

Deconstructing Water Scarcity in Water-Rich Himalayan Region: A case study of Sikkim, India

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Abstract:

Sikkim falls under the Eastern Himalayan Region(EHR) and in spite of being seated in a volumetrically water-rich region with torrential rainfall and abundant water sources, the people living in this mountain state face acute water scarcity not only during the dry season but also during monsoons. While difficult terrain makes engineering facilities for better access to water difficult, the focus on this physical aspect has overshadowed other major shortcomings in the provision of providing water. Contrary to the belief of these mountainous regions which boast of ‘water towers’ do not face water scarcity or if it does, it is only because of biophysical reason, the paper argues and entails to understand the cause of the existing paradox of “*too much, too little*” water. Such a complex water system in the hills has been a problem with no or little solution for decades as it has to be looked upon from regional-based solutions in order to have secure water distribution systems.

Water scarcity in mountain regions such as the Himalayas has been studied with a pre-existing notion of scarcity justified by decades of communities' suffering from physical water shortages combined with difficulties of access. The Eastern Himalayan Region (EHR) of India receives significantly high amounts of annual precipitation. Studies have nonetheless shown that this region faces a strange dissonance: an acute water scarcity in a supposedly ‘water-rich’ region. The main objective of this paper is to decipher various drivers of water scarcity by locating the contemporary history of water institutions within the development trajectory of Gangtok, Sikkim particularly focusing on Gangtok Municipal Corporation wards. A key feature of the region's urban water governance that defines the water scarcity narrative is the multiplicity of water institutions and the intertwining of formal and informal institutions at various scales. These factors affect the availability and basic access to domestic water by communities in various ways resulting in the creation of a preferred water bundle consisting of informal water markets over and above traditional sourcing from springs and the formal water supply from the formal system.

Introduction

Most water scarcity studies typically provide a very narrow view of the contextual reality, describing them as physical water shortages, perhaps distinguishing them as either physical, economic or institutional scarcity (Falkenmark & Lundqvist, 1998; Seckler *et al.*, 1999;

Government of West Bengal, 2012; Hoekstra & Mekonnen, 2012; Molden *et al.*, 2014; Vaidya, 2015). Locally, scarcity almost always manifests through a combination of all three typologies both spatially and temporally, and is also differentiated based on social class and geographic location (Bandyopadhyay & Gyawali, 1994; Ohlsson & Turton, 1998; Anand, 2001, 2004, 2011; Wolfe & Brooks, 2003; Mehta, 2006; Mehta *et al.*, 2011; Srinivasan *et al.*, 2013; Badiger *et al.*, 2014). Concerns related to domestic water scarcity often overlook social–institutional drivers which influence access. Translation of physical water availability and accessibility for communities depends on the current state, scale, and ability of the water infrastructure to overcome seasonal changes and reduce the burden of water collection. This process requires a detailed understanding of the functioning and organisation of multiple water institutions (Agrawal & Yadama, 1997; Anand, 2001, 2004; Badiger *et al.*, 2014). Institutions are rules, norms, and practices which govern decision-making in a society (Kiparsky *et al.*, 2013). Formal institutions are associated with the State and are present at central, provincial, regional and local levels. Informal institutions are based on social networks which emerge from the need for social safety nets triggered by the absence of State-driven initiatives (Lebel *et al.*, 2005; Hillmann, 2013). The intertwining or hybridization of these institutions can be observed here in the way formal (in this case, Water Security & Public Health Engineering Department or PHED) and informal (*samaj* – a self-help group, described below – and private water suppliers) work in cognizance of each other's abilities to monopolise, dominate or complement. This intertwining and overlapping are also evident in the way households are able to create their own ‘water bundles’ using a combination of water sources that they can access or afford and prefer. We use the term ‘*water bundle*’ in a similar context to the ‘optimal consumption bundle’ (Brunnermeier, 2004) of goods in microeconomics – where a consumer (a household in our case) is able to meet the net requirement of their goods’ (here, the total domestic water requirement) needs through a particular combination of different goods (various water sources); where each of them has a known rule of preference over the other and has a differential cost (monetary or non-monetary) associated with acquiring them.

A different story of “*too much, too little water*” in the mountain region

Mountains are often referred to as natural ‘water towers’ for humanity, highlighting their importance as a prominent water source for the arid and semi-arid lowlands but with little reference to water security in the mountains themselves. The Himalayas in the Indian context are perceived as an inexhaustible freshwater source but only a small fraction of the streamflow is stored and consumed by the communities living in these mountains. Water

scarcity in these mountains is largely influenced by the unique local hydrogeology, climate and social characteristics. Harnessing and storing water in large quantities is also impossible in this seismically active mountain range. Hence, springs have historically been an important and primary source of water for a significant proportion of the population, both for rural and urbanising communities (Khawas, 2002; Sharma *et al.*, 2010; Boer *et al.*, 2011; Mahamuni & Kulkarni, 2012; Tambe *et al.*, 2012; Tiwari & Joshi, 2012; Mukherjee, 2013; Agarwal *et al.*, 2015; Ghatani, 2015; Basumajumdar, 2016; Drew & Rai, 2016). Urban political ecological studies and their focus on water. Water is provided as the starting point for discussions within Urban Political Ecology (Heynen, 2014). "Environmental crisis unfolds in relation to historical and spatial patterns of inequality that, in the context of increasing urbanisation, are manifest within the city" - spatial differentiation in urban areas (Broto et al 2012). First, it advances research of urban political ecology in terms of the manifestation of water scarcity (Mehta, 2010; Millington 2018) from the macro to the micro level. Additionally looking at the manifestation driven by the interactions between the state and the private water markets along with the socio-economic and political aspects that lead to disproportionate burden (Birkenholtz, 2010; Truelove 2019). Second, it deconstructs the notion of how water availability is conventionally associated with physical shortage rather than a product of underlying socio-institutional drivers. This perspective creates an image of water abundance in the mountains which is contrary to the water insecurity faced by the mountain communities (Joshi 2018). Third, it is one of the first comprehensive comparisons of two similar study areas in the EHR, while providing baseline household water (in)security data, which the team will leverage for future research.

Using the theoretical framework(table1) on orders of water scarcity (Mehta,2006) it will argue that the issue of water scarcity in the region has been wrongly equated to water shortage rather than searching for and finding solutions in the economic and institutional space – so, the problem, often misconstrued as a paradox, is actually more of a conundrum. The paper will primarily look at various drivers of water governance and social organisation that translate to domestic water scarcity in Gangtok which is catered for by a centralised formal water supply, as well as the surrounding sprawl whose water comes from multiple informal sources including water tankers and directly from springs. A description of methods and the selection of Gangtok as a study site and its history are presented first. This is followed by a presentation of the history and current scenario of formal and informal water institutions in Gangtok. Next, the paper draws insights into the coverage of the various institutions, their multiplicity in some cases and their intertwining in others, contributing to water scarcity at the household level.

	Physical/ First Order	Economic/ Second Order	Adaptive Capacity/ Third Order	Socio-Political Processes/ Fourth Order
Characteristics	Volumetric quantities; Population growth; Projection of future demand; industrial growth	Inadequate development of water infrastructure; Poor management and institutional arrangements	Social, political and economic context of water management*	Scarcity as product of discursive and socio-political processes; Entitlements failures

Table 1: Adapted from Orders of water scarcity (Mehta,2006)

Lastly, the associated risks, uncertainties and conflicts surrounding the creation of water bundles to handle the water scarcity so created are presented. Informal institutions emerge due to circumstantial constraints like the absence and/or unwillingness of the state (Hillmann 2013; Lebel, Garden, and Imamura 2005; Cleaver 2000). They are driven by the force of necessity to take up ventures individually or use kinships for the redistribution of social goods and opportunities, and cultural and political autonomy (Bayat 2000). The majority of the population in the developing world depends on informal water providers (Burt and Ray 2014; Joy et al. 2011; Meehan 2013; Samsom 2006).

The limited formal water supply focuses on middle and high-income households or areas (Samsom 2006) because the state lacks political will and funding for supplies to distant areas or ‘informal settlements’ where the urban poor lives (Wutich 2006; Anand 2012). In areas with formal water supplies, their availability depends on the household’s legal residence (Hellberg 2014). In spite of a functioning and reliable formal water supply, it only partially replaces the pre-existing informal water setups (Burt and Ray 2014). The informal is embedded within the formal so that the functioning of one requires the support of the other; for example, the state relies on the informal water suppliers to provide water for the population as they are unable to do so themselves (Meehan 2013). The creation of scarcity in the developing world is enmeshed in the preconditions required to even apply for a formal connection (Anand 2011b). One of the direct consequences is the reliance of socio-economically weaker sections of the society to stay out of the formal systems because of rigid bureaucratization and difficulties of access to the formal systems in comparison to the ease of access and reliability of the informal systems, which comes at a huge financial cost. The socio-economically weaker households have the least access to drinking water due to the

uneven distribution of physical water infrastructure (Schmidt 2020). Uneven experiences of scarcity manifest due to differentiated historical and contemporary water infrastructure, and capabilities of the households (Millington 2018; Bjorkman 2014). An example of this is the unequal distribution of water within urban areas in South Africa - a legacy of Apartheid (Bakker 2003; Gandy 2006). Access to water highlights distressing social inequality at one end and the difficulties faced by the governments to improve urban conditions at another; questions of governance therefore must not be understood as separate from but as an integral part of the larger discourses on equality and justice. Elite access to piped water supply and the socio-economically weaker sections relying on informal water sources is a pattern across the world (Bakker 2003). In addition to these developmental and governance factors, access to resources is also affected by marginalisation. Marginality is “an involuntary position and condition of an individual or group at the margins of social, political, economic, ecological or biophysical systems, preventing them from access to resources, assets, services, restraining freedom of choice, preventing the development of capabilities, and eventually causing extreme poverty” (quoted in Braun and Gatzweiler 2014: 70). It can be categorised as spatial or societal. Social factors denote the human dimensions such as demography, religion, social structure, economics, and politics; spatial factors indicate environmental and geographical settings such as the physical distance from the development centers (ibid: 70).

The process of acquiring urban citizenship under the rules, laws, and policies of the cities and states make differentiated, informal, and abject populations (Anand 2012). Places with colonial histories of rules and regulations get imprinted and reproduced in the postcolonial forms of citizenship (Björkman and Harris 2018). Additionally, the belongingness of a city based on ownership of property and tenancy drives the policies which make the ‘unrecognised’ residents disconnected citizens (Anand 2011). Water scarcity is unique in mountain towns due to biophysical and social characteristics. The topography of the mountains poses a difficulty to harness and retain water for use with energy being a limiting factor (Bandyopadhyay and Gyawali 1994). Another significant characteristic of mountainous regions is the springs which everyone depends upon. Mountainous regions have the altitudinal aspect to the pattern of urbanisation and strong seasonal water demand, too. The structural backwardness of the mountainous regions, the unavailability of infrastructure to harness their resources, and the skewness in development in the favour of other regions push them into underdevelopment. It can also be attributed to their inaccessibility, fragility, marginality, and heterogeneity (Jodha 1990). The mountainous urban areas of India are dependent on funding from the provincial and central governments (Munsi et al. 2006). Low coverage of formal supplies, proximity to the forests and springs, and vast prevalence of informal supplies especially in the urban areas makes the case all the more unique. Issues of water scarcity are

faced by the mountainous regions within the state of Sikkim, which fall in the Eastern Himalayan Region (Barua et al. 2012; Joshi 2014; Lepcha 2013; Thapa 2017; Tambe et al. 2012) along with the Western and Central Himalayan Region (Madan and Rawat 2000; Kelkar et al. 2008; Domenech, March, and Sauri 2013; Shrestha and Shrestha 2014).

Study Area and Filling the Gaps

It was reported that nearly half the perennial springs in the Himalayan region have dried up or become seasonal in nature, due to natural dynamism, erratic rainfall, seismic activity, and ecological degradation associated with land use change for infrastructural development impacting mountain aquifer systems (Gupta and Kulkarni, 2018). When considering the case of Sikkim, it was important to identify the traditional and natural wetlands and water bodies such as village ponds, *dhara/pandhera*(springs), *kuwa* (shallow wells), *khola/kholsa* (small rivers or rivulets arising from a spring), and *devithan* (water sources, abode of local deities) which have all been rapidly degrading over the last few decades (Sharma *et al.*, 2012; Tambe *et al.*, 2011, 2012). In Spite of rural water security projects like “Dhara Vikas” implemented by the government of Sikkim (Tambe et al,2013) little or no research has been done on Gangtok water insecurity, most studies focused on physical scarcity, water quality, and on the rural landscape (Tiwari,2012). This paper will be the first of its kind on domestic water insecurity in Gangtok. Gangtok, the capital of Sikkim (Fig 1) falls under the East district of Sikkim which houses 46% of the state population making it the most populous district. The Water Security & Public Health Engineering Department(PHED) supplies the town with water from the Ratey Chu glacier which is around 16 km away. Ratey chu, which is the only source of formal water supply caters to the domestic water needs of the city with a population of more than 1.6 lakhs without including the influx of tourists and other floating population. The inability to meet the water demands by the government has led to the formation of informal water markets which in return has affected the availability and accessibility of domestic water for the citizens of Gangtok.



Fig 1: Map of Gangtok (Source: Maps of India)

Methodology

Focus group discussion, stakeholders interview and household survey were conducted to understand the demand-supply gap, water markets (if existing as similar to Darjeeling- our other study area), change in water source pattern and address the major research objectives. The field survey was covered during the non-monsoon season and extensively during the lean season from February to April. A household survey with a stratified sampling technique was used along with a structured questionnaire consisting of both closed and open-ended questions. A pilot survey was conducted in 3 wards and transect walks were done in order to identify the problem and construct a structured questionnaire for the survey. A target of 200 households was taken into account given the paucity of time and the size of the households across 17 wards under Gangtok Municipal Corporation(GMC), Sikkim. I carried out pilot visits and fieldwork in December 2018, followed by a prolonged period of fieldwork from January 2019 to April 2019. I undertook topic-guided interviews with key stakeholders. I did transect walks to understand the layout of the city and constantly reviewed available public records and secondary literature. After building up my knowledge base, I created a questionnaire and was tested in different parts of the city, updated, and implemented. I used stratified sampling to select the wards using two spatial variables: (1) Average altitude of the

ward (smallest administrative unit of the municipality) and (2) distance from the main supply tanks within the town for stratification. The questionnaire included household details, socio-economic and housing conditions, *samaj*¹, water sources used, water storage and quality, water usage, satisfaction and sufficiency levels, and grievances handling. While carrying out the questionnaires, I also recorded them with the respondents' consent which acted as a reference for cross-checking. Topic-guided interviews were undertaken with key informants such as officials from the PHED, Gangtok Municipal Chairman, staff of the water department and associated staff/lineman and middle agents in/with the operation and maintenance of the water supply infrastructure. Focus group discussion was conducted in 5 different wards to understand the complexities within each area. Secondary data were gathered from official municipal reports, archives, existing public documents and literature. Using the guidelines of the Asian Development Bank (ADB) (Ministry of Urban Development Government of India & Asian Development Bank, 2007), the status and performance of the PHED as a water utility provider was assessed. I also used GIS to map the elevation, mark the household and show the spatial variations if or any differences were that to the access, distribution or any intertwining relationships with the households.

Findings

i) Governance: multiplicity and hybridity of institutions

Water, unlike a classic commodity, is a multifaceted resource that reflects on the nature of institutions that govern it and their intertwining in terms of governance and access by communities (Mehta, 2006; Kiparsky *et al.*, 2013). Institutions that govern a water resource vary and so do associated property regimes. The fluidity of water creates competitive and overlapping water rights, which leads to a mix and intertwining of informal and formal arrangements (Mehta, 2006) which we refer to here as hybridity, since no single institution on its own is capable of meeting communities' demands for domestic water. In the case of Sikkim, water is a public, private, or common property resource depending on the location, presence, or absence of an institution and the nature of these institutions. Multiplicity and intertwining of institutions make urban water governance complex because the institutions involved have overlapping and fragmented responsibilities, jurisdictions and decision-making method silos (Anand, 2001; Hillmann, 2013; Kiparsky *et al.*, 2013; Fuenfschilling & Truffer, 2016). The fragmentation of institutions can be political, and issue-based, due to gaps in the design and implementation of programs, and as a result of a mismatch between biophysical and political boundaries. Political fragmentation is created here with multiple sources of

¹ Community-based organisations

funding and multiple institutions responsible for the implementation of projects (Kiparsky *et al.*, 2013). Issue-based fragmentation occurs because the land and water resources of Sikkim and the surrounding areas lie with different State-affiliated organisations such as the military, Forest, fire or medical department, which increases a physical constraint on the town and restricts access to the resources under the other organisations. The city municipality only manages the sewage system and the formal supply and water infrastructure is maintained by PHED but the areas served by springs which a large section of the city is dependent on fall outside the jurisdiction of the municipality. The multiplicity of institutions leads to an interrupted transition from planning to execution to implementation with a different institution being involved at every other step. Another way of locating the multiplicity of institutions is through the infrastructure of the states formal water supply system (Kiparsky *et al.*, 2013), from source to taps. The water harnessing infrastructure falls under the GTA and PHE, whilst the water supply distribution system falls under the PHED (Samanta & Koner, 2016). The water supply lines pass through forested areas under the Forest Department or army cantonment areas under the Indian Army. This multiplicity of formal institutions denotes a political fragmentation through an overlap but at the same time a conflict of responsibilities among various levels of government and agencies, making complex governance structures for urban water (Kiparsky *et al.*, 2013). This shows the dominance of an engineering outlook with ‘add more’ as the only solution, without reining in an adequate knowledge of ecology or socio-economics. The stress has to be shifted towards distribution infrastructure and effective institutional functioning to enable better access, which needs support from both political and executive departments. Lack of incentives for positive performances in the public sector makes that sector more conservative and risk-averse to innovations. The absence of innovation restricts initiatives for mountain regions especially to overcome the constraints posed by the topography of the region to build sufficient, effective and less energy-intensive water distribution systems (Bandyopadhyay, 1989; Kiparsky *et al.*, 2013). As water users, communities have to work around these multiple institutions and interact with both formal and informal, to cushion the water scarcity they face. The cushion is generally in the form of a water bundle created using a combination of water sources, as noted above. The composition and proportions of a water bundle are primarily dependent on the financial resources available to a household, and its spatial proximity to the water sources. In the presence of multiple institutions, and the amount of time and resources they have to spend navigating around them, we observed that the higher the number of resources households had access to, the more secure they felt, i.e. the more varied a water bundle was, the more secure a household felt because they could have an array of resources to turn to if they had insufficient water. With the low frequency of PHED supply,

if a household can afford a private supply, the frequency increases because they can ask for water to be delivered to their households. If a public spring is present in the household water bundle, a household feels more secure, regardless of the time and effort involved in fetching water from the spring (Shah, 2015).

Any external or non-local interventions tend to overlook the informal and social institutions which have emerged over the years to manage common water resources, such as *samaj*, which makes the interventions counterproductive (Bandyopadhyay & Gyawali, 1994).

Problems occur at various levels pointing to the need to understand the interconnectedness of biophysical, socio-economic, political and institutional issues at each level and across various levels to enable integrated planning (Badiger *et al.*, 2014).

ii) The Case of Informally Formal System

Formal and informal institutions handling water resources in Sikkim and the rules with which these institutions are governed influence how they understand and handle issues of resource access, in this case, communities' ability to access water. Emphasis on resource access is necessary because it helps individuals and communities shape their development but the institutions might enable or curb such development processes (Mell & Sturzaker, 2014). The intertwining or hybridity occurs at the institutional level where the State-run PHED supply and non-State entities work together and, at times, against each other to cater to the water requirements of the communities. The low coverage, low frequency and quantities of supply make it imperative for the state to seek ways to fulfill the demands of households who are dependent on its distribution lines. The PHED as a formal institution interacts with the private water suppliers, especially the water tankers in times of supply deficit in their system. Vehicles used for private water supply, such as carts and tankers, have to work around the traffic police of the town, underlining the interaction of the formal and the informal. When the PHED seeks tankers, traffic rules are relaxed accordingly. *Samaj* looks after the springs which are ignored by the formal institutions, hinting at the emergence of informal institutions in the absence or negligence of a formal body. *Samaj* also approaches the PHED on behalf of their members when there is a need for public standpipes in their vicinity, and even collectively pays for the installation costs which in most cases are borne by the department – highlighting their importance as a conduit between communities and the State.

Informal institutions which do not fall under the ambit of the state have emerged due to the absence, inability, or unwillingness of the state to provide formal institutions as public goods. These include a variety of private suppliers - water porters, hand-drawn carts, 6000-litre tankers, households that share/sell their spring water or surplus water, 2000-litre pick-up trucks, direct self-drawn supplies from springs and streams in forested areas at some

or zero cost, indirect self-drawn supplies via private suppliers who draw from springs and streams or tankers, military cantonment, landlords who give water to the tenants, and all other water which is bought. Though Cantonment is a state body, provisioning of water is not their primary function, but they do provide water to the communities around them. These water setups sometimes act like appendages and sometimes are in direct competition with formal water supplies. The emergence and prevalence of the informal structures can be attributed to (1) the inability of the PHED to scale up; (2) inefficient project implementation; and (3) informal being considered more dependable. Rigid bureaucratic processes that prevent the households to apply for PHED connections such as documentation, high costs, corruption, and red-tapism further contribute to the growing presence of these informal structures.

The private-public dualism breaks down in urban water supply of Southern cities (Bakker 2003). Where formal water systems exist, they cannot work without informal ones. Informal networks actively work within formal institutions to enable the provisioning of formal water connections. The bureaucratic process is lengthy where once a household has filed an application for a private connection with the PHED, its movement within the office requires connections and networks. Informal institutions like *samaj* actively interact with the state for acquiring connections. The PHED is responsible for assessing the needs for public taps and setting them up. In many cases, *samaj* (where they exist) write applications for a public tap. Materials for sanctioned connections need to be provided by the PHED but are provided by the *samaj* in many cases due to the dire and immediate needs of the communities.

Respondents across town said, “Public taps come and go with PHED commissioners.” Some specifically mentioned, “There used to be one in the front of a household (pointing in the direction) and in the last five years it has appeared twice and disappeared both times.” Public officials with power take over the ownership of the public taps diverting for their use. PHED public taps are put in charge of individuals to curb theft, thereby emphasising the need for the state to resort to the informal to keep their systems functioning effectively. The informal institutions such as *samaj* or smaller groups interact with the formal by creating rules of access over formal resources such as P-shared taps and public taps. Rules are in place for public taps in parts of the city in the local language; Nepali. Access to public taps isn’t always inclusive. Public taps guarded by the *samaj* are vested with the power to (dis)allow access only to members based on their residential location. In some areas, only house owners have access with tenants being denied. Such practices, while maintaining some form of water availability balance, also exacerbate socially embedded discriminatory practices, reproducing class/caste/ethnic and other hierarchies. Some households, for instance, shared their

experiences of facing discrimination from the residents based on their origins or the change in residence as a consequence of getting married to someone from outside demarcated households. This shows how free-for-use public taps installed by the PHED get overridden by the rules of informal norms and socio-cultural practices of the *samaj*. The rules of access are justified by the *samaj* members by invoking their active participation in acquiring the public tap. The justification implies that members who had taken the initiative for applying for their public taps and have acquired it have 'more' rights on the taps. The setting and enforcement of rules make them controllers of the source. Apart from setting of rules of inclusions/exclusions for accessing water sources, the access is also physically restricted by locking the public taps and springs during the dry season. This reveals that resources that are designed for the public or thought to be a common property resource do not function as such but are now parts of new hierarchies and power systems overridden with socio-cultural and customary patronage.

iii) Who is the “Water Mafia” ?

Tankers have been used by the PHED during the 1990s (Interview with the author, 08.03.2019) due to the disturbances in their supply. Tankers are also said to have *mafia-like behaviour*. This terminology was used by respondents across the city with agreements and disagreements with it. *Mafia in this context ascribes to those who control the resource and its supply*. The tankers do not have ownership and rights over the water sources. When the tankers first came into business in the 1990s, the tanker drivers used to set up ponds for water collection in the forests and collect water for free. But, now they have to make payments to middlemen in the forest areas who provide access to the water sources along with No Objection Certificates (NOCs) from the forest officials after paying a certain fee. The tankers association highlighted that payment for water sources in the forests is a recent phenomenon, suggesting the entrance of new actors into private tanker water supply systems with the costs of accessing water in the forests. The fee began at Rs. 10 and currently stands at Rs. 200. The payment systems can be done per access, per month, or per year (Interview with the author, 28.02.2019). The tankers are in active and passive confrontation with the formal bodies (Shah and Badiger 2018), facing financial costs for water access in recent times where none existed before. They believe that the PHED has the power to control all this. But, the PHED is said to neither work towards alleviating these issues nor in providing water to the communities. The PHED might have the power to stop what is termed the *mafia* and are acquainted with the politics of resource control for tankers, but are also cognizant of their shortfalls, which draw them back from taking any action.

Pseudo-department Systems

'*Uhiley ra ahiley*' (the past and the present) are not so different for water issues in Gangtok city. Institutions other than the PHED, such as the cantonment or *samaj*, function as pseudo-department systems. Across Gangtok, primarily in slum areas, households depend on *samaj* water systems. It has a water distribution infrastructure similar to the PHED. This area has very few formal connections and depends on private water suppliers throughout the year. 6000-litre tankers are the most commonly used private water suppliers here followed by 2000-litre pick-up trucks. These vehicles cannot reach the households because there are no roads in the dense settlements. The *samaj* has hence created their distribution network. This network has an inlet at the road and multiple outlets below inside the settlement. A household can be connected by making changes at this network junction. Vehicles come to the road and connect to this network inlet and release the water.

The *Police Dhara*² Water System is another system. It utilizes the Police Dhara located lower than the village. The *samaj* has constructed a water storage and pumping system. Water delivery is systematised streetwise for a group of households, with a nodal person for each group. Gram Water System is another where the water is pulled from a spring into a reserve tank with multiple taps. It was set up for the comfort of the villagers and has a defined opening and closing time. These *samaj* water supply systems are in areas officially defined as slums where the absence of a dependable water supply has forced communities to create their own supply systems. Households located in slum areas do not get a permanent holding number without which they cannot get the necessary land and valuation documents to apply for a PHED connection. This is another example of a pseudo-department system coming into play because of the lack of functional, formal structures.

My fieldwork unveiled many different kinds of water setups on which the communities of Gangtok city are dependent to fulfill their daily water requirements. Household-based water suppliers are also common across the town. A water supplier in the central upper part of town said that tankers, which supplied water to him, could no longer come to his doorstep because the morning walkers who used that road had expressed their disappointment with the water supply vehicles. The morning walkers had installed one-and-a-half to two feet iron pillars on the road to prevent tankers and other vehicles from using that road. The prevalence of informal water suppliers and the inefficacies of the formal suppliers indicate marginalisation and lack of development of the region. The lack of political willingness of the state to actively upgrade their system as well as curb the systems which they term 'mafia' is evident. Even where the formal supply is present, it is hard to let go of the informal processes by the state themselves as well as by the citizens. Communities are forced to come

² Translates to water police

together to create water sources for themselves in the absence of strong, formal water supply sources with ease of access and accountability. The communities have to meander through this mix of formal and informal institutions and processes to get a basic amount of water. The socio-economic and physical location of the households affects the creation of water bundles highlighting differentiated experiences of scarcity throughout the town.

iv) Modern water; local springs and disconnected citizens

Most studies on urban citizenship and the making of informal and abject populations are focused on the megacities of the developing world and within them the poor squatter settlements as their sites of inquiry (Wutich 2009; Bjorkman 2014; Anand 2012; Hellberg 2014). In the case of Gangtok, the making of abject populations occurs for the region/town as a whole with further differentiation within the town. The creation of abjection occurs through repetitive actions of marginalising the people through a social and political process that they are no longer considered subjects of the government (Anand 2012). It can also be interpreted as the exclusion of people by the state such that the state is not accountable for them (Agamben 1995). Being disconnected, unlike unconnected, involves a process through which people are gradually pushed out of a system. The ethnic grievances of the communities stem from multiple sources of alienation and deprivation - access to decent living standards and basic public amenities being one of them. This happens through the many requirements to get a formal PHED water connection. The provisioning of a formal water connection is attached to the legality of one's residence - a problem for a majority of the Hill population with no access to land rights and papers. This illegality, as defined by the state, prevents them from acquiring basic entitlements (Anand 2012; Hellberg 2014). The demand for land rights continues to remain in the heart of the statehood movement. Despite endless promises for '*parja- patta*' (land deed) all that it has been reduced to is mere political gimmicks for sectarian and electoral gains, obscuring the precarious position of the people and their everyday harassment due to lack of such documentation in the first place. The application requires three different documents and Rs. 250 only but the actual amount that goes under the table is dependent on how fast, how much or how you access or through whom you get the water. Such requirements disallow residents from even beginning the application process for a legal water connection. The waiting time for getting a connection depends on whether the connection is *tatkal*³ or regular. For a regular connection, it can take one to three years also depending on one's social and political networks within the PHED to expedite the process. With no solution in sight for the past decades, the people have come to terms with the scarcity. For Gangtok, water scarcity has been normalised and internalised along with the

³ Swift process

experiences of marginalisation. Statements such as “*our water issues are not as bad as the households a little ahead of the turn*” were prevalent upon asking about their experiences of water scarcity and which regions in the town experience the most scarcity.

Communities create varied water bundles (Shah and Badiger 2018) as coping measures outside the PHED sources due to inefficient, irregular, and insufficient formal supplies. The top three water bundles used in Gangtok are single-source private water supplier, two-source bundle of public tap and private supplier, and private individual connection and private supplier. Private water suppliers are not only the highest used water source; they make up all the top three water bundles. Households with PHED connections need to be supplemented with other sources to have a sufficient amount of water. The formal supply or PHED supply has not reached all households. Only when the connection reaches the vicinity of a household, do they fathom applying for a connection because the more the distance from the nearest municipality network the more the labour and materials costs. The high costs and lengthy time taken to get a PHED connection disables people from the lower socio-economic strata from applying. The proof of legality further cuts off a section of the population such as the migrant population and those living in informal settlements and slums. In most cases, these two sets of people overlap, hence creating a disproportionate disadvantage for access to formal water systems. PHED usually provides public taps in informal settlements and slums which all the households depend upon. The residents in such areas face disconnections and interruptions because they had been included in the water services, but as an element of exclusion/ marginalisation (Hellberg 2014). When basic services become inaccessible in this way, people find alternate ways to acquire them. The alternate means are illegal connections provided by middlemen or private water suppliers where the citizens end up paying higher rates. Due to the hassle of acquiring legal documents and the uncertainty of water availability, residents prefer the informal over the formal despite it coming at a price (Anand 2012). Communities prefer them for ease of access and are free from rigid bureaucratic centralization. They are also satisfied paying similar labour and material costs for informal water suppliers which are certain and frequent than the PHED suppliers (Anand 2012).

As informal water suppliers find legitimacy, it also disconnects people from formal structures of governance, with red-tapism and corruption becoming the norm. The decay and deterioration of formal governance structures on the other hand contribute to a growing sense of disconnect and alienation from the people. They become disconnected citizens (Anand 2011b, 2012) as they are unable to access state supplies due to their illegality as citizens of the municipality. The ethnic tension of the Indian Nepali community, ethnically Tibetan but originally Sikkimese, the Lepchas and many other communities emerge from a sense of

disconnection and alienation from the mainstream and a sense of deprivation from the state of Sikkim. Malgovernance is not merely an outcome of bureaucratic red-tapism but is often an outcome of shrinking democratic spaces and the collapse of formal structures of governance and civil society in conflict-ridden societies. The state has a pertinent role to strengthen these systems to establish a permanent sense of peace and stability in such spaces. In the absence of the political will to do so, the void is bound to be filled by informal structures of power defined by a political culture of violence, corruption, and instability. The outcome is glaring inequalities contributing further to a sense of alienation, deprivation, and disconnect, as is evidenced by this paper through the growing disparity in access to water in the region.

Conclusion:

Despite being located in a volumetrically water-rich region, Gangtok has faced water scarcity for a number of decades now. We argue that the crisis is the result of a conundrum due to the interlinked problems across political unwillingness, insufficient investments, failure of cooperation between the state and regional institutions, and inadequacies in local governance including institutional capacity. Translation of physical water availability to access for communities is an important factor that alleviates or reinforces water accessibility. The multiplicity of water institutions and the way in which they are intertwined reveals the complexity of urban water governance. The creation of a household water bundle by communities through complex interactions with these institutions illustrates the difficulties they face in acquiring a basic amenity such as water. Water scarcity here is cushioned to a certain extent by the presence of springs and private water suppliers, both of which fall under the ambit of informal institutions. As an exclusive dependence on PHED or formal supply is not enough to meet basic water needs, communities create a water bundle from a combination of available sources which are in turn dependent on a variety of factors such as socio-economic status and the spatial location of households, among many others. In a similar way to other global experiences, engineering solutions have been the order of the day, with supply augmentation the only route pursued in Gangtok. The success rates of such augmentations have been low and have not been enough to close the gap between increasing water demands and augmented supply. Low success rates show the need to look at aspects of both harnessing and supplying water. An acknowledgment of natural, social, and traditional knowledge is needed to provide better solutions and water rights and, in this case, existing systems such as springs and the array of private water suppliers should not be left out. Various departments need to work together for a better solution to the increasing water crisis. There is an absence and reluctance on the part of the government to push for development schemes with a thorough study. Difficult terrain, lack of funds, and an imbalance between

urban growth and the provisioning of services might intercept any initiatives taken or render them futile after a certain period of time. However, with these progressive developments and many projects under the various National schemes, initiatives seem to be making positive headway, with the former looking at reforms in water governance (specifically at the formal water distribution system) and the latter at harnessing rainfall. The implementation of these projects might lead to the alleviation of water scarcity in Gangtok and will additionally provide pointers for effective intervention in similar cities/towns within the EHR.

References

Agarwal, A., Agrawal, N. & Rathi, V. (2015). Water stress on springs of lesser Himalayan region. *British Journal of Applied Science & Technology* 9(3), 243–255. <http://doi.org/10.9734/BJAST/2015/17140>.

Agrawal, A. & Yadama, G. (1997). How do local institutions mediate market and population pressures on resources? Forest panchayats in Kumaon, India. *Development and Change* 28(3), 435–465. <http://doi.org/10.1111/1467-7660.00050>.

Anand, P. B. (2001). Water ‘Scarcity’ in Chennai, India: Institutions, Entitlements and Aspects of Inequality in Access. (No. 2001/140). WIDER Discussion Papers, World Institute for Development Economics (UNU-WIDER), Helsinki.

Anand, P. B. (2004). The political economy of water scarcity and issues of inequality. Entitlements and identities: a tale of two cases from southern India. *International Journal of Technology Management and Sustainable Development* 3(2), 115–132. <http://doi.org/10.1386/ijtm.3.2.115/0>.

Anand, N. (2011). Ignoring power: knowing leakage in Mumbai’s water supply. In: *Urban Navigations: Politics, Space & the City in South Asia*. Anjaria, J. & McFarlane, C. (eds). Routledge Publishers, New Delhi, pp. 191–212.

Badiger, S., Gopalakrishnan, S. & Patil, I. (2014). Contextualizing rural–urban water conflicts: bio-physical and socio-institutional issues of domestic water scarcity. In: *Globalization of Water Governance in South Asia*. Narain, V., Gurung Goodrich, C., Chourey, C. & Prakash, A. (eds). Routledge Publishers, New Delhi.

Bandyopadhyay, J. (1989). Riskful confusion of drought and man-induced water scarcity. *Ambio* 18(5), 284–292.

Bandyopadhyay, J. & Gyawali, D. (1994). Himalayan water resources: ecological and political aspects of management. *Mountain Research and Development* 14(1), 1–24.

Basumajumdar, A. (2016). Impact of global warming on climate change regarding water supply in the Darjeeling Hills of the eastern Himalaya and change in mountain ecology. In: *Globalization and Marginalization in Mountain Regions*.

Chand, R. & Leimgruber, W. (eds). Springer International Publishing, Switzerland, pp. 161–171.

Bhutia, S. (2017). A situational analysis of water resources in Darjeeling Municipal Town: issues and challenges. *International Journal of Research in Geography* 3(4), 52–60.

Biswas, S. (2013). Urban growth centers in Darjeeling Hills of West Bengal: a geographical analysis. *The Journal of*

Bengal Geographer 2013(January), 30–48.

Boer, L., Joshi, D., Rai, S. & Thomas, S. (2011). The Perennial Springs of Darjeeling, A Survey to Community Based Conservation. Internship Report. Wageningen University, The Netherlands.

Brunnermeier, M. K. (2004). Learning to reoptimize consumption at new income levels: a rationale for prospect theory. *Journal of the European Economic Association* 2(1), 98–114.

Chakraborty, A. S. (2018). 'Hamro Jhora, Hamro Pani' (Our spring, Our water): water and the politics of appropriation of 'Commons' in Darjeeling Town, India. *Hydro Nepal* 22, 16–24.

Chattorpadhyay, S. S. (2005). Emphasis on Infrastructure. Retrieved April 11, 2018, <http://www.frontline.in/static/html/fl2201/stories/20050114005712000.htm>

Chettri, M. (2013). Choosing the Gorkha: at the crossroads of class and ethnicity in the Darjeeling Hills. *Asian Ethnicity* 14(3), 293–308. <http://doi.org/10.1080/14631369.2013.764763>.

Chettri, V. (2016). Centre Funds Darjeeling Water Supply Rejig. *Telegraph India, Siliguri*, 26 April 2016. See: https://www.telegraphindia.com/1160426/jsp/siliguri/story_82251.jsp.

Chhetri, B. & Tamang, L. (2013). Population growth and associated problems: a case study of Darjeeling Town. *International Journal of Humanities and Social Science Invention* 2(5), 63–67.

Dasgupta, A. (1999). Ethnic problems and movements for autonomy in Darjeeling. *Social Scientist* 27(11), 47–68. See: <http://www.jstor.org/stable/3518047>. Department of Environment. (2016).

Detailed Project Report for National Adaptation Fund: Rain Water Harvesting and Sustainable Water Supply to the Hilly Areas in Darjeeling as an Adaptive Measure to Potential Climate Change Impacts.

Drew, G. & Rai, R. P. (2016). Water management in post-colonial Darjeeling: the promise and limits of decentralised resource provision. *Asian Studies Review* 40(3), 321–339. <http://doi.org/10.1080/10357823.2016.1192580>.

Falkenmark, M. & Lundqvist, J. (1998). Towards water security: political determination and human adaptation crucial. *Natural Resources Forum* 22(1), 37–51. <http://doi.org/10.1111/j.1477-8947.1998.tb00708.x>.

Fuenfschilling, L. & Truffer, B. (2016). The interplay of institutions, actors and technologies in socio-technical systems – an analysis of transformations in the Australian Urban Water Sector. *Technological Forecasting and Social Change* 103, 298–312.

Ghatani, S. (2015). Sustainable Urban Water Management in Darjeeling. Master of Philosophy Dissertation. Sikkim University, Gangtok, India. See: [http://14.139.206.50:8080/jspui/bitstream/1/3112/1/Suvechha Ghatani\(Geography\).pdf](http://14.139.206.50:8080/jspui/bitstream/1/3112/1/Suvechha%20Ghatani(Geography).pdf)

Government of West Bengal. (2012). West Bengal State Action Plan on Climate Change.

Government of West Bengal (2018). Public Health Engineering. Retrieved July 12, 2018, from <https://wb.gov.in/portal/web/guest/public-health-engineering>

Hillmann, H. (2013). Economic institutions and the state: insights from economic history. *Annual Review of Sociology* 39(1), 251–273. <http://doi.org/10.1146/annurev-soc-071811-145436>.

Hoekstra, A. Y. & Mekonnen, M. (2012). The water footprint of food. *Proceedings of the National Academy of Sciences* 109(9), 3232–3237. <http://doi.org/10.1016/B978-0-12-799968-5.00007-5>.

Khawas, V. (2002). *Environment and Rural Development in Darjeeling Himalaya: Issues and Concern*. Centre for Environment Planning and Technology, Ahmedabad, India.

Kiparsky, M., Sedlak, D. L., Thompson, B. H. & Truffer, B. (2013). The innovation deficit in urban water: the need for an integrated perspective on institutions, organizations, and technology. *Environmental Engineering Science* 30(8), 395–408. <http://doi.org/10.1089/ees.2012.0427>

Lebel, L., Garden, P. & Imamura, M. (2005). The politics of scale, position, and place in the governance of water resources in the Mekong region. *Ecology and Society* 10(2), 18. <http://www.jstor.org/stable/26267731>.

Lepcha, N. K. C. (2013). Problems and prospects of water resource of Kurseong municipality, Darjeeling District, West Bengal. *Science Park Research Journal* 1(19), 1–11.

Mahamuni, K. & Kulkarni, H. (2012). Groundwater resources and spring hydrogeology in South Sikkim, with Special Reference to Climate Change. In: *Climate Change in Sikkim – Patterns, Impacts and Initiatives* (M. L. Arrawatia & S. Tambe, eds). Gangtok: Information and Public Resources Department, Government of Sikkim, pp. 261–274. Retrieved from http://www.sikervis.nic.in/writereaddata/16-Chapter_Groundwater_Resources_and_Spring_Hydrogeology_in_South_Sikkim.pdf.

Mehta, L. (2006). *Water and Human Development: Capabilities, Entitlements and Power*. United Nations Development Programme.

Mehta, L., Xenos, N., Hartmann, B., Fine, B., Luks, F., Samuel, S., Robert, J., Thompson, M., Hildyard, N., Scoones, I., Millstone, E., Lankford, B., Jairath, J., Gyawali, D. & Dixit, A. (2011). Introduction. In: *The Limits to Scarcity: Contesting the Politics of Allocation*. (L. Mehta, ed.). NOIDA: Orient Blackswan Private Limited, 1–8.

Mell, I. C. & Sturzaker, J. (2014). Sustainable urban development in tightly constrained areas: a case study of Darjeeling, India. *International Journal of Urban Sustainable Development* 6(1), 65–88. <http://doi.org/10.1080/19463138.2014.883994>.

Ministry of Housing and Urban Affairs (2017). *Atal Mission for Rejuvenation and Urban Transformation – AMRUT*. Retrieved July 11, 2018, from <http://mohua.gov.in/cms/amrut.php>

Ministry of Urban Development Government of India, & Asian Development Bank. (2007). *2007 Benchmarking and Data Book of Water Utilities in India*, 104. See <http://www.adb.org/Documents/Reports/Benchmarking-Data-Book-Utilities-in-India/2007-Indian-Water-Utilities-Data-Book.pdf>.

Molden, D. J., Vaidya, R. A., Shrestha, A. B., Rasul, G. & Shrestha, M. S. (2014). Water infrastructure for The Hindu Kush Himalayas. *International Journal of Water Resources Development* 30(1), 60–77.

<http://doi.org/10.1080/07900627.2013.859044>.

Mukherjee, D. (2013). Critical analysis of challenges of Darjeeling Himalaya: water, natural resources, hazards, and the implications of climate change. *International Journal of Agriculture Innovation and Research* 2(1), 13–22.

Ohlsson, L. & Turton, A. R. (1998). *The Turning of A Screw: Social Resource Scarcity as a Bottle-Neck in Adaptation to Water Scarcity*. SOAS Occasional Paper. SOAS-KCL Water Issues Group, London.

Rasaily, D. S. (2014). *Darjeeling Pahadka Nagarpalika Kshetra ko Vikas ra Khane Paani Ko Itihaas Sanchipta ma, San. 1835–2012*. New Delhi.

Samanta, G. & Koner, K. (2016). Urban political ecology of water in Darjeeling, India. *SAWAS Journal* 5(3), 42–57. Seckler, D., Molden, D. & Barker, R. (1999). *Water Scarcity in the Twenty-First Century*.

Shah, R. (2015). *Understanding Water Availability and Accessibility Issues From a Perspective of Climate Variability and Climate Change: A Study in the Darjeeling Municipality*. Master of Science dissertation. Tata Institute of Social Sciences, Mumbai, India.

Sharma, G. (2014). GORKHALAND – Darjeeling Gorkha Hill Council (DGHC) to gorkhaland territorial administration (GTA) what next? *Asian Journal of Multidisciplinary Studies* 2(6), 44–50.

Sharma, B., Riaz, M. V., Pant, D., Adhikary, D. L., Bhatt, B. P. & Rahman, H. (2010). *Water Poverty in the Northeastern Hill Region (India): Potential Alleviation Through Multiple-Use Water Systems – Cross Learnings From Nepal Hills*. New Delhi.

Sonntag, S. K. (1999). Autonomous councils in India: contesting the liberal nation-state. *Alternatives: Global, Local, Political* 24(4), 415–434.

Srinivasan, V., Seto, K. C., Emerson, R. & Gorelick, S. M. (2013). The impact of urbanization on water vulnerability: a coupled human-environment system approach for Chennai, India. *Global Environmental Change* 23(1), 229–239. <http://doi.org/10.1016/j.gloenvcha.2012.10.002>.

Tamang, P. & Jana, S. K. (2017). Willingness to Pay for improved water services: a case of Darjeeling, India. *Asian Journal of Water, Environment and Pollution* 14(2), 51–59. <http://doi.org/10.3233/AJW-170015>.

Tambe, S., Kharel, G., Arrawatia, M. L., Kulkarni, H., Mahamuni, K. & Ganeriwala, A. K. (2012). Reviving dying springs: climate change adaptation experiments from the Sikkim Himalaya. *Mountain Research and Development* 32(1), 62–72. <http://doi.org/10.1659/MRD-JOURNAL-D-11-00079.1>.

Tiwari, P. C. & Joshi, B. (2012). *Urban Growth in Himalaya*. Mountain Research Initiative Newsletter, Berne, Switzerland.

Vaidya, R. A. (2015). Governance and management of local water storage in The Hindu Kush Himalayas. *International Journal of Water Resources Development* 31(2), 253–268. <http://doi.org/10.1080/07900627.2015.1020998>.

Wenner, M. (2015). Legitimization through patronage? Strategies for political control beyond ethno-regional

claims in Darjeeling, India. *Geoforum* 66, 234–243. <http://doi.org/10.1016/j.geoforum.2014.11.002>.

Wolfe, S. & Brooks, D. B. (2003). Water scarcity: an alternative view and its implications for policy and capacity building.

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ANNEXURE

1. Some excerpts from the stakeholder's interview

- *“For years we have assumed that there is enough water but how long is that water going to be enough? If you look at it now, the water issue has been here for the longest time but we were not able to dissect it because the hills are blessed with spring water but our pipelines are always leaking, the roads are filled with leakage and we hardly have any maintenance. The service is poor from the water department”*

- *“Water is diverted from the consumers to the hotels by bribing the revenue and maintenance departments of Water Supply department”*

- *“The shortage is because of less awareness amongst the community and people are also self-centred. Here the issue of ‘my property’ has stopped a lot of developmental work. People do not allow others pipes to be laid through their property, the pipes are routed through government property like through roads, jhoras and open drains and the damages that occur because of them are uncountable”*

- *“We should find alternative ways to conserve the water in the hills. We have been blessed with abundant water and the cleanest source of water from the hills but all sources are finite and hence, it is important to conserve and educate people about it”*

- *“I have seen water thefts countless times and tried to stop it. What can be done when the politics is played within the system?”*

- *“No, we are not able to cater to 135 LPCD but the current amount of supply is more than enough for the domestic needs of the consumers”*

Source: Authors interview with government officials

2. Narratives from FGD

- *“Everyone has water scarcity but no one talks about it. The problem is that we have solved the issue ourselves. We are lucky that there are alternative sources in our state so somehow we are able to find ways to but for how long? Is it not the duty of the government to be able to provide water to its citizens? During peak tourist seasons we have acute water scarcity*

and we buy water from commercial water trucks(Syntex-2000 litres) at the cost of 1500 rupees every dry season. The government water supply here does not last for more than an hour and the pipeline system here is complex. I have to store water near the main road in the tank(his house is located below the road) and supply it back to my house using an almost 1.5 km pipe stretching from the storage tank to the overhead tank above my house. If I don't do this, by the time the water reaches my house there will be 80% pipe loss or sometimes people tend to steal connection midway and since we do not use pumps, the force is comparatively less to those living in higher elevation. The problems and complexities of the water system are many and it is not new, it has been this way for years now”, narrates 46 year old residents of the Development area ward.

- “We get water for 40 minutes maximum and it gets less and less as the season fades to monsoon. It is the worst during monsoon. The pipelines are already in a horrible condition and the government does not do anything about it even after multiple complaints.I live on the 3rd floor across the road so the pipeline has to be passed through the footover bridge(pic 1) and by the time the water reaches my house, either the pressure is too less or the water supply time is reduced by half. We have to buy water from the nearby villages. At least 50% of the houses here buy water from the villages. Water pipes are connected to the nearby villages and a lump sum of 600-700 rs is given depending on the need/amount and the frequency of the water required by the consumer. It is an easy way, unlike the water dept who does not bother to come even after endless complaints about no water and pipe leakages. Most of the houses here are renting out commercially as well so it becomes difficult for us to get rents if we do not provide the most basic requirement”, says a 32 year old resident from Ranipool ward.

3. Gallery



