the 2000 drought (discussed in Section Two) was that there was a need for more robust water conservation practices and effective rainwater capture, including maintenance of the existing smaller regional dams. In 2000, however, construction on the Sardar Sarovar dam was tied up in legal appeals (Table 2) and many commentators and government officials maintained that the crisis could have been avoided had the dam's construction not been delayed (South Asia Network on Dams, Rivers and People 2000). This set the stage for a dramatic revision of the plans for distributing Narmada water in order to fast-track drinking water directly to drought-prone regions of the state through massive pipelines, a plan which would also conveniently sidestep the increasing technical and political challenges posed by canal construction and maintenance.

Once permission had been granted to start raising the dam in 2001, Gujarat's political leadership rushed to complete it as soon as possible. Meanwhile, farmers had turned out to be unexpectedly reluctant to part with valuable farmland for the construction of canals and resistant to the expectation that they construct the smaller channels themselves. The need to pay higher prices for land and hire contractors for all aspects of construction increased the cost of the project and wreaked havoc with the delicate timing needed to have the irrigation network complete right as water was available to fill it (Aandahl 2010). As a result, when water started flowing in 2002 Gujarat found itself with a seeming abundance of Narmada water before canals were ready to distribute it (Aandahl 2010, 304). Aandahl (2010, 189) quotes Sanat Mehta, ex-chairman of SSNNL, as follows:

> [T]he present Chief Minister [Narendra Modi], when he realised that the canals will not be ready in … time … and he want[ed] to create the impression all over the country that waters of Narmada has reached the people … he converted it into a pipeline scheme [for] drinking water.

The influx of international funding after the 2001 earthquake also contributed to the pipeline project taking off in a timely way: in Kutch, funds from an Asian Development Bank

reconstruction loan were used to construct the pipeline from Maliya to Mandvi, Bhuj, and Rapar (labelled K on Map 5) (Asian Development Bank 2008).

Despite Mr Mehta's attribution of the drinking water pipeline scheme to Chief Minister Modi, plans for the project had in fact been outlined before Mr Modi took office; they are discussed in a report by the Gujarat State Drinking Water Infrastructure Company dated December 2000 and were referred to by his predecessor Keshubhai Patel in a 2001 report to the Indian Planning Commission (Gujarat State Drinking Water Infrastructure Co Ltd 2000; K. Patel 2001). But by the time water was flowing from the Sardar Sarovar dam into Gujarat, Mr Modi was in power and was easily able to position himself as the champion of the drinking water grid. This re-branding has been so successful that numerous recent commentators give 2002 as the starting date of the project and name Mr Modi as its initiator (Biswas-Tortajada 2014; Press Trust of India 2015a). Similarly, Modi's lasting association with the grid—and by extension the SSP as a whole—is underlined by his successor Anandiben Patel's statement at a 2015 ceremony inaugurating the pipeline to Saurashtra and Kutch: "This is our prime minister's [Narendra Modi's] dream project. He … had worked tirelessly to solve the water scarcity of this region. He also fought hard to increase the height of Sardar Sarovar dam and provided us the technology to lay the canals quickly"[38] (Times News Network 2015b). We can see here the way in which the dam, the pipeline, and modern technology are all rhetorically tied together and linked with an image of Mr Modi as a benevolent protector for Gujarat.

4.4 Implementation And Changes To The Project

The initial master plan in 2000 for the drinking water grid proposed to supply 3,500 MLD to 8,215 villages and 135 urban areas in Saurashtra, Kutch, north Gujarat and the Panchmahals in the east, costing Rs. 7,000 crores or roughly US $1.6 billion (Gujarat State Drinking Water Infrastructure Co Ltd 2000). In 2009, the number of villages and towns to be

38 Although it is unclear what Mrs Patel meant by this reference to canal-laying technology, the image of the Narmada project as innovative and high-tech is an integral part of its marketing, as we will see below.

covered remained the same, though mention of the Panchmahals had been dropped as they were now to be covered by a system of check-dams and other existing dams in the centre of the state (Gujarat Infrastructure Development Board 2009). Today, in 2016, the SSNNL website describes the project as covering 9,490 villages and 173 towns, although the amount of water allotted appears to remain the same (Sardar Sarovar Narmada Nigam Ltd. 2016).

In fact, studying the news archive from 2000 to 2015 reveals regular allocations of Narmada water to new projects across the state: for example, in 2012-2013, 190 MLD to a special industrial region in the Baruch-Dahej area of South Gujarat (near the now-dry mouth of the Narmada), 90 MLD to the Gandhinagar International Tech City Special Economic Zone (SEZ), and 38 MLD to Vadodara (Baroda), also in South Gujarat. A 2012 plan for public-private partnerships (PPPs) to develop water treatment and drainage systems in cities across the state included plans for the provision of 140 litres per capita per day (LPCD) in every municipality by 2014, much of it to be supplied from the Narmada grid. Kutch and Saurashtra have also seen short-term outlays to refill ponds and dams in drought-stricken areas, and in 2013 the overall water supply to Kutch and Saurashtra was reportedly increased by 50 per cent. In 2015, new pipeline branches not included in the initial plan were inaugurated to cover yet more area. Discussing similar off-plan outlays of water for irrigation, a GWSSB engineer quoted by Aandahl (2010, 305) sums up the situation: “If you give water for ten years and then stop, there will be riots. Some will say we should therefore not give outside the command area. But the other school says: Should we waste water for ten years?” With votes to secure and reputations to maintain, Gujarat’s leading politicians unsurprisingly fall largely in the latter camp.

Nonetheless, these new allocations are contested by entities both within and outside the state government: for example, a 2013 newspaper article documents a refusal by SSNNL officials of the GIDB’s demand for 947 MLD of Narmada water as part of their development plan for the Dholera special industrial region (SIR), on the grounds that all 1.02 MAF

intended for drinking water or industrial use had already been allocated (R. Shah 2013).[39] Aandahl (2010, 190) also suggests that there is an inherent tension between SSNNL technocrats and politicians over the appropriate allocation of Narmada water, writing: "In the opinion of the SSP planners, everything is planned, and scientifically so. … The only factor not factored in was the complexities of human agency, in particular, politicians use of water for votes, and the local politics of access and project implementation." However, this narrative is overly simplistic, as the SSNNL and GWIL are far from perfect stewards of scarce water resources. The 2005-6 report of India's Comptroller and Auditor General, for example, highlighted GWIL- and SSNNL-sanctioned "deviation from the master plan" and "excess allocation of water to industrial users" as significant issues that detracted from Gujarat's ability to effectively deliver on its commitments to drought-prone areas as outlined in the Narmada project master plan, and found a frightening lack of balanced accounting for changing water allocations (Comptroller and Auditor General of India 2006, 18–19). Specifically, the report criticized SSNNL for justifying its allocations to industrial areas with a claim that the amount of water earmarked for industry had been increased from 0.2 MAF to 1.0 MAF, pointing out that there was no corresponding reduction in allocations elsewhere. Since this report, unplanned-for allocations have only increased, while the stated amount earmarked for drinking water and industry remains constant and there has been no official reduction in irrigation area (Gujarat Infrastructure Development Board 2009; Sardar Sarovar Narmada Nigam Ltd. 2016; R. Shah 2013).

Meanwhile, there continue to be almost-yearly reports of water crises in Kutch and/or Saurashtra, with tensions rising to the point of full-blown water riots in Rajkot in 2015 (Times News Network 2015a). Officials blame theft by farmers along the canal for the water's failure to reach the pumping station which serves those regions (at Maliya, see Map 5), repeatedly deploying police to remove illicit pumps as an emergency relief measure and promising to construct more stretches of enclosed pipeline to thwart theft. Tellingly, a 2012

39 Development of the SIR has continued, although it remains unclear from where water will be sourced. Dholera SIR is now considered one of India's new "Smart Cities" (Datta 2015a).

newspaper article noted that officials had been lax about enforcing prohibitions on pumping from the canal owing to it being an election year, revealing the perverse incentives dictating how water is controlled in the state (R. Shah 2012). Note that compared to the intended Kutchi beneficiaries, these upstream farmers are in positions of relative privilege by virtue of their geographical location in higher-rain areas, their cultural affiliation to central Gujarat, and their apparent ability to afford pumps and the electricity to run them. Nonetheless, in 2015 the state began using unmanned aerial vehicles (UAVs) to monitor the Saurashtra branches of the canal for illicit pumping, and a new State Reserve Police battalion was also formed that year to defend "critical infrastructure" (Parmar 2015b; Press Trust of India 2015b).

For decades, the Narmada was heralded as a long term solution to the issues of drought and precarity in Western India, and a major claim in favour of the state-wide grid has been that it will assist in creating a "tanker-free" state (Times News Network 2015b; Water and Sanitation Management Organisation 2015).[40] Security measures aside, however, there has been no apparent effort to reduce upstream (e.g. south/central Gujarat) use of water in order to ensure adequate supply to Kutch and Saurashtra. In fact, aside from one-time emergency relief allocations, the vast majority of unplanned allocations described above have been to central/south Gujarat, which is not only the cultural heartland of the state but the region with the greatest rainfall.

As a result of the ongoing water shortages, solutions that had been discarded before the Narmada project are now beginning to get more attention. In the short term, these include dam desilting efforts and the use of remote sensing technology to locate new borewells in Saurashtra and Kutch (DNA correspondent 2013; Press Trust of India 2014). Longer-term, the state is continuing to look to infrastructural megaprojects such as river-linking canals between Gujarat and Maharashtra and the fantastical Kalpasar Project, a proposed 64-km-

40 While tanker trucks are a feature of the waterscape across a wide range of India's regions and socioeconomic classes, their association with drought relief and by extension water insecurity is what lends this image its rhetorical power as a representation of progress and development.

long dam across the Gulf of Khambat that would trap the outflow of five seasonal rivers, or essentially the majority of the state's freshwater runoff (Gujarat Infrastructure Development Board 2009). Nonetheless, at the 2015 inauguration of three new branches of the Narmada pipeline, then-Chief Minister Anandiben Patel promised that these branches would "permanently solve" water scarcity in Saurashtra and Kutch, proving that the dream of the Narmada project has not yet entirely run its course (Press Trust of India 2015a).

4.5 Assessments And Critiques

In the media and in academic writing, proponents of the Sardar Sarovar project—and more specifically the drinking water grid—have largely treated it as a technical solution to a technical problem: that of "effective, efficient and sustainable" distribution of water (Gujarat Infrastructure Development Board 2009). The shortage of water, whether for household use or for irrigation, is presented as purely an issue of physical scarcity that can therefore be remedied through water transfer from more well-endowed areas.. This is reflected in how the GIDB (2009, 76) presents Gujarat's water situation:

> Due to erratic rainfall and ground characteristics, there are regional imbalances in the distribution of water. [...] While North Gujarat, Saurashtra and Kachchh constitute 71% of [the] total geographical area of the State, they account for less than 30% of the water resources. Further, more than 40% rainwater flows into the sea as run off every year due to absence of water conservation structures.

Similarly, coverage of the project often repeats the fact that Gujarat has 6.4 per cent of India's geographical area but only 2.3 per cent of its freshwater resources, suggesting that the natural distribution of water is unfair and that Gujarat's water woes are essentially due to this hydrological inequality (Gupta 2002). While natural scarcity is an undeniable fact, a full accounting of Gujarat's water crisis must address the forces that have driven consumption far beyond the capacity of existing natural resources. Although tacit acknowledgement of the role played by over-consumption can be found in official pronouncements about the need for drip irrigation and water conservation, in practice the ongoing promotion of highly water-intensive industries such as cement and pharmaceutical manufacturing tell a different story

(Gujarat Infrastructure Development Board 2009).

In contrast, official documents do not give any attention to social or political determinants of access either to irrigation or to drinking water. In fact, state responsibility over the pipeline extends only to providing a single point source for each local body, from which the municipal government or village water committee (*pani samiti,* an unelected 'participatory' body) is responsible for distribution. Uneven infrastructure coverage within municipalities or, for example, caste-based discrimination in single-source villages are therefore unaccounted for in the plan, a fact brought starkly to light in scattered newspaper reports of Dalit residents being denied access to newly-arrived Narmada water (Parmar 2015a, 2013). Similarly, the previous chapter revealed how connection to the Narmada grid has not resolved water insecurity for residents of under-served areas of Mahesana. By framing the issue simply as a nearly-inevitable overall physical shortage, Government of Gujarat solutions to water insecurity do little to address the causes of the insecurity experienced by individuals and even less to mitigate its particular effects on the hardest-hit residents. Instead, the physical layout and governance structures of the pipeline set it up for capture by local and state-level elites.

4.6 Third-Party Analyses

In 2005, a consortium of NGOs working on water-related issues in Gujarat established a citizen monitoring program in order to understand the effectiveness of the Narmada Pipeline Project on the ground (Hirway and Goswami 2008; Pravah 2009). The study surveyed the 2,044 villages covered at the time (roughly 20 per cent of the entire project), and found that only 82 per cent of the villages covered officially were actually receiving Narmada water, of which nearly two thirds (roughly 60 per cent) had received water fewer than 60 days out of the previous three months. Twenty per cent of the villages had received water fewer than 30 of the past 90 days. As none of the villages had meters, the amount of water supplied could only be approximated based on timing: a village of 500 people (which all of the surveyed villages surpassed) was estimated to require at least two hours of daily water flow in order to

reach 70 LPCD. Even on days when water was supplied, however, only 30 per cent of the villages were observed to receive more than two hours of water supply. Meanwhile, *pani samitis* had been constituted in only 30 per cent of the villages where water was received, many of which existed only on paper while many more included no women members. As the *pani samitis* are intended to be responsible for setting and collecting water fees, maintaining intra-village water infrastructure, testing water quality and ensuring representation of women and minorities in water governance, this lacuna has profound repercussions for the efficacy and equity of the project. Major shortfalls were also found in terms of communication between state-level bureaucrats, contracted valvemen, and village authorities—particularly in terms of water testing and treatment. Although GWSSB is supposed to provided clean (chlorinated) water, the water delivered to villages was typically untreated river water. Valvemen who were responsible for adding chlorine if necessary were not equipped to test water quality themselves, and neither the valvemen nor the village authorities were kept reliably informed of any quality testing that may have been performed by District or *Taluka* (sub-district) authorities.

More fundamentally, the study found that all of the villages surveyed had existing local sources, either within the village or from small-scale local and regional distribution schemes. While these sources may not have been entirely adequate to serve village needs, since the introduction of the Narmada pipeline the maintenance of these sources has been completely neglected. This caused a reduction in the total amount of drinking water available, and increased villagers' dependence on outside sources over which they have little control, while raising the per-unit cost of water as low-cost sources were replaced with higher-cost Narmada water. At the same time, project 'beneficiaries' are saddled with the responsibility of managing and maintaining this new distribution infrastructure. The study's concluding report to GWSSB and WASMO thus strongly argues for a sustainable water policy that prioritizes local sources and rainwater collection and treats the Narmada pipeline as a backup solution during the driest months of the year (Pravah 2009).[41]

41 At this time, Gujarat does not have a state water policy.

Unfortunately, an equivalent study has not been done on the urban areas served by the grid. An urban service level benchmarking project, however, found that by 2015-16, the state's municipalities were providing a total of 4,519 MLD of water, 80 per cent of which was from surface water sources including the Narmada and other rivers (Performance Assessment Project 2016b). This is nearly one and a half times as much as was being produced in 2008 when the study began, and the researchers attribute the increase to the Narmada canal/pipeline project. Without a baseline from before construction began it is impossible to fully quantify how much of an impact the pipeline project has had on water availability in the state, but it is clear that today the Narmada is the principal source of municipal water in Gujarat. Even with the project more or less complete, however, the state is struggling to meet the high level of water supply it has promised. The current reported availability of municipal water supply averages out to roughly 130 LPCD, the minimum level of provision the Government of India mandates for urban areas. The distribution of service is profoundly unequal even between cities, with the capital city of Gandhinagar providing a reported 254 LPCD to its residents in contrast to a measly 35 LPCD in, for example, Wankaner, Saurashtra. Similarly to the rural findings discussed above, the Performance Assessment Project study reports an average of fewer than two hours of water supply per day 23 days per month, with no significant improvement over the 2008-2016 study period. It is important to note that given the absence of metering in most urban local bodies, most of the data for this study consists of estimates by municipal staff, which suggests that actual numbers may be significantly lower (Urban Management Centre 2011). The data also does not address inequalities within urban areas, nor does it recognize how much of this water is destined for commercial and industrial uses rather than solely domestic ones.

Overall, the picture painted by the media and by these two studies is far from the universal, steady "lifeline" promised by planners and politicians alike. Distribution has been unequal and unreliable, affected by political patronage and uneven hydrological cycles as well as by theft, breakage, and over-exploitation. Regardless of the planners' intentions, the

design of the project has left Kutch and Saurashtra particularly vulnerable to the effects of increased demand in central Gujarat, whether through illicit water pumping by local farmers or more official allocations of water to politically-important locations. In stark contrast to crowing declarations of success based on technical indicators such as number of kilometres of pipe laid and amount of water flowing, water riots and impending crop failures continue to be regular occurrences in Gujarat, and new water provision schemes are now being proposed to fill the gaps left unfilled by the Narmada grid.[42] The following sections take us beyond the project's apparent failures to describe the political purposes it serves and the effects it has had outside of addressing water scarcity.

5 The Hydropolitics Of Nation-Building

Writers discussing the Sardar Sarovar project and other dams often quote the claim of India's first Prime Minister, Jawaharlal Nehru, that large dams were to be the temples of modern India (Nehru, 1954). This quote, and its enduring popularity, are testaments to the important place of large infrastructure projects in both the political and psychical landscape of the Indian state over the years. India is far from alone in having associated large dams with modernity and development, particularly among post-colonial states, but a look at the particular history of the Indian hydrocracy will help to illuminate what is occuring in Gujarat today.

In her history of dam engineering expertise in India, Swayamprakash (2013) compellingly argues that the ways of thinking that underlie dam construction and design were essential to nation-building, perhaps more so than any material development benefits derived from the final products. She writes (Swayamprakash 2013, 154) that large dams "were meant to fundamentally rearrange natural and social geographies"; the scientific re-imagining of rivers and their surrounding geographies as 'river basins' and catchment areas undercut the strength of local and regional place-based identities, so that instead of culturally

42 In fairness, the SSP has significantly increased water flow to non-riparian areas of Gujarat. However the net gain has been far smaller and far less reliable than promised, throwing the cost-benefit analyses used to justify the project into question (Hirway and Goswami 2008).

important places and processes with their own histories and ecologies, waterways were recast as latent resources waiting to be exploited for the good of the nation. Meanwhile, dam proponents homogenized widely disparate relationships to water in order to portray their projects as the natural evolution of the subcontinent's millennia-long tradition of waterworks and irrigation technology, creating a unifying national mythos. The displacement of local knowledges set up technical experts as the only legitimate directors of development, creating "powerful state hydraulic bureaucracies [that] became…synonymous with the project of 'development'" (Swayamprakash 2013, 154).

Dams thus served not only to provide needed services to India's citizens, but in fact to make 'citizens' of them in the first place, incorporating them into a national geography and demonstrating the strength of the state as a techno-economic power. Discussing the failed nation-building ambitions of Pakistan's contemporaneous Tarbela dam, Akhter (2015, 850) argues that unifying infrastructure projects can only succeed in that aim if a concurrent nationalism is constructed. The success of India's hydrocracy, therefore, lay not only in its technical prowess but in the strength of the mythos built to support it and the trust its attendant institutions were able to garner. As we will see, the construction of unifying national narratives has been an important part of Gujarat's political scene over the past fifteen years as well.

5.1 Nation-Building In Gujarat

As described in Section Two, modern-day Gujarat is an imagined community made up of culturally distinct areas with separate histories. The dominant south/central region is more urbanized, as well as more fertile, than the rest of the state: it contains the state's three largest cities (Ahmedabad, Surat, and Vadodara) as well as the areas of greatest average rainfall. In contrast, in addition to representing culturally distinct groups from central Gujarat, Kutch and Saurashtra are border areas and are home to a higher percentage of Muslims than other parts of the state. In light of contemporary geopolitics and the sectarian nature of local politics, development in these regions is thus seen as part of a counter-terror effort, and their

integration into the ambit of central Gujarat and the capital, Gandhinagar, as a necessary counterweight to the perceived influence of Pakistan.[43] Kutch, in particular, has long been portrayed in the popular imagination of non-Kutchis as a wild and potentially dangerous place, whether due to its land border with and cultural affinities to Pakistani Sindh, or to its harsh and 'lawless' desert (Ibrahim 2007; Simpson 2013). These sentiments are not entirely new: early proponents of the SSP looked to Israeli settlements as a model for using irrigation to build a buffer of farmer-settlers against the combined threat of desert and foreign enemy (Gupta 2001).

Security and cultural politics aside, the aridity of Kutch has been a central argument for the SSP from its inception: early tensions between Gujarat and its co-riparian states stemmed from the fact that Gujarat envisioned a dam high enough to irrigate all of Kutch, entailing a submersion area that would have destroyed prime cropland in Madhya Pradesh (Cullet 2007). The final NWDT decision only allowed for the irrigation of two per cent of Kutch, one-tenth of the already reduced final demand that Gujarat had put before them. Despite this huge reduction in scope, state rhetoric around the role of the SSP as a 'lifeline' for Kutch has changed very little over the years. Mehta (2001, 2029) writes that "there has been a marked mismatch in official rhetoric concerning the claims by project authorities about the benefits of SSP to Kutch and the actual irrigation benefits going to the region." Design and logistical issues also indicate that Kutch is less of a priority than the rhetoric would suggest: as Kutch is served by the final leg of the drinking water pipeline and the irrigation canal, Narmada water has reached it only after all other regions were served and remains at all times highly susceptible to disruption and shortfall due to high demand or damage in central Gujarat.

While the drinking water grid physically and administratively unifies large swathes of the state, another project is being simultaneously deployed to politically and affectively unite it —and the country as a whole. The Statue of Unity, portraying Indian independence fighter and statesman Vallabbhai ("Sardar") Patel, is designed to be the world's tallest statue, and

43 Vocal anti-dam protesters have in fact been accused of being Pakistani agents (Indian Express, 2014).

will stand at the base of the Sardar Sarovar dam along with a museum dedicated to the man's legacy. The rediscovery and celebration of Gujarati heroes is a tried and tested strategy for the Gujarati BJP: Simpson (2013) describes the way in which after the 2001 earthquake the Kutch-born revolutionary Shyamji Krishnavarma was commemorated in renamed buildings, speeches, and school curricula. He argues that the choice to celebrate a Gujarati freedom fighter who opposed Gandhi and the Congress Party was deliberately intended to create an alternate image of Gujarati identity that aligned with the right-wing politics of the time.

The Statue of Unity gains its name from Mr Patel's role in unifying the country, persuading various jurisdictions to join the newly-forming nation. The statue has been the object of a massive mobilization, particularly in rural areas. As Mr Patel was a farmer, farmers across the state and across the country have been solicited to contribute used metal tools and scraps to be melted down into the statue, along with photographs and signatures to be included in the museum at its base. Although Mr Patel was a member of the Congress Party, he has gained sympathy within the BJP for having been passed over in favour of Jawaharlal Nehru as the country's first prime minister, positioning him in seeming opposition to the Nehru-Gandhi dynasty opposed by the contemporary BJP. In a 2012 blog post honouring Mr Patel, Narendra Modi celebrated his simple life and dedication to the cause—both elements of Mr Modi's own personal mythos—before suggesting that had Mr Patel been prime minister, the situation in Kashmir and in India as a whole would be much better today (Modi 2012). Where Mr Krishnavarma's rediscovery strategically tied Kutch into the BJP's image of Gujarat, the celebration of Mr Patel served as a springboard from state to national politics, positioning Mr Modi to take on the role of prime minister that his icon never got.

Given its symbolic link to farmers, situating the statue at the base of the Sardar Sarovar dam solidly anchors the narrative of the Narmada as a lifeline of rural development, while also placing Narendra Modi's personal stamp on the project through his identification with Sardar Patel. At the same time, it is fitting that a nationally-significant symbol would be placed at the dam, as Mr Modi has promoted the drinking water grid model far and wide,

inspiring copycat projects in the states of Telengana and Maharashtra as well as at the national level. Finally, the statue and museum will serve to reinforce tourism to the dam site, already served by Gujarat Tourism bus tours and promoted as a picnic area. By linking the dam with a hero, the Narmada project, too, acquires a kind of heroism by proxy. Visits to the museum and statue will reinforce the visibility of the dam to Gujaratis and visitors, helping it serve one of the purposes of mega-infrastructure described in Section Three: to offer visible evidence of development even to those who have not been directly served by it.

Figure 4: The recreation area at the Sardar Sarovar Dam (source: SSNNL website)

6 The Anti-Politics Machine

The majority of existing scholarship on the Narmada pipeline and the larger Sardar Sarovar project has focused either on determining whether it has been successful, or whether it is justifiable (typically by weighing anticipated benefits against projected or observed harms.) To a great extent, responses to these questions seem predetermined by the authors' political stances, with success and justifiability both measured by moving goalposts, especially as the project continues to expand and change. Regardless of the conclusion, this framing of the question continues to support the idea that the project is a technical solution to a technical problem, and that exposure to the right evidence will therefore generate better water policy in the future.

My experiences discussing the project with project proponents and engineers suggested that there was a different dynamic at play. Although the mid-level bureaucrats I spoke to were adamant that the project was the most efficient way of achieving the desired transfer of water from the Narmada to drought-prone areas, when pressed on the framing of the problem

as one of inter-region transfer they treated it as self-evident or, at most, suggested the problem statement had been formulated by higher-ups. Although the irrigation component of the SSP was planned by a high-level committee made up of economists and regional planners, overseeing a technical team of engineers, that committee had disbanded by the time the drinking water component was added (Aandahl 2010). Since 1999, the Gujarat Infrastructure Development Board has played a critical role in state planning processes, proposing projects across a range of infrastructural sectors that align with the logic of International Financial Institutions (IFIs) and the state's development goals (Gujarat Infrastructure Development Board 2015). Understanding the Narmada pipeline project thus requires a recognition that it is a product of a larger system of actors and discourses, operating independently yet in tandem. This section attempts to describe this network's effects more precisely.

6.1 The "Anti-Politics Machine" And Its Effects

In his influential study of why development projects in Lesotho repeatedly failed, Ferguson (J. Ferguson 1990) describes development actors and discourses as constituting a 'machine' that produces results that go beyond the intentions of any one of its parts. Although the project he studied failed to achieve the stated goal of 'modernizing' the region's cattle agriculture, it nonetheless has a range of predictable and far-reaching effects. He writes, "there may be some justification for beginning to speak of a kind of logic or intelligibility to what happens when the 'development' apparatus is deployed—a logic that transcends the question of the planners' intentions. In terms of this larger unspoken logic, 'side effects' may be better seen as 'instrument-effects' (Foucault 1979); effects that are at one and the same time instruments of what 'turns out' to be an exercise of power" (J. Ferguson 1990, 255). Thus, instead of understanding development projects in Lesotho as poverty-reduction programs that incidentally produce increased bureaucracy, Ferguson suggests that it is more accurate to see them as a machine for expanding state power that happens to take poverty as its starting point or justification. Note that this is a description of the projects' effects, not necessarily of their planners' intentions.

Fundamentally, Ferguson argues that the development apparatus of technical and bureaucratic fixes to deprivation serves to *depoliticize* the issue of poverty, leading him to dub it the "anti-politics machine." He writes, "By uncompromisingly reducing poverty to a technical problem, and by promising technical solutions to the sufferings of powerless and oppressed people, the hegemonic problematic of 'development' is the principal means through which the question of poverty is de-politicized today. At the same time, by making the intentional blueprints for 'development' so highly visible, a 'development' project can end up performing extremely sensitive political operations involving the entrenchment and expansion of institutional state power almost invisibly, under cover of a neutral, technical mission to which no one can object" (J. Ferguson 1990, 256). Ferguson warns against conspiracy thinking, arguing that these instrument effects are the product of the interactions of a network of norms, discourses, and actors. They do not have to be fully intentional to be politically useful, however, or for that usefulness to contribute to the repetition of 'failed' approaches over and over again.

The instrument-effects of the Narmada pipeline project are more complex than an across-the-board expansion of state power. Although in some cases the project has objectively expanded state power (such as through the creation of additional police regiments to monitor the pipelines), in others it has simply shifted responsibility from one level or department of government to another. The overall effect has been an increase in the power of a select number of state-level officials (namely the Chief Minister, cabinet, and the appointed heads of various agencies and parastatals) who control the allocation of the water itself as well as contracts for infrastructure operation and maintenance. Ironically, this effectively runs contrary to the mandate for decentralization of urban and rural governance established by the 73rd and 74th constitutional amendments.

At the same time, the Narmada pipeline project—both directly and through the resulting reduction of funding for other water management projects—serves to reduce the independence of Gujarat's minority regions and open them up for industrial exploitation.

Water availability in North Gujarat, Kutch and Saurashtra, at least in the areas served, is no longer determined by local resources but by the state's willingness to deliver water to them. Despite stated intentions to serve the most water-scarce areas, the structure of the pipeline has contributed to increasing access to water for more centrally-located and more powerful individuals and entities at the expense of the most vulnerable. It has also facilitated the establishment of industrial parks and special economic zones, often against the wishes of local residents (R. Shah 2013). Simpson (2013) describes how post-earthquake industrial development in Kutch, served by the new water pipelines alongside new roads and railways, has created hardly any jobs for local residents who do not possess the required qualifications, but has brought masses of Gujarati-speaking outsiders and disrupted more traditional ways of life. In the previous chapter, we saw how connection to Narmada water did nothing to ameliorate existing problems of unequal water distribution in Mahesana, where low-income residents continue to be water-poor.

While these instrument effects were not necessarily the intention of all (or any) of the SSP's planners and promoters, they reflect the fact that purportedly apolitical development ends up reinforcing the interests of the powerful. For Ferguson (1990, 276–77), the image of a 'machine' helps explain the connections between planning, discourse, and effect:

> Plans constructed within a conceptual apparatus do have effects but in the process of having these effects they generally 'fail' to transform the world in their own image. But 'failure' here does not mean doing nothing; it means doing something else, and that something else always has its own logic. Systems of discourse and systems of thought are thus bound up in a complex causal relationship with the stream of planned and unplanned events that constitutes the social world.

Instrument-effects of the water grid such as consolidating power and unifying the state, while they contrast with the stated intention of the project to expand access to drinking water, nonetheless exist alongside other more deliberate efforts to cultivate popular identification with and support for Mr Modi and the BJP, e.g. through affective projects such as the Statue of Unity. The following section goes deeper into the discourses and conceptual frameworks which have been used to justify the Narmada grid and where they have fallen short.

6.2 Knowledge And Ambiguity

Ferguson describes how the failed projects he studied in Lesotho were justified by a particular distorted image of the country that is repeated in the reports of international financial institutions and NGOs, and which he calls the fantasy of the less developed country. This fantasy of a 'primitive', isolated economy, whose problems are solvable by intervention at the level of the nation-state, is shaped by the discursive norms of a development apparatus that has blueprints for addressing such situations. In other words, in a field of hammer-wielders, every problem must be a nail.

In Gujarat, the GIDB's orientation toward large projects that could attract international investment and provide contracts for large corporate developers coincided with an established tradition of hydrocratic development to make the Narmada project seem necessary and even almost inevitable. Here, the fantasy is not of a 'primitive' economy needing to be integrated into modern agriculture, but of a large-scale hydrological imbalance: 'wasted' water in the Narmada and irremediable water scarcity elsewhere in Gujarat. Thus we get the spectre of hundreds of "source-less" villages that turn out, in fact, to have access to drinking water sources after all (Hirway and Goswami 2008). Similarly, Mehta (2001) notes that the narrative that is commonly used to explain water scarcity and justify the Narmada project—that rainfall in Kutch has declined in recent years—does not reflect the hydrological record. Instead, rainfall in Kutch has always been highly variable, with roughly three 'good' years and three drought years out of every decade and additional regional variation within those years. Rather than a change in rainfall patterns, anthropogenic changes to the environment (namely, de-vegetation and over-exploitation of groundwater) have reduced the reserves available in bad years, as a move away from pastoral lifestyles and rain-fed agriculture toward industrialization and irrigated crops has increased the cost of drought. Given the central role that water scarcity in Kutch has played in arguing for the Sardar Sarovar dam, even before the details of the drinking water component were established, Mehta (2001) argues that this narrative has been manufactured in support of the claim that "there is no alternative" to bulk inter-basin water transfer, specifically from the Narmada.

The use of the word ‘manufacture’ here, in a Chomskian sense, suggests not a deliberate campaign of misinformation but rather the tendency of narratives that support popular or powerful positions to spread, regardless of their veracity.

The disconnect between popular representations and hydrological data in terms of Kutch’s rainfall record is but one example of the ways in which knowledge about the Sardar Sarovar and pipeline projects is contested and malleable. Historically speaking, Swayamprakash (2013, 162) writes that as hydrological knowledge began to be prized, “The natural world came to be arranged as a system of excesses and deficits that could be corrected with mathematical precision to yield steady, uniform results.” This precision, however, is and has always been somewhat illusory; any model remains an approximation of complex and highly variable natural systems. In the case of the Narmada, tentative estimates of average water flow have been taken to represent fixed quantities, and the apparent knowability of water flows has coincided with neo-Malthusian fears of scarcity to justify the allocation of every last drop to ‘productive’ use.

In this context, much has been made of the planned technological superiority of the Narmada project (Biswas-Tortajada 2014; A. Dholakia and Dholakia 2015). Writing about the project is sprinkled with precise numbers, from the height of the dam to the number of villages served and the length of pipe laid, creating an illusion of knowability and authority. In reality, however, flow meters are either not installed or not functional and a combination of money shortages and poor inter- and intra-agency communication means that water quality testing is often done late, not reported, or not done at all (Hirway and Goswami 2008). In the absence of concrete data on water flow and even on construction progress, overburdened functionaries report crude estimates as fact, leading to official aggregated numbers that have only the flimsiest basis (for more on this, see Satterthwaite 2003). It should be noted that the inaccuracy of these numbers is not wholly born of malice or intentional deception. On the one hand, Gujarat suffers from a shortage of qualified bureaucrats at the district and local levels; on the other, variable water flows simply do not lend themselves well to precise

measurement. Anand (2015) points out that water meters become unreliable in situations of interrupted flow, as in the case of the Narmada pipeline project, and that measurement of changing water flows therefore necessarily relies on assumptions that reflect the investigators' biases.

Thus, from the assessment of need to the determination of available water to the measurement of its distribution, discussions of the Narmada pipeline—and water mega-projects in general—rely on constructed and contested approximations and claims often masquerading as hard facts. Dig deeper and the veneer soon crumbles, as I have found repeatedly in this research. In fact, even the actual layout of the grid may not be fully known: Aandahl (2010) describes how on-the-ground negotiations by contractors and farmers have resulted in the as-built Narmada irrigation canal system deviating from the planned network. Coelho (2004) and Anand (2015) make similar observations about Chennai's and Mumbai's municipal water grids, respectively. Of Chennai's water grid, Coelho (2004, 434) found that it "represented a myth of order, produced by silences, euphemisms and half-truths which permitted and regularized the unofficial arrangements through which lower-level bureaucrats, local politicians and the public together devised solutions to the exigencies of daily life. The myths were ritually enacted through public excavations of illegal connections through which engineers policed and protected the integrity of the grid, despite common knowledge of the ubiquitous underground compromises."

Similarly, just as the Narmada pipeline project is justified and made legible through the creation of apparently concrete facts and figures, ignorance and ambiguity are also strategically deployed.[44] In his discussion of water audits in Mumbai, Anand (2015, 309) writes that "Ignorance … is not so much a *lack* of knowledge as it is a form of not knowing that, like knowledge, participates in the production of meanings, materials, persons and institutions." In other words, ignorance is not simply the absence of knowledge, but has its

44 Readers may also be interested in Sud's (2009) description of how government memos employ silence and indirect references to avoid informing the developers of a Kutch cement factory of relevant environmental regulations that could delay or shut down the project.

own effects and consequences. Thus, the ignorance of water distribution networks within villages and municipalities, which are placed outside the jurisdiction of the Narmada pipeline project, helps maintain the narrative that water insecurity is primarily an issue of regional physical disparities rather than one of social inequality. Similarly, the impossibility of accurately monitoring water consumption facilitates a policy of arbitrary allocation of water in response to crises and perceived shortages, rather than demand management. We have seen earlier how illicit water pumping by upstream farmers is tacitly condoned until a crisis makes it politically necessary to be seen to take action against it. Official ignorance and ambiguity create space in which the fantasy which justifies the project can continue to be asserted even as it contrasts with experiences of the project in everyday life.

6.3 Depoliticizing Deprivation

This ignorance is not simply the result of a neglectful or deceitful political class, but is enabled by the choice of particular infrastructural systems over others. In this case, the choice to centralize drinking water distribution and render the entire system easily legible has also flattened regional differences and made it much harder to isolate and address water issues in a particular city or district. Indeed, by making it (relatively) easier to add more water to the system than to identify how much water is going to any particular endpoint, the design of the Narmada pipeline predisposes decision-makers toward supply-side rather than demand-side solutions and contributes to a continual increase in the state's water consumption. Similarly, routing scarce water through areas of high demand in an open canal suggests that ensuring water security for the farthest reaches of the state was not the primary design priority.

Nonetheless, the presentation of these plans as technical development projects serves to remove them from the political sphere, except perhaps for those who are denied even the promise of their benefits. The incontrovertible scarcity of water in Gujarat obscures, to a large extent, the question of who benefits from the project devised to respond to that scarcity. Something is being done, and if problems of water scarcity continue, that only serves to justify additional development projects. Referring the issue to the developmental state's

bureaucracy ensures that the solutions devised will serve what has been identified as the national (or state) interest without overmuch debate on what that might be. Meanwhile, the BJP leadership and the industries and regions they favour have secured massive gains in both political and economic capital, as we have seen.

7 Conclusions

This chapter has outlined the evolution of the Sardar Sarovar Canal Based Drinking Water Supply Project within the Gujarat model of development. We have seen how efforts to consolidate and make legible the state's drinking water apparatus have allowed water to be easily redirected to politically favoured regions and projects by simultaneously facilitating such transfers on a technical level and concentrating decision-making power within a relatively small elite. Using Ferguson's image of the anti-politics machine, we can understand these instrument-effects as the result of a development discourse and approach that obscures the socio-political dimensions of water poverty and insecurity by presenting technical solutions to problems defined in hydrological terms. While this approach can be situated within a longer history of hydrocratic nation-building in India, understanding Gujarat as a developmental state—in which state power is leveraged in a relatively unified way to promote GDP-enhancing sectors of the economy—helps explain the particular ways in which the Narmada pipeline project has been planned and carried out. We have also seen how certain trends in Gujarat's governance have been strengthened since liberalization and especially under the BJP and Mr Modi: the emphasis on infrastructure development in the Gujarat Model, the centralization of power, and the skillful use of narrative and spectacle as a mode of governance.

Where Ferguson's analysis of the 'anti-politics machine' in Lesotho focused largely on the way development projects expanded bureaucracy thereby extending state power, the Narmada pipeline project evidences the important role the spectacle of development projects plays in maintaining state control over populations. Manji (2015, 216) also uses the idea of development as spectacle in her work on highway construction in Kenya, where she argues

that "infrastructural capitalism" is serving to prop up political authority as "the heavy lifting equipment [seem] to embody the virility and hard work being done by the state on behalf of its spectator-citizens", even as those who live in the way of the proposed highways are actively dispossessed. Similarly, regardless of the Narmada pipeline's level of success as a drinking water 'lifeline', some of the most important impacts of the project have been at the level of (a) the creation of an image of massive investment in high-tech water provision that could be marketed both to a domestic audience and international investors and (b) the replacement of local relationships to water with dependence on the state, creating inter-region competition for patronage and scarce resources.

I do not want to downplay the increase in water that the SSP and Narmada Pipeline Project have brought to urban and rural residents of Gujarat. It is no doubt significant that, for example, most of the state's municipal water provision is supported by the Narmada project. Nonetheless, increased water from the Narmada has been accompanied by a decrease in care for other sources, increasing consumption for industry and industrial agriculture, and elite capture of scarce resources. Although it is impossible to know precisely what the water situation would have been had the Narmada Project not been constructed, it is clear that such a supply-side solution, particularly one focused on a single source, has not addressed the root causes of the issue and cannot be a permanent fix in a context where demand is continuing to grow unfettered.

As in many developmental states, the technocratic approach to development adopted by Gujarat presumes a singular common good, ignoring existing inequalities and potentially divergent interests (see Ooi 2005; Wee and Jayasuriya 2002). As a result, a development intervention such as the Narmada pipeline ends up serving the needs of more powerful sections of society, potentially even exacerbating unequal access to resources. This can be seen in the continuing neglect of Kutch and coastal Saurashtra even as their plight is used to justify the project's necessity. Similarly, at a local scale, control over disbursed water lies with urban or village authorities that prioritize service to wealthier areas or more powerful

residents over the most vulnerable. Consciously or not, the construction of water infrastructure and water governance structures in contemporary Gujarat reproduces exclusions and power imbalances that mirror the ongoing rhetorical construction of Gujarat as Hindu, capitalist, and centred around the south-central region (R. Desai 2011).

These findings suggest a need for more research into how infrastructural development projects work in tandem with ethno-nationalist tendencies. Seeing Gujarat as a developmental state may also help find points of connection with other similar contexts for better theory-building. As we have seen, such projects can reinforce inequalities and consolidate power even as they aim to provide universal goods. As climate change contributes to both growing resource insecurity and tensions over migration and economic competition, the apparent ability of water mega-projects to serve as displays of strength while resolving development issues may be increasingly appealing to decision-makers in India and elsewhere.

Finally, this chapter has shown some of the limitations state-led interventions in the water sector face when responding to low-income residents' experiences of water insecurity. Perverse political/economic incentives and the limits of technocratic fixes suggest that the solutions most appealing to state actors are not likely to align with the needs of poor and marginalized people. This is not to say that the state cannot or should not be an agent of water provision. State participation in water provision must, however, be carefully designed to address social and political barriers to water access at macro and micro scales, a fact which the Government of Gujarat's pipeline grid has largely ignored. The following chapter therefore looks beyond state-provided water grids to see what small-scale water vendors and other localized water provision systems contribute to low-income residents' ability to access water.

VI. Water Vending and Informal Water Provision in Weavers' Colony

1 Introduction

In the preceding chapters we looked at the experiences and coping strategies of low-income urban dwellers facing water insecurity in Gujarat and at the state's attempt to address the issue through large-scale infrastructure development. What we have not seen so far in this dissertation is much discussion of the market, or of third-party water providers who, despite being widespread in India and in other water-insecure contexts, did not play a major role in the areas of Mahesana I studied.[45] This chapter therefore looks at water and livelihoods in a mostly working-class area of peri-urban Bengaluru unserved by the municipal water grid. Although still relatively low-income, the neighbourhood of Weavers' Colony is both more socioeconomically diverse than the areas surveyed in Mahesana and slightly better-off overall. Whether due to residents' slightly higher incomes or to the peri-urban location of the community far from any free public water taps, purchasing water plays a much larger part in residents' daily water practices than was found in Mahesana. This case study therefore provides an interesting counterpart to the discussion of non-market-based approaches discussed above.

The city of Bengaluru (often still referred to as Bangalore) is a metropolis of 8.5 million people (as of the 2011 census) and the capital of the south Indian state of Karnataka. Located on the Deccan Plateau far from any perennial source of water, it faces somewhat similar hydrological challenges to north Gujarat despite its vastly different location. As discussed in Chapter Three, Bengaluru's municipal water utility draws most of its water from the Cauvery River 100 km away and recently reached the limit of 1,450 million litres per day dictated by an interstate tribunal. Alongside Gujarat, Karnataka has been widely praised for its "reform"

45 The reasons for this absence are somewhat unclear, although a comparison between Mahesana and present case study suggests that the relatively widespread availability of free water along with the strength of gendered divisions of labour played a significant role in limiting the appeal of paying for water.

orientation in development policy and governance practices. This openness to the private sector has facilitated the rapid expansion of information technology (IT) industry campuses around the city, contributing to an extremely high rate of urban growth (discussed later in this chapter). This demographic and economic growth, far beyond the capacity of existing infrastructure and local water sources, is one of the factors shaping the waterscape of Weavers' Colony.

In the following pages, I draw on interviews with water consumers and small-scale water vendors to describe the informal water economies that exist in Weavers' Colony and the variety of factors that contribute to residents' choices and actions within them. As discussed in Chapter Two, I draw on a feminist political ecology framework to understand the ways in which social (including political and economic) and ecological forces are co-implicated in shaping this environment. Even more so than in Mahesana, I find that access to water varies widely within the community of Weavers' Colony, and that access is shaped by class, spatial location, and the physical/material characteristics of water. This unequal access becomes a business opportunity for some while creating an additional time or financial burden for others, which shapes their livelihood choices.

Weavers' Colony therefore provides an opportunity to look at the economic side of the waterscape, including the ways that cost shapes water source choice, the ways residents make money off of water, and the impacts of paying for water on households' budgets and livelihoods decisions. This case also focuses on the role of third party or independent water suppliers and forms of water provision that are not dependent on a municipal water grid, in contrast to Mahesana's municipal standpipes. Finally, the cultural differences between North and South India and between urban and peri-urban settings allow us to see which elements of the case studies hold true across the board, and which are locally specific.

This chapter begins with a brief discussion of the literature on informal water provision in India within a larger context, describing what existing studies have found and what

knowledge gaps remain to be filled. The scholarly context is then followed by an introduction to Bengaluru and the Weavers' Colony case study in order to situate the findings described later in the chapter. These findings are presented in three parts: a description of the sources used by residents and an examination of their preferences; a description of the water vending practices in Weavers' Colony and the implications of these practices for the livelihoods of both vendors and consumers; and finally, a discussion of how the waterscape has come to be the way it is and what factors shape water sourcing in Weavers' Colony. I conclude with some observations on the differences between this case study and that of Mahesana, and suggestions for further research and policy-making.

2 Informal Water Provision In India And Elsewhere

Much of the literature on urban water supply in India is oriented toward improving the performance of water utilities through public sector reform or private sector participation. Another, smaller body of work documents the experiences of people who are unserved by those systems, and sometimes describes their attempts to rectify them. Even in the latter body, however, the focus tends to be on how water consumers relate to the state, relegating water vendors to a side-note. This chapter therefore seeks to contribute to a third small body of literature that looks directly at water livelihoods, which I summarize in the next section.

2.1 Informal Water Provision

Research on informal water provision globally emerged in the late 1980s and 1990s (Blanc 1998; Cairncross 1990). Solo (1999, 117–18) captured the state of discourse in 1999 through a fairy tale allegory in which a "beautiful kingdom" advertises for a "private sector prince" to solve its water problems, only for the prince to discover that the "terrible trucker dragons" are not nearly as exploitative as he was led to believe, and he finds himself up against stiff competition from an informal sector that largely meets people's needs at a price that they are willing to pay. This tale was meant to illustrate two things: first, the role of state bias in promoting a negative view of informal enterprises, and second, the fact that in reality, competition among small-scale water providers resulted in fair prices and desired services.

For advocates of liberalization, the allegory was also a cautionary tale about how to approach private sector involvement in water, and suggested integrating these small enterprises into the formal water sector instead of only thinking in terms of large utility contracts.

The research on informal and small-scale urban water provision that has followed has continued to largely focus on describing specific water vending practices and demonstrating their usefulness for broader development purposes. Specifically, research on water vending has often been oriented toward formalizing small water enterprises (SWEs) or using water vending models to extend the reach of water utilities (Conan 2006), and there is still relatively little literature—especially in the Indian context—that explores the existing relationships between small-scale water providers and their customers. For example, McKenzie and Ray (2009, 455) write (emphasis mine): "given the significant infrastructure investment needed to extend piped connections to the urban unserved, the operating deficits of most Indian utilities, the inability of most slum dwellers to contribute to capital—though not necessarily operating—costs and the unattractiveness of peri-urban areas to the formal private sector, *more city governments should consider recognizing, contracting with and regulating local water entrepreneurs*." Similarly, a meta-analysis of case studies in Africa concludes by arguing that regularizing SWEs could reduce capital expenses for utilities,

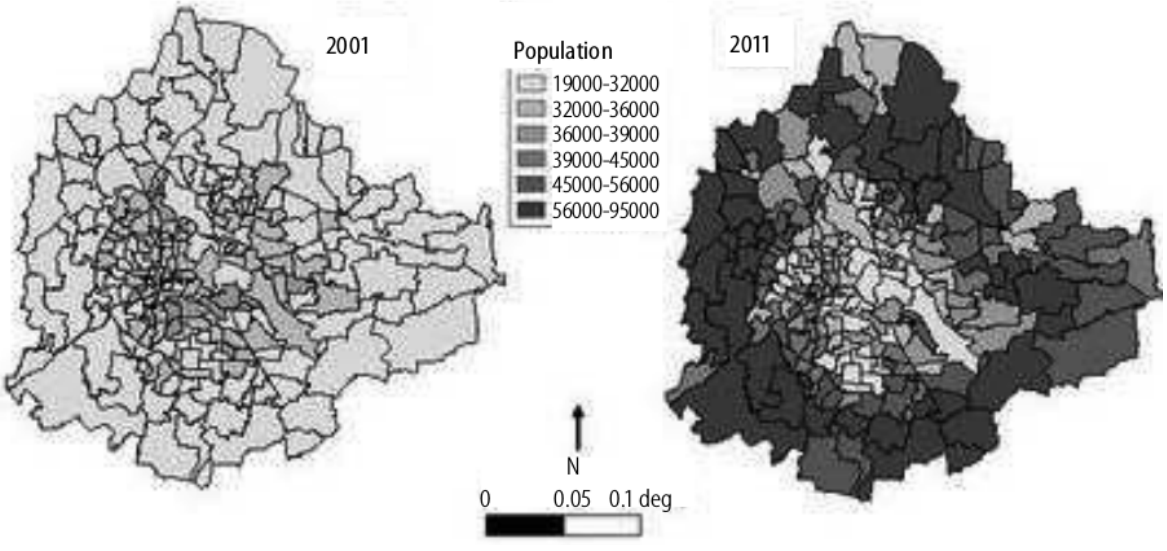


Figure 5: Metropolitan population growth in Bengaluru, 2001-2011 (Source: Mehta et al., 2013)

reduce illegal connections, and improve revenue collection while creating more stable and secure working conditions for small-scale providers and expanding coverage across the board (Albu and Njiru 2002).[46]

One of the strongest themes throughout the literature on SWEs is the argument that small enterprises are better at realizing the anticipated benefits of private sector participation in the water sector than large, monopolistic utilities. A report for the Asian Development Bank on supporting small-scale piped water providers in Asian cities concludes that they, "in comparison with water utilities, can be more dynamic in filling the gap between supply and demand and have more incentives to grow and expand their services" (Conan 2006, 8). SWEs' small scale and proximity to their clients are considered advantages that allow them to adapt to the particular needs of niche markets. In peri-urban areas, specifically, Allen, Dávila and Hofmann (2006a, 14) argue that "non-centralised services may offer a solution that is more in keeping with the changing needs of local users" than what large-scale public or private utilities can do.

In addition to promoting SWEs as relatively efficient market actors, the scholarly literature on informal water provision generally contradicts popular depictions of SWEs as exploitative. For example, one multi-country survey found that whereas SWEs are adaptable to market variation and responsive to consumer needs due to their minimal capital investments (much of it in portable infrastructure), their incomes typically barely cover their costs (Opryszko et al. 2009). At the same time, SWEs may be preferred by consumers who cannot afford the upfront connection fees charged by many utilities. From a societal point of view, SWEs provide more employment per litre of water than utilities, although it is usually

46 The field has yet to come to a consensus on terminology, with terms such as the "other" private sector (Solo, 1999), small-scale independent water providers (SSIPs; Albu and Njiru ,2002) or small-scale private water providers (ADB 2006), and small water enterprises (SWEs; Opryszko, et al., 2009) in common use. Another study differentiates between "needs-based" approaches—those developed by water users themselves or by the informal sector—and "policy-based" approaches—led by governments and planning departments (Allen, et al., 2006). In this chapter I use small-scale water providers and SWEs interchangeably to refer to small for-profit water-provision businesses, and "the informal water sector" or "needs-based approaches" to refer to all sources of water outside the formal piped network.

poorly-remunerated and less stable than that in the formal sector. That employment is also highly gendered, with most paid work in the water sector (formal or informal) going to men, even when the task of fetching water at home is seen as primarily women's work (Kjellén and McGranahan 2006).

In India, research on water vending practices remains singularly absent from the urban literature. In this absence, unsubstantiated references to a water 'mafia' persist among decision-makers and in journalistic writing (Sethi 2015; Yasmeen 2015). One Indian study that did investigate water vending, looking at water sources within two small cities outside Mumbai, revealed that reliance on a diversity of mostly privately-owned water sources appears to be the norm in peri-urban India (Angueletou-Marteau 2010; see also Allen et al., 2006, for more on this topic). Another study conducted while I was in India looks at tankers serving middle-class areas of Bengaluru and finds that they operate much more independently than had been expected (Rajashekhar 2015). These findings indicate the need for more research on water practices in peri-urban India and on informal-sector water providers serving poor and working-class communities, as the existing water literature mainly focuses on the experiences of water users in urban centres or the vastly different challenges of rural life.

Meanwhile, although state and central governments often use the rhetoric of competition and responsiveness to promote private-sector participation in the construction and management of water infrastructure, official policy continues to promote a centralized, monopolistic paradigm of water provision (Lefeber and Vietorisz 2007). As we saw in the previous chapter, opening the construction of pipeline segments up to bidding by private contractors does nothing to make the resulting system more responsive to the needs of water consumers. Part of what this chapter will explore is the extent to which this kind of market-based responsiveness is present in the highly-decentralized, small-scale water economies of Weaver's Colony.

3 The Weavers' Colony Case Study

The research described in this chapter consisted of fieldwork carried out in peri-urban Bengaluru in January and February of 2015. The research site, Weavers' Colony, was chosen based on the area's observed reliance on multiple informal sources of water including water vendors of different types, its socioeconomic class make-up, and its recent administrative transformation from a self-governed village into an area under the jurisdiction of the metropolitan government (BBMP). The study is not meant to be representative of peri-urban Bengaluru as a whole, but rather serves as an illustrative case study of certain common types of informal water sources and dynamics that may affect water sourcing choices for poor and low-income residents. As mentioned above, this chapter specifically delves deeper into certain dynamics that were mostly absent from the Mahesana case study, namely the sale and purchase of water and the role of tanker trucks, which are a common water delivery method across India and other water-scarce settings.

My research included 67 interviews with residents and nine interviews with water vendors serving the area, either at their homes of places of work.[47] Interviews were loosely structured and residents were asked about where they got their water, why they chose one source over another, how water practices had changed over time and what might change in the future, whether there were tensions or discrimination between groups in Weavers' Colony, whether people in their household had ever worked to change things individually or collectively, and who influenced decisions made for Weavers' Colony. I also visited the area with residents on multiple occasions and observed water gathering at the various sites. As in Mahesana, a diverse sample of respondents was achieved using a modified snowball sampling technique in which interviewees were asked to suggest other households to be interviewed whose water practices or demographics differed significantly from their own. The water vendors interviewed were either identified by respondents who obtained water from them or by other water vendors, and were asked about their business practices, incomes,

47 I also interviewed three officials within various levels of the municipal utility and requested interviews with state and local elected officials or their staff, from whom I received no response.

motivations, and general opinions on the water situation in Weavers Colony (see Appendix E). Since I do not speak Kannada, interviews were conducted by a team of experienced research assistants and the recorded interviews transcribed and translated.

3.1 The Bengaluru Metropolitan Region

The Bengaluru metropolitan area is a prime example of what India's unevenly distributed urban growth can look like on the ground. While India's overall urban population grew from 28.6 per cent to 31.2 per cent from 2001 to 2011, the metropolitan population of Bengaluru grew by 3.9 per cent each year (compounded), ending the decade with a population roughly half again as large as in 2001 (D. Kundu 2013). Ward-level census data reveals that the growth of peri-urban areas far outpaced that of the city centre, a fact which was reflected in the annexation of hundreds of peri-urban villages into the Greater Bengaluru Metropolitan Area (Bruhat Bengaluru Mahanagara Palike, or BBMP, Bengaluru's governing body) in 2013 (Deccan Chronicle 2013a) While the jurisdictional boundaries of the BBMP have steadily expanded outward, the reach of municipal infrastructure has been much slower to follow. A detailed study of residential water consumption patterns conducted in 2013 reveals that water distribution is highly unequal, with privately-sourced groundwater (either directly from borewells or distributed through tanker trucks) accounting for major swathes of Bengaluru's water consumption, especially outside the city centre (V. Mehta et al. 2013).

As mentioned above, the site of this study is Weaver's Colony, a peri-urban neighbourhood directly south of central Bengaluru. Once a village, it had been part of the BBMP for roughly 18 months at the time of this study. The area's estimated 10,000 households can largely be classified as lower-middle and working-class; as the name suggests, the population is made up predominantly of hand loom and power loom weavers (some who have their own home workshops with owned or rented looms, others who work as hired labour) as well as those in associated trades such as dyeing. As Bengaluru grows, however, the area is increasingly drawing both working-class and lower-middle-class newcomers who are attracted by the relatively affordable housing and proximity to major

transit axes. At the same time, hereditary weavers and their children are leaving the textile trade to seek more rewarding employment. The residents interviewed for this study included maids, construction workers, drivers, factory workers, teachers, salespeople, IT technicians and of course water vendors in addition to textile workers.

Until 2013, the village *panchayat* (council) was responsible for managing its own water infrastructure with the support of the state rural water authority (Karnataka Rural Water Supply and Sanitation Agency, or KRWSSA). Since the area's amalgamation into the BBMP, however, it lies in a jurisdictional grey area with regard to water provision. While the service area of the municipal utility (Bengaluru Water Supply and Sewerage Board, or BWSSB) remains smaller than the expanded BBMP city limits, the newly incorporated areas are no longer eligible for support as independent rural villages, nor has the state corporation in charge of non-Bengaluru urban water supply (KUWSDB) stepped in. Whether this service gap is due to a lack of interest or a lack of capacity, it is no doubt exacerbated by the fact that while the BBMP has been controlled by the Bharatiya Janata Party (BJP) since its inception in 2010, since 2013 the Karnataka state legislature has been controlled by the rival Congress party. The state may therefore be reluctant to intervene and essentially make up for BBMP's shortcomings in the greater Bengaluru area.

4 Water Sources In Weaver's Colony

Interviews and walk-throughs in Weavers' Colony identified seven distinct sources of water: public road-side taps, "BBMP" water tankers, private borewells, private water tankers, open wells (both public and private), coin-operated water kiosks, and bottled ("Bisleri") water. Most residents also collected rainwater when available, though this practice is seasonally dependent. In contrast to Mahesana, where almost all sources depended directly or indirectly on the municipal water grid, in Weavers' Colony all but two of the source types are independently operated. The sources varied in terms of their reliability, price, quality and accessibility, and the pros and cons of each source were sometimes assessed differently by different respondents. Brief descriptions of the sources are given below, roughly in order of

most- to least-commonly used. These are followed in the next section by a discussion of the livelihood decisions and other impacts this waterscape has on residents' lives.

4.1 Road Taps

Most of the roads in Weavers' Colony are lined with pipes that have several public taps along the length of each block, supplying water from a large elevated tank. When the system was maintained by the village *panchayat* and state utility, residents reportedly received water once every week or ten days during most of the year. At the time of interviews, however, road taps had been empty in most areas of the village for between one and eighteen months. Residents reported being told by officials that the borewell that fed the tank was broken or that the groundwater table had sunk too low, but many also attributed the lack of water to increasing demand, either within the community or from the newer, and wealthier, developments that have sprung up around Weavers' Colony in recent years (see colour plates). Whatever the immediate issue, a proximate cause is likely the administrative vacuum left by the amalgamation of Weavers' Colony into BBMP.

Even at peak performance in the best-served areas, the road-side pipe system provided no more than enough for each household to collect 20-30 pots of water weekly. The standard water pot used in Weaver's Colony holds 15-20 litres, so this amounts to somewhere between 300-600 litres total once a week, or at most 40 LPCD. Many respondents mentioned having struggled with poor timing, such as when water only flowed overnight or during work hours. The pipes are located above road-side open gutters for maximal drainage, but this also leads to concerns about contamination and unpleasant or unhygienic conditions when collecting water. Tensions over the sharing of common taps will also be discussed below.

4.2 "BBMP" Water Tankers

As the taps failed, water tankers took over the role of public water supply in much of the colony, though access varies tremendously from location to location. While some areas get regular weekly service, others reported that it was closer to two or three weeks between visits

and that there was no way to know when the tanker would come. Most people stated they could get 10-25 pots of water (150-500 litres), though reports of fighting over water were common especially in areas where the tankers were more infrequent. Although ostensibly the tankers provide water free of charge, most people reported giving the drivers a tip. Some asserted the tip was entirely voluntarily, but others reported being stopped from collecting water unless they paid. In either case, respondents agreed that tipping the drivers helped ensure that they would return.

Despite the fact that these tankers are referred to by residents of Weavers' Colony as corporation or BBMP water, they do not appear to be an official municipal service.[48] Instead they seem to be dispatched by the local corporator (city councilman) or his staff and likely paid for from his discretionary budget in order to secure popularity. Access to this water is therefore dependent on political favour, or residents' ability to collectively organize and pressure officials. In addition, some narrow, unpaved streets are physically inaccessible to the tanker trucks, and therefore are not served. These are unsurprisingly located in the poorest and most-remote areas of Weaver's Colony, compounding the barriers faced by economically and geographically marginalized residents.

4.3 Private Borewells

Given the limitations of public water provision described above, residents who have the land and capital to do so have begun digging borewells from which they sell water to their neighbours by the pot. Some also operate what Malghan (personal communication, 2013) calls "micro-utilities", running piped connections to neighbouring houses that can be supplied at will. These neighbours are then charged either by time used (typically by the half-hour), or at a set monthly rate. In most cases the well-owners reported making the initial investment, although one resident mentioned that she and her neighbours had all made an

48 Inquiries to the BBMP referred me to the BWSSB (city utility), who stated they do not supply water to Weavers' Colony and that I should contact the KUWSDB (state utility), which redirected me back to the BBMP. The corporator's office did not respond to my interview requests.

initial contribution of INR 2,000 (roughly US $33)[49] toward digging the borewell, followed by a monthly subscription fee. The reliable electricity connection in Weavers' Colony—also necessary for the power looms that are the mainstay of the local textile economy—is what makes these electric pump-based systems practical, although as the water table continues to fall they too may fail to be sustainable.

Although some borewell owners simply meet their own needs and give away a few pots of water to any neighbour who comes asking, most charge for water, typically at a rate of INR 1-2 (US$0.02-$0.03) per pot. Timing varies, with some supplying water at the same time every morning and others turning on the tap any time the queue for water reaches a certain length, e. g. 100 vessels. Most borewell customers reported choosing their supplier based on convenience or existing relationships; quality, price, or service did not seem to vary enough within a neighbourhood to influence decision-making.

4.4 External Water Tankers

The other major private source of water in Weavers' Colony comes from water tankers that import water from outside the area and deliver it on demand to customers' homes in loads of 3-5,000 litres, at a price of INR 300-500 (US$5.00-$8.30) per load. Although this system allows residents to steadily meet their water needs for several weeks without having to leave home, the required large upfront payments and adequate storage space for thousands of litres of water make the external water tankers off-limits for most tenants and many homeowners as well. Some tanker operators will divide their loads between several smaller containers and even between neighbouring households, but many will only deliver to a single underground sump, which most homes do not have—especially rented ones. Tanker delivery thus favours homeowners over tenants, particularly wealthier residents who have more space on their properties for storage and can afford the cost of building a sump.

The other major concern residents expressed with regard to tankers was that the source

49 For context, a power loom weaver can expect to earn around INR 5,000 (US$83) per month depending on demand.

was unknown, leading many of them to prefer it for household uses as opposed to drinking or cooking. “He says it can be used for drinking,” one customer said of their tanker supplier, “but we don't know what water he supplies.” While some tanker trucks belong to a borewell owner who consistently sells water from the same source, many purchase water from a variety of sources (often farmers) to resell at a markup. Consumers therefore have less knowledge of what they are getting when purchasing tanker water, and are to some extent sacrificing transparency for price and convenience. While some residents have a single trusted tanker delivery man, others showed me a handful of numbers in their phone book and said they just order from whomever is available at the time.

4.5 Coin-Operated Water Kiosks

Existing somewhere between the public and private sectors, coin-operated water kiosks are an interesting feature of Weaver’s Colony’s water ecosystem. Essentially, their appeal lies in the fact that they offer reliably clean water in small quantities at reasonable prices. Two of them, installed by the local Member of the Legislative Assembly one year previous to the interviews I conducted, feature a coin-operated water tap that provides 20 litres of filtered borewell water for INR 1. Two older kiosks exist, charging INR 2 or INR 5 for the same product. They each have limited operating hours, and a limit of two pots per person is enforced by a security guard. In spite of these limitations nearly everyone who could afford to pay for water and lived within walking distance of the cheaper kiosks indicated that they had switched to using them for drinking water.

Many residents, however, felt that they were too far away to make the trip. The number of people who rely on water kiosks is actually smaller than the number relying on micro-utilities or neighbours with borewells, even if we look solely at drinking water. In addition, the two- and five-rupee kiosks, which cannot compete with borewell owners on price, exclude a segment of the population who cannot justify the additional cost. They remain popular with residents who can place concerns for quality over price, but seem to be less universally praised than the one-rupee kiosks.

4.6 Wells

While shallow wells were at one time the main source of water in Weavers' Colony, they have almost all dried out today. Those that have not are polluted by septic systems and can no longer be used for drinking, although some residents still use public or personal wells for household purposes. Long-time residents spoke of wells with mixed feelings: although they represent one of the few sources of free water, even ten or fifteen years ago wells were crowded and provided water slowly. Some mentioned having spent hours collecting water at night when the wells were less frequented, and said that they welcomed more convenient sources of water.

4.7 Bottled Water

By far the costliest source of water used in Weavers' Colony are 20 litre bottles, known colloquially as “Bisleri” water after a major Indian bottled water brand. Most of the bottled water for sale in Weavers' Colony in fact comes from local bottlers, and is typically delivered to people's homes on demand. At rates of roughly INR 30 (US$0.50) per bottle such water is exclusively reserved for drinking purposes, and with the arrival of the coin-operated kiosks that offer a similar product for a fraction of the price many people who previously purchased bottled water have switched away. A few households do continue to prefer it, however, on the basis of convenience or perceived quality.

5 Factors Structuring Water Access

What do these different types of water provision—and water users’ preferences between them—tell us about the waterscape as a whole? The following section examines recurring themes from household interviews to understand how the current distribution of water practices has come to be and what factors are important to consider for any future intervention in the area’s water sector. The factors described here pertain strictly to the segment of the waterscape between tap and home, so to speak. Larger hydrological and political concerns, such as over-exploitation of groundwater, are obviously also major elements shaping the waterscape but lie slightly outside the scope of this study.

5.1 Materiality

The weight and volume of water are major structuring factors of the waterscape. The need for space to store water, whether in a purpose-built sump or in a variety of vessels within the home, was a recurring theme of people's water concerns. At the same time, for residents without vehicles the weight of water directly limits the distance from which they are able to fetch water, particularly if also dealing with time constraints. One couple stated that in order to fetch drinking water from the nearest coin-kiosk: “First one of us will go and collect water but the other will meet us halfway to take it from us. It's very far, one person cannot carry it all the way.”

Work schedules, children and other home-based responsibilities all act to reduce the area within which households can reasonably source water. A woman in a very poorly-served area of Weavers' Colony explained her situation as follows: “No one person can bring water, we need three people at least; we have to go half a kilometre and cross a drainage, so men will accompany us. It takes two hours.” With most of her household working outside the home and children at home, fetching water is a major daily challenge.

Nonetheless, timing does not govern Weavers’ Colony residents’ choice of water source to the same extent as it does for residents in Mahesana, since most water sources in Weavers’ Colony are available for longer periods of time. On the other hand, Weavers’ Colony residents are more able to prioritize perceived quality in their water choices, and many people maintain separate drinking water and household water sources, although few are able to significantly prioritize water quality over location and price. Most respondents in Weavers’ Colony indicated that they acquire as much as they can of the best quality water available to them—limited by the amount available, in the case of public tap or tanker water, or by the two-pot limit at coin-operated kiosks—and then supplement that with an eye to price and convenience in order to meet their household needs. Even if water vendors are conscious of market competition—particularly its effect in driving down prices—many water consumers still feel that their options are extremely limited. When asked about their water choices, “we

have no other option" was a common explanation from my respondents, even when the interview made clear that they were aware of water sources that they did not use. This suggests that although water source choice can be influenced by a variety of factors, the priorities of any given household are relatively fixed and therefore exclude many of the areas' sources from consideration.

5.2 Social Capital And Class

Borewells can provide their owners with water security, income, and social capital, but they are far from accessible to all Weavers' Colony residents. "People who have money, they dig their own well or borewell. People like us will buy water, that's all," expressed one long-time resident. It is not only the price of the borewell that is prohibitive, although the investment is beyond many residents' reach. Digging a borewell also requires space and home-ownership, further cementing a divide between homeowners and tenants that is a source of some tension in Weavers' Colony. Finally, as water tables fall and borewells fail, it becomes an investment fewer people can afford to risk.

Although the differences in access between borewell owners and non-owners are evident, there are also more subtle class-based geographical impacts. In an environment of widespread water vending, even simple proximity to wealthier residents expands people's range of water sources, potentially reducing the time or financial burden they face and improving their livelihood options. Tenants with several borewell-owning neighbours nearby were likely to describe being able to purchase water fairly easily before or after work. In contrast, those with few nearby sources spoke of long waiting periods and chronic water shortages that required supplementation from other, more distant wells, or missing work to wait at home for BBMP tankers. These microgeographies of water access have exacerbating effects on livelihood and income inequality, where one's proximity to wealthier neighbours represents a key factor in a household's ability to prioritize income-earning activities over water collection.

Relationships are another important factor that affects water access. These relationships can be mutually beneficial: for example, a regular purchaser of tanker water explained that she always bought from the same vendor because she trusted him and his water sources: “They bring water from Kottigere. Here also we have water suppliers, but we know him so we call him.” However, they can also reinforce spatial inequalities, such as when residents of a better-served lane band together to deny outsiders the right to collect water from their taps or borewell owners give away water to the neighbours they know but not to others. Finally, reliance on relationships to acquire water can deepen situations of dependency, e. g. in the several cases where tenants reported that they purchase all their water from their landlords.

It would be remiss not to mention the role of class in accessing not only the private supply of water but government services as well. As one resident explained, “whichever area gives more money, the tanker turns to that side.” Not only does the “tipping” system bias so-called BBMP tanker drivers toward richer areas, but residents felt that class dictated who had the ear of local politicians: “If a chairman goes and asks, the next morning the work will be done. Since I am poor and he is rich, if I ask for a facility this January the work will be done by next January,” said one man. While Edelman and Mitra (2006) find that slum-dwellers in Delhi strategically use their numbers as a vote bank in order to secure water through political favours, residents of Weavers' Colony mostly indicated that people kept to themselves, and suggested that work schedules prevented them from collectively visiting government offices during opening hours—and even from collectively organizing at all. This also echoes Mehta and Karpouzoglou's (2015) finding that existing models of working-class politics break down in peri-urban areas (see also Harriss 2006).

When asked about decision-making and discrimination in the neighbourhood, residents indicated that tensions existed between tenants and homeowners and between older and newer residents. Some older residents feel that newcomers act unjustifiably entitled to water which should be theirs. In an interview with one woman, she confessed: “when we go to take water, we do have fights. We say, ‘you have been moving from one place to another and we

have been staying in same place, why do you have such a big head?' and so on. These types of issues happen very regularly." Other long-time residents echoed the sentiment, with one homeowner suggesting that newer tenants, especially, have an advantage since they can move to a different neighbourhood with better water conditions, unlike homeowners who are tied to their property. Meanwhile, tenants feel that they are not welcome to speak up and advocate for better conditions. One woman explained, "who will listen to us? And we are newcomers here, we don't know anything also. Our landlord knows everything. We are tenants, why should we bother?" This lack of unity reportedly contributed to the difficulty some residents experienced in trying to organize collectively to demand water service.

5.3 Gender

Gender is another social division that shapes the Weavers' Colony waterscape. Discussing the practice of going to the local government office to demand water, one woman stated: "If it is about water, only the women have to go, how will men know about these things? They don't know about all those things and moreover they would be gone to work." As we also saw in Mahesana, residents assume that water decisions are naturally women's work, an association reinforced by gendered labour practices that make men more likely to work outside the home and that value men's labour more than women's when both are employed. At the same time, these gender roles play out differently in Weavers' Colony than in Mahesana, with women in Bengaluru suggesting that they should go demand water without the men, rather than being stymied by male community leaders' lack of interest in the issue.

In Weavers' Colony the work of fetching water is not exclusively done by women, and in fact the home-based nature of most of the weaving workshops means that the division of women doing home-based work versus men working outside the home is weaker in weaving households than elsewhere. At the same time, women in Weavers' Colony who work outside the home are more likely to work in the formal sector (e.g. in garment factories) than women in Mahesana, and thus have less flexibility with their hours. Nonetheless, even when men assist with the physical work of fetching water the responsibility for water-related decisions

tends to lie with women, who often expressed their role of keeping the household provided with water in terms of familial duty.

The impacts of gender roles are particularly visible when it comes to collecting water from the BBMP tankers, which was associated with fighting in many interviews. “Here when it comes to water it's just like India-Pakistan matches,” quipped one resident. While areas with regular tanker service described orderly queues and the timely handing-off of taps from one woman to the next, where water was scarcer the arrival of the water tanker was met with sometimes-vicious fighting. These fights were seen as exclusively the domain of women. Men often dismissed water-related fights as an inevitable part of feminine nature, but women in one lane explained that they had chosen to ban men from fighting for water alongside them for reasons of comfort and safety. Although residents insisted that water-related fights didn't lead to lasting animosity, they did put women at regular risk of physical injuries, with women describing sometimes being elbowed, shoved, and even having nose rings and earrings ripped out in the struggle.

The gendered burden of water collection does not affect all women equally. Older women, disabled women, and women with small children are sometimes unable or unwilling to collect BBMP tanker water at all. “Tanker water comes here but we couldn't risk it. [Only] people who have strength can collect there,” explained an older woman. Another stated, “when women go to the vehicle to collect water kids will fall down or hurt themselves. We cannot mind our kids and go to collect water.” Working women are also penalized, as they have to choose between going to work and staying home to collect water. One woman explained the high cost of 'free' water: “Sometimes we wait at home and they say not today, tomorrow, so again we have to wait for water and that way we lose INR 1,000.” This opportunity cost means that many women who work outside the home have no option but to purchase all of their water, leaving them with little choice as to quality or price.

6 Water Vending As A Livelihood

> What else can you do? You pay for salt, milk, similarly for water also. What is free in Bangalore? Everything is based on money; the city is floating on money. (a lifetime Weavers' Colony resident)

The increasing inadequacy of the municipal water system in Weavers' Colony has created a situation in which informal water vendors are the primary providers of water for much of the local population. Despite the prevalence of water vending in customers' portfolio of water sources, however, it is not a full-time occupation for most of the vendors interviewed. In fact, out of nine water vendors interviewed, only two considered it their primary source of employment or income (see Table 3). Most of the vendors interviewed in this study made creative use of existing assets or social networks, using water vending to diversify their earnings rather than launching a brand-new business. For example, a young man who owned a two-wheeler (moped) supplemented the family spice and flour milling business by delivering bottled water sourced from nearby. Another bottled water vendor started out by arranging for water supply at functions and weddings for which he was printing invitations, eventually building up a small base of home-delivery clients as well. For households who had drilled a borewell for their own use, selling water through a small network of pipes was a natural response once neighbours began regularly coming to ask for water at their door, or an incentive that facilitated the decision to make the expensive investment in a private borewell.

6.1 Expenses and Profits

In general, water vendors reported making very little profit in return for fairly high capital outlays. The reported cost of digging a borewell starts around INR 150,000 (US$2,500) and can run to many times that amount, with electricity and maintenance costing INR 15,000-INR 25,000 (US$250-$420) per month. One borewell owner who now supplies water in a tanker estimated his earnings at INR 100 (US$1.70) per 3,000 litre load—or between INR 200-500 (US$3.30-$8.30) per day depending on the season—which provided enough for his family to live off of. Another interviewee, a farmer who earned a salary driving a tanker, reported that the owner of the tanker earned an estimated INR 50 (US$0.83)

per load (INR 300-350 or US$5.00-$5.80 per day) after buying water from well owners (INR 150 or US$2.50 per load) and paying the driver's salary and other expenses. Without location-based constraints tying their customers to them, tanker vendors were particularly concerned with keeping prices competitive and said that even a INR 10 or INR 20 price difference per load could lead their customers to call someone else.

Bottled water vendors have lower upfront costs, especially if they already own the vehicle in which they transport the bottles. Bottled water of this sort is a delivery service: vendors purchase bottles from a bottling plant and deliver them to their customers' doors, picking up the empty bottles to return for a deposit. Their profits run to INR 2 or INR 5 per 20-litre bottle (US$0.03-$0.08), roughly INR 25-120 (US$0.40-$2.00) daily. One bottled water vendor explained that he had tried to make a full-time business of it, which netted him a maximum of INR 350 (US$5.80) per day. As competition increased and demand decreased, however, he found it unsustainable. Because these vendors are dependent on the bottling company for their supply, they have little room to vary their prices even as the coin-operated kiosks cut into their market.

6.2 Motivations And Relationships

One man who helped sell water from his uncle's borewell explained: "Some 5-6 houses are our customers … If they need water for their basic needs they will come and ask. Not people from the entire colony, just some houses in this road, that's all. There is another bore in the lower area and people from there will go to that one; there are borewells here and there [throughout Weavers' Colony]." Another borewell-operator serving 15-20 households had a similar story: "we had water problems [shortages] so we dug a bore well. So people around here came asking for water. So from then we started supplying water. During the summer we may sell up to 300-400 pots of water per week, but during the rainy season it's not so much. We couldn't depend on this for a living."

Water tanker owners or operators are more likely to see water vending as a career. A

Weavers' Colony man who owned a private water tanker with his brother stated that although water vending was not a great way to make a living, "we have invested money in this so we have to do it at any cost. All business has some problem or the other. … The best part is that we are near home … We are our own masters and don't have to wait for someone, … and all our daily expenses are at home, such as breakfast and food." He and his brother only own the tanker, not a well, so they seek out farmers willing to sell them a tankerful of water for INR 150 (US$2.50) and then resell it for INR 300 (US$5.00), out of which they pay for fuel, tanker repairs, and their own living expenses. They do not have standing orders or permanent customers; it is only when they receive a phone call from a customer that they set out to fill their tanker, so their daily output is variable: "some day we take one load, some days two loads, and some days we even take five loads. And some days nothing. But during the rainy season there is no [water transport] at all, and now water tankers are numerous so there is less work." Similarly, they source water from different farmers depending on which well is able to supply the amount of water they need at the time they need it.

In contrast, the farmer who drove for a larger water tanker operation—run by a man who owns several tankers and employs several drivers to operate them—explained that they source their water from a particular borewell whose owner is paid monthly. Customers can

Table 4: Examples of small water enterprises in Weavers' Colony

A resident selling water seasonally to five or six neighbouring houses from his uncle's borewell.
A family that supplements an informal business grinding and selling spice mixes and flour by also delivering bottles filled outside Weavers' Colony to roughly 30 households every other day.
Two brothers who own and operate a water tanker full time, purchasing water from various wells and delivering one to five loads per day.
A baker subcontracted to a bottled water company, supplying 20-30 households regularly.
A farmer working as a full-time hired driver for larger water tanker operation, paid a daily wage.
A local landowner who runs a micro-utility serving 15-20 neighbouring households through pipes he has set up.
Temple workers who supply water from the temple borewell on demand.

also settle their accounts weekly or monthly rather than paying for each load separately. The daily wage for drivers is constant, despite deliveries varying between four and eight loads per day. As a result, the driver felt that it was a good job. “There is no problem in this work,” he stated. “If we [worked] as chartered car drivers, if they asked us to come for a whole week we would have to go, and if we [drove] heavy vehicles we would have to go out of station [out-of-town] also.” The appeal of staying close to home is therefore apparent even when working for a larger tanker company which serves a slightly more widespread area. Finally, the last water tanker operator I interviewed actually owned a borewell, which had been dug for personal use and then turned into a business. Like the other tanker suppliers, he made his entire living from selling water—between two and six tanker loads per day—supplementing water from his own borewell with water from other wells when necessary.

Finally, bottled water vendors presently operate only as side businesses, although as mentioned above one former water vendor explained that he had tried to operate full-time. Even among those for whom bottled water sales supplement another income, the viability of their water resale business has dwindled with the advent of water kiosks. “Earlier we used to sell 150 bottles per week,” explained one vendor, “but now after this coin booth started, our sales have reduced. Now it’s only 50-60 bottles, that’s all. We couldn’t survive with just Bisleri-selling, so we have this bakery also.” This vendor and his family supply roughly 20-30 households, some of whom pay immediately and others on a subscription basis. Bottled water is particularly in demand for functions such as weddings, and for those they may get clients even from outside Weavers’ Colony. All of the bottled water vendors in this study who mentioned their source get water from a plant in Kemmathalli, roughly two kilometres away from Weavers’ Colony. While some resellers purchase the bottles directly from the plant, others with less available capital (such as the baker quoted above) simply deliver bottles as a subcontractor to someone (in this case their landlord) with the means to pay for large number of bottles upfront—and who takes a cut of the profits.

It is difficult to paint an overall picture of water vendors in Weavers’ Colony, as they

pursue their trades in a diversity of ways and for a diversity of reasons. What is clear is that given the dearth of free water sources within Weavers' Colony there is a high demand for water in the area, and a strong incentive for anyone with access to a water source to charge a nominal fee for sharing it. And while people in a variety of economic strata participate in the water vending economy, the most lucrative sectors require significant capital investment and —in the case of borewells—ownership of land. Although both water vendors and purchasers agreed that water vending has opened up increased access to water in an area with limited options, the water vending economy as it stands does not significantly disrupt social hierarchies, particularly the relationship between landowners and tenants. In fact, several tenants reported depending on their landlords to provide water, suggesting that water vending provides some landowners with a way to combine profit from renting space above-ground with those from the sale of resources below-ground.

6.3 A Water Mafia?

In both the academic literature (excluding studies of water vending specifically) and the popular press, India's informal water vendors—especially tanker operators—are often referred to as a water mafia, forcing poor people to pay extortionate amounts for a public good (Graham, Desai, and McFarlane 2013; Higler 2012; Rai 2012; Sethi 2015; Yasmeen 2015). In Weavers' Colony, however, this does not appear to be an accurate description. Prices are indeed high, running from INR 50 to INR 250 per kilolitre (US$0.80-$4.20) as opposed to the INR 22/kL charged by BWSSB. However, given that BWSSB's subsidized rates do not cover its operating costs, much less its capital expenditures, this is hardly surprising.[50] Vendors' profits are fairly minimal, as competition keeps prices low and customer satisfaction is essential to staying in business. In fact, many vendors saw their work as somewhat service-oriented and expressed a hope that public water provision in Weavers' Colony would improve, even though that would presumably cut into their business.

50 BWSSB's actual operating and maintenance costs were estimated at INR 82 per kilolitre (Viswanath, 2016), and as discussed above the most recent expansion of BWSSB's grid required residents of newly-connected areas to contribute to the cost of construction in addition to the standard connection fee (Ranganathan, Kamath and Baindur, 2009).

This is not to paint an overly rosy picture of water vending. Selling water is a profit-seeking venture for most SWEs, and seasonal price variation indicates that vendors are not above raising prices when they believe they can get away with it. Although the prices given above may not seem unreasonable, they constitute a major drain on incomes at or near the poverty line (defined as INR 47 per day in urban areas). At INR 1-2 per 20 litres, the 70 litres necessary for a healthy life cost INR 4-7 per person, or 8-15% of poverty-line daily spending.[51] Leaving aside concerns about the morality of putting a price on water, however, I found no indication from either water vendors or consumers that private water vending in Weavers' Colony is based on collusion or constitutes an unusually exploitative system. Neither did residents express concern over the organization of the private water sector. This aligns with Rajashekhar's (2015) findings that Bengaluru's private water tankers, specifically, do not operate in a monopolistic or anti-competitive way.

In contrast, 'BBMP' tanker provision is worryingly inequitable, opaque, and politically motivated. Residents attributed the decision to send out tankers to local party officials, suggesting that they are not a formal replacement for the water utility but a tool of patronage politics. Many indicated that the only time they receive water tankers regularly is when elections are upcoming. Similarly, the importance of tips and bribes in dictating where tankers go creates a patchwork of uneven access to public services within Weavers' Colony that mimics the elite capture of public services that is better-recognized at the metropolitan scale. In her work on water and land mafias in Bengaluru, Ranganathan (2014a) calls for a reconceptualization of the problem that looks beyond a particular sector—e.g. the private water tanker sector—and instead sees mafias as occupying strategic positions in between state institutions and citizens. She points to state denial of service to unrecognized areas, collusion between state officials and 'mafia' men in matters of water provision or land deals, and her interview subjects' 'welfare' roles as not only water providers but brokers and 'fixers' to argue that 'mafias' occupy a complex and integral position in the landscape of

51 India's poverty line is measured in terms of monthly household consumer expenditure—the amount a household spends in a month—rather than income. In 2011-12, the average per capita consumer expenditure for urban casual labourer households was INR 1502/month or INR 50 per day (NSSO 2015)..

India’s urban governance and social control.

Finally, Rajashekhar (2015) makes the important point that whether water vending practices are monopolistic or exploitative in the present is not the only aspect of water vending worth looking at; groundwater depletion remains a concern and unsustainable water vending practices today are, effectively, stealing from future generations. While consciousness of the need for groundwater recharge is growing across Bengaluru and was present among my interview participants, the regulatory landscape has lagged behind. Within Bengaluru, rainwater harvesting (typically for groundwater recharge) became compulsory on large properties in 2016. At the state level, the 2011 Karnataka Ground Water Act (Government of Karnataka 2011) requires that all borewells obtain a permit, and provides for the prohibition of well-digging in over-exploited watersheds by a newly-constituted Groundwater Authority. While this law represents a recognition of the need for a concerted response to groundwater over-exploitation, it poses serious enforcement challenges (Hastak et al. 2013). In addition to the difficulty of enforcing regulations on borewells located on private property, there are significant outstanding planning issues, including the lack of accurate information about the distribution and flows of groundwater underlying Bengaluru, and the absence of a mechanism for public input in decision-making about water allocation priorities (Das 2011; V. Mehta et al. 2013; Menon 2015).

7 Conclusions

This study of Weavers' Colony builds on and supplements existing literature on informal water provision in several ways. In line with much of the literature from elsewhere in the world, it underscores that water vendors are a useful and even essential part of the peri-urban waterscape, more responsive to user needs and market forces than large utilities have been. Similarly, concerns about a private-sector water 'mafia' were seen to be overblown, at least in the case of Weaver’s Colony, while nominally public water provision was seen to be inequitable and opaque.

Although a major aim of this study was to look at the role of market forces in Weavers' Colony's waterscape, a significant finding was the important role of patronage in dictating access to water whether at the level of political parties or relatively-affluent neighbours. Reliance on the goodwill or self-interested benevolence of borewell owners and party leaders has created an environment in which access to water—unless one can afford a borewell or at least a sump and regular tanker deliveries—is always precarious and always contingent. The emotional labour of maintaining friendly relationships and worrying about changes in circumstances is an additional unrecognized tax on the water access of marginalized households, and where women remain primarily responsible for water decisions this tax is borne by them. Although gender-based division of water labour was less prevalent in Weavers' Colony than has been found by similar studies in North India or Bangladesh (including my work in Mahesana), the concepts of gendered physical and emotional "suffering for" and "suffering from" water continued to be relevant in this context (Sultana 2011).

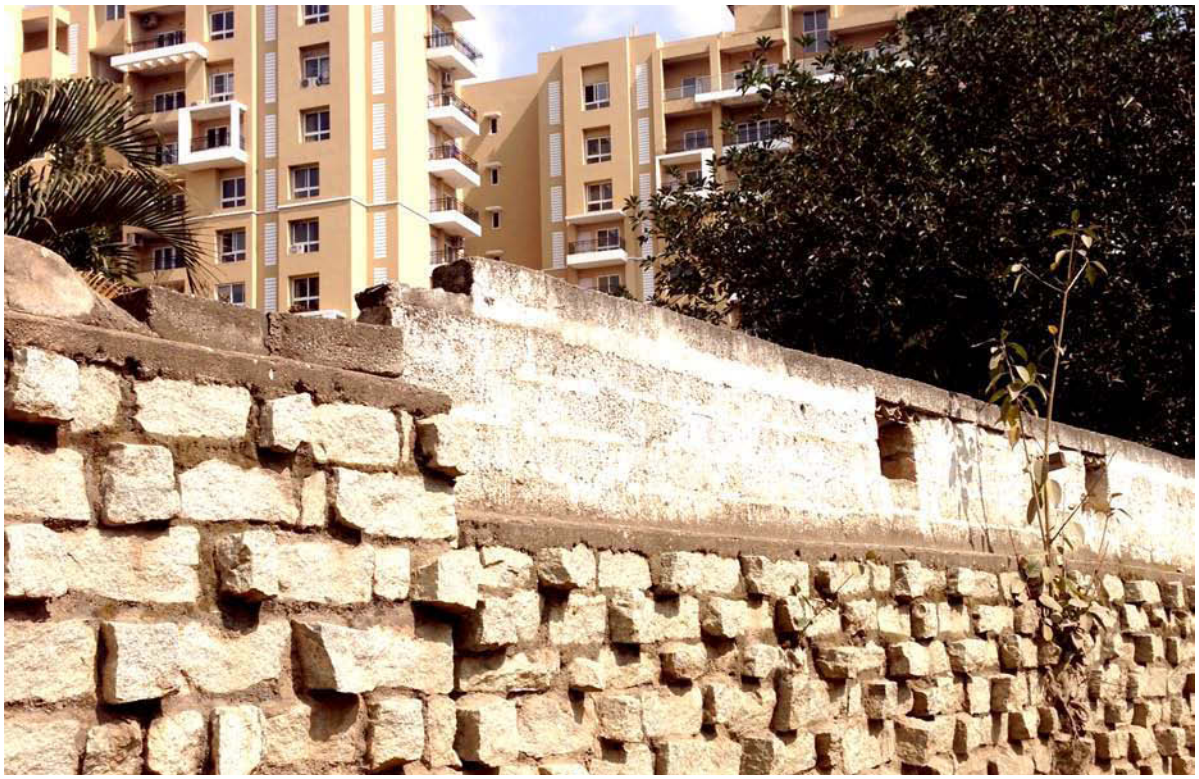
Although the location of Weavers' Colony with regard to the municipal water grid may make the type of multi-source water foraging discussed in Mahesana more difficult, residents in the poorer parts of Weavers' Colony did describe spending long hours fetching free water from outside sources or local wells. Better-off residents' willingness to pay for water is not simply a result of limited choice: instead, it would seem that greater (formal-sector) employment for women, higher household incomes overall, and different cultural norms are all contributing factors to households' greater willingness to pay for water. Longtime residents also described the normalization of water vending over the past twenty years as more borewells were dug and common wells became unusable. While this willingness to pay has created an environment conducive to entrepreneurial solutions to water insecurity, the challenges of transporting and storing water continue to constrain consumers' decision-making. Even if SWEs are more competitive than monopolistic utilities, they are still operating in very imperfect markets.

A second contribution from this study is the importance of microgeographies of social and physical location in differentiating access to water. Even residents with similar willingness and ability to pay for water might have very different levels of water insecurity due to their location. Recent work on disaggregating the concept of "community" in water access has primarily looked at demographic lines such as gender or caste (Bakker 2008; O'Reilly 2010; Truelove 2011). While respondents in Weavers' Colony denied any caste- or religion-based water discrimination, spatial distribution of water sources—informed by class, the placement of public infrastructure, topography and hydrology—have created a wide variation in water access within the Weavers' Colony "community." Given the physical qualities that govern the transportation and storage of water, spatial considerations are an essential, and overlooked, part of understanding water distribution.

Finally, the connection between water access and livelihood is an under-studied and important one. Where the Mahesana study hinted at the occasional decision to pay for water in order increase earnings from paid labour, this was a regular occurrence in Weavers' Colony. Although there was a widespread feeling that it was unfair that women who worked outside the home could not reap the benefits of free water delivery, women who could access water for sale generally did not bother to stay home to wait for free water, evidently feeling that their earnings made up for the burden of purchasing water. Meanwhile, selling water provided their neighbours with useful additional income. In either case, it is evident that integrating livelihood considerations into planning for infrastructure and services, and vice versa, is essential in order to reflect the reality of how decisions are made in residents' everyday lives.

Future research and policy-making around peri-urban water access would do well to keep these lessons in mind. In particular, an interesting follow-up to the study described here would be to look deeper into the microgeographies of access, mapping the areas served by various SWEs or the distance residents go to source their water. This kind of detailed work is critical to understanding how to achieve better coverage of under-served areas. Similarly,

while research in other contexts has already established that improving access to water can improve women's earning potential (see, e.g., A. J. James et al. 2002), it would be interesting to investigate the role of attitudes toward women's wage-work in shaping household access to (purchased) water. Where the hours of unpaid water collection labour shouldered by women are so normalized as to render their cost invisible, household willingness to pay for water is likely to remain extremely low, reducing the possibility of implementing any water provision solutions that pay for themselves.



New high-rise condominiums in a gated community near Weavers' Colony (above), and a street vendor selling water jugs on Weavers' Colony's busy main street (below).

Public water distribution in Weavers' Colony: a defunct road-side tap (above) and a 'BBMP' tanker (below).

Weavers' Colony's newest water kiosk (above), and a home connection for a 'micro-utility' (below).

Above, a now-disused communal well, with trash floating in it. Below, a household well that is still in use despite poor water quality.

VII. Conclusions and Implications

1 Introduction

At the beginning of this dissertation I set out "to gain a better understanding of the water strategies employed by people in small cities and peri-urban areas of India; … to examine what possibilities (or obstacles) exist for expanding or replicating these strategies with a view toward creating a more universal and sustainable network of coverage; and … to make a contribution to broader theory building on the role of various actors in providing 'public goods' in general—and water in particular—in the context of neoliberalism and a worldwide retreat of the welfare state" (33). In order to address the overarching research question of what current water distribution practices in urban India tell us about how to sustainably and equitably provide water in rapidly changing or highly-informal cities, I identified four questions focused on different actors.

In the previous four chapters we have seen an overview of India's fragmented waterscape and the results of three research projects which each aimed at addressing one or more questions. What progress has been made toward this research objective? In this final chapter, I begin by summarizing what the previous chapters have raised in response to each of the questions and the overarching research question itself. The following sections discuss insight for policy and theory respectively, and I conclude with lessons from the research process and directions for future research.

2 Findings

2.1 Question One

In response to the first research question, "what strategies are employed by residents in rapidly-changing contexts (second-tier cities and peri-urban areas) to access water?", I

identified a number of different sources in both urban and peri-urban settings including sources provided by the state, better-off neighbours or employers, and community institutions such as temples, mosques, and public buildings. In neither case study area did NGOs or community-based organizations play a role in providing water, and in fact respondents largely indicated low capacity for or interest in collective action. This aligns with what Harriss (2006) finds about the limited role of sustained community organizing or established organizations in the political struggles of India's poor urban communities, who he argues are more likely to engage in one-off protest actions and vote-bank politics than invest time in building and maintaining organizational structures. At the same time, the findings from both Mahesana and Weavers' Colony suggest that it is not simply time that constrains residents' capacity for collective organizing, but that intra-community inequality also creates barriers to seeing problems as communal and seeking collective recourse, even if those divisions may occasionally be overcome if the situation becomes dire enough.

Nonetheless, residents who shared water sources developed systems to ensure equitable distribution and minimize conflict. At public taps or with tanker trucks this tended to take the form of a simple queue and a limit on the amount of water allowed for any one person. Within smaller groups using more reliable water sources, more complex forms of organization were possible: rotating turns for water collection, shared tanker orders, and 'micro-utilities.' Such coordination relies on a certain level of homogeneity within the in-group (and by extension the exclusion, implicit or explicit, of non-group-members) and requires a significant amount of uncompensated labour, which may help to explain why the relative success of these small informal groupings does not carry over to formal structures such as the *pani samitis*. The findings suggest that research on common property resource management (e. g. Ostrom 2015) may be applicable to urban water distribution, particularly in order to understand how to scale up or replicate successful resource-sharing arrangements.

In general the attitude among respondents was that they would find ways to "adjust," preferring individual solutions—or collaboration with their neighbours—to collective

demands for redress. Although respondents agreed that better public water provision would be nice, they did not generally see it as worthwhile to advocate for it, perhaps because they did they did not believe it was likely to be granted. This contrasts with the more strongly-expressed need for government action on drainage, the absence of which is less easy to work around.

Access to water in all study locations was also significantly constrained by the fact that residents did not use vehicles to transport water but carried it by hand. Similarly, home storage capacity played a major role in determining how reliable residents' water supply was. Although many respondents spent significant portions of their days searching for water, especially in Mahesana, those who did not have enough storage in the home for the entirety of their daily needs had no option but to go out in search of water at least twice per day. The presence of significant storage space in a single household or even shared between several homes allowed for the use of tanker delivery water, reducing water insecurity and allowing residents—especially women—to engage in more or better-paid wage work.

Overall, the research in both Mahesana and Weavers' Colony upheld previous findings that water collection falls largely to women, imposing disproportionate burdens of physical and emotional labour and harm (Bapat and Agarwal 2003; L. Mehta and Karpouzoglou 2015; Sultana 2011; Truelove 2011). Even where women did not bear full responsibility for collecting water, they were primarily responsible for decision-making and use of water, and where there were risks of personal injury (fighting over water, domestic violence) these were disproportionately borne by women. At the same time, significant differences between the two case studies (Mahesana and Weavers' Colony) raise questions about the role of culture and class in determining gendered divisions of labour (see also O'Reilly 2006). While in Mahesana—where women were strongly expected to stay relatively cloistered—the devaluation of women's time and labour more or less invisibly subsidized the reliance on 'free' water, Weavers' Colony residents appeared to be generally more conscious of the opportunity cost that staying home to collect water represented. Arguably, then, cultural

values and social forces—including the job market—are important factors in deciding between two potential water acquisition strategies: minimizing expenses through investing uncompensated time to acquire free or low-cost water, or maximizing household income in order to be able to pay for water. Each of these strategies essentially relies on a positive feedback loop, and switching between the two may not be easy.

In fact, I found that distance and price overwhelmingly govern decisions about water, more than any other factors.[52] Residents' ability to gauge the quality of water is extremely limited and even in cases where water is clearly unsuitable the cost of acquiring water is such that they have little choice but to use it. Interviewees also reported forgoing basic hygiene practices due to lack of water, or using unsafe water for food-related uses such as washing dishes even if they would not drink it. Thus water insecurity in terms of quantity is intrinsically linked to concerns about the health impacts of water quality.

Finally, the case studies, especially in Mahesana, highlighted the temporal aspect of the urban Indian waterscape. In addition to receiving water for a limited time, low-income areas are also likely to receive water at inconvenient times (e.g. over night) or unpredictably. For residents who rely on multiple sources, like most of my interviewees, managing the scheduling of water collection around other household tasks, wage work, and basic needs such as sleep is a constant concern. One of the distinguishing features between those interviewees who experienced significant distress over water insecurity and those who felt the situation was more or less acceptable was the ability to have water at the time of one's choosing, either by delivery or a water source that is operational throughout the day. In a similar vein, by far the most commonly desired improvement to water service among respondents was that supply be reliable at a fixed and convenient time even if quantity and quality were not improved.

52 The distance residents are willing to travel is a factor of the time they have available, as well as the difficulty of transporting the weight and volume of water over longer distances.

2.2 Question Two

The findings above contribute in some ways to answering question two: what role do small-scale water vendors, 'micro-utilities', and other informal water suppliers play? One of the major roles of water vendors in Weavers' Colony is the exchange of money for convenience. Long-time residents generally spoke favourably about the development of a water economy, indicating that the ability to make money from selling water had led to the development of many more—and more convenient—water sources than had existed in the past. Even in Mahesana, where not paying for water was the norm, residents who paid the water tax did not object to the idea of paying for water, just the fact that they had paid and yet got unreliable or non-existent service.

In Weavers' Colony it appears that one of the functions performed by micro-utilities and household reselling of borewell water is the extension of some of the benefits of relative wealth to neighbours in the immediate vicinity. While this has the positive effect of expanding the options available for certain people who otherwise would face greater water insecurity, the situation of having one's access to water hinge on the goodwill of a vendor who is motivated by profit and otherwise unaccountable is a precarious one. The reliance of poorer households on household re-sellers and micro-utilities instead of tankers—due to space constraints and limited cash flow—also means that low-income residents in mixed-income neighbourhoods have better access to water than those in purely low-income neighbourhoods.

Overall, while small water enterprises play an important role in expanding access to water for low-income residents—particularly in two-income households—they also take control of scarce water resources out of residents' hands. The increasing popularity of borewells for personal use and resale in Weavers' Colony likely contributes to the falling groundwater table, while water tankers and bottling plants source their water from undisclosed locations whose impacts on the general availability of water is therefore unknown. While water vendors may improve the distribution of water resources in the

context of unequal access, they do so predominantly by expanding supply (while sources last) rather than reducing demand elsewhere or improving overall distribution, making them unlikely to serve as the key to equitable and sustainable water provision without some form of effective regulation. Even though most of the vendors I interviewed expressed concern for the community as part of their motivation, we have seen that even the BBMP trucks that are mandated to serve the public are biased in favour of areas where they can make more money.

2.3 Question Three

The third question concerned how state decisions are made regarding municipal water and how responsive they are to the dynamics identified in questions one and two. First, it is important to recognize that "the state" is a series of institutions with often-contradictory positions and goals, and that any attempt to discuss the state's role in water provision means compressing a complex landscape into the semblance of singular actor. This network of actors and institutions nonetheless employs a certain set of discourses and responds in certain predictable ways to certain pressures and motivations. Thus, an analysis of the state is possible even while recognizing its internal contradictions (Sharma and Gupta 2006). At the same time, we see in Gujarat an effort to unify the state in terms of information-sharing and common vision, making a state-level analysis increasingly relevant.

The impact of such internal tensions on state water provision is visible in the Weavers' Colony case study. As a peri-urban area within the BBMP, Weavers' Colony is in a grey area with regard to state water provision. In fact, the shift from recognition as a rural village to incorporation within the city worsened the area's water situation both on paper and in fact, as there is now no entity responsible for ensuring that water is provided or that existing infrastructure is maintained. Because the duty of providing water to areas within metropolitan limits but outside the BBMP's coverage area is contested by opposing parties at the city and state levels, it is left to individual politicians to provide water with more of an eye to securing votes than ensuring human rights are met. At the local level, the drivers of the water tankers are susceptible to bribes, further exacerbating the inequality of state-provided

water supply. Decision-making around water provision in Weavers' Colony is therefore based on a mutually-reinforcing combination of partisan politics, official ignorance and indifference, and petty corruption.

While it might appear that the devolution of water responsibilities to urban local bodies or panchayats is the problem—especially for peri-urban areas in unclear or changing jurisdictions—state attempts to create a single comprehensive water provision network in Gujarat have been similarly problematic. In general, it is safe to say that state approaches to water provision do not respond to the concerns, needs, and practices identified by the studies in Mahesana and Weavers' Colony. Where the people I interviewed are largely concerned with *how* water is distributed (timing, distance from their house, reliability, etc) state intervention in Gujarat—and elsewhere in India—is almost entirely concerned with *how much* water is distributed, with very little attention paid to how or when it is supplied. Note that better attention to how water is supplied might in fact reduce wastage and over-consumption in some cases (Zérah 2000), and would certainly create the conditions for alleviating some of the gender inequality exacerbated by having to stay home from work or school to collect water.

One of the factors governing state decision-making is the endowment effect: the fact that water users are more likely to protest losing service than not having it in the first place. Thus in an environment where full and equitable water provision is not yet assured, extending water to under-served areas is politically unfeasible if it means reducing allocations elsewhere. As we have seen in Gujarat, however, the promise of water can be almost as politically useful as water itself. Nor can the shortcomings of state provision be entirely attributed to the political class. On the one hand, the nature of the civil service means that bureaucrats who are useful to politicians are likely to rise in standing, somewhat eroding the distinction between bureaucratic and political aims. On the other, the aims of a strong bureaucracy of technocrats working toward the "good of the nation" may well still be at odds with the needs of marginalized communities. In addition to the emerging trend toward

promoting economic efficiency at the cost of human welfare, bureaucracies' preference for streamlined and legible systems (Scott 1998) and tendency to view complex social issues as technical problems needing technical solutions (Radin 2007; Swayamprakash 2013) contribute to the gap between state solutions to water insecurity and the needs and priorities of low-income people.

If anything, the research described in this dissertation further confirms the lack of meaningful accountability for state actors who fail to deliver basic services to marginalized communities. As a functional and responsive state is equally necessary to enforce accountability for the private sector, Budds and McGranahan (2003) conclude that what is needed first and foremost is better democracy. In contrast, research on urban India suggests growing inequality is eroding democracy. While some see hope in the 'occupancy urbanism' and popular mobilizations of poor and marginalized people (e.g. Benjamin 2008; Gopakumar 2011), it is clear that decisions about infrastructure are increasingly being made in two separate spheres: imagined and approved in the boardrooms and closed consultations of "Shining" India, and then contested and appropriated in streets, slums, and ward-level offices (see also Coelho, Kamath, and Vijayabaskar 2013).

Finally, the fourth question raised at the outset of this dissertation was: what role must the state and other actors each play in order to ensure sustainable and equitable water provision in urban India? Although this question was not directly addressed by either of the three studies some part of the answer emerged in the discussion above. It will be discussed more comprehensively below, under insights for policy. One clear conclusion from the three case studies, however, is that differences in existing infrastructure, available water, local culture, and political and governance climate from state to state and even city to city and neighbourhood to neighbourhood make universal solutions to water insecurity unlikely and even undesirable.

3 Insights For Theory

In addition to the findings described above, a few insights emerge from this dissertation in terms of how we think about water infrastructure and access to water, especially in urban areas. I discuss these here, situating them in relation to other work on water in urban India. In keeping with the aims set out in Chapter Two, I have attempted to approach this work in a way that centres the voices and experiences of those affected by the issue, takes a nuanced view of intra-community inequality, and engages with the political, physical, social, and ecological dimensions of the waterscape. As much as possible, these aims are reflected in the theoretical agenda outlined below.

As discussed in Chapter Four, one conclusion emerging from this work is the importance of physical and social feedback in encouraging sustainable and equitable use of shared water resources. We see that distributing water through closed pipes to individual house connections removes a sense of collective responsibility while facilitating and obscuring unequal consumption. This replicates at a micro scale the depoliticization of water provision that is happening through the construction of the Narmada pipeline grid. In both cases, as water infrastructure is enclosed, decisions about water become governed by individual client-patron relationships between the water user and water provider/utility rather than by collective decisions about how to share scarce resources. As recent research on water in urban India has focused on the implications of these relationships—between water users and state actors or other water providers—for what they tell us about contemporary Indian state and society, the idea of water as a commons has gotten increasingly short shrift (Bakker 2008, 2007).

This dissertation argues for a view of urban water that foregrounds the nature of water as an essential resource, the allocation and distribution of which is an inherently political question at every scale. A return to the commons as a framework for understanding water helps us to see water not only as a tool of state power but as a “power-full” object/flow that can be (and is) acted upon and leveraged by many actors (Meehan 2014). As a result, it

allows for the study of how water flows are shaped by state power and flows of capital while making space for processes of meaning-making between water users and water practices that are not mediated by the state or by capital (Sultana 2011). At the same time, a commons approach to water recognizes the links between peri-urban water use for farming, domestic, and even industrial use, and strengthens the "ecology" part of political ecology (McFarlane 2013). Thus discussions about water use must simultaneously engage at the level of the watershed, aquifer, neighbourhood, and relevant political jurisdiction(s).

Finally, one of the major shortcomings of recent urban water literature on material citizenship and abjection (Anand 2012; Graham, Desai, and McFarlane 2013; N. Mehta 2012b; Ranganathan 2014b; Truelove and Mawdsley 2011) is that it does not reckon well with problems of absolute scarcity and the finite nature of water resources. What does it mean to demand inclusion in a system in which citizenship is predicated on unsustainable consumption? A commons view of urban water allows us to evaluate socio-technological systems not just on who they leave out, but on how equitably water is distributed across the board (and into the future.) The necessity of grappling with over-consumption in order to address insecurity is an important contribution from the work that Mehta et al. (2013) have done on the social hydrology of Bengaluru, and I am grateful for the insight. As groundwater regulation emerges as a growing concern in the policy world, these questions become increasingly important sites for theoretical inquiry.

A second, and related, concern raised by the work in this dissertation pertains to the scale at which waterscapes are analyzed. The massive project that the Narmada Pipeline Project represents necessarily invites reflection on the appropriate scale for water distribution projects and suggests that a larger scale may only lead to more distance between decision-making and on-the-ground realities. The scale at which meaningful differentiation in access to water occurs may, however, be even smaller than the neighbourhood or community level typically addressed by research on water. Taking up Truelove's (2011) concept of the "micropolitics" governing access to water in Delhi resettlement colonies, I argue for

"microgeographies" of access to water that recognize how the physical properties of water circumscribe the area for which any given water source can be said to be accessible, and the ways in which proximity to neighbours with higher social or financial capital can improve residents' options for acquiring water.

While feminist geographers have called for the idea of a single community with relatively similar levels of access to be disaggregated according to gender, caste, and other identity positions (Bakker 2008; O'Reilly 2010), I contend that our understanding of positionality must include spatial location, and particularly must account for the ways in which spatial proximity to others with different social positions can blur some of these demographic lines. While the ways in which neighbourhood demographics mediate, e.g., racial inequality have been studied in Western cities (Sampson, Morenoff, and Gannon-Rowley 2002), this same sensibility is still largely lacking at a micro scale in Indian urbanism.

This concern goes hand in hand with the need to understand womanhood as an intersectional identity (Crenshaw 1991; Valentine 2007). The research in this dissertation indicates that while many women share similar experiences with, and relationships to, water work—and, similarly, that certain relationships to and experiences with water are perceived as universally constitutive of womanhood—women's class, caste, age, disability, family situation, and cultural context all contributed to widely differentiated experiences even among the women I interviewed. Thus while gender emerged as a structuring factor of the waterscape in both Mahesana and Weavers' Colony, gendered divisions of labour are most usefully understood as a response to a combination of factors including the nature of the job market, the amount of labour required to run a household on extremely low wages, and socio-cultural expectations around gender roles. An excessive or predetermined focus on gender as a structuring framework—rather than a broader interest in how difference impacts access—does not leave space to recognize alternative ways of navigating these pressures, including by non-heterosexual or non-cisgender people (Cornwall, Corréa, and Jolly 2008).

At the same time, I pick up Sultana's (2011) concern with the emotional labour of water collection and argue for increased attention to the labour of *caring about* water even if physical tasks are delegated (see Mederer 1993 for a discussion of the gendered labour of caring about household chores). Where water sources are shared, this work of caring about water extends to the labour of organizing the distribution of water and mediating conflicts. Such logistical and administrative work is part of the (remunerated) value added by water vendors or by the guards at Weavers' Colony's water kiosks, but it is unpaid and often unrecognized labour in the case of stand-pipes and other shared water sources, as well as in the home. Understanding caring/coordinating as labour allows us to better understand the additional burden posed by reliance on multiple water sources, as well as the importance of including reliability in assessments of the quality of water sources (see also Zérah 1998).

Finally, Gopakumar (2011, following Benjamin, 2005) presents India's cities as the stage for a battle between the many-headed 'hydra' of informal economies and patronage politics and the anti-politics machine seeking to tame it, arguing that confrontations over infrastructure are one site where the hydra is able to slow the 'juggernaut' of reform. By expanding the anti-politics machine to include an understanding of development as spectacle, we can see that the roles of hydra and anti-politics machine are not always that separate. In fact, rather than trying to crush or discipline the messy hydra of politics, the development machine may in some cases simply be able to keep distracting it.

4 Insights For Policy

In addition to seeking to better understand the existing waterscape in urban India, this dissertation set out to gain insights into what might be done to improve the state of water provision in under-served areas in an equitable and sustainable way. This section suggests certain directions for policy and action, with the understanding that these must first and foremost be responsive to local needs and circumstances. The choice of policy as a framing, even when discussing the role of non-state actors, comes from the understanding that non-state actors in the water sector require a policy environment that enables—or at least does not

hinder—their operations (Environment and Urbanization 2003). Hasan (2008) points out that this is particularly true as projects expand: the larger a project, the more contact it will necessarily have with the agency in charge of water or sanitation. I will therefore focus my discussion here on creating a policy environment conducive to more equitable and sustainable water distribution, regardless of who actively provides the water. I also discuss which types of water distribution systems were most promising in terms of scaling up equitable, sustainable access to water, although I do not specifically recommend attempting to replicate any one of these water distribution strategies without further research.

4.1 Directions For Policy-making

The first clear lesson from the research outlined here is the inadequacy of the centralized municipal pipe grid as a technology for providing water in India's cities. At the city scale like at that of the state, the piped water network is a black box whose functioning is obscured from citizens and poorly grasped by decision-makers (see, for example, Aandahl 2010; Anand 2015, 2011; Coelho 2004). The low pressure in Mahesana's water grid, no doubt due to unaccounted-for leakage and high demand, means it functions more like a gravity-fed system than a pressurized one and does not reach topographically ill-favoured residents. The need to maintain some level of pressure also dictates the rotating nature of water supply, contributing to residents in low-income areas receiving water at inconvenient or unpredictable times. These shortcomings are only likely to worsen if grids are expanded. Additionally, an interconnected grid in a highly unequal setting facilitates the appropriation of scarce resources by users who are better situated or have set up pumps to extract additional water from the pipes.[53] Without both accurate metering and the capacity to collect payments due, there is very little disincentive for over-consumption.

This indictment of city-scale (or larger) grid infrastructure should not be seen as necessarily excluding the possibility of in-home taps, however. Micro-utilities such as those operated by small water entrepreneurs in Weavers' Colony demonstrate the feasibility of

53 This practice is illegal, but relatively common nonetheless.

small-scale piped water networks and their convenience for users. A significant difference between the functional micro-utilities in Weavers' Colony and the inadequate (illegal) household taps in Mahesana is that micro-utilities disbursed water to each house sequentially, instead of simply increasing the overall demand on the water source. The other major difference has to do with the knowability of the amount of water available. While the micro-utility owner knows how much water can be pumped in a day and delivers water accordingly, the informal plumber and his clients have no way of knowing what other demands are being made on any given water main, nor do they have an incentive to regulate their water usage to leave water pressure for others. As a result, informal water connections such as those in Mahesana maintain an unequal distribution of water favouring those higher upstream (where water pressure is still strong) or those with stronger pumps.

It is important here to return to the types of proposals for integrating water vendors into the formal utility system discussed at the beginning of Chapter Six. Although the usefulness of alternative water provision technologies for expanding service is undeniable, the informal water economy operates in a very different way from the formal system. The contrast between the efficacy of the BBMP and private tankers, for example, indicates that simply reproducing similar technologies is not enough. As Gopakumar (2014) discusses in relation to the attempts to incorporate informal "tendrils" into the scope of the BWSSB, there are clashing norms and logics that accompany the various technological systems, which cannot easily be integrated into those of the formal institution. Attempts to regulate or formalize informal water vending practices must therefore be firmly grounded in an understanding of the motivations and practices of all of the actors within those informal economies.

4.2 Policy Proposals

Although this research project did not reveal any entirely sustainable and equitable water distribution practices to replicate or scale up, three types of water sources did strike me as promising. As discussed in Section Two, the collective self-organization of communities sharing standpipes reveals the importance of treating water as a commons, and the influence

of traditional practices of hospitality and neighbourliness in enforcing a relatively equitable distribution of water. Again, micro-utilities were also interesting as an example of in-home water connections that did not depend on a city-wide water grid, and provided more immediate feedback on water availability. Although most micro-utilities are based on patronage relationships, one respondent did state that she and her neighbours had all contributed to the construction of the well and paid a monthly contribution to offset operation and maintenance costs. Such a cooperative model eliminates some of the power imbalance inherent in the micro-utility structure, although it is once again dependent on access to capital and relative homogeneity between co-investors. Finally, the water kiosks in Weavers' Colony are interesting as the only source of filtered water that was discussed in either case study. Although additional maintenance costs are implied, the filtration technology available today makes the installation of filtered water kiosks a potentially viable alternative to standard standpipes, although they must be combined with sterile transportation and storage vessels to be effective.

The varied experiences documented in Chapters Four and Six also show that improved home storage capacity can reduce the stress of intermittent water supply to manageable—and even nearly imperceptible—levels. For residents in Weavers' Colony with sumps or storage tanks, replenishing their water supply was simply a matter of calling their micro-utility manager or water tanker operator every week. To take another example, in my middle-class apartment complex in Ahmedabad, the superintendent simply allowed a roof-top tank to fill every afternoon when city water was supplied, ensuring 24-hour water supply for the apartments below. Storing water also provides immediate feedback about how much water is available and what has been consumed. While the ability to store large amounts of water requires space and the capacity to make relatively large lump-sum payments, even a barrel or small storage tank improves water users' ability to store water from one day to the next, collect rainwater, or receive shared tanker delivers with neighbours. Incentivizing or facilitating the purchase and installation of home water storage could be a useful policy intervention to reduce the effects of water insecurity. An ideal combination of these models

might involve collectively-managed "micro-utilities" providing filtered water from a borewell or municipal pipe through local pipe networks to homes with improved storage capacity.

While the tendency in Indian policy circles has been to focus on macro projects, the findings above indicate that it is imperative for action on improving water supply to also look at local and hyper-local scales. The water kiosks in Weavers' Colony are one example of hyper-local interventions that have had a significant impact on improving quality of service at relatively low cost. The challenge lies in how to keep them sustainable when, for example, the MP who established them is replaced and they no longer serve political aims. While the micro-utilities and household re-sellers of borewell water provide another example of potentially mutually beneficial water provision, with revenue from sales subsidizing the cost of borewell construction and maintenance for household use, encouraging the development of borewells is counter-productive to the goal of sustainable water use.

In fact, much more than centralized infrastructure, what is needed is centralized planning for water use. Mehta et al. (2013) call for a "social metabolism" framework for planning, which situates human-made flows of water within the broader hydrology of the city and aims to balance the totality of the water cycle. Such planning depends on accurate data including on consumption, the location of aquifers, and the layout of any infrastructure, all of which is largely lacking in Indian cities today. Still, as mentioned in Chapter Six, efforts are being made in Karnataka and elsewhere to improve monitoring and regulation of groundwater use. At the same time, this dissertation shows that accurate hydrological data alone is not enough to make decisions about water distribution and use; an understanding of social relations as well as household priorities is also essential. Finally, while metering is a vital part of water conservation efforts, popular movements have often perceived the installation of meters as a precursor to water privatization and mounted significant opposition to such projects (Asthana 2009; Gopakumar 2014). At the same time, meters are generally inaccurate where there is not a constant flow of water, leading metering initiatives to typically require increased water

provision in order to be viable. There is therefore a need to find alternate ways of gathering accurate data on water use that are appropriate to the urban Indian context.

Even without a fully accurate hydrological picture of the city, however, planning for water can be improved. One major failure in the growing concern with city-level infrastructure planning has been the neglect of regional economic planning. The promotion of economic growth concentrated in already-booming cities has contributed to the expansion of unserved peri-urban areas as well as the neglect of the infrastructure of small and medium cities. At the same time, investment in economic development with no consideration for environmental carrying capacity (e.g. cement factories in Kutch or IT campuses in peri-urban Bengaluru) needlessly exacerbates both insecurity and absolute scarcity in order to foster a geopolitical agenda. More comprehensive and more transparent economic and regional planning processes are essential to steward India's limited and unevenly-distributed water resources. Of course, these proposals assume a shift in policy priorities from supply-side to demand-side; a need that is made clear in the discussion of the Narmada Pipepline Project in Chapter Five.

Finally, the findings of this dissertation push back against the use of households per tap as a metric of coverage, commonly used in the development and policy literature including by the Government of India. As we have seen above, one tap serving ten households may in fact be substantially better-managed and thus more useful than ten taps serving one household each. The measurement of taps rather than, for example, hours of supply encourages the continuous expansion of the "black box" of municipal infrastructure and subdivides a limited water supply into increasingly smaller amounts without necessarily improving coverage. While individual taps fit well into the optics of the hyper-modern "global city" promoted by India's city leaders, the widespread expansion and maintenance of public standpipes, accompanied by subsidies on water storage tanks and water treatment drops or filters, is likely to be much more effective in addressing water insecurity.

5 Future Steps

This final section reflects on lessons learned from the process of conducting this study and suggests directions for future research. Although the projects contained herein have generated important insights and reflections on the functioning of water distribution networks in urban India, they also suggest the importance of certain types of research and certain methodologies. One of the most important lessons from this research is the importance of fieldwork for understanding the issue of water poverty. The urban Indian waterscape is an incredibly complex and diverse organism, and understanding any part of it requires extended observation and investigation. As highlighted by Katherine Boo in the epigraph of Chapter Two, the disconnect between what is officially 'known' and what is practised in everyday life is immense, making multi-method research essential in order to reconcile various perspectives and attempt a more complete representation. At the same time *relational,* multi-scale, and multi-site research has been essential to mapping patterns and understanding forces that may be obscured in the minutiae of any one case study. Just as studying the gigantic Narmada pipeline gave insights into the functioning of city-level water grids, the more diverse family structures of Weavers' Colony helped me think about the question of gender in Mahesana.

A second lesson is the need for flexibility in research design. At one level, it is necessary to be able to adjust in the face of methods that prove impracticable and concerns that turn out to be non-existent. At a more fundamental level, the complexity and murkiness of the topic lends itself extremely easily to projecting preconceived notions onto the research setting seeing what one expects to find. As the head of university-based research teams working with highly marginalized people, I had to work to preempt assumptions and premature theorizing on my part and that of my research assistants. Allowing theory to emerge as much as possible from the stated views and experiences of research participants has generated a very different picture of the urban Indian waterscape than I expected, or, in fact, than any one of my respondents described. This suggests that such grounded theory-building has much to offer future work on Indian water systems as well.

While this dissertation has contributed to the understanding of water practices in under-served communities and highlighted several factors shaping the urban and peri-urban waterscapes in India, more research is needed to elucidate the microgeographies of access and the time dimension of the waterscape. Specifically, research on how the weight and volume of water circumscribe residents' options would significantly contribute to the research on water vending and informal water supply. Similarly, an analysis of how the timing of water sources fits into households' daily routines would help develop better frameworks for understanding the desirability of certain form of water supply over others, as well as the ways in which timing is used to prioritize certain areas.

Second, like Allen et al. (2006a) I recognize a difference in family structure between urban and peri-urban spaces, with extended families more commonly living together in Mahesana and a transition toward nuclear families underway in Weavers' Colony. This suggests a need for more research on how changing family structures—especially in peri-urban areas—affect water strategies, and particularly gender roles and the position of women in the community. It would also be interesting to look more at the transfer of practices of collective water management from rural to urban settings, either as individuals and communities migrate, or as rural areas urbanize.

Finally, more research is needed into the persistence of a technological system (the water grid) that manifestly does not work in much of the Indian context and more broadly in the Global South. I have begun some of that work in my discussion of the anti-politics machine and the role of infrastructure in development as spectacle. Taking a different approach, Gopakumar's (2014) discussion of the tensions between different socio-techological systems in Bengaluru addresses the challenges of technological-institutional "fit" between existing utilities and non-traditional forms of water provision. For water access in Indian cities to significantly improve, however, much more research will be needed not only on technical solutions but on how those solutions align with the interests and needs of several actors, including water users, political elites and state bureaucracies, and existing water

entrepreneurs, each with their own internal diversity and complexities.

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Appendix A

Scoping Interviews

Dr. Shrawan Kumar Acharya *Professor of Planning and Public Policy, CEPT, Ahmedabad*	In-person interview, October 2012
Dr. Susan Chaplin *Research Officer, Royal Melbourne Institute of Technology, Melbourne*	Phone interview, July 2011; In-person interview, October 2012
Saugata Dasgupta *Urban Specialist, Asian Development Bank, Delhi*	In-person interview, October 2012
Kalpana Gopalan *PhD Candidate, Centre for Public Policy, IIM-Bangalore*	In-person interviews, Fall 2011
Rimi Goswami *PhD Candidate, Centre for Public Policy, IIM-Bangalore*	In-person interview, October 2012
Dr. Rajeev Gowda *Chairperson, Centre for Public Policy, IIM-Bangalore*	In-person interview, October 2012
Dr. Darshini Mahadevia *Member-Secretary, Centre for Urban Equity, CEPT, Ahmedabad*	Phone interview, July 2011; In-person interview, October 2012
Dr. Deepak Malghan *Assistant Professor, Centre for Public Policy, IIM-Bangalore*	In-person interview, October 2012
Dr. OP Mathur *Vice-President, National Institute of Urban Affairs, Delhi*	In-person interview, October 2012
Dr. Emma Mawdsley *Senior Lecturer, Political Ecology Group, Cambridge University, Cambridge*	Phone interview, August 2011
Dr. Partha Mukhopadhyay *Senior Research Fellow, Centre for Policy Research, Delhi*	In-person interview, October 2012
Dr. Malini Ranganathan *Post-Doctoral Fellow, Social Dimensions of Environmental Policy, University of Illinois, Urbana*	In-person interview, May 2011
Dr. Vinod Tewari *Professor of Political Studies, TERI University, Delhi*	In-person interview, October 2012

Appendix B

Questionnaire for Household Interviews in Gujarat

Informed consent form (English translation): *A copy of this page in Gujarati was given to research participants along with a business card with my contact details in India.*

Hello.

My name is Mona Luxion, I am a student in the School of Urban Planning at McGill University, in Canada. My research assistant, Kalrav Shah, is a student at CEPT University in Ahmedabad. We are conducting a research study, interviewing people in Mahesana to learn how they get water aside from being connected to the city water pipes. If you do not have a water pipe connection, would you be willing to participate? It will take under half an hour, and you are welcome to stop at any time.

We cannot offer anything in return for your time, but when the study is completed we will share what we have learned in a number of ways (for example: a thesis, published articles, and submissions to the government on how to improve the water situation.) Your answers will be anonymous: you do not have to give us identifying information (name or address), but if you do it will be kept in a locked box to which only I have the key, and seen only by myself and my research assistant until it is no longer needed, at which point it will be destroyed.

You are under no obligation to participate. If you do not have time, do not want to reply to a question, or if you want to stop at any point, please say so. We will also be recording the interview. The recording will be stored in password-protected electronic form and only accessed by us to transcribe it. It will be destroyed once it is no longer needed.

If you have any questions you can contact this number: _____ .

I confirm that I have been informed that I am under no obligation to participate in this survey and that I have chosen to respond anyway. I understand that I can withdraw from the study at any point during the interview and the recording and notes of my interview will be destroyed. (The researchers cannot identify your particular interview after the fact, so if you want to withdraw you must do so before the interview concludes.)

Signature _____ [or initials of researcher if oral consent given]

Supervisor at McGill University: Dr. Madhav Badami, madhav.badami@mcgill.ca

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the McGill Ethics Officer at 514-398-6831 or lynda.mcneil@mcgill.ca

Survey instrument (English translation):

Note for respondents: *Your answers should represent your own beliefs and experience. There are no right and wrong answers, please simply state your honest opinion. Ask clarifying questions when needed.*

Survey Respondent # _____

Demographics

Gender _____ Age _____ Community/caste _____

Address _____,
(street or lane) (area)

Eligibility questions

1. Do you get municipal (nagarpalika) water piped in your home?
Yes No

2. Is it adequate to meet your needs, or do you also get water elsewhere?
Yes, it's enough No, I get water elsewhere *(If yes, please stop here.)*

3. Are you responsible for fetching water for your entire household?
Yes No *(If no, ask to speak to the person responsible)*

Household Details

4. Please list all of the members of your household (people who share a kitchen with you.)

	Relationship to you (Male/ Female/ Other)	**Age**	**Employment / Occupation**	**Approx. Income / mo.**
1	Yourself M/F/X			
2	M/F/X			
3	M/F/X			
4	M/F/X			
5	M/F/X			
6	M/F/X			
7	M/F/X			
8	M/F/X			

5. Do you have:
electricity? a mobile? a TV? a vehicle? a washing machine?

6. What are the walls and roof of your house made of? _____

7. How many of your neighbours have piped water connections?
None Some Most Almost all

8. Does your household pay the water tax? Yes No

Water use

9. What does your household use water for, and roughly how much water do you need for each?

Drinking	_____ / day	Cleaning the home	_____ / day
Cooking	_____ / day	Bathing adults	_____ / day
Washing vessels	_____ / day	Bathing children	_____ / day
Washing clothes	_____ / day	Religious practices	_____ / day
Toilet flushing	_____ / day	Other _____	
Other _____	_____ / day	Other _____	_____ / day

10. How much water do you need in a day, total? _____

11. How do you store water for later? _____
_____

12. How much water do you store, usually? _____

13. Do you use stored water for different things than fresh water? If so, what?
_____
_____

Water collection

14. Please tell me all of the places or people you have gotten water from **in the past week**. (Omit people's names if you prefer)

A. _____
B. _____ C. _____
D. _____ E. _____
F. _____ G._____

15. Are there other places you sometimes get water, for example in other seasons?

H. _____ I. _____
J. _____ K. _____

16. For each source, please describe (a) how you get water from each there, (b) how much water you usually get, (c) how much does it cost for that amount, (d) how much time it takes to get water, (e) how frequently you do so, (f) how safe the water is, and (g) what you usually use it for?

17. Please list which water source(s) you prefer and why.
_____

18. How much time do you spend collecting water every day? _____

19. Do you rely on others to help you get water (for example, family members, neighbours, officials)? If so, how (feel free to omit names)?
_____

Daily life

20. How can you tell if water is safe to drink? _____

21. If it is not safe, what do you do? _____

22. How often is someone in your household sick from bad water? _____

23. Does how much water you use or how you use it change depending on how much or what kind of water you can get?
Yes No

24. What changes do you make? _____

25. Do you sometimes have to compromise on water quality, or avoid doing things that would make water safer in order to save water? If so, what? _____
_____

26. Do you sometimes have to make decisions between getting water and something else
because of time? Yes No
because of money? Yes No

27. Please describe one such decision you have had to make.
_____

28. Do women in this neighbourhood have to stay home from work in order to fetch water, or children home from school? Yes No

29.What percentage of women in this neighbourhood have paid work? _____ %
What percentage of men? _____ %

30. Overall, are you satisfied with your water situation?
Yes No

31. What are the two or three aspects that are best, and the two or three aspects that are worst?

Best	*Worst*
_____	_____
_____	_____
_____	_____

Other questions

32. What do you think are the one or two most important things that need to be done with regard to water?

_____

33. Are there things you could do (or are doing) yourself or with your neighbours to improve the situation?

_____
_____

34. What one thing do you think the government could do to improve your water situation?

_____
_____

Thank you very much for your time and input. Please give your contact information to the interviewer if you would like to participate in a follow-up conversation (focus group) with other participants.

Appendix C

Guiding Questions for Gujarat Focus Group Discussions

The focus group facilitator was directed to ask follow-up questions as appropriate, and to encourage back-and-forth between discussions between participants, in order to get as rich a picture of the situation as possible. As a result, conversations were relatively free-flowing and went in different directions in each of the different communities studied. Although the questions intentionally did not focus on gender in order to allow gendered issues to emerge naturally, the facilitator was attentive to follow up when they did emerge.

Explain the project and obtain consent from participants (see below).

Introductions (name, age, caste, any family details they want to share)

"Please start by describing how you get or use water throughout the day: where do you get it, when, and with whom?"

(For example: in the morning my daughter and I go to the tap and wait for the water to come on at 7am...)

"How does the water situation impact your life?"

(For example: Do you lose work to collect water? Do you spend money on water? Do you have to make do without water sometimes?)

Additional questions if necessary to spark discussion:

"How would your life change if your water issues were fixed?"

"Has your water situation changed over the past 10 years? How so?"

"Have you and/or your neighbours organized together to manage your water situation?"

(For example, to decide who gets piped water, or to go demand better service from the government.)

Follow-up: "Please explain how you organized things."

Conclusion: "Do you have any other thoughts on the water situation you want to share?"

Focus group discussion informed consent script:

> Hello. Thank you for coming.
> Mona Luxion, whom you have met before, is a student in the School of Urban Planning at McGill University, in Canada who is doing research on water in Mahesana, especially how people get water when they are not connected to the city water pipes.
>
> Today we are going to ask a number of questions, but once again you are under no obligation to participate. If you do not want to reply to a question, or if you want to stop at any point, you are free to do so. If you want to withdraw entirely and have the recordings and notes from this session destroyed, you may do so at any time before you leave. We will also be recording the interview. The recording will be stored in password-protected electronic form and only accessed by us to transcribe it. It will be destroyed once it is no longer needed.
>
> Please respect what others say, and do not share their personal information outside of this discussion. If you feel uncomfortable saying something in front of the other participants, please feel free to come tell one of the researchers privately after the discussion. Similarly, your names and contact information are not being recorded and will not be included in the transcript of this conversation, and we will not include personal information in anything we publish or share with others.
>
> The conversation will take no more than 1 1/2 hours. If you need to leave before that, please let me know so that we can plan accordingly.
>
> If you have any questions please ask the researchers before agreeing.

Respondents were asked to sign a consent declaration (reproduced in translation below), and were given a copy of the declaration along with a business card with my contact details in India:

> I confirm that the focus group process has been explained to me, I have been informed that I am under no obligation to participate, and I have been given the opportunity to ask questions. I agree that what I say in this discussion can be used as part of the research project described above.
>
> Signature _____ [Researcher initials if oral consent given]

Supervisor at McGill University: Dr. Madhav Badami, madhav.badami@mcgill.ca

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the McGill Ethics Officer at 514-398-6831 or lynda.mcneil@mcgill.ca

Appendix D

Interview Questions: Weavers' Colony Household Interviews

Informed consent script/form (English translation):

Hello.

My name is Mona Luxion, I am a student in the School of Urban Planning at McGill University, in Canada. [Introduction of research assistants] I am conducting a research study for my PhD, and as part of the study I will be interviewing people to learn how they get water and why they choose different ways of doing so. Would you be willing to be interviewed? It will take about half an hour, and you are welcome to stop at any time.

I cannot offer anything in return for your time, but I will use what I learn to make recommendations to the government and to inform other people of the situation here. Your identity will remain confidential: I will not use your name or address in anything I publish, and anything with that information in it will be kept under lock and key or password-protected, seen only by the research team (myself and my research assistants and translators), and destroyed once it is no longer needed.

You are under to obligation to participate. If you do not have time, do not want to reply to a question, or if you want to stop at any point, please say so. We will also be recording the interview. The recording will be stored in password-protected electronic form, only accessed by the research team, and destroyed once it is no longer needed.

If you have any questions you can contact this number: _____ .

I confirm that I have been informed that I am under no obligation to participate in this interview, and I have chosen to respond anyway. I understand that I can withdraw from the study at any point and the recording and notes of my interview will be destroyed.

Signature _____ If oral consent was given, researcher initials: ____

Supervisor at McGill University: Dr. Madhav Badami, madhav.badami@mcgill.ca

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the McGill Ethics Officer at 514-398-6831 or lynda.mcneil@mcgill.ca

Participant were provided with a copy of the consent statement (in Kannada), and a business card with contact information

Interview guide:

Interviewers may reorder questions, rephrase them, ask follow-up questions, or make other similar changes in order to elicit answers that are as complete as possible and to put the interview subjects at ease. Interviews will be conducted in Kannada.

First, inform participant(s) about the project and get written or oral consent.

- Please tell me a bit about your household: How many people live here, what is your employment, when did you move to Weaver's Colony, and so on?
- Please describe your water situation: How do you get water for household needs and for drinking? How often do you do so? Is this situation adequate?
- Are you the person who makes decisions about how to get water? If not, who does?
- Why do you/they choose to get water in these ways? Are there other options you have considered?
- Did you ever get water in other ways in the past? How was that? Why have things changed for you?
- Other people get water in other ways: [for example, they dig borewells to be self-sufficient, or they organize together to demand better services from the government.] Have you considered doing those things? Why, or why not?
- What is your sense of the water situation in Weaver's Colony. Are there differences between how people get water? Why do you think that is?
- Tell me a bit about Weaver's Colony: Who has power? How do big decisions get made?
- Are there disagreements between groups, do you think? For example, different castes, or between old and young, or men and women, or newcomers and older residents?
- What is the biggest problem with water right now in Weaver's Colony, in your opinion?
- What is the thing that is best about the water situation? What would you keep the same if you could?
- How do you imagine the water situation in Weaver's Colony in 5 years?
- Is there anything else you would like to add?

Appendix E

Interview Questions: Weavers' Colony Vendor Interviews

Informed consent script/form (English translation):

Hello.

My name is Mona Luxion, I am a student in the School of Urban Planning at McGill University, in Canada. [Introduction of research assistants] I am conducting a research study for my PhD, for which we are interviewing people in Weavers' Colony to learn how water vending works. We were told that you have a water vending business and we were wondering if we could ask you some questions. Would you be willing to be interviewed? It will take about half an hour, and you are welcome to stop at any time.

I cannot offer anything in return for your time, but I will use what I learn to make recommendations to the government and to inform other people of the situation here. Your identity will remain confidential: I will not use your name or address in anything I publish, and anything with that information in it will be kept under lock and key or password-protected, seen only by the research team (myself and my research assistants and translators), and destroyed once it is no longer needed.

You are under to obligation to participate. If you do not have time, do not want to reply to a question, or if you want to stop at any point, please say so. We will also be recording the interview. The recording will be stored in password-protected electronic form, only accessed by the research team, and destroyed once it is no longer needed.

If you have any questions you can contact this number: _____ .

I confirm that I have been informed that I am under no obligation to participate in this interview, and I have chosen to respond anyway. I understand that I can withdraw from the study at any point and the recording and notes of my interview will be destroyed.

Signature _____ If oral consent was given, researcher initials: ____

Supervisor at McGill University: Dr. Madhav Badami, madhav.badami@mcgill.ca

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the McGill Ethics Officer at 514-398-6831 or lynda.mcneil@mcgill.ca

Participant were provided with a copy of the consent statement (in Kannada), and a business card with contact information

Interview guide:

Begin with something like: “Thank you for agreeing to answer some questions. Please feel free to speak openly. We will not connect your name to anything you say.”

- How did you begin selling water?
- How much water do you sell each week?
  Does that change by season?
- Do you have another job, or is this your only source of income?
- Do you work alone, or are there other people in the water selling business with you?
- How do/did you find your customers? Are they all in Weaver’s Colony?
- Roughly how many customers do you have?
- Where do you get your water? How much does it cost? Do you have other expenses (fuel, electricity, repairs, etc)?
- Do you feel like this is a good way to make a living?
  Why or why not?
- What is the hardest part of this job?
- What is the easiest or best part?
- What do you think of the water situation in Weaver’s Colony?
  Or in Bangalore?
- Do you think the government should change what it is doing about water?
  What should change?
- How do you see the water situation in five years? What do you think will have changed, and what will be the same?
- Is there anything else you would like us to know?

Appendix F

Ethics Review Board Documentation

McGill

Research Ethics Board Office
James Administration Bldg, room 429
845 Sherbrooke St West
Montreal, QC H3A 0G4

Tel: (514) 398-6831
Fax: (514) 398-4644
Ethics website:www.mcgill.ca/research/researchers/compliance/human/

Research Ethics Board I
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 4-0613

Project Title: Beyond the Private/Public Debate: Decentralized Water Strategies in India's Second-Tier Cities

Principal Investigator: Mona Luxion

Department: Urban Planning

Status: Ph.D. Student

Supervisor: Prof. M. Badami

Co-Investigators/Other Researchers: Dietlind Stolle

Approval Period: **June 27, 2013 to June 26, 2014**

The REB-I reviewed and approved this project by delegated review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans.

Deanna Collin
Ethics Review Administrator, REB I & II

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* All research involving human participants requires review on an annual basis. A Request for Renewal form should be submitted 2-3 weeks before the above expiry date.
* When a project has been completed or terminated a Study Closure form must be submitted.
* Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can't be initiated until approval is received.

McGill

Research Ethics Board Office
James Administration Bldg.
845 Sherbrooke Street West. Rm 429
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Tel: (514) 398-6831
Fax: (514) 398-4644
Website: www.mcgill.ca/research/researchers/compliance/human/

Research Ethics Board I
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 291-0115

Project Title: Differences in Water Sourcing Strategies in Weaver's Colony, Bangalore

Principal Investigator: Mona Luxion

Department: Urban Planning

Status: PhD Student

Supervisor: Prof. Madhav Badami

Approval Period: **January 26, 2015 – January 25, 2016**

The REB-I reviewed and approved this project by delegated review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans.

Deanna Collin
Ethics Review Administrator, REB I & II

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* All research involving human participants requires review on an annual basis. A Request for Renewal form should be submitted 2-3 weeks before the above expiry date.
* When a project has been completed or terminated a Study Closure form must be submitted.
* Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can't be initiated until approval is received.