Water Security in the Darjeeling Himalaya, unravelling the seen and unseen forces.

Darjeeling Himalayan Initiative, Roshan P. Rai[1], Priyadarshinee Shrestha[2], Deependra Sunar[3], Praful Rao[4], Lakpa Tamang[5]

20th to 22nd September 2016
Venue: Sindhu Sanskriti Kendra, Leh-Ladakh, J&K

[1] DLR Prerna, rairoshan@gmail.com
[2] WWF-India, pshrestha@wwf.panda.org
[3] WWF-India, deependrasunar@gmail.com
[4] Save the Hills, savethehills@gmail.com
[5] University of Kolkata, tamanglakpa@gmail.com

Abstract

Water crises are spreading across the length of South Asia at an alarming rate, and some of the pockets of stress include unexpected locations such as Darjeeling, West Bengal, India where rainfall is plentiful. Darjeeling Himalaya receive a high amount of rainfall, primarily during the monsoon months and range from annual averages of 4000-5000 mm in the southern slopes to 2000-2500 mm in the leeward side. This rainfall pattern coupled with a high forest cover 38.23% of the total district land area (State of Forest report 2010-11) makes water stress right across the landscape an ironical phenomenon. To make explicit the stress, the per day urban water deficits are 13,32,500 gallons in Darjeeling; 5,02,750 gallons in Kurseong town and 3,00,000 gallons in Kalimpong.(Municipality Reports).

This paper attempts to critically analyse water stress citing rural and urban cases as means of unravelling the complexity of the issue.

Upper Lanku, rural Darjeeling depend on three main springs for their water. Anecdotal narratives express that all three springs have shown a declining trend in its discharge over the past 10 – 15 years. WWF-India conducted a study in 2013-14 and found that the major recharge zone lies under the jurisdiction of the Forest Department and has yet to grant permission for recharge interventions.

Darjeeling Municipality established in 1850 has a centralised water management infrastructure laid down between1910–30. The system originates in Senchel Wildlife Sanctuary, located 15 kilometres upstream of Darjeeling with two lakes and a storage of 33 million gallons of water that is recharged by 26 springs. This centralised system fails to acknowledge the vibrant 90 odd natural springs in the town that people are dependent upon. These urban springs have diverse community based management systems that have evolved over time and are now facing challenges of rapid urbanisation, market forces, upstream concretisation and contamination and reducing discharges.

Kalimpong Municipality in 2016 woke up to drilling of groundwater dividing the town sharply between for and against groups. The drilling brought about a host of issues of policy gaps,

downstream and intergenerational equity, ownership and access as well as what is sustainable water management in an urban mountainscape.

These cases will be used to critically analyse gaps in National Water Policy 2012, Wetland Conservation Rules 2010, Groundwater extraction rules with a mountain lens and propose recommendations.

Key Words: water crisis, Darjeeling Himalaya, springs, aquifers, recharge, water security, governance, equity

Darjeeling and its 'water crisis'

The National Water Policy 2012 points to "Large parts of India have already become water stressed where issues related to water governance have not been addressed adequately. There is wide temporal and spatial variation in availability of water'. Darjeeling Himalaya elucidates this scenario of water stress and availability in all its complexity.

Darjeeling Himalaya, West Bengal, India is rich with water coming from plentiful rains in the monsoon and snow fed rivers passing the land. Yet, in this water rich region there is 'water crisis' as seen in the Darjeeling, Kalimpong and Kurseong Municipality reports. This situation extends to large sections of rural communities too but goes under-reported. In the context of growing water insecurity in the South Asian region it is important to look into the ironical situation of water crisis in a water rich region of the Darjeeling Himalaya, decipher the complexity, for sustainable use of water.

We intend to look into this crisis and ask if it is a natural or a created phenomenon. The flows of water are complex and in many instances, issues of water security are a result of power relationships and placement in the landscape. It is also a reflection of management visions and ideologies that bring about key questions of equity, access and inclusion. In a rapidly urbanizing Darjeeling Himalaya, the rural urban divide along the lines of water as well as marketisation are key debates to be looked into for inter and intra generation water equity and water as a right. Increasingly water discourse is not just about water that can be seen above the ground but also about the unseen water in the aquifers below the ground. The fluidity of

water, what is beneath the ground, also pushes the ideas of ownership, governance and management of water beyond the traditional departmental silos. In the Indian context even though the Himalaya is constantly portrayed as the water towers, yet, for the people living the Himalaya, water policies are not always contextualized or pertinent to mountain needs.

The paper revolves around three narratives through the involvement of members of the Darjeeling Himalayan Initiative, namely DLR Prerna, WWF-India and Save the Hills to highlight the seen and unseen forces of water within two urban and one rural context. This will enable to put a human face to the complex water flows and analyse the 'crisis' locally as well ask critical questions for policies and practices for sustainable water use in the Himalaya.

Locating Darjeeling

Geography

Darjeeling District(26.02 - 27. 13 N and 87.59 - 88.53 E; Area: 3,263 km2; Elevation: 92 m – 3539 m) occupies 3.68 % of the total area of West Bengal (Pradhan and Bhujel 2000). It is the only hill District and has three hill subdivisions (Darjeeling, Kurseong and Kalimpong) and Siliguri in the foothills and plains. Darjeeling is part of a transboundary landscape adjoining Nepal in the west, Bhutan in the east, Sikkim in the north. Darjeeling's topography contain both the *terai*, lowland foothills, and the mountains. Darjeeling belongs to the Lower or the outer Himalaya with long ranges generally running north to the south and consist of a mass of mountainous spurs and ridges.

Transboundary biodiverse landscape

Darjeeling is part of the Eastern Himalaya, globally important for its biodiversity, and coupled with the geo-political situation, the region is described as a critical transboundary Kanchenjunga (highest peak in India) Landscape. The Eastern Himalaya has been included among Earth's biodiversity hotspots (Myers *et al*. 2000). The Himalaya is geologically young (Xu 1993), its richness in biodiversity has many factors including its location at the juncture of two continental plates placing it in an ecotone represented by flora and fauna from both. There is considerable climatic variability associated with the topography and vast reach of the mountains. The moisture-laden monsoon winds bring a deluge of rains in the eastern extent of the mountain range, which bears the brunt of the wind resulting it to be more biodiverse. (WWF and ICIMOD 2001). The southern slopes of the ridges get much higher (4000-5000 mm) precipitation than the leeward sides (2000-2500 mm).

Gorkhaland and the demand for statehood

While describing Darjeeling, it is important to highlight the long standing demand for Gorkhaland as a separate state from West Bengal within India by the people of Darjeeling. The demand is one of a regionally marginalized mountain community that is socio-ecologically completely different from the rest of Bengal and whose identity is not acknowledged at the national level. In recent times the demand has led to autonomy experiments of the Darjeeling Gorkha Hill Council(DGHC) in 1988 and the Gorkhaland Territorial Administration(GTA) of 2011. This political history narrative is important as

there are various elements of the Integrated Mountain Initiative vision being played out in the microcosm of the Darjeeling Himalaya. There are issues of regional marginalization, politics of identity, exclusion and implementation gaps, flow of goods and services downhill without reinvestment flowing uphill and as simple as lack of understanding or an attempt to understand the Darjeeling socio-ecology. This scenario is played out by water too where water plays many roles: basis of life, element of power relationships, ownership, equity, conflicts, disasters, religious beliefs and policy gaps.

Water in the Darjeeling Himalaya

The most visible water systems in the Darjeeling Himalaya are the innumerable streams and rivers that flow through the landscape, most of which are perennial, finding their origins in glaciers or snowmelt and groundwater recharged by rainfall. Of them River Teesta is the mightiest, originating in the Teesta Khangshe glacier in North Sikkim, and joined by countless tributary streams as it drains the Sikkim Darjeeling Himalaya and flows downstream. River Rangit originating in West Sikkim from the Rathong Glacier with smaller rivers Rammam and Little Rangit originating from Singhalila range in Darjeeling hills joining it, is the major tributary of Teesta. In the sub Himalayan Darjeeling, the Teesta is joined by tributaries such as Leesh, Geesh, Chel, and Neora among countless others further adding to its might. The river finally joins Brahmaputra in Bangladesh after travelling 315 km long distance from its source. The transboundary basin of the Teesta River encompasses 12,159 square kilometers, of which 10,155 km^2 are in India and 2,004 km^2 are in Bangladesh.

Innumerable smaller rivulets and streams, locally known as *kholas* define the waterscape of Darjeeling. These *kholas* are celebrated in religious beliefs, folk tales and find place in songs of almost all communities that reside in these areas. They are one of the main sources of water for drinking as well as for agriculture.

At a micro level people have strong connections with water on a daily basis through the many springs that dot the mountain landscape. Springs or *Dhara(s)* are the points in which groundwater come into contact with the surface. Springs are discharge points of groundwater and are crucial water resource supplying the immediate need of drinking water in mountains and a key element of human life and well-being. Groundwater flowing in the form of mountain springs, ensure water security to a sizeable chunk of both rural and urban population. Depending on various geohydrological elements, springs can be perennial or seasonal. 'Irrigation practices in the higher altitude are also mostly banking on springs or initial order streams, fed by the springs' (Central Ground Water Board report, 2014). These springs are fed by groundwater and are largely recharged by rainwater infiltration. The Himalayan region is blessed with adequate rainfall, but an overwhelmingly high proportion of the same is restricted to the monsoon season and adequate groundwater recharge is hampered by high levels of surface runoff (Tambe et al, 2013). The springs also have a strong cultural connections of *choko pani*: sacred, clean and pure water which includes traditional conservation practices.(Lama and Rai forthcoming)

Much of the debate and discussion with regard to water in this mountain region has primarily revolved around what is seen above the surface, with

very little attempts made to understand what lies beneath. Beyond this visible realm of surface water, lie the groundwater aquifers that are not seen, and most often ignored. The groundwater situation has not been studied in-depth, and in the context of Darjeeling, yet to be brought into the foreground of the water discussions. It is critical that these unseen aquifers are brought into the discourses around water for multiple reasons including sustainable use and climate proofing. 'In the present situation of growing population and also due to climatic aberration, availability of groundwater in springs and streams in mountainous terrains is becoming scarce day by day. This has warranted the necessity of deciphering groundwater from further deeper sources as also to make the spring and lower order stream sources adequate and perennial adopting various scientific measures so that sustainable water supply may be continued.' (Central Ground Water Board 2014).

Darjeeling Himalaya defined by the monsoon and a water rich land yet with 'water crisis' needs to be deconstructed at various levels to get a finer nuanced understanding of the crisis. This deconstruction is attempted through three case studies that will portray the complexity of the issue to delineate possible solutions.

Darjeeling Municipality: Centralised and decentralised.

Darjeeling Municipality is touted as one of the oldest municipalities in India being established in 1850. The municipality in 2011 had a population of 120000 living in 13.81 sq km. Darjeeling is located at an average elevation of 6,982 ft (2,128 m). The annual total rainfall in Darjeeling town fluctuates between 1870-3690 mm.

The water supply system of Darjeeling town consists of tapping of 26 springs from the Senchal Wildlife Sanctuary located about 15 km away from the main town. The water from the springs are collected and fed to twin Senchal lakes, inaugurated by the Hon'ble Lady Jackson in 28 February 1932. The combined capacity of the two lakes are 33 million gallons (north 20 million and south 13 million gallons). This water is distributed through a combination of pipes and tanks across the town. The existing water supply installations were meant for a population of about 15000 (fifteen thousand) during the year 1910-1915. A number of water supply installations, like Khangkhola Station, Rambi water line, Sindhap Lake (capacity 15 million gallons), Bokshi Jhora and Bangla Khola were added to augment the water supply. But this could not cope up with the rapid rise of population of the town and the 'water crisis' especially in the dry period (December to May) has remained a constant feature for the last two decades or so. The crisis during the last few years or so has worsened due to the drastic fall in the volume of water discharged in the natural springs of catchment area. The water deficit in Darjeeling can be as high as 13,32,500 gallons per day. This crisis is further compounded by the massive influx of tourists, students and migrant workers to the town. Part of the reason for the 'water crisis' is that almost 95 % of the system of about 35 km of transmission main and 83 km of distribution main (excluding service lines and public hydrants) pipelines and valves were laid at the time of introducing water supply through pipeline in Darjeeling town with patch work repairs. (Darjeeling Water Works Department report 2012).

'According to a water engineer at the Waterworks Department interviewed in early 2014, the loss of water in transmission from Senchel lakes to the

township is around 30–35 per cent of the water supplied. The employee commented that *about as much* again could be lost within the distribution main. This means that another 30–35 per cent of the water supply could be lost after a mere 65–70 per cent of the town's water capacity reaches the distribution centre'.(Drew and Rai 2016). The crisis has meant a spin off a lucrative private water trade of over 120 tankers, hand pushed carts, water carriers and private pipe lines from different water sources.

Water crisis goes hand in hand when one talks about Darjeeling town and within it is the dysfunctional Senchel system that dominates all conversations around water in Darjeeling. Improvement interventions revolve around augmenting, repairing, adding a new lake or augmentation through the Balason River Project of recent times. This debate over Senchel when examined closely is a debate from the perspective of the water haves and the water privileged.

The stories of a large portion of the community who depend on myriad springs dotting across the town are never discussed or entertained. Access to municipal water as a right is never talked of, as many of these communities who solely depend on the springs for their water and have no municipal lines. 32 springs were counted (Boer 2011) that were accessed and managed by communities. A more indepth study of the springs of Darjeeling Town has expanded this count of 32 springs to over 90 springs (personal communications with Lakpa Tamang 2016). The access and management systems of these springs are diverse ranging from oral, well documented, within members only, open to all and individually managed. These springs can be seen in the heart of Darjeeling Town like the *Lal Dhiki* and *Giri Dhara* to the

outskirts of town like *Bhotay Dhara, Mull Dara Dhara*. They are mostly managed by *Gaon Samaj* or village, community based organisations. These *Gaon Samaj* are based on geographical membership and provide welfare services in times of births, deaths and marriages as well as conflict resolution to its members. Within the geographies of the *Gaon Samaj* that have springs, they have included its management within their ambit. These *Gaon Samaj* are providing a critical service to the community and in many cases manage and distribute water where municipal water do not reach and are an everyday example of decentralised and efficient management systems. But, they are challenged in the fact that their intervention is limited to their *Gaon Samaj* boundaries.

Within the Darjeeling Municipality context, it is evident that a large percentage of people are not connected to the municipality water grid and depend on local springs partially or completely for their water requirements. It is fascinating how an age old local self-governance institution, Darjeeling Municipality, does not include these urban springs in the water discourse and policy. Responses to the water 'crisis' is always a centralised extractive solution of bringing water from outside the town limits to augment the network of tanks and pipes. This seems to be a colonial hangover of a centralised management outlook of accessing water from outside the urban built environment failing to acknowledge the pool of water below the town that emerges through these myriad springs that provide water to the many outside of this pipe distribution. This centralised system of water extraction also fails to acknowledge equity issues of water as urban needs are prioritized high on the pyramid of water needs over rural communities. Thus Darjeeling

demands its rights over the water from a distance of 15 km and terms the needs of communities like Rungbool directly below the Senchel Lakes to be 'illegally tapping'. This scenario of urban spaces rights over water from a distant source even over and above the people next to the source is continuously played by the municipalities in Darjeeling as well as many other urban spaces in India. This centralised system of water management from a distant source does not see the many decentralised sources like the 90 odd springs of Darjeeling. Since it fails to see these numerous springs in Darjeeling as water being discharged in different points from underground aquifers, it lacks the vision and understanding of conservation and recharge of these springs. Within the Darjeeling Municipality context there has not been a proper hydrological study of the aquifers and the possible recharge zones which results in a lack of management and conservation plan of the springs.

Hyrdological studies should be key to the development of the town and since there has not been a proper study, the development of the built environment does not take into consideration of the impacts they cause to spring discharge. Just through the process of concretisation, recharge has dramatically reduced resulting in reducing flows. Most springs have anecdotes where 20 years ago a 20 litre vessel would fill in 5 minutes and now it takes 15 minutes and this gets compounded by the fact that the waiting line has grown longer in springs (Drew and DLR Prerna community conversations 2016). The rapid and random construction has also meant landslides and destruction of springs which makes life extremely difficult if the community is solely dependent on that spring for water. Thus a hydrological study would indicate critical zones of recharge too where built environment is just not acceptable.

It is also not just a question of a conservation plan but converging a decentralised approach to the existing Senchel would also enable support to communities to manage the flows of their springs better whether it be better storage systems or reducing contamination impacts. It must be noted that in Darjeeling, waterways are also carriers of waste, and with increasing waste these springs are critically threatened with contamination.

The combination of centralised and decentralised management systems, a convergence of colonial and traditional would be the way to move forward towards water security in Darjeeling Municipality. Recognition of the community managed springs are critical with growing crisis and marketisation of water which results in short term water extraction projects like the next case in Kalimpong.

Drilling for solutions in Kalimpong

The article 'Concerns spring from borewells' (The Telegraph, June 3, 2016) brought to the forefront the delicate issue of digging borewells in Kalimpong for groundwater extraction. With the first privately commissioned borewell extracting almost 6000 liters of water per day, the technique seemed the ideal solution for this water scarce town that had been battling severe water crises for decades. 10 more borewells were proposed by the Gorkhaland Territorial Administration backed by a feasibility study conducted by a world renowned hydrogeologist to address the 'water crisis' of the town. This was met with resistance by environmentalists on the grounds of sustainability and equity of such a venture, with demands for proper studies to be conducted. The District Administration swung into action and the State Water Investigation

Department (SWID) concluded that the borewells had been dug without permission as mandated by the West Bengal Groundwater Resources (Management, Control and Regulation) Act, 2005 further adding that for extraction of water beyond 50 cubic meters, permission had to be sought from the State Level Ground Water Resources Development Agency. Going beyond, raising the lapses in administrative technicality of the boring, SWID also mentioned that impacts of digging borewells 'on a young mountain like the Himalayas' would be an important factor to consider. Following this, the Kalimpong Municipality suspended the drilling until a scientific study of the area was conducted.

Kalimpong is an important town in the Darjeeling Himalaya with a population size of 49,403 (Census 2011) and spread over 23 wards in 3.5 sq km. The town centre is located on a ridge connecting two hills, Delo and Durpin at an elevation of 1247m and 1704m. The River Teesta flows in the valley below separating Kalimpong from the state of Sikkim. The town is a major hub for the agricultural communities of the sub-division and used to be the gateway to Tibet. The town is different from Darjeeling in that in all directions the town merges seamlessly with agricultural communities.

A report by Kalimpong Sangrachan Samity and Gorkha Dukha Niwarak Samelan, 2012 states that water has been supplied to Kalimpong through a system from the British times. The inadequacy of water supply necessitated the Neora Khola water project. The report suggests that the water crisis is a management issue and not due to lack of water. 'Kalimpong requires about 10 lakh gallons of water every day and half of the need is met by the Neora Khola scheme. About 7,500 households receive water for about 30 minutes every

second or third day, depending on the availability of water and the rest depend on natural springs and streams to meet their water needs.'(The Telegraph 29 September 2015). This situation means that the town has a water deficit of 3,00,000 gallons per day.

In this scenario of water deficit, boring of wells especially when the first one at the top of the hill gives 6000 liters of water per day becomes a very tempting venture which appears to solve the problem immediately. Yet, one cannot overlook the other voices 'A proper survey needs to conducted before the mountains are drilled. The impact of drilling the fragile mountains needs to be studied, the type of aquifers beneath the surface needs to be understood, the quality of water needs to be tested and the amount of water that can be extracted needs to be carefully analysed before such an adventure can be allowed.' challenged Wing Commander Praful Rao, Save the Hills and veted by Dr. R. K. Bhandari, renowned, Landslide and Disaster expert. This is a highly polite response to the drilling and needs reading between the lines. 'Proper survey needs to be conducted' questions the authenticity of the feasibility report conducted by the world renowned hydrogeologist. With the lead taken by Save the Hills, the feasibility report was requested by a number of organisations including DLR Prerna, yet the document is not public and seen the light of day.

Requesting a study on the impacts of drilling and the aquifers beneath is a tall order when the region is data insufficient and the Ground water scenario of Himalayan Region, 2014 says 'Hydrogeological data has been generated through short-term water supply investigations carried out

for Defence establishments, Railways and Tea gardens in the Darjeeling district of West Bengal', this leaves out most parts of Darjeeling. The same report continues to say 'The yield of a few such springs ceased while the groundwater was intercepted by a bore well at Namchi area, South Sikkim. To avoid such a situation, it is essential that a thorough survey of the geological structures and human settlements down below along the dip direction of fractures is undertaken before selecting sites for the boreholes.' The Namchi statement is critical, considering the report appears to have been written with a rationale of finding out how much water there is beneath us for extraction. It does point out the fact that downstream needs to be considered and the downstream is not just of the visible water but the invisible water of the aquifers and groundwater extraction could mean drinking into the water of others as well as the coming generations.

In case of the Kalimpong borewells, while a feasibility study had been conducted with the involvement of a hydrogeologist, the same was not available in the public domain despite repeated requests from many different organisations. Decisions around water, a public good cannot be taken based upon by a feasibility report that is not open and transparent. The notions of inter, intra generational, geographical placement equity and carrying capacity has to be taken into account.

Water crisis is not just an urban phenomenon in Darjeeling but this complexity is being experienced increasingly in rural Darjeeling. The next case elaborates the complexity in addressing the issue.

Rejuvenation of springs in Upper Lanku: Beyond the feasibility report

Upper Lanku is located in the District of Darjeeling under Gram Panchayat Unit Sittong III of Kurseong Block. The village lies very close to the NH31A above the River Teesta and the forests surrounding the village are under Kurseong Forest Division and are contiguous with Mahananda Wildlife Sanctuary. Siliguri is the nearest town for the villagers. Upper Lanku has a population of around 450. Agriculture is the main source of livelihood for most of the village, with a small population engaged as labourers and in Government service as well. The main crops of the village are maize, millet, soya, ginger and broom grass. The main cash crops are Darjeeling Mandarin (*Citrus* sp) and broomgrass (*Thysanolaena maxima*). Darjeeling Mandarin production over the years has gone down and villagers' anecdotes reveal a shifting of the crops to higher elevation. Agriculture as in the hilly areas is mostly rain fed, and largely also dependent on springs. Livestock is reared by all households as an additional source of income with average 5-6 livestock per household.

The community of Upper Lanku depends on three springs, *Saroj Dhara, Birsing* and *Gokul Dhara* for their water. They are located on the same hill side, almost along a same fracture coming down from top of hill. Saroj Dhara is first one in the series of springs followed by Birsing Dhara at 743 m followed by Gokul Dhara at 724 m. Around 200 households are dependent on these springs for drinking water for people and livestock, as well as for crop irrigation. Community narratives talk about how all three springs in the village have shown a declining trend in its discharge over the past 10 – 15 and the reason for the decline is mainly perceived by communities as

deforestation in the catchment areas of the spring. All three springs show more decline in discharge during the winter months of November – March during which time the villagers face serious of water scarcity.

WWF-India worked with Lanku Valley Biodiversity Conservation Committee and proposed to increase the discharge of two springs through groundwater recharge by reducing surface runoff thereby resulting in overall landscape level improvement in water availability in the springs as well as streams in lean seasons. The expertise was provided by the trained resource persons from Rural Management and Development Department, Government of Sikkim. The resource team key in the springshed programme implemented by the state of Sikkim very successfully under the Dhara Vikas programme. Within 5 years it has shown encouraging results by increased discharge of most springs under intervention. This programme was mainly targeted in the drought prone areas of the state in South and West Sikkim, and so far more than hundred springs has been brought under intervention. (www.sikkimsprings.org)

A detailed study was conducted after communities identifying the springs. They were further tracked using Global Positioning System (GPS) reading of the spring source. This data was detailed with land tenure, spring discharge, trends of lean period discharge over the last decade, and number of households dependent on the spring. To understand the springs' basic characteristics, the geology of the area was studied and observed which lead to the identification of the recharge area of the springs. It was concluded from the study the major chunk of the recharge area fell inside the forest land which fell under Kurseong Forest Division. A feasibility report was prepared

in 2013 and community capacity enhancement programmes were undertaken as part of the plan which also included physical land use changes and vegetative options in the recharge zones. A letter asking for a permission to work in the forest department area was submitted to the Forest Department on February 2015 with the feasibility report. Personal meetings with the department were also scheduled, but permission has not been granted even after the assurance that no permanent structures will be built.

The Upper Lanku narrative throws a number of critical issues of governance and convergence when it comes to groundwater management in the Darjeeling Himalaya. Darjeeling has 1204 sq km recorded forest land amounting to 38.23% of the total district land area when the state average is 13.38 recorded forest land. (State of Forest Report 2010 – 2011). It has four designated Protected Areas, Senchel Wildlife Sanctuary, Singhalila National Park, Neora Valley National Park and the Mahananda Wildlife Sanctuary - all catchment sources for important rivers, streams and natural springs. Darjeeling town's centralised water system originates in Senchel with large constructions, yet in the case of Upper Lanku, recharge interventions could not be taken forward yet. There is a clear demarcation of mandates between various departments and in this case, the forest department has not been able to expand its mandate to include artificial recharge even when the identified recharge is outside of protected areas and is degraded. In today's understanding of ecosystem services there is a need to review mandates of departments with land tenure to include enabling interventions of recharge in the Darjeeling Himalaya.

Towards water Security in the Darjeeling Himalaya and beyond

The three narratives clearly highlight the importance of springs in the Darjeeling Himalaya, an issue that finds resonance in the Central Ground Water Board report, 2014 in the context of the entire Himalaya. The challenges and issues of the three narratives may appear different in terms of their management regime, ownership of underground water to ownership of recharge zone yet the common thread of groundwater aquifers binds them all together.

The National Water Policy, 2012 progressively highlights, 'environmental needs of the Himalayan regions need to be recognized and taken into consideration while planning'. It also narrates the 'need to document groundwater, strengthen institutional mechanism for its management, climate change adaptation and the use of a holistic and integrated approach'. Even though recognising that the policy is generic for the entire country, it is predominantly downstream and river basin focussed failing to include mountain specific issues to the extent that is required.

While there are many references to aquifers and streams in the document, there is no mention specifically of springs, which as the Darjeeling case studies have highlighted are of utmost importance. This lack of specificity carries with it the danger that all the good indicative measures outlined by the policy might be interpreted to exclude springs altogether, and thereby the mountain people who depend on these springs.

This lack of inclusion is reflected also at the local level within the water scenario of Darjeeling and Kalimpong, where urban springs are altogether ignored. These are still perceived as rural water sources even when a large portion of the town depend on them. In the case of Darjeeling, even the centralised water system of the Municipality directly collects water from springs and acknowledges it, yet fails to see the 90 odd urban springs within the town itself. This highlights the existence of a tunnel vision of extracting water from a distant exists when it comes to urban water in the mountains and brings into question equity and resilience of the system.

An integrated management system drawing from centralised and decentralised approaches are critical for water security in the mountains. The Wetlands Conservation and Management Rules 2010 and the Conservation of Wetlands in India: A Profile 2007 are good indications for possible inclusion of urban springs in policies. The 2010 Rules mention conservation plans that include the built environment plans, and the 2007 Profile even goes in-depth for the need to conserve urban wetlands for water security. Thus acknowledging urban springs in the lines of the 2010 Rules and 2007 Profile would enable the conservation of urban springs and the delineation of critical zones of recharge and inclusions of built environment rules. This would be key for urban water security as well as regional water equity of the mountains. Taking this conclusion further there is clearly a need for further refinement of policies of individual water extraction through deep boring within the context of the mountain landscape.

The need for an integrated approach within the seen and unseen nature of water cannot be highlighted better than by the case of Lanku. Here is a

community committed to undertake water conservation initiative supported by competent resources, yet, stuck due to issues of land tenure and limited departmental mandates. Considering the high number of anecdotes of reducing spring discharge coupled with the fact that in Darjeeling, most of the recharge zones would lie within forest areas, this debate of land tenure is of crucial proportions. The National Water Policy 2012 states, 'There is a need to remove the large disparity between stipulations for water supply in urban areas and in rural areas', and if Darjeeling town can have their centralised water from within Senchel Wildlife Sanctuary, why should there be restrictions for the village of Lanku to recharge their dying spring? This narrative is also a reflection of any case which has its recharge zone lying outside of its jurisdiction which is usually the case for most springs. Even for Darjeeling town, where the layperson perspective of recharge zones, lie in cantonment, temple, Governor's House and the zoo areas, none of whom have a water recharge or conservation mandate.

In the Darjeeling Himalaya, the need for rejuvenation of springs for ensuring water security and as an effective climate change adaptation measure is irrefutable. This cannot happen till departmental mandates are expanded to converge and to take on holistic and integrated roles. The fluidity of water, and the spaces it occupies both above and underground flowing beyond borders have to be acknowledged with responsibility that reflects governance and management of water beyond traditional departmental silos.

There is a definite need for a water policy with a mountain lens that includes the diversity of springs that communities depend upon. This policy needs to actively imbibe equity and social justice at all levels. The existing large data

gap on aquifers that support these spring discharges needs acknowledgement followed by adequate measures put in place to bridge the gap. In the context of rapid urbanisation and climate change, long term strategies for recharge and rejuvenation of springs is critical for water security in the Indian Himalaya. For this to happen a mutli-sectoral and interdisciplinary discourse needs to be further promoted that seeks to address the seen and unseen forces of water.

References:

· Boer, L. 2011. The perennial springs of Darjeeling, a survey to community based conservation. Internship Report. ATREE, Darjeeling.

· Georgina Drew & Roshan P. Rai 2016. Water Management in Post-colonial Darjeeling: The Promise and Limits of Decentralised Resource Provision, Asian Studies Review, 40:3, 321-339, DOI: 10.1080/10357823.2016.1192580

· Government of India, Ministry of Environment and Forests, 2010. The Wetlands Conservation and Management Rules 2010

· Government of India, Ministry of Environment and Forests, 2010. The Conservation of Wetlands in India: A Profile 2007

· Government of India, Ministry of Water Resources, 2014. Ground Water Scenario of Himalayan Region of India

· Government of India, Ministry of Water Resources, 2011. National Water Policy 2012. Government of India.

· Government of West Bengal, Directorate of Forests. State of Forest Report 2010 - 2011

· Government of West Bengal, 2005. The West Bengal, Ground Water Resources(Management, Control and Regulation) Act, 2005

· Kalimpong Sanrakshan Samiti and Gorkha Dukha Niwarak Samelan, 16 May 2012, Report on the fact finding visit to the water sources of Kalimpong town.

· Mahendra P. Lama and Roshan P. Rai(forthcoming). *Chokho Pani*: An Interface Between Religion and Environment in Darjeeling, *Case Study*

· Myers, N., R. A. Mittermier, C. G. Mittermier, G. A. B. da Fonseca, and J. Kent. 2000. "Biodiversity Hotspots for Conservation Priorities." *Nature* 403:853–858

· Sharma, E; Chettri, N; Tse-ring, K; Shrestha, AB; Fang Jing; Mool, P; Eriksson, M, 2009. Climate change impacts and vulnerability in the Eastern Himalayas. Kathmandu: ICIMOD

· Tambe S, Pem Norbu Sherpa, Nima Tashi Bhutia, M. L. Arrawatia, Sarika Pradhan, and D. R. Nepal, 2013. Enhancing the Hydrological Contribution of Mountain Ecosystems: Environmental Change Adaptation Experiments from the Sikkim Himalaya. Success Stories in Mountain Ecosystem Management, Mountain Ecology Division SAARC Forestry Centre, Thimphu, Bhutan

· WWF-India, 2013. Rejuvenation of springs in Upper Lanku, A feasibility report

· Chettri, V and Ravidass R, 6 June 2016, "Concerns spring from borewells" The Telegraph

· Ravidass R, 29 September 2015, "Kalimpong water hope" The Telegraph