

Institutional Design and the Geography of Rural-Urban Water Conflict in Mumbai

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Abstract: Water security in metropolitan cities is increasingly important in the developing world. In Mumbai, for example, rapid urban growth has dramatically increased the demand for water, which has resulted in serious consequences for the water entitlements of rural communities located near the sources of water. This presentation focuses on the regional dimensions of water delivery and looks at the role of institutions and the impact of local laws, agencies, and governance on how water is shared between rural and urban areas.

Key words: Urban; rural water access; metropolitan urban governance; commons; Mumbai;

India

Introduction

In the case study literature on the commons, there are few studies that examine the institutional implications of water demand for a growing metropolitan region on its rural hinterland.¹ Urban expansion and growth often leads cities to take water from distant rural watersheds that irrigate agriculture for urban use. Urban water appropriation is rapidly becoming an important policy question in developing countries. At the same time, the institutional mechanisms and regulatory frameworks that underlie access to water from rural areas are poorly understood. Through a case study on the city-region of Mumbai, India, this paper tries to develop a new understanding of an unexplored institutional dimension of inter-sectoral water politics.

This paper hopes to make a contribution to the institutional and metropolitan governance literature on water in large city-regions. The primary contribution is empirical where the paper seeks to examine how a large city's ability to access rural water quotas and infrastructure has been mainly aided by a very particular evolution of the legal-institutional architecture around water (and land). Its second contribution is to highlight the common ground between the geographical and institutional economics (including the CPR) literatures on this subject, and in doing so, it tries to identify some of the key distinctions and commonalities between these fields.

I begin with a critical evaluation of the literature on rural-urban water transfers in institutional economics and human geography and lay out the theoretical framework of the paper in Section 4.1. Section 4.2 and Section 4.3 present the theoretical framework of the paper. From Section 4.4 until Section 4.8, I deal with the case study of the collective action² problem in local water management that has important implications for developing an understanding of the

mechanisms of rural-urban water transfers in the Mumbai context. I end with an institutional analysis of the findings in Sections 4.9 and 4.10

4.1 The Problem: Water Abundance and Metropolitan Water Governance

What role do institutional arrangements and factors play in meeting the basic water needs of communities living near source areas for large and growing mega city-regions? How do these institutional arrangements on water sharing between urban and rural evolve at the level of geographical scale and how do they influence local collective action in rural areas? These are the two main questions this paper tries to answer with a case study of water institutions and politics in the Mumbai region. Large and growing mega-urban regions in the developing world often source water from distant rural watersheds; however the basic water needs of human habitations near the reservoirs get clubbed with the problem of water provision for peri-urban areas. In the Indian context, the water problems of such source areas can often be a product of willful neglect by local and state governments, or of a larger exclusion of rural indigenous communities who usually live in proximity to dams located in forested watersheds. There has been voluminous literature in the Indian context on problems of peri-urban areas and rural-urban conflict in general (Joy et al., 2008a; Iyer, 2009), but very little research focused on local institutional factors that influence the interpretation of local water entitlements in rural watersheds that serve as sources of water for large metropolitan cities.

The action situation described and analyzed in this case study is in the context of a major water district called the Tansa-Vaitarna water district (henceforth T-V) where five major dams for the city of Greater Mumbai have been constructed in the last 100 years. The five dams in the T-V water district are located within a conservation area and water storage in the dams is pre-assigned and quotas are reserved for various cities in the metropolitan region, viz. Mumbai, Thane,

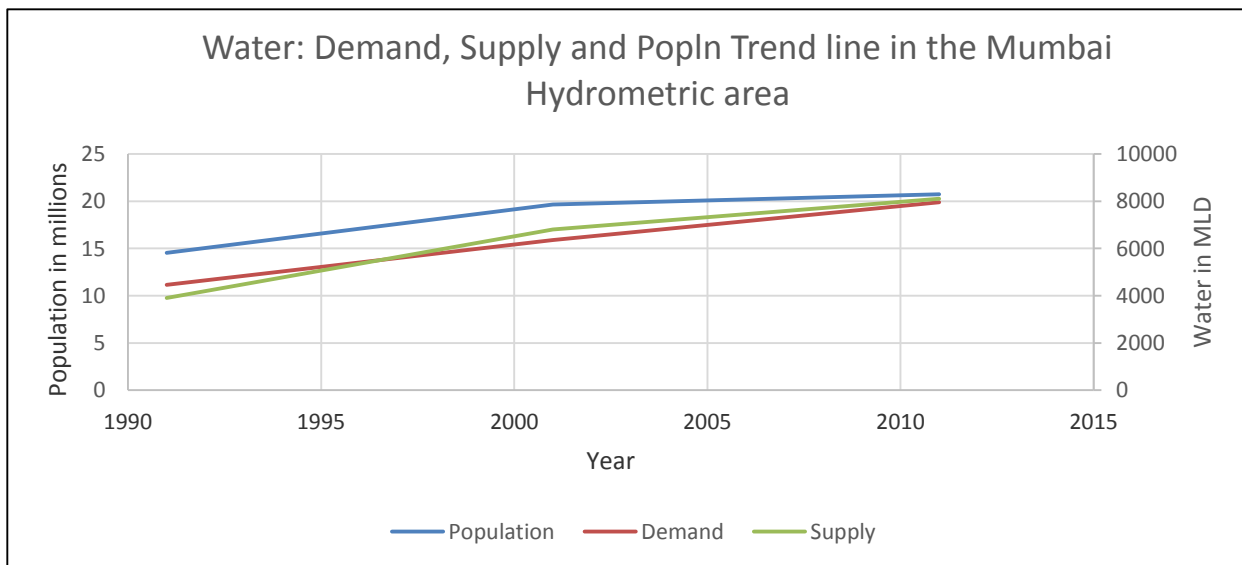
Bhiwandi and some designated outlying villages. The T-V water district faces socio-economic problems typical of forested areas in tribal areas of Western India (Louw and Mondal, 2013, p. 50-51). Low levels of economic development combined with high rates of seasonal migration are a central part of the experiences of these communities. These problems of access to resources in forest areas and the state's monopoly rights are the focus of a large literature in South Asian political ecology since the 1980s.

The Municipal Corporation of Greater Mumbai had, during the completion of the Upper Vaitarna (1972) and Bhatsa projects (1983), promised water supply to villages and towns (Mulekar, 1985). Water is conveyed from this region through large aqueducts into the Bhandup complex of the Mumbai Municipal Corporation. These water mains, as they pass the villages near the source areas in the T-V water district, are all above ground. The sight of water being conveyed to a large metropolitan city while the inhabitants of the source area suffer from endemic water shortage became major ground for resentment for inhabitants of this area. This led the Government to implement a rural water supply project that would source its water from the dams owned by the Mumbai Municipal Corporation under a water sharing agreement. The maintenance of the water supply scheme was handed over to the local government as part of state policy to decentralize water provision in rural areas.

It is useful to see T-V as a "problemshed" within the Vaitarna sub-basin. Conflicts over water in this area have ranged from demands for water quotas that were originally promised for irrigating agriculture, to demands for water for domestic consumption in the villages that lie in the proximity of the reservoirs. The Vaitarna basin is the largest amongst the North Konkan river basin groups that constitute water sources for metropolitan Mumbai and the region. The Second Irrigation Commission of the State Government of Maharashtra went into this region and

recommended that water intensive agriculture be encouraged (Government of Maharashtra, 1999, p. 432). The Committee report stated “that the requirements of the megacity and that of industrial use are going to remain the principal determinant of planning and management of water in this area instead of irrigation” (Government of Maharashtra, 1999, p. 432). However, thirty nine percent of the area was found to be cultivable and the report concluded that conditions in the basin were favourable for water intensive agricultural production that was amenable to the needs of civic supply (Government of Maharashtra, 1999).

Figure 4.1: Urban water demand and supply in Mumbai Hydrometric Area in million litres per day (1991-2011). Source: Government of Maharashtra, 2003-2010 & 2005. Tables on Water Budget



The report thus indicates a sufficient availability of water for meeting both irrigation and the domestic and industrial water needs in this region. While there are urban water supply dams constructed in this water district, there are also multipurpose dam projects that supply water to irrigate agriculture through canal systems. This imparts a variety of water rights to the rural population. However, the last two decades have witnessed significant water quotas from this area’s largest dam, the Bhatsa multipurpose project, allocated for urban-industrial use (Government of Maharashtra, 2005). For this reason, Greater Mumbai and towns that access

reservoirs with the city have not witnessed any significant shortfalls in supply since the early 1990s (See Figure 4.1 above). The Bhatsa presently irrigates land in downstream Bhiwandi (in

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

, the red lines indicate the canals that bypass the predominantly tribal parts of the T-V water district).

An empirical focus on the main water district for Mumbai as a unique context for metropolitan water governance presents some advantages. Mumbai is one of the largest metropolitan cities in India. It is also an outlier in the Indian context on urban per capita water consumption and ranks amongst the world's leading and more prosperous global cities on this indicator. However, its water sources are located in an underdeveloped tribal area of rural Maharashtra where there is a seasonal scarcity of water. A recent National Sample Survey on the reliability and availability of drinking water in rural Maharashtra shows that the state scores below the rural average for India on both the sufficiency and availability of improved sources of drinking water (NSS 2012: p.15). This is despite the fact that the state has the largest and highest number of dams and per capita availability of water. This paper will thus explore the disparities between rural and urban areas in India and will also shed light on how institutional arrangements that are crafted at the local level often influence regional water in one of the fastest growing metropolitan cities of the world. Secondly, this paper will explore how a city's demand for water can crowd out the needs of the outlying rural areas. In addition to identifying the main legal principles that

have played an important role in the evolution of water governance system in the Mumbai metropolitan region, the paper will highlight the role of local agro-ecology in shaping institutional arrangements on water.

4.2 Rural-Urban Water Transfers: Power or Institutions?

A review of theory from human geography (HG) and institutional economics (IE) in a case study on a rural-urban water conflict might seem strange to readers of an institutional economics journal. While there is an active program within economic geography on institutions (Gertler, 2004), there has not been a great deal of interest amongst environmental geographers in applying institutional theory to resource problems such as water. The main distinction between frameworks in both disciplines towards rural-urban water transfers lies primarily in the different theoretical paradigms that are dominant in these disciplines. In environmental geography, the dominance of Marxism and post structuralism has focused on the role of power and politics in water appropriation by cities from rural areas. In his landmark study of the City of Guayaquil, the geographer, Erik Swyngedouw has argued that urban water capture can be attributed to the power of capital located in urban areas and considers water appropriation an inevitable outcome of capitalist urbanization (Swyngedouw, 2004; Gandy, 2008). The political-ecological analysis in this Marxian framework hinges on social and political processes and is chiefly informed by dependency theory and ecological economics. Both of these fields explain contestation over the consumption of resources as a result of competition between urban and rural areas.

Another track within geography that uses power revolves around analyzing the governance of inter-sectoral water conflict by applying a Foucauldian lens. Here, the concept that has been utilized is "governmentality" where the argument is that governments control populations by using the knowledge acquired from their information gathering abilities. This post-structuralist

framework takes the view that institutions, such as the government, its regulatory frameworks and even organizations promoting people's participation in the management of public works, are part of a power gathering exercise, which in the process of development, craft a complex (but amorphous) system of governance.

It is important to see this framework as complementary to the Marxian approach. Both try to examine the role of power, but both often overlook the fact that state power in relation to water is exercised through specific legislative mandates or executive decisions, especially in democracies. Empirical data on regulations and instruments of governance are also conspicuous by their absence in these frameworks. The complexities of geographical scale, boundaries and institutions that often manage through overlapping jurisdictions around large metropolitan cities are also ignored. An example of the application of a governmentality framework is Matthew Gandy's 2008 paper on Mumbai. While the main focus of this paper is the uneven distribution of water among rich, middle class and poor residents of the city over time, Gandy also grapples with the regional power and influence of Mumbai's claims to water over other towns and villages in the region. However, his use of governmentality does not help us to understand Mumbai's total control over water in the region, beyond an argument about the "performativity" of local right-wing populist politics and the influence of the Shiv Sena over local water policy through its influence within the Mumbai Municipal Corporation. This "performativity thesis" assumes that right-wing politics and neo-liberal ideology act in tandem and completely explain the phenomena he describes. This argument does not stand critical scrutiny as it ignores two important facts: a liberal/mainstream party, the Indian National Congress, enacted water policy for the entire state for the last fifteen years; and the state government's Irrigation Department owns two of the largest reservoirs that constitute the water sources for Greater Mumbai. Moreover, neo-liberal policies

have made little headway in the transformation of the regional and urban water system -- which continues to be a state monopoly at both levels. Because Gandy seems to ignore these facts on the ground, the paper is unable to analyze why the Municipal Corporation of Mumbai -- despite the construction of numerous dams and high per capita water consumption -- is unable to meet the water needs of the poor in the urban and rural areas. Formal state law on water and mechanisms of legitimation and enforcement that shape water rights and entitlements are treated as epiphenomena and ignored.

Research on rural–urban water transfers within IE has been primarily influenced by common pool resource (CPR) theory. Water’s characteristics as a renewable resource, its variable legal status within different contexts and the ability to store it in reservoirs makes it amenable for empirical analysis using CPR theory. In the last two decades, economists and even social scientists using institutional theory have also outlined a variety of market and non-market mechanisms that exist in the context of inter-sectoral transfers of water from aquifers and surface water storages (see Saleth and Dinar, 2004; Molle and Berkoff, 2006 for a review). There has been a whole range of theoretical approaches from transaction cost analysis to the empirical examination of rules that undergird rural-urban water transfers. From the water markets of the Western United States and Australia to administrative water transfers in Asia, one of the main strengths of this literature is a close attention to the wide variation in institutional arrangements on rural-urban water transfers that can exist in real world contexts.

While the gap between the HG and IE literatures can be wide, some scholars have recently tried to bridge the distance by producing case studies on water transfers that draw on insights from both disciplines. An instance is a recent contribution, by Celio et al., (2010) who in their case study of Hyderabad, Southern India have pointed to the interesting complementarities that exist

between both the IE and HG perspectives. Applying institutional and geographical tools to water transfers, their research finds that “appropriation of water” often has a spatial and temporal dimension and involves the capture of rural water infrastructure by cities (as Marxian geographers have argued). At the same time, the authors also present counter examples of water transfer that focus on two reservoirs and are part of the same context in the Hyderabad region. While transfers in the first example within this case study points to outright appropriation of water, the two other examples in the same case study also leads them to identify the importance of rules around such transfer that ensure compensation for farmers.

While common features to IE and HG have been highlighted, there are also gaps in both literatures. For example, the power and influence of complex water bureaucracies and the path dependence of institutional rules are not particularly well researched in either literature. On the other hand, the problem with the IE literature (given the influence of common pool resource theory) is that resources are defined too essentially and “presuppose a cause and effect of ecological analysis that may or may not be universal” (Forsyth and Johnson, 2014, p. 9). Also, while institutional scholarship has been very useful in furthering our understanding of these processes and the dynamics of collective action in small scale communities, it is yet to develop a theory of local collective action could be influenced by the sharing of the commons with larger geographical entities (Harvey, 2013: p.68-72). However, scholars working within CPR literature have now begun to point to the lack of attention to the interconnections between different institutions and resources, which are primarily a legacy of the decades of engagement with the tragedy of the commons argument within CPR theory (Cole et al., 2014). This is particularly relevant to developing our knowledge of how water is shared between geographically dispersed rural communities and large urban areas. Given the dependence of the rural poor in developing

countries on common resources and land, an evolutionary understanding of the relationship between various institutions that manage these resources is crucial.

4.3 Institutions and Action Situations: The Context of the Socio-Ecological System

This paper utilizes some of Elinor Ostrom's key insights and methodologies that she developed using institutionalism to research commons problems within the field of development studies. Ostrom (1990) inspired a wide body of work within development studies, economic history and other disciplines in the social sciences in India, in particular, and also by overseas scholars studying environmental problems in India and other parts of South Asia. This literature has consistently pointed out how the excessive authority and power placed in a centralizing colonial and post-colonial state and the consequent failures of governance and institutions had characterized the experiences of the rural poor in their access to the commons (Wade, 1988; Gadgil and Guha, 1995; Chakravarty-Kaul, 1996; Agrawal, 1999). In a recent review of Ostrom's contributions to development studies, Tim Forsyth and Craig Johnson have highlighted the integration of theory from political science and economics that emerged from her work on resources as her chief theoretical contribution to this field (Forsyth & Johnson, 2014).

For the purposes of this paper, institutions are systems of established and embedded social rules that structure social interactions between individuals and organizations (Hodgson, 2006). Though I explicitly identify and give a central role to formal rules and organizations that manage water in this context, my description and analysis of water politics in this paper does not strictly distinguish between formal and informal institutions. The role and presence of caste groups and associations, the media, political parties, and everyday enforcement of rules by various organizations viz. the municipal corporation, irrigation and forest departments as actors in the

water district are examples of how the formal and informal interact. The treatment of institutions in this paper is thus different from that in the new institutional economics, which emphasizes the role of quasi-autonomous individuals (Hodgson, 2006; 2012; 2014).

Within common pool resource theory, a socio-ecological system is defined as an ecological system intricately linked with and affected by one or more social systems. It can loosely be defined as an interdependent system of organism or biological units. In her initial outline of the socio-ecological system, Ostrom identified five design principles for the successful implementation of bottom up solutions for socio-ecological systems. The first was that a resource system has clearly defined boundaries. The importance of internal rules comes next, where it is critical that there should be rules that prevent users from appropriating too much of the resource. Third, rules work better when they are locally adapted as it helps prevent free riding. Next, strong monitoring and enforcement mechanisms also play an important role and so do dispute resolution mechanisms. If dispute resolution mechanisms are transparent and clear and well-established procedures are in place, any decentralized resolution of common pool resource problems can be successful. Finally, it is also important to focus on the interaction between different systems of rules. Often governments try to decentralize resource management but the overall legal frameworks in place means that central authorities still assume responsibility for determining most of the rules that govern the use of resources (Pennington 2011, p. 26-29). All these factors affect the incentive structure that faces actors in the context of specific common pool resources and these incentives constitute what Ostrom calls "action situations". In this paper, the term "commons" is used to describe water storage as well as water that is distributed through conveyance systems as public and club goods.

The case study I present in this paper uses the social ecological systems (SES) and action

situation methodologies, which are drawn from the CPR literature. The paper uses this framework to relate the water question in the action situations to conflicts around resources such as land within forests and tries to develop a more contextual understanding of the institutional arrangements around resources (Ostrom, 2009).

An action situation following Ostrom (2005) refers to a situation whenever two or more individuals are faced with a set of potential actions that jointly produce social outcomes. Within every action situation, an individual occupies a certain social position. The same participant can interact in another action situation where they occupy different positions. An action arena combines the action situation, which focuses on the rules and norms, with the participants who bring with them their individual preferences, skills and mental models. Action situation methodology has been employed by scholars investigating outcomes of collective action situations with respect to the decentralization of resource management, but also in general studies of the commons (Anderies and Janssen, 2013). Unlike other studies using the SES and action situation methodology, this paper draws on cartographic and archival data, and synthesizes ethnographic research with data collected from local newspapers, and dam reports.

The action situation (see **Error! Reference source not found.****Error! Reference source not found.**) described in this paper is located within what is called the Mumbai hydrometric area (see Note 2) in the T-V water district in Thane. Following Ostrom (2011), I utilize the Social - Ecological Systems framework to research a particular SES, namely the coastal plains and uplands in the region that are located between the Western Ghats and the Arabian Sea coast. The city of Mumbai has identified a hydrometric area in this region on which it claims a priority of ownership of water use since the early 1970s. The Regional Map (see Figure 4.3) is a cartographic representation of the location of various dams for the entire Mumbai metropolitan region. The

Mumbai hydrometric area has several reservoirs (large, medium and small) that impart a variety of local water rights to the various agricultural regions and smaller towns and villages adjacent to Greater Mumbai within and outside the metropolitan region (Government of Maharashtra, 2005; UNDP, 2009; SANDRP, 2012).

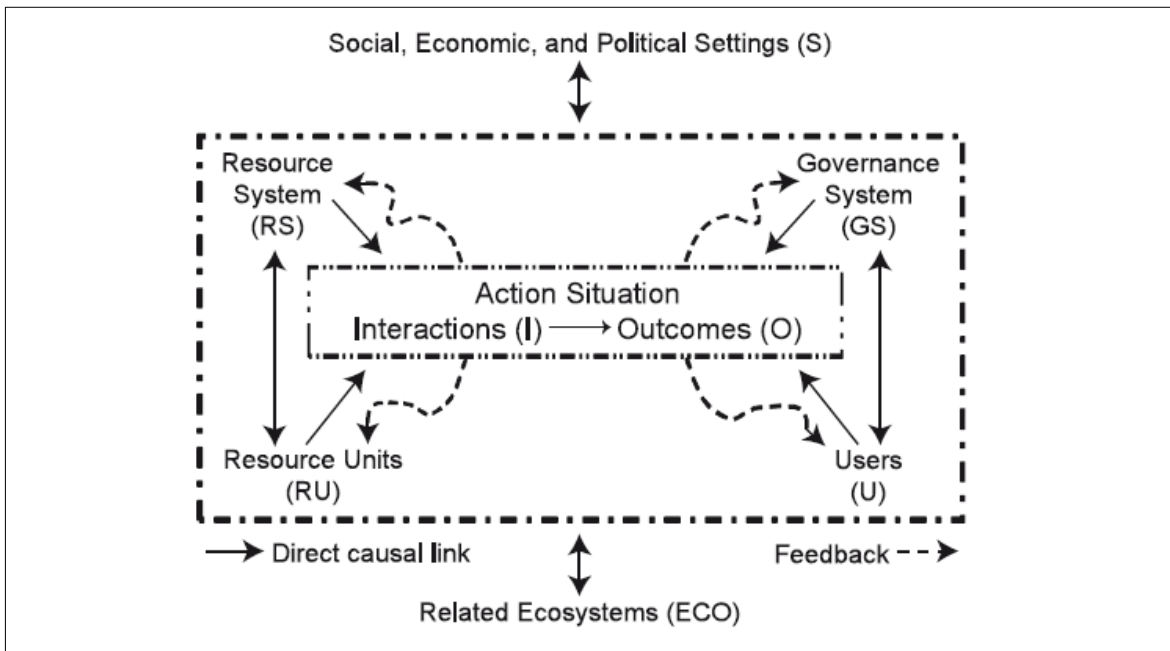


Figure 4.2: Action Situations embedded in socio-ecological systems. Source:

These local rights create grounds for contestation over the city’s claims that the water belongs to it exclusively. The action situations analyzed below describe the state’s attempts to resolve these disputes by the construction of a rural water supply system and the attempts of the communities to inject transparency into local water governance. Later, I examine how the attributes of a resource system (i.e., the coastal plains below the Western Ghats), resource units generated by that system and its ownership (i.e., the large dams), and a governance system affecting who is authorized to undertake what policies under what conditions jointly affect and are affected by outcomes of the action situation (See **Error! Reference source not found.** and

Table).

This paper combines the framework of a socio-ecological system with the legal institutionalist (L-I) approach in order to understand the role of law in access to resources (Rhodes, 2006; Deakin et al., 2015). The L-I approach helps to identify important legal principles and to analyze the influence of water laws and their evolution

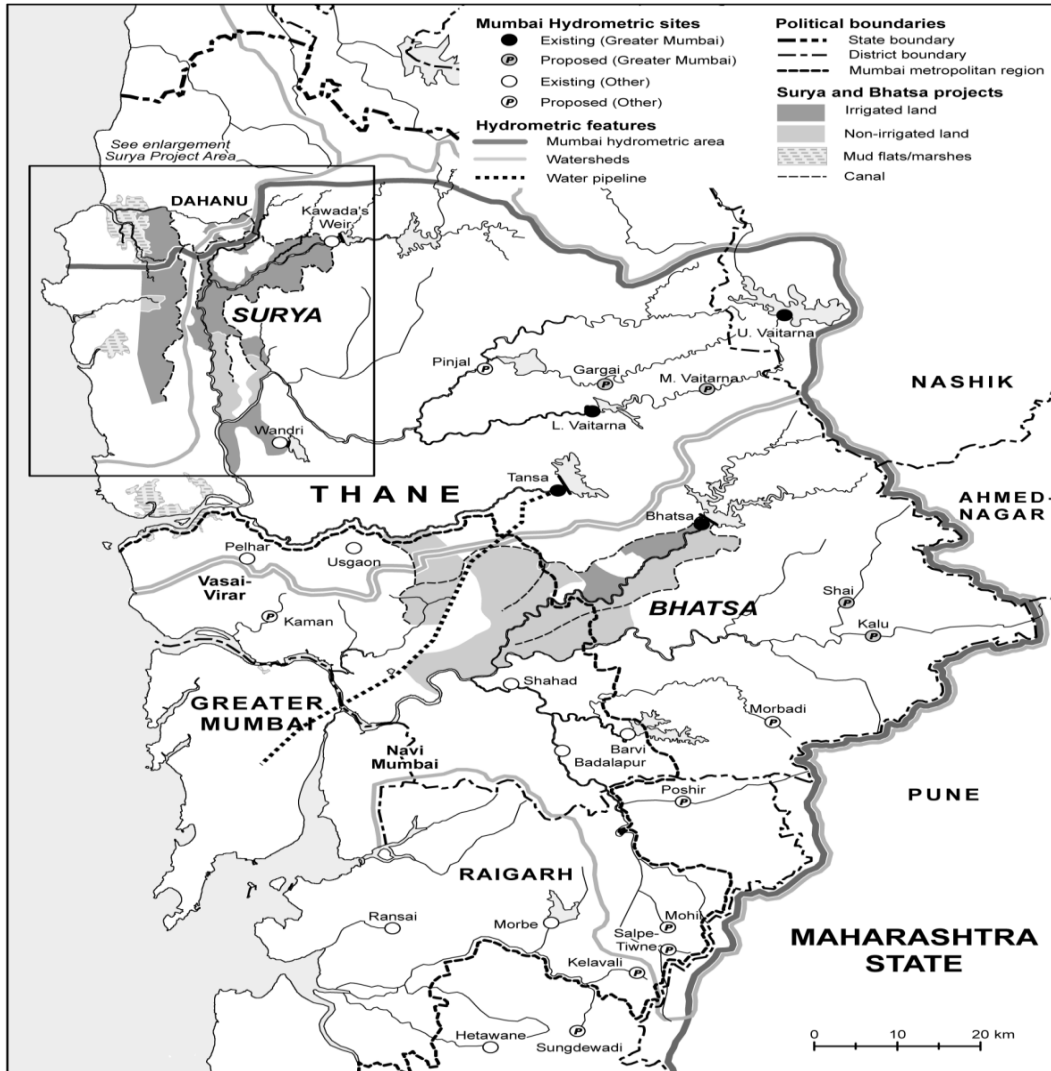


Figure 4.3 - Regional Map of Mumbai Hydrometric Area.

in particular local contexts. Thus, this paper departs from a spontaneous conception of law and property rights that downplay the role of the state, as in the transactions cost literature. A weakness of that literature is that it assumes relatively small numbers of agents and has an underdeveloped conception of the nature of law. The L-I approach on the other hand shares with other institutional approaches an emphasis on social rules. It basically argues that the “more important and powerful social rules are legal in character and they are backed by the power and authority of the state” (Deakin et al 2015: p 17).

The institutional complexity of the Indian context makes one ask; “how should we frame and analyze institutions in all their contextual variety, so that our approach is relevant for the purposes of institutional design?” (Aligicia, 2013, p.73) The analysis of contestation in contemporary India requires an examination of place specific laws and rights and how they emerged from constitutional provisions in relation to the socio-ecological context. For the purposes of this paper, the legal rules and procedures are the basic independent variable and the water governance and institutions in this region is the dependent variable.

To summarize, this paper applies common pool resource theory through the use of SES and action situation methodologies to analyze how state actors attempt to resolve disputes between urban and rural water supply in the Mumbai hydrometric area. This action situation also analyzes attempts of the communities to advocate for transparency in local water governance. A legal institutionalist (L-I) approach is applied to analyze influence of water laws and social rules in the institutional complexity of the Indian context.

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4.4 Placing the Action Situation in a Historical-Evolutionary Context

In a critical review of the CPR literature, Arun Agrawal has pointed out that researchers within the common pool resource literature have paid more attention to the characteristics and functioning of institutions than to the social and historical context in which those institutions actually function and evolve (Agrawal, 2002). A large body of empirical research in the common pool resource literature has also ignored the evolutionary trajectory of institutions and the knowledge systems that influence resource management systems. The CPR literature also fails to

analyze how institutions of resource governance interact with one another horizontally or across levels of social organization (McCay, 2002; Young, 2003). This gap is widely prevalent in CPR research because it is considered impossible to combine the use of historical data with a socio-ecological framework (for two exceptions to this trend, see Chakravarty-Kaul, 1996; Mwangi, 2007). In a context where institutions managing varied resources intersect and overlap, a discrete approach to one resource may not be particularly insightful. While privatization and extractive practices around resources could be one vital aspect of social and ecological transformation, other factors such as choice of technology, organization and legal frameworks are also important to develop a better understanding of institutional evolution in the context of resources.

My focus on the legal-evolutionary aspects of water resource management in the Mumbai context is thus informed by combining the substantive and methodological lessons from Ostrom's corpus of theoretical work on the commons, with Geoffrey Hodgson's recent collaborative research on legal institutionalism (Deakin et al., 2015). The broad lessons from this literature include embracing complexity and developing an understanding of how institutions have evolved in concrete and real situations through interdisciplinary empirical case studies (Frischmann, 2013, p. 393; Pennington, 2012). An understanding of rules that underlie water governance entails developing an in depth understanding of what legal principles have played an important role in the evolution of organizations that manage water systems for large metropolitan urban regions. From an institutionalist perspective, a closer scrutiny of debates on dam location in the Mumbai context yields important information on the institutional evolution of the regional water system. Urban water supply dams fall in a category of engineering projects where technological choices are considerably influenced by the institutional framework around land, water, and geography. While planning these reservoirs, engineers have to be mindful of both the costs and efficiency aspects of

these projects, but they also seek to provide a reliable water supply to large cities without creating conditions of legal

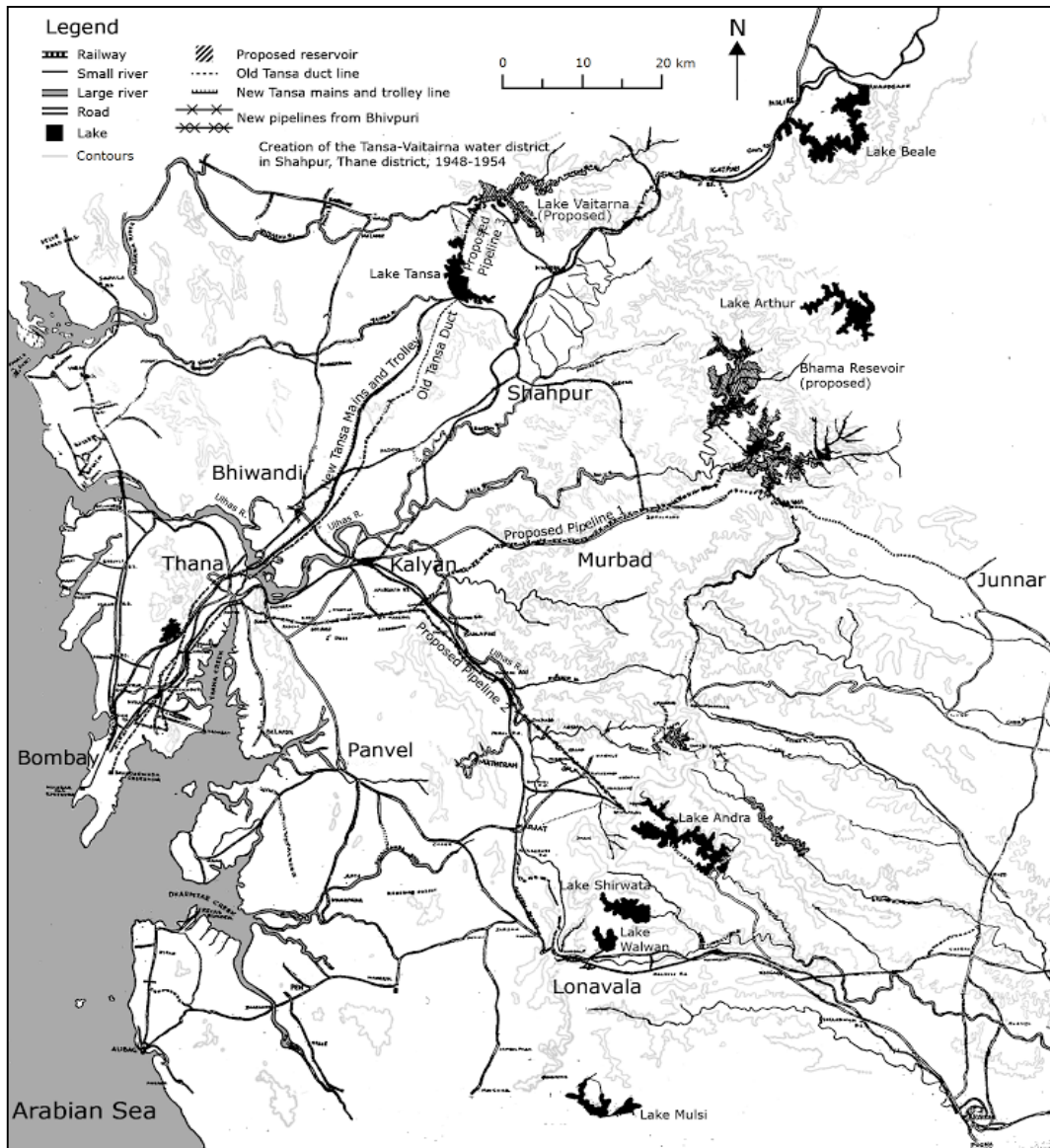


Figure 4.4: Creation of Tansa-Vaitarna water district in Shahpur, Thane District. **Note on Source:** This map was re-worked from a 1948 original by Modak. I thank the University of Chicago Crerar Library for making available the microfiche with the original map.

insecurity around water rights. Such debates on dam location were and continue to be covered in great detail in engineering journals and Government reports and often reflect competing visions of what can be accomplished by these dam projects.

4.5 The Action Situation - Hydropower versus Urban Water Supply: Creating Mumbai's Property Rights over Water in the Mid-Twentieth Century²

In the mid-1940s, Mumbai was faced with severe water shortages. Financial constraints to expand the city's water supply network during the war had made the situation precarious. The Mumbai Municipal Corporation turned to two of the best experts in India, Sir M Viswesarraya and the English hydrologist Claude Inglis, for advice. Claude Inglis, in a paper in the *Journal of the Institute of Indian Engineers*, advocated the use of the tail race water of the Tata hydroelectric power project in the Lonavala area (also in the Western Ghats) (see Figure 4.4) for meeting the future needs of the city. Though located in the Western Ghats, the Tata project was an independent private sector project and developed independently of the Bombay water supply system.

This understanding of institutions and legal-evolutionary aspects of water governance help to contextualize the action situation in the Mumbai hydrometric area and illuminate the legal principles significant to this case.

The Tata power project (Bhivpuri, Andra, Walwan, Shirwata reservoirs) (see Figure 4.4) was completed in 1919 to generate electricity for the city of Mumbai (Vora, 2009). Inglis advocated that Mumbai access the Lonavala reservoir system because he saw it as the most 'efficient' and cost effective solution to the city's needs. These reservoirs were built in the 1920s and the water from the dams (after generating hydropower) drained into the Arabian Sea through the Ulhas River. This water was seen as being wasted. Inglis pointed out that thousands of acres of valuable agricultural and forest land would be inundated in any potential project in Thane district and exercising the Lonavala option would therefore provide a good alternative.

4.6 Outcome of the Action Situation under the BMC Act of 1888

In a dissenting response, first in an interim report in 1947, and later in a final report in 1948, NV Modak, the special engineer of the Mumbai Municipal Corporation advocated the construction of a new dam in Thane district on the grounds of meeting future needs and the creation of an exclusive water district. Modak argued that the growth of the city due to industrialization and an influx of population after the partition of India coupled with the existence of a massive forested watershed in tribal Thane made the Tansa-Vaitarna area more attractive for building a new dam and could also become a future site of large scale dam building (Modak, 1948, p.47). He also argued that “an adequate infrastructure existed in Thane since the nineteenth century to haul the pipes and the various machinery to build a new reservoir.” This, according to him, would provide economy to any dam project and future dam projects undertaken in the next 100 years. The Tata project, in his view, had limited yield and the tail race water from the reservoirs was in fact accessed to some extent downstream by farming communities and smaller towns that lay along the Ulhas River, thus imparting towns and villages riparian rights (Modak, 1947). Along with the potential issues arising out of the riparian rights of rural communities, Modak also pointed out the legal complexity and uncertainty that a water sharing agreement with a private corporation that produced hydro power, would cause in a year with erratic rainfall. This would create potential pitfalls in securing Bombay’s future water needs from a legal perspective (Modak, 1948). In a 1948 report authored again by Modak, the two other interlocutors in this debate, Claude Inglis and the Indian engineer S Visvesvaraya gave their written assent to Modak’s proposals, one to build a new independent dam on the Vaitarna river and secondly, to link the new project with the Tansa dam (built in the 1890s) through an aqueduct (Modak, 1948) (See

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

). As the Bombay Municipal City Corporation decided to construct the next dam in Vaitarna, the region to the north in the Tansa-Vaitarna water district was reserved for meeting demand from Mumbai with all the attendant socio-ecological consequences for the local population (*Times of India*, 1954). The eventual choice to build a dam at Vaitarna highlights the importance of the local water rights situation in the 1940s. Indian water law in the late colonial period was informed (and still is largely influenced) by riparian principles (Singh, 1992; Cullet, 2011) and the Municipal Corporation used its knowledge of the local water rights situation in its eventual choice of dam location. Communities in the T-V water district enjoyed weaker water rights because they lived in what were mostly forested areas. A broad local scholarship has highlighted the historic contestation around land rights (in the tribal parts of Thane district) where T-V is located (Ambasta, 1998; Munshi, 1998). Since most communities in the T-V did not have clear rights towards land, Modak and the Municipal Corporation of Mumbai did not foresee any major legal challenge to the claims and authority of Mumbai to the water in this area. In the American urban context, the late Vincent Ostrom has pointed to similar strategies employed by the City of Los Angeles to secure and control its own water supply. Ostrom highlights that “the phase of the cycle involving the movement of water across the land represents the most strategic opportunity for human control and development” (Ostrom, 1953, p.232). He argues that while most governments are not conceived on this notion, the city of Los Angeles was deliberately organized to assure control over the San Fernando Valley, a basic hydrological unit of the Los Angeles river system. Ostrom argues that having the hydrological unit as the area of government has been the basis of annexation policies for the Metropolitan Water District (Ostrom, 1953).

Similarly, in the Mumbai context, while advocating for a second dam in the T-V water district, Modak foresaw how the construction of a new dam project in the T-V water district would potentially strengthen the city's rights in a forested watershed where there were no other claimants to the water (Beaumont, 1943). Given that there was agricultural activity in the T-V watershed, (as pointed out in Inglis' 1945 paper) the only way to secure the city's interests was to reserve the watershed and the land around it for the future. In 1964, the technical report of the Bhatsa multipurpose dam further confirms this perception of the importance of this watershed and the role of land rights in influencing dam location. The Bhatsa report too points to the “non-existence of riparian rights upstream of the river” and where the reservoirs were built (Government of Maharashtra 1964, p. 10). The construction of more dams in the same water district in the subsequent decades indicates a preference of the Mumbai Municipal Corporation to construct reservoirs in forest areas and is further evidence of the important role played by the engineering perception of the relationship of local land and water rights in this region. The absence of strong riparian rights for the local population in the T-V water district in the 1940s and the absence of water claims made it attractive for engineers to exploit the rivers in this area. The subsequent reservation of the watershed in the 1950`s weakened whatever future claim local communities could have had to water resources in the area. Reservation, by default, recognized Mumbai as having prior appropriation rights to the water of the area.

In the early 1970s, when metropolitan planning was introduced in Mumbai, the T-V water district was not included within metropolitan region boundaries. The two major institutional developments in this period were the creation of a local Water Resources Board in the late 1960`s and the drawing of a hydrometric area that would help with water planning in the region; the hydrometric boundaries of the Mumbai region were extended far beyond those of the metropolitan

region and included the T-V water district and the major watersheds to the north, east and south of the metropolitan region (see

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

.4). The Water Resources Board did not survive beyond a few years and was disbanded (Binnie`s Consulting Engineers, 1971; World Bank, 1996), but the hydrometric area continues to inform water planning and is a term often used to affirm the city`s claims over water (MMRDA, 1996). This period from the early 1970s until the late 1980s coincided with the planning of major new towns in the metropolitan region and an attempt was made to balance agricultural and industrial water demand by constructing large multipurpose dams in the T-V water district and in other parts of the hydrometric area. Some of these projects were designed to both irrigate agricultural land and supply water to Greater Mumbai and the metropolitan region, whereas some others existed to simply irrigate agricultural land (such as the Surya, that lies outside the T-V water district but within the Vaitarna basin, see

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

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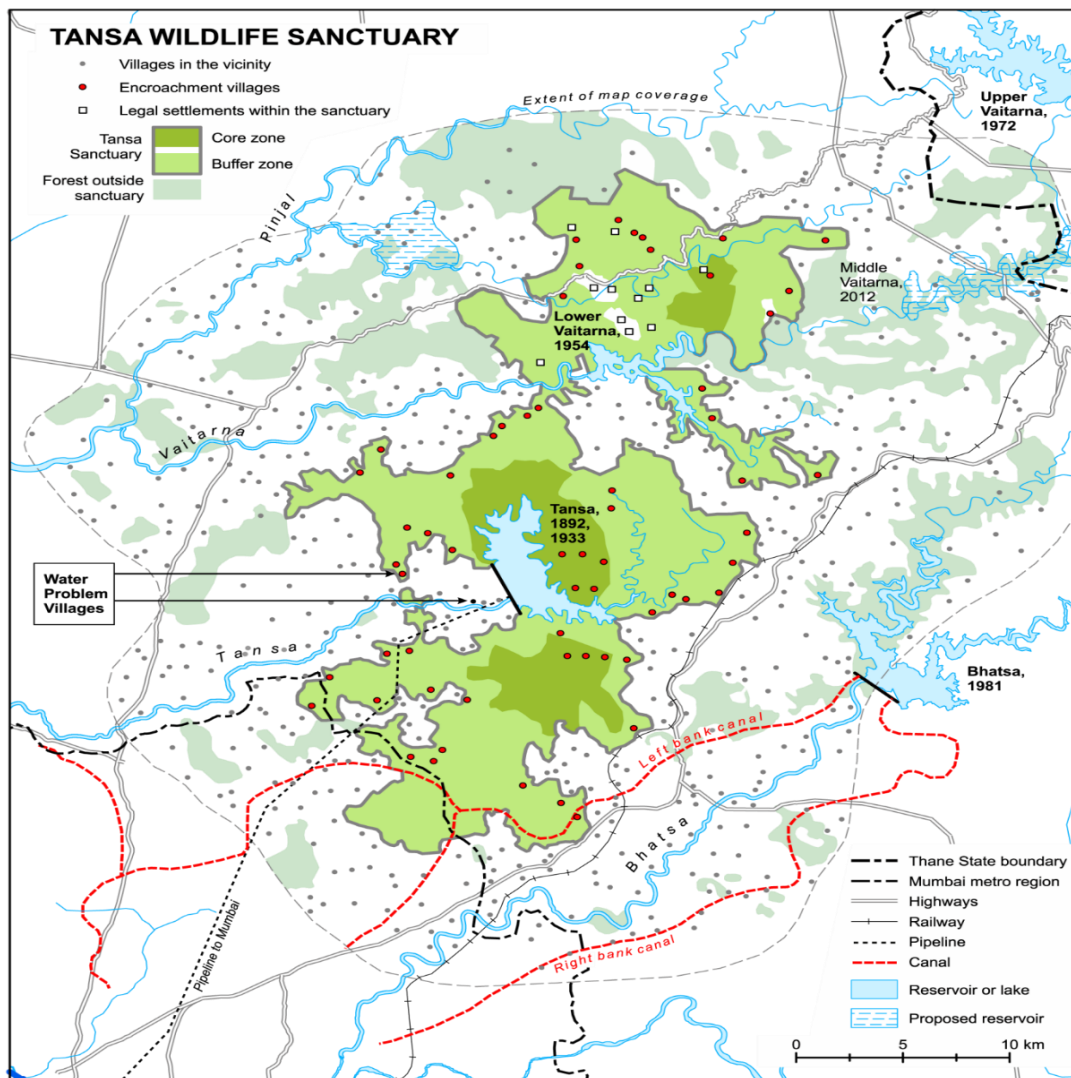


Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

How does this specific account of water policy and the politics of dam location help us understand the role of water institutions and rules in an action situation today? Case studies on water governance in India completely dispense with the historical evolution of rules in local contexts. Moreover, it is often claimed that Indian water law is made up of a number of formal and informal laws, norms and principles (Cullet, 2010). However, the influence of the common law tradition within Indian water law means that local water rights and rules in any context carry

their own importance. Any exercise of state power in a democracy has to depend on the prevailing legal system and local rules that evolve (or stay the same) over time.

The above account shows us that Greater Mumbai's claims to water in the T-V district were strengthened by the decision to reserve the watershed in the T-V water district (after the construction of the Vaitarna dam in the 1950s). The city's water rights were further entrenched in law by the creation of a wider hydrometric boundary which later became the basis for water planning and the assignment of quotas from the 1970s (MMRDA,1996; Binnie's Consulting Engineers 1971: 37). Both these decisions to create boundaries had direct implications for the rights of local communities to the water of the T-V watershed. The paper now examines how these institutional choices impacted policies and state and grassroots-led collective action attempts to resolve local water conflicts in the T-V water district.

4.7 Action Situation in the T-V Water District: Outcomes under the BMC Act 1888, the 1976 Maharashtra Irrigation Act, the 1972 Wildlife Act and the 2005 Maharashtra Water Resources Regulation Act

In the early 1970s, a wide forested and predominantly tribal watershed in the Tansa-Vaitarna water district was incorporated into and made part of the Tansa Wildlife Sanctuary. Figure 4.6 below illustrates the evolution of water governance in the Mumbai-Thane region from 1892 to today.

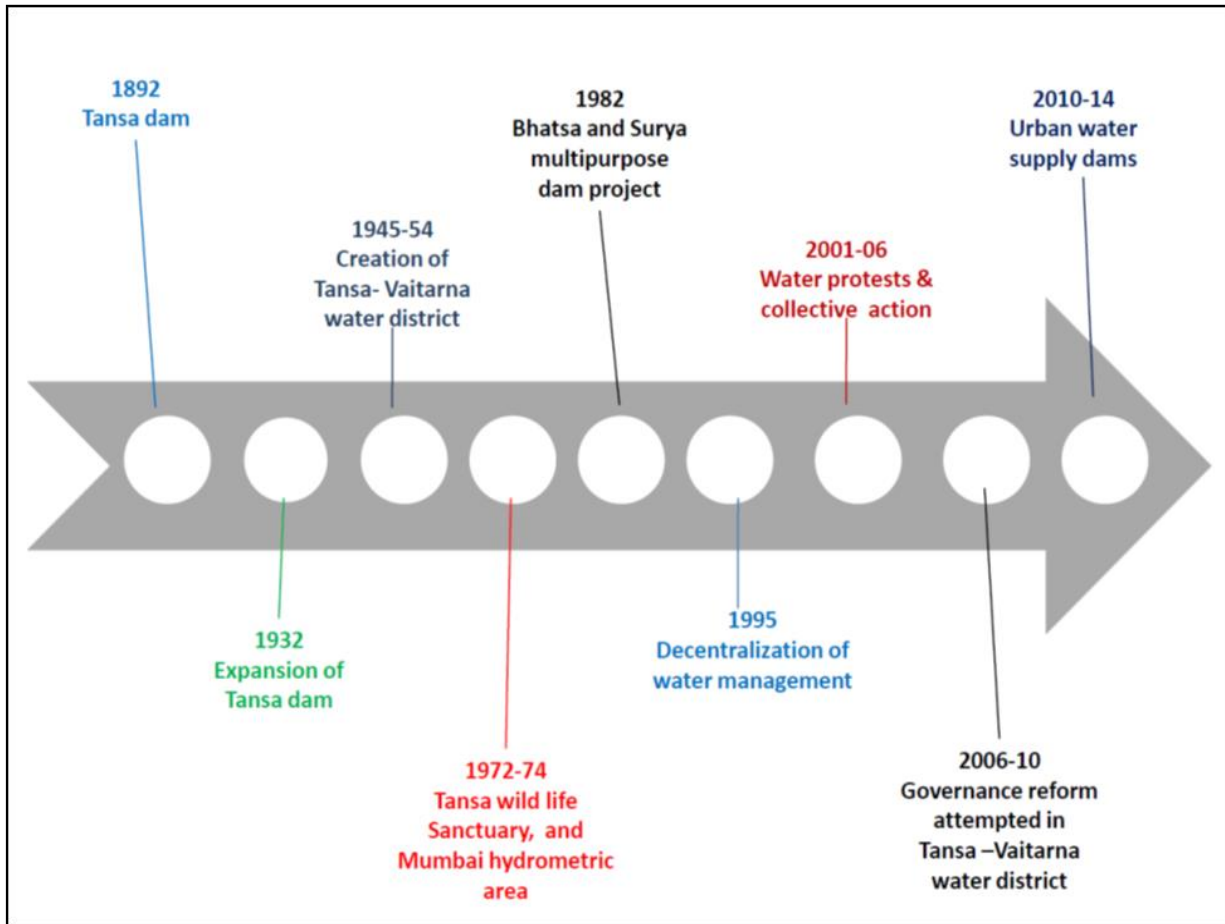


Figure 4.6: Chronological Timeline: Evolution of Water Governance in Mumbai-Thane region.

The map of the Tansa-Vaitarna Water District (

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

) displays more than four hundred habitations in the core and buffer zones of the Sanctuary (see

Table on the laws that govern resource management in the area). This development brought part of the Vaitarna watershed under the Wildlife Protection Act 1972 and its stringent provisions that governed access of agriculturists to water, land and forest resources. Since the nineteenth century, communities in the T-V district have had a long history of conflict with the state over access and ownership over the use of land plots in the forest area for agriculture (Tucker, 1978; Saldanha, 1992; Ambasta, 1998; Munshi, 1998; Bokil and Dalvi 2000; Louw and Mondal, 2012). Over the last 25 years, frequent conflict between the forest department and local inhabitants has further intensified due to the attempted evictions by the local Forest Department of the local tribal population which is engaged in agriculture on their forest land plots within the sanctuary. This conflict has been intensified by the growing curtailment of various rights of the rural population over the last three decades (Draft Forest Plan, 1996; Pathak, 2005) that has also witnessed the state declaring more than forty human settlements in the T-V water district as being “illegal”(see

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india->

wris.nrsc.gov.in. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

.5). The population living in settlements in this area has been periodically displaced in the last 140 years to create a category of "protected forests" that serve to protect the watershed (Tulloch, 1872; *Times of India*, 1954; Ambasta, 1998). At least four thousand tribal cultivators, therefore, continue to live in the forests of Tansa (see "encroachment villages" in Fig 4.5), precariously clinging onto patches of land while battling against state forest department's regulations that threaten their livelihoods. In order to understand this relationship of land and forest tenure with water, it is important to understand the institutional diversity of property rights around land and forests and the implications it has for collective action.

Forest regulations establish three categories of agricultural land. While a third of land holdings are recognized by the state, at least two thirds of the land plots fall under land tenure systems that are renewed every year. Some agriculture is also located within forest areas where cultivation is carried out in contravention of the state regulations around forest land. A majority of farmers in this region are small and marginal cultivators and are dependent on their land holdings and access to the forests for their livelihoods. In terms of pursuing an everyday existence and basic livelihoods, the population living in the Tansa-Vaitarna water district thus face a very difficult situation.

Table 4.1: Resource and Governance Systems. **Sources:** Pathak (2005); District Census Handbook (2001); Louw & Mondal (2013); Gazetteer of Thane District (1981).

Resource System	Attributes of the Resource System
Type of resource system	Coastal alluvial plains and forest ecology
Location	Konkan; North of Mumbai city
Productivity	Varied, but high in the coastal alluvial plains in Thane district
Clarity of watershed boundaries	Clearly demarcated in the 1980s

Constructed infrastructure	
Not Well developed until the 1940s	
Diversion dams	Weirs mostly set up on rivers to convey water to cities from larger storages
Headworks	These are mostly located in forest areas
Channels and Canals	These have been constructed in very difficult terrain
Road and Rail network	Markets well developed because of an infrastructure
Resource Units	
Spatial distribution of rainfall	Concentrated in the monsoon (June-September)
Temporal distribution of rainfall	Heavy in the mountains and hills near storages
Economic value of land	High
Economic value of water	High
Actors	
Tribal farmers	Poor-below the official Indian poverty line
Non-Tribal farmers	Middle Farmers, owning more than 2 hectares
Landless	20% of farming population
Economic Status	
Tribal Farmers	Poor access to modern crops or industrial jobs, and they don't migrate to the city
Non-Tribal Farmers	Less poor; 50% are marginal cultivators with access to urban and industrial jobs
Central Government and State Government	
Members of Legislative Assembly	Can request water for their constituency, deny water for certain kinds of demand
National Water Development Agency	Planning large water projects
State officials	Mostly involved in water planning
Local Officials	Not involved
City Officials	City Corporation officers and engineers
Shared knowledge of resource system	
Shared norms among actors	Very low due to caste status of rural communities

A preliminary examination might fault the absence of clear land rights as a problem in resource management in this area (see **Error! Reference source not found.**). However, such a perspective would be overlooking the problem of geographical scale in resource governance in the water district. The changing agro-political-ecology of the T-V water district has had a more significant influence on the resource rights of the local communities. For reasons that are

elaborated below, it can also be discerned that the institutional design and biophysical boundaries of both the forests and watersheds in the Sanctuary and the T-V water district show considerable overlap. This spatial fit and the legal architecture that has been created in the 1970s to draw a boundary around the forests in the watershed also completely leaves out the local communities (who are one of the main stakeholders) from the decision making and planning process around water and land. The Mumbai Municipal Corporation's stated policy for discouraging human habitations is not to allow pollutants from rural settlements to enter the water within the reservoirs. This has led to very tight regulation of human habitation and land use in the forested belts between the Upper Vaitarna and Modak Sagar Dams (Mulekar, 1985, Gokhale, 1995). However, the exclusion of local communities from the governance of the T-V water district by the various agencies also leaves out any potential co-operation between local communities and the state agencies.

Two local researchers have highlighted the following about the predicament of the local communities when it comes to livelihoods in the T-V water district:

Faced with the choice of either surrendering completely to the dictates of a market economy they are ill equipped to deal with or seeking to eke out a miserable living on small patches of land, most tribals have chosen the latter option i.e. occupation of the conservation area in the T-V. The close symbolic attachment that tribals have to traditional forest land underpins this choice and determines, clearly, a rational choice that underpins their livelihood strategies. Not surprisingly, this reinforces a destructive circle, bringing tribals and conservation authorities into increasing conflict over the two critical resources discussed earlier, namely, access to land and water (Louw & Mondal, 2013, p. 54).

The current institutional-geographical profile of the T-V water district has thus been influenced by past enclosures around land and forest resources. These struggles around forests and land have also helped shape place based collective identities in the action situation around water. Figure 4.5 vividly illustrates the spatial geography of land, forests and water resources which the

rural communities have to deal with in the T-V water district. It also shows the spatiality of the commons problem and the spatial domains of resource users and the commons. These agro-ecological features and the resource governance system in the area are further delineated in Table 4.1. The poor economic status of farmers in the water district and high value of water (due to urban water demand) in what is a forested area makes water provision for local communities who are socio-economically poor a challenge.

The denial of basic amenities such as water to the local population in the T-V water district as part of a conscious policy by the Mumbai Municipal Corporation (which owns most of the infrastructure in the area) led to the local self-government to plan and construct a rural water supply system in the T-V water district.

4.8 Rural Water Supply Project: Decentralization in Action

In the T-V water district, the provision of rural water services takes two forms. Rural water supply is a subject of local self-government in the state of Maharashtra. However, communities in rural Maharashtra are also reliant on their own village based wells. The presence of a large Municipal Corporation's reservoirs and water main infrastructure in the water district meant that the water problem could only be alleviated if the Municipal Corporation shared water from its reservoirs in the T-V Water district with villages. Traditionally, in the Indian context and in the state of Maharashtra, water storage and supply are within the domain of state owned enterprises and the state Irrigation Department. Partly, this is a historical inheritance from the colonial period, more importantly "the characteristics of water with a high degree of natural monopoly, high capital intensity, the presence of sunk costs, the multipurpose and hydrologically interconnected nature of water itself ensures that the state continues to monopolize the provision of water in rural areas in India" (Sangameshwaran, 2010, p. 54). However, two dominant trends in the area of water

distribution took over in rural areas of Western India from the mid-1990s onwards. One was sectoral decentralization which was particularly influential and the second was privatization. Noting wide disparities in water access between cities and rural areas, a White Paper on the Drinking Water Problem (Government of Maharashtra, 1995) had acknowledged and emphasized the needs of water in source areas that were located next to dams on a priority basis. In the T-V water district, overhead water tanks were constructed as part of a project to alleviate the problem for eighteen villages with a total population of 15,000 people by decentralizing water provision. The Maharashtra State Rural Water Supply and Sanitation Corporation (MSRWSSC) now called the Maharashtra Jeevan Pradhikaran set up a Water Supply Division in the T-V water district to provide water to eighteen villages. The construction of water tanks to provide water to the villages in this region started in 1992. Upon completion in 1995, the scheme was to be handed over to the village councils for operation and maintenance. Water for this scheme came from the Mumbai Municipal Corporation reservoirs in the T-V water district. This water supply project in the T-V water district claimed to have involved participation of rural communities, but in fact this was a scheme mostly implemented by a parastatal corporation that supplied water to peri-urban areas in Mumbai (IRHDP,1997).

The completion of the project and the transfer of water supply systems to local self-government, which did not have the technical capacity to maintain the project, caused recurrent failure in water provision within various villages (IRHDP, 1997). Water provision in rural areas in India is considered the domain of local self-government and village councils (also called Panchayats). However, local village councils that were put in charge of the project complained of shoddy work and poor maintenance, but the main complaint of the local villages was unavailability of water from the Municipal reservoirs and the exorbitant water tariffs. What made the water

problem difficult to solve for the inhabitants was the scattered nature of the human habitations with the main villages cut off from several tribal settlements by forests and rivers (see map in

Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at <http://www.india-wris.nrsc.gov.in>. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.

). Given the forest department's control over land in the area, maintenance work on the water pipes that conveyed water to the tanks through forest land was often not allowed. The location of some of the eighteen villages within the buffer zone of the wildlife sanctuary also added to the challenge. Land use in the buffer zones of wildlife sanctuaries is always marked by a priority to the ecology of the area over human habitations. In the case of the T- V water district, the fact that the water district is located in the middle of a conservation area (where the interests of the local inhabitants on the one hand and the Forest Department and Municipality on the other have been in conflict) led to frequent impasse over the maintenance of the pipeline infrastructure. However, no such obstacles are encountered by the Municipal Corporation in maintaining its own water mains infrastructure for the city of Mumbai as it enjoys more rights of access in the T-V area. Section 263 of the Mumbai Municipal Act that applies to the T-V water district empowers the Municipality to access "any water work within or without the city, adjacent to or in the vicinity of such water-work, in whomsoever such land may vest" (BMC Act, 1888, p. 352). The hierarchy of local rules on land that privilege the BMC over the local self-government institutions in the maintenance of their respective water infrastructures was also perceived as a major cause of failure of the rural water supply project. Moreover, most of the village councils in this area did not have

the revenue to purchase water from the Mumbai Municipality, as they are located in a conservation area where land use is severely regulated by the local Forest department and economic activity is severely curtailed. As a result, their revenue base could not meet the expenditure required to maintain an independent rural water supply scheme in the T-V water district (*People's Daily*, 2007).

The policy to decentralize water through the rural water supply project for eighteen villages thus did not take into account the complex ecology of the area and the evolution of the socio-economic context through the 1980s and 1990s. In this period, the structure of local rules around water and land had further entrenched the interests of the city. The construction of a new dam and the reduced forest in the T-V water district in the 2000s (Singh and Mishra, 2012) as a result of dam building only further widened the lack of trust between various state departments that manage water, forests land and the local communities. The centralized policy making around water planning in the T-V water district where most of the decisions around dam building and water allocation were taken by bureaucracies in New Delhi and Mumbai further worsened the prospect of a good outcome. The role of geography, types of water storage, and water rights in creating a complex water governance system is highlighted in **Error! Reference source not found.** and Table 4.3 below. The over concentration of urban water supply dams in a forested watershed has

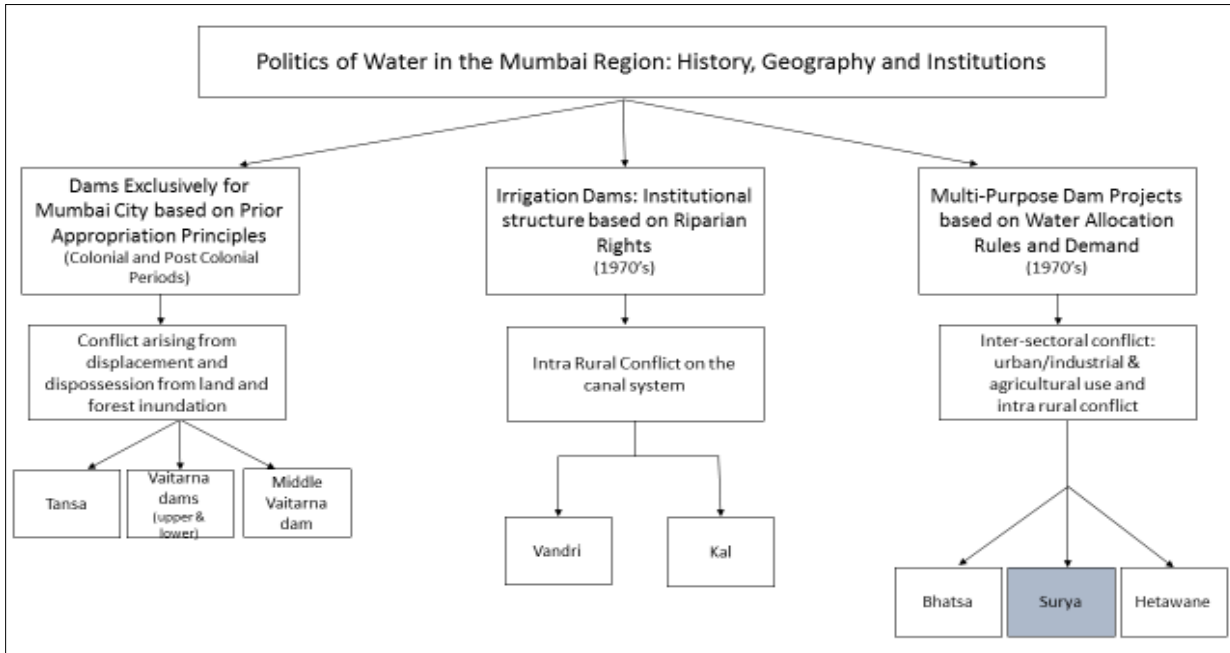


Figure 4.7: The Varieties of Water Conflict – Politics of Water in the Mumbai Region.

only helped worsen the uneven geography of water entitlement between the city of Greater Mumbai and the T-V water district (see **Error! Reference source not found.**). Since the water district is outside the boundaries of the metropolitan region, per capita water consumption can be even lower than what is in the table.

Table 4.2: Water consumption disparities between villages and towns in the Mumbai metro region (Government of Maharashtra, 2005).

Per Capita Domestic Water Use Per day in Liters (Mumbai region)	
Area	Water Usage in Liters
Greater Mumbai	240
Navi Mumbai	150
Other Areas	150
Villages to be incorporated in municipalities	70
Other Villages in Rural Areas	70

4.9 Nested Nature of Rules: An Obstacle or an Opportunity in Collective Action?

Problems with lack of access to domestic water such as the ones facing the T-V water district are not unique to this context. Where multiple and often competing policy and legal frameworks around water exist, the problem of rural water supply and provision is difficult to

solve. These issues are exacerbated by chronic corruption fostered by the lack of participation of local communities in water supply projects and drinking water laws that do not recognize the right of rural communities to a minimum per capita quantum of water. Given that the basic water entitlements of the local communities were not addressed by state agencies in the T-V water district through the water supply project, the only alternative to the population in the T-V water district and their representatives was to mobilize rural communities and seeking the intervention of higher levels of government.

The early 2000s witnessed the emergence of a local movement that managed to bring the local tribal and non-tribal communities on a common platform and widened the list of demands from domestic use to water for irrigation use. It also questioned the wisdom of the government constructing multiple urban water supply projects in an area where people displaced by past projects were yet to be rehabilitated within the same forested belt. Given that the local context was characterized by divisions of caste amongst the poor inhabitants of this water district, this rare moment of rural collective action was a significant development. Mobilizations, work stoppages on maintaining the Municipal Corporation's infrastructure (local communities are employed in maintaining the city corporation's infrastructure) and information campaigns on the water issue followed (Centre for Science and Environment, 2013). In the summer of 2006, communities living in 104 villages next to the reservoirs threatened to break the valves of the water mains supplying water to Mumbai. The immediate cause for such direct action was an acute water problem and a localized crisis with non-availability of water for irrigation. The State Government's persistence in going ahead with a new project led to a major change in the strategies of local actors in their advocacy on water issues in the T-V water district (CSE, 2012 see '*Mumbai's Water Fuels Rural Ire*').

In 2007, another local political party in the T-V water district revealed that the Mumbai Municipal Corporation which accessed the T-V water district owed millions of rupees in water revenue to local village councils and district level governments (*People's Democracy, 2006*). This symbolized a major change of strategy from action at the local level to a higher level of governance. The tax revenue according to the party was to be paid as part of an inter-governmental transfer of revenue from the Municipal Corporation to the local village governments as the Corporation had sourced water for decades from a rural area. This change in strategy by local political actors was an acknowledgement of the nestedness of the water rules that governed the management of reservoirs in the water district. This change in strategy also revealed a major dilemma for the local movements with the governance arrangements in the water district. The ownership and management of various reservoirs in the T-V water district was found to be divided between the Mumbai Municipal Corporation and the State Irrigation Department. Three of the five major reservoirs in the T-V water district are owned by the Mumbai Municipality and two are owned by the Irrigation Department. Dams south east of the T-V water district are owned by parastatal agencies like the Maharashtra Industrial Development Corporation, smaller municipal councils while some others are owned by the Mumbai Municipal Corporation (see Table 4.3 for ownership and water rights to reservoirs in the T-V water district and the hydrometric area)

Given that there is no formal authority (other than a committee headed by the Chief Minister of the state of Maharashtra) to manage the apportionment of water between various users and adjudicate water disputes, the higher status accorded to Mumbai's water demand in the T-V water district is identified in this paper as one of the major factors that led to frequent conflicts between the state Irrigation Department and the Municipal Corporation. These problems often reach their peak in the summer when the State Irrigation Minister has the sole authority to manage

water conflicts between various large users in the T-V water district. Given Mumbai's senior water appropriation rights, the beneficial aspects of urban drinking water use, and the political clout of the city, water quotas are always allocated to Greater Mumbai, even if such a decision clashed with the water needs of other Municipal Corporations in the region (*Indian Express*,2010; *Asian Age*,2012).

The unwillingness of the state government to reform the local institutional architecture around water in the T-V water district echoes a similar problem with water governance throughout the state of Maharashtra where the absence of water councils at the district level is noticed in the above analysis. Decisions around water allocation in the context of disputes are made by the state Irrigation Minister on an interpretation of state policy and local water laws. This has led to a situation where there are conflicts between governmental authorities at various levels in the metropolitan region (Pethe, 2011) and growing discontent within rural communities that are faced with very poor per capita access. Thus, in some respects, the action situation in the T-V water district is also characterized by `institutional opacity`. The lack of co-ordination between the territory planned and governed by the metropolitan/ municipal authorities and the so called hydrometric area has further contributed to a fragmentation of metropolitan water governance. The resulting fragmentation in water governance is further exacerbated by the ownership of reservoirs by different state and para-statal entities which in turn is sought to be co-ordinated centrally by the state ministry in Mumbai when a local district council in the Mumbai-Thane region could better adjudicate water disputes between different actors (see table 4.3 for data on institutional ownership of dams).

Identity politics in the water district with antagonistic relations between caste Hindus (locally called the Kunbi Marathas) and the tribal community also had their own negative impact

on the outcome of the action situation. Culturally, tribals are placed outside the fourfold hierarchy of the Hindu caste system and past struggles around land have often pitted caste Hindus against the tribal community in the water district. Moreover, every village and the local self-government is structured in a manner where caste Hindus inhabit the main villages and tribal communities that are part of the same village are dispersed in settlements in the forest surrounding the villages. This geography of human settlements had its own impact on collective action. Political leadership in the villages is usually drawn from the tribal community, but caste Hindus tend to be dominant which tends to influence rural collective action (Varshney, 1995). In the water district, however, both Kunbis and tribals are equally impacted by the monopoly of the Municipal Corporation over the water in the T-V water district. However, the tribal community is poorer and faces high seasonal distress migration rates.

4.10 Prior Appropriation and Local Water Institutions: Implications for Water Governance and Mumbai's Senior Water Rights

The eventual outcome of the action situation was influenced by the social and economic constraints faced by participants that result from the structure of water governance in the T-V water district. The rural water supply project was also located in a forest area where at least a third of the farmers in the T-V water district did not have legal titles to their land plots, were mostly poor and also as a result faced high seasonal migration rates as a result of a lack of viable livelihood options within agriculture (see tables 4.1 and 4.3 on the governance system around land and water). Access to information on the management of water and the vertical hierarchy between various organizations (the Mumbai Municipal Corporation, the State Irrigation Department and the Forest department) are also a major constraint to successful state led or bottom-up collective action. The civic officials in the Municipal Corporation are not equipped to be sensitive or deal with the problem of rural

water supply in the T-V water district. Most importantly, the action situation highlights how the local institutional arrangements enable the regulator (in this case, the state Government of Maharashtra) to favour one user of water over another. This interpretation and use by the state government of local water law to privilege Mumbai over other water users in the region is a significant finding from the above analysis.

Table 4.3: Large and Medium Dam Project Ownership and Water Rights.

Dam Name and year of completion.	District	Institutional Ownership of reservoirs	Urban Water Supply (to Mumbai and other cities in metro region)	Irrigation	Industrial Water Supply	Hydro Power	Legal framework that influences rights to stored water	Designed Live Storage in Mm3
Dhamani (Surya project) 1987	Thane	Irrigation Department of Maharashtra	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		R	276.52
Kawadas (Surya project) 1979	Thane	Irrigation Department of Maharashtra	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		R	9.96
Bhatsa 1983	Thane	Irrigation Department of Maharashtra	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		R, PA	942.10
U.Vaitarna 1972	Nashik	Irrigation Department of Maharashtra	<input checked="" type="checkbox"/>				PA	331.31
Wandri 1987	Thane	Irrigation Department of Maharashtra		<input checked="" type="checkbox"/>			R	35.94
Mulshi 1927	Pune	Tata (Pvt. Corporation)				<input checked="" type="checkbox"/>	R	522.76
Andhra 1916	Pune	Tata(Pvt. Corporation)				<input checked="" type="checkbox"/>	R	339.14
Walvan 1916	Pune	Tata (Pvt. Corporation)				<input checked="" type="checkbox"/>	R	66.12
Shirawata 1916	Pune	Tata (Pvt. Corporation)				<input checked="" type="checkbox"/>	R	191.28
Lonavala 1916	Pune	Tata(Pvt. Corporation)				<input checked="" type="checkbox"/>	R	11.72
Modaksagar 1954	Thane	Mumbai Municipal Corporation	<input checked="" type="checkbox"/>				PA	128.93
Tansa 1892	Thane	Mumbai Municipal Corporation	<input checked="" type="checkbox"/>				PA	145.08
Vihar 1860	Mumbai	Mumbai Municipal Corporation	<input checked="" type="checkbox"/>				PA	27.07

Tulshi 1860	Mumbai	Mumbai Municipal Corporation	<input checked="" type="checkbox"/>				PA	8.05
Middle Vaitarna 2012	Thane	Mumbai Municipal Corporation	<input checked="" type="checkbox"/>				PA	194.72
Barvi 1978	Thane	Maharashtra Industrial Development Corporation	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		PA	180.03

Sources: Irrigation Department, Thane Irrigation Circle: [http://www.seticthane.org/storage-position_Data on dam completion dates from National Register of Large Dams, 2014:](http://www.seticthane.org/storage-position_Data_on_dam_completion_dates_from_National_Register_of_Large_Dams_2014_.pdf)
<http://www.indiaenvironmentportal.org.in/files/file/NRLD%202014.pdf>

Note: Data on ownership accessed from Chitale Committee Report (1994); Maharashtra Irrigation Commission Report (1999); and Thane Irrigation Circle website. PA stands for prior appropriation, and R for riparian rights. This classification is based on analyzing water diversion data from various reports, and responses of State Government to legal affidavits challenging such diversions. Dams in T-V water district are reserved for Mumbai, which has senior rights to water. In the case of Bhatsa Dam prior appropriation and riparian rights overlap. The primary objective of Bhatsa Project is to meet demands of Greater Mumbai and other MMR towns, but water is allocated by Ministry of Irrigation based on local water rights, needs and scarcity. While this dam was built in a watershed reserved for Mumbai, farmers in Shahpur and Bhiwandi have rights to water from the reservoirs, and other cities in the metro region downstream of Bhatsa but upstream of Greater Mumbai also have developed rights to Bhatsa water. Tata stands for Tata Power Corporation.

Another example of appropriation in the T-V water district is the case of water diversion from the Bhatsa multipurpose dam project (*Mumbai Mirror*, 2010). When the World Bank funded this project in the 1970s, no known allocation rules from rural to urban use were tied into the dam's project design, though the Bank had advised state officials to manage water resources in a comprehensive multi sectoral way (World Bank, 1996:p.29; Binnie`s Consultancy 1971: pp.35-38). The city of Greater Mumbai has benefitted from a diversion of water from the Bhatsa project since the mid-1990s (Chitale, 1994). This is unlike the Hyderabad context, where the World Bank (perhaps due to its knowledge of the local rights of farmers in the Andhra Pradesh context) ensured that it funded a dam project that had allocation rules written into its objectives. This ensured that the state government could follow these rules when it regulated the re-allocation of water from rural to urban use (Celio, 2009). Not much is known whether such rules exist in the context of Mumbai.

How do Ostrom's design rules help us understand the working of institutions in this particular context? While the T-V water district has clearly defined watershed boundaries and Mumbai's water resource boundaries are defined by the hydrometric area that coincide with these boundaries, the internal rules of allocation do not prevent the main user, in this case, the Municipal Corporation of Greater Mumbai, from over- extracting water from the T-V water district. The following excerpt from a water bylaw of the Brihanmumbai Municipal Act (1888) provides some insight into the power of the Corporation in the water district,

The Municipal Commissioner of Mumbai may supply water from a municipal water-work to any local Authority or person without [Greater Mumbai] on such terms as to payment and as to the period and conditions of supply as shall be, either generally or specially approved by the corporation (BMC Act, 1988, Provision 288, p.188).

The excerpt above tells us that the Municipality of Greater Mumbai has the sole authority to decide if other towns in the metropolitan region and villages in the T-V district can share water from the dams owned and accessed by the Mumbai Municipal Corporation. Given the mandate provided to the state government by the Irrigation Act of 1976 as a regulator, the decisions on disputes over water allocation and the construction of more dams in the T-V water district by the Central and State government has only affirmed these senior rights of Greater Mumbai. This means that not only do the local rules of allocation in place favour the Municipal Corporation's rights to draw more water from the water district and build more reservoirs, but the higher level rules that are meant to balance that right of the Municipal Corporation with those of the rural communities have not been utilized optimally by the state government.

The status of the T-V water district being located in a designated tribal area actually empowers its elected representatives to advocate for the interests of the villages and their basic water needs under constitutional provisions that protect tribal areas. However, the interpretation

of the local water rights structure and the priority accorded to Mumbai's water demand coupled with the political clout of the city ensures that this mandate is never exercised. The situation is worsened by the absence of an impartial monitoring and enforcement mechanism at the regional or the state level. The Maharashtra Water Resources Regulatory Authority, a regulatory body, that was set up in 2002 to adjudicate disputes and allocate water entitlements, has a provision that subordinates its power to make decisions to state water policy, thus making the act ineffective in dealing with water disputes in a fair and transparent manner (Wagle et al., 2012).

A legal-institutional analysis of local water governance in the T-V water district reveals that the water laws of the Mumbai Municipal Corporation and the State government of Maharashtra rely on a combination of prior appropriation and riparian principles (Beaumont, 1943; BMC Manual, 1976); also see

Table). The implication is that since the Mumbai Municipality was the first to harness water resources in the T-V water district and reserve the watershed for its purposes, Indian water laws confer upon it a status for senior rights over local users and even other cities that share

water from T-V reservoirs. However, the riparian influences in state and central water laws only confer usufruct rights to local water users in the T-V water district thus rendering their claims weaker in comparison to those of the city of Mumbai and other towns in the Mumbai metropolitan region (see

Table). Table 4.4 summarizes the attributes of the governance system at play in the T-V water district. The reservation of the T-V water district in the 1950s for Greater Mumbai had a direct impact on both the water and land rights of the local communities. While the implementation of the Bhatsa Multipurpose irrigation project sought to balance the water needs of the city and irrigation demand in this water district, the governance arrangements around the intersectoral sharing of water ended up turning out to be inadequate. The conferral of senior water rights to Mumbai from the Bhatsa project only reinforced this disparity since national water laws such as the Indian Easements Act only grant customary rights to local communities and no contestation of prior appropriation through the existing legal framework is possible

In 1992, the Indian legal scholar, Chatrapati Singh critiqued the influence of prior appropriation principles in national water laws (like the Indian Easement Act) and local water laws. Singh pointed out that prior appropriation fails to recognize the rights or needs of new users for distribution and does not meet the demands of natural justice. The influence of prior appropriation principles that inform the senior water rights of the city of Mumbai in the T-V water district is primarily a vestige of the colonial period in India. It merely records and recognizes “political fact of acquisition or appropriation”. Furthermore, “it also provides no legal grounds for why the new settlers or users cannot appropriate water for their own beneficial use”. Moreover, “instead of providing a legal arena for conflict resolution, prior appropriation leaves the entire matter to political or coercive methods” (Singh, 1992, p. 69-70). Many countries that share the common law framework with India have reformed their water laws to reduce the influence of riparianism and prior appropriation, South Africa being a case in point.

Table 4.4: Governance System and Outcome of Action Situations under Central, State and local water laws in northern and coastal Thane District. **Sources:** Following Bombay Municipal Corporation Act (1988), People’s Democracy (2006) and Pathak (2005).

Governance System	Attributes
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National Legislation	<ul style="list-style-type: none"> Indian Easements Act, Statute of Limitations
State Legislation	<ul style="list-style-type: none"> Bombay Irrigation Act 1976
City Legislation	<ul style="list-style-type: none"> Bombay Municipal Corporation Act 1988
Rules regarding Landholding and Forests	<ul style="list-style-type: none"> Land Ceilings in place Tenancy rights under Bombay Tenancy Act 1953 Wildlife Protection Act governs Forest land Eksali laws (one year leases to cultivate land in forest area)
Average size of landholding	<ul style="list-style-type: none"> 0.2-0.5 hectares Contestation around land in forest areas
Formal rights to land	<ul style="list-style-type: none"> Not always assigned formally. Land in forest areas under control of farmers (see Figure 4.5: Tansa-Vaitarna Water District (Pathak, 2005). This map is a reworking of originals from Tansa Wild Life Sanctuary and GIS shape files from the Water Resources Information System of India at http://www.india-wris.nrsc.gov.in. Population of this 659.75 sq. km area was about 95,487 people in 1991 (Pathak, 2005, p. 449). Precise figures unavailable for current period.) One Year leases for cultivation. Formal Land Titles needed to access water from canals
Property rights to water	<ul style="list-style-type: none"> Riparian Principles in areas serviced by canal irrigation Prior Appropriation principles in Tansa-Vaitarna water district Rights to water under the Indian Easement Act Bombay Irrigation Act
Ownership of irrigation and water supply dams	<ul style="list-style-type: none"> Water in storages owned by different parastatal entities such as state Irrigation Department, public water agencies, state industrial corporations & Municipal Corporations. Other River use regulated by state
Financing of rural water supply for domestic use	<ul style="list-style-type: none"> State support; grants provided by the state government
	<ul style="list-style-type: none"> Water charges paid by village councils
Monitoring of relevant transactions	<ul style="list-style-type: none"> Public sector irrigation corporation/Bombay Municipal Corporation
Conflict = resolution arenas	<ul style="list-style-type: none"> Local Courts, High Court, District Council (Zilla Parishad)
Action situations around water	Attributes
Maintenance of rural water supply systems. Water for domestic use in rural areas	<ul style="list-style-type: none"> Poorly serviced infrastructure Revenue often not shared by city with rural areas Multiple agencies with conflicting agendas Low revenue base of Village Councils due to their location in forest areas

Maintenance of irrigation in major and minor projects	<ul style="list-style-type: none"> • Poorly maintained conveyance systems; lack of co-operation amongst farmers; absence of participation by farmers • Arbitrary diversions of water to urban areas
Social Action and search for institutional alternatives	<ul style="list-style-type: none"> • Demands for rural water quotas • Struggles against displacement

4.11 Conclusion

From a theoretical perspective, this case study on the Mumbai region has identified some of the potential common ground between the IE and the HG literature(s) on the theme of water sharing between large cities and their source areas. First, the findings could remind environmental geographers that bad rules are as much to blame as political power and the social and cultural hierarchy of different places in the uneven distribution of water. The paper identifies the influence of prior appropriation in the water bylaws as a major constraint in the ability of villages in the T-V water district to meet their basic water needs and their demand for irrigation quotas. Ostrom's SES framework is a useful tool to identify the influence of rules that are implicit in the application of local water laws and policy. On the other hand, institutional economists could better appreciate the significance of geographical variables in the outcome of action situations. The demands of a large and growing urban center, the forest ecology and the evolution of land, forest and water institutions are some of the enabling spatial factors that influenced the outcome of the action situation. An understanding of the politics of scale can thus be a helpful addition to the toolkit of institutional economists; they can be useful in telling us how geographical scales are socially produced in the course of action situations (Swyngedouw, 2004). In addition to the rules and the geographical context of the water district, a third factor that overlaps geography and institutions is the fragmentation of water governance in the so called Mumbai hydrometric area. This is identified as another major impediment to ensuring a fair distribution of water between various regions. Recent research in the Mumbai context has argued that the presence of multiple

Government agencies with overlapping functions has actually obstructed the effective implementation of decentralization and governance reform in several development schemes (UNCHS, 1993; Pethe et al., 2011).

Reform of water governance in Mumbai could begin by confronting the archaic legal institutions on water in this growing mega-urban region. Reform also needs to address the fragmentation of metropolitan governance, and establish a more democratic arrangement that is representative of sectoral interests on water. Empirical evidence from Southern India that cites court judgements indicates that the state has an absolute right to regulate prior appropriation and use by legislation, and to change the entitlements and rules of allocation at its discretion (Iyer and Jairaj, 2009: p. 7). However, such reform in local and regional water governance is possible only if it is realized that the power of the city over the water resources in the T-V water district and the rest of the hydrometric area is written in rules that were crafted for another time.

Notes

1. My reference here is primarily to developing countries. This lack of attention could be attributed to the focus on small-scale communities in the common pool resource literature. However, a classic in the institutional literature on this subject of the creation of water districts that predates the common pool resource literature is Vincent Ostrom's book *Water and Politics*, a study of Los Angeles (Ostrom, 1953). There are also several multidisciplinary studies on inter-sectoral water management and water conflict in development studies, political science, geography, but few of these have focused on the institutional and geographical implications of an exclusive water district for a fast growing city at the level of contextual detail as V. Ostrom's 1953 case study of L.A.

2. This debate from the 1940s is presented to further my argument that the Mumbai Municipality and the Metropolitan Planning Authority's present refusal to countenance any claims by rural communities towards water has been shaped considerably by engineers to take for granted that the water within the "hydrometric area" has been allocated to for urban and industrial use. The Mumbai Municipality has refused to take any lessons from its experience because as an organization, its behavioral habit and institutional disposition to serve urban interests are mutually entwined and reinforcing. Its stated commitment to serve urban demand completely ignores rural aspirations. This is despite legitimate rural claims for minimum water entitlements that even the state government has acknowledged. There is no official acknowledgement by the Mumbai Corporation or the State Government of Maharashtra of a water district, though water resources in the hinterland have been reserved for future urban utilization since the early 1960`s. Instead, the vague technical term 'hydrometric area' has been constantly referred to in the water plans and the metropolitan planning documents since the 1970s. The first reference to a hydrometric area was first made in Binnie's consultancy report of 1971 for the Government of India on planning water resources in the Mumbai region. A hydrometric area is generally referred to a grouping of catchments for monitoring and reporting purposes. My interviews with planning officials in Mumbai revealed that water in this entire hydrometric area is reserved for the city, though the reality is that the water rights situation in rural communities is far more complex and variegated with small, medium and large irrigation projects that continue to supply water and meet irrigation demand in some pockets (see Figure 4.3).

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