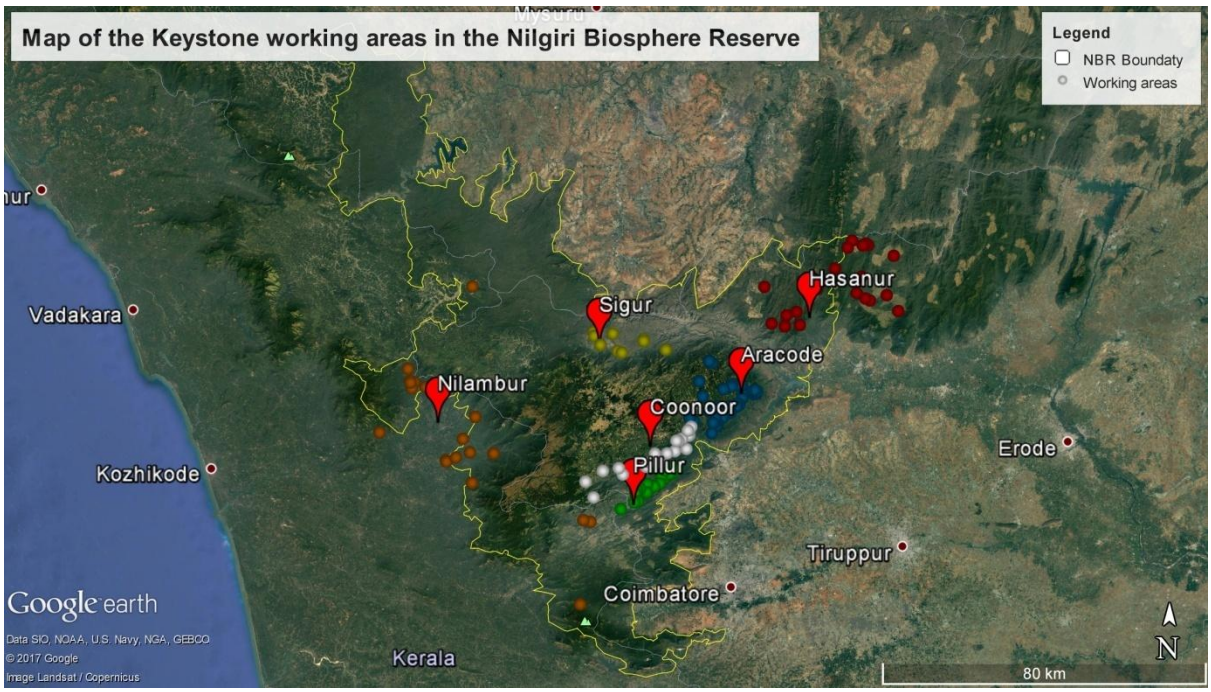
Description of Keystone's working Areas

Keystone works in tribal pockets in Aracode, Kotagiri, Sigur, Pillur, Coonoor, Nilambur, Hasanur and Punanjanur spread across the Nilgiri Biosphere Reserve. However, the work on Water resources has focused on urban and other rural areas in the Nilgiris District. Coonoor town and the surrounding five panchayats were studied for the past seven years by taking Coonoor river basin as a Watershed. The Payment for Ecosystem Services assessment focussed on the important water sources tapped by the Coonoor municipality. Four major water sources were prioritised and the catchment, land use dynamics and Hydrogeological aspects were studied in detail. ACWADAM team comprising of Aditya Dabhole and Imtitula helped us map and understand the Hydrogeological aspects of these four water sources.

During the past two years, Keystone has expanded the Springs and Water work to tribal pockets across NBR. This was to leverage the ongoing interventions of Keystone in these areas and to demonstrate a diversity of approaches in varied settings. During the last two years, the work in Nilambur, Punanjanur and Sathyamangalam could not progress satisfactorily. Therefore the focus in this note is on the areas of Aracode, Sigur, Pillur and Tribal and Non tribal areas of Coonoor and Kotagiri. Springs, Wetlands, Open Wells, Bore wells and Streams were inventoried and some are being monitored right now. As we move on to diverse landscapes and geological set ups, we have made an effort to understand the dynamics and diversity of communities, forests, land & livelihoods and hydrogeology of these.



Aracode

Aracode region has various village panchayats in Kotagiri taluk and geographically falls in the eastern slopes of the Nilgiris. The panchayat has a mix of tribal communities like Irulas and Kurumbas and other communities in the upper ridges. The primary occupation is millet based agriculture and coffee plantations with other seasonal allied crops like pepper and silk cotton. People have started to work as wage labourers in nearby private estates due to increasing Human Wildlife conflicts and monsoon failure adding to drying up of Water resources which have made agriculture a hard and tedious job.

The topography of the area has hillocks and steep slopes. The major land categories are Shola forests, Tea and Coffee plantations, Farm lands and Fallow lands that are infested with invasives like lantana and parthenium. The region is now attracting people from cities to buy lands as the area is remote and also the land prices are cheap compared to the upper plateau and closer to the towns like Kotagiri.

Water

The major water sources in the area are Springs, Wetlands, Streams and Wells. Due to the drought situation in the District the main water sources are drying up, Bore wells are being promoted now due to decrease in the ground water level in the shallow unconfined aquifer. The area falls under the rain shadow region and the average rainfall is much less compared to Kotagiri which has an annual average of around 1600mm.

The springs are mostly a combination of depression and contact type. The weathered layer is thin and springs originate in closer proximities. The springs as described by the people are mostly perennial. These perennial sources are fed by either wetlands and forested catchments upstream or a fractured rock. However in the past two years, these perennial sources have also gone dry due to drought situation and the peoples' perception towards perceiving and relying on them as perennial sources have changed.

Accessibility and Reliability is an issue as the sources are mostly distant from the village locations added with Wildlife traffic in the sources especially during the summer season. People have given up on agriculture due to the scarcity of Water and Wildlife moving in in the recent past. These agricultural lands are now covered with invasives and exotics which have a negative impact on the soil and water in the region. Promoting coffee and other agro-forestry model is being tried out through NABARD and other projects combined with the Springs work to achieve maximum benefit.

Geology

The region forms the eastern boundary of the Nilgiris, with major rock outcrops on the ridge followed by weathered material with highly steep valleys. The major rock type is Charnockite and banded gneiss overlaid by weathered Charnokite and Lateritic soil. The rocks are mostly seen with North to South trending fractures. The springs and streams flow southward and joins the drainage system (SSW-NNE) to flow in the eastern direction towards Bhavani reservoir.

Working towards Water Security

We have also understood that there are multiple sources of water for each village used for their drinking and other domestic purposes. In major cases the supply system set up by the panchayat has gone obsolete and needs a replacement or needs some investment for operation and maintenance. We have documented repeated complaints of motor failure or wires burnt in the pump rooms which go unattended for months or sometimes years together. Under such situations the community is forced to walk uphill or downhill to reach the source and head load water back to the village which is long distance with added risk of elephants, bison and bear in the closer proximity. The wildlife also damages the pipeline systems which bring water to the village. This leads to leakage and wastage of water and leaves the village GLR dry until the damage is fixed. The damage of pipelines are mostly inside the forests, and the villagers who go around grazing their goats and cattle are the ones who fix it with temporary solutions like tying a cloth or rubber tubing to arrest the leak to as little as they can.

There are women's groups who are proactive about water conservation and have shown more interest in managing their resources from contamination and deterioration. The youth groups have also taken efforts in setting up systems like systematic times for water access from the centralised supply points. The groups have also taken initiative to fix the damages and leakages in pipelines running all the way from source up till the storage tank to secure water for their village. Catchment protection has also been major focus with the capacities of these community institutions being developed along with educating village communities on springshed & watershed management and restoration.

One of the private estates in the region has been pumping water from a well which is village drinking water source. While the village runs the pump for one hour only, the private estate was found pumping the water for a longer period. The private estate has set up a resort in their land close to one of the tribal villages and has been using the water for their guest rooms. The estate has also been using the water to irrigate their crops like chow chow that are water intensive. Some villagers dependent on the estate for their livelihood have a lesser voice and are marginalised in terms of equity to water. There were instances where the tourists who were at the private resort have jumped into the drinking water well and have bathed in it using soap. The villagers were quite agitated by this behaviour of the tourists and have asked the estate to clean up the well.

In a series of these events, the private estate and resort had dug a new well a few metres above the drinking water well for pumping water into their estate and guest house. The aquifer for both these wells are the same and pumping in the new well would affect the water level in the old drinking water well. When we had a chance to visit the District collector to present our work on water, we briefly updated her about such situations in different tribal villages. With the District administration looking into the problem, the new well was asked to shut down keeping in mind the drinking water source of the community is close by.

Kotagiri

The Kotagiri area falls under the Kotagiri Taluk and the villages are scattered across the South Eastern slopes falling under various panchayats. The villages are highly remote and have no access by road sometimes. The area that Keystone works in has only tribal communities like Kurumbas and Irulas. Even though there are a few Kota and Toda communities in the upper catchment, the other two tribes seem to dominate in terms of presence in the area. The main occupation used to be millet cultivation and NTFP collection. There are also coffee plantations along with pepper which gives an alternative income to the community. These tribal habitations dotted in lower forest ranges are completely surrounded by tea and coffee estates in which most of the tribal people work as wage labourers.

The topography of the area changes from gradual slopes to steep slopes with dense forests running towards the Mettupalayam range. The area is on both sides of the Maamaram river that flows towards the Kallar river and Mettupalayam to join the Bhavani Sagar Reservoir. The major land cover is under forests and coffee plantations. Tea and built up have slowly started to move down slope with new areas getting access to roads.

Water

The main sources of water in the region are Springs, Wetlands and Streams followed by a few old and new open wells. The communities believe to have perennial springs as sources that have been tapped by communities for their drinking water needs. The recent droughts have changed the perceptions of these communities on their understanding of Water resources. Some villages have tapped stream water from far away by pipeline and some have springs tapped from across slopes. The wetland sources upstream are the sources of water for their stream waters and are mostly falling inside private estate lands. The water from these wetlands are stopped inside the estates by building check dams or by diverting and channelling to the artificial water bodies created inside the estate for the aesthetic purpose. These practices affect the stream flow and downstream communities especially during the summer when the water is in high demand.

At times there are two or more villages tapping the same source with the same watershed or catchment. While the ground water from the same aquifer tapped by one village is through spring box, the other village upstream taps it through an open well dug next to it. The people seem to understand them as independent sources but these networks of springs are originating out of the same aquifer. Due to the slope aspect the water runs off quickly towards the down slope and has less time for infiltration. The thick vegetation in the lower reaches help in slowing down the water to a great extent and sustains the stream flows for most part of the year.

Human Wildlife

The human wildlife interaction in this region is high and there is history of Wildlife traffic being a major reason for some of the Keystone colleagues not reaching work on time! Especially during the summer season when the Jackfruit starts to fruit the elephants are seen walking up close to the village locations and estates with the strong scent emitted by the fruit. This season sees the highest number of elephants moving up and are also seen on roadsides chewing on the jackfruits fallen down. This being a traditional understanding with most of the people in the region, the elephants are also seen taking refuge next to water sources during this season which goes

unreported. With the streams running dry, the elephants seem to come up in search of the spring water sources used by communities for their drinking and domestic purposes. On the other side elephants and gaur have also been raiding the millet crops from peoples' farmlands. With no fences around the farmland and still wanting to practice millet agriculture, the community is at huge risk of wildlife related losses.

With the Forest department and government schemes providing free goats and cattle to the tribal people as an alternate livelihood, the Leopards have started to move closer to the human habitations for an easy prey. This has increased the risk factor for people to move freely around the village area just after dusk. Loss of livestock on one hand and not enough grazing land on the other hand leaves the community with no option other than stall feeding them. The gaur and elephants have been damaging the pipelines which are exposed. The area having more rock exposures and steep cliffs, there is very less chance of burying the pipelines to safeguard them from wildlife.

Geology

The entire South Eastern region has major rock exposures on the hill tops and mid slopes. The major rock type is Charnokite and Granitic gneiss overlaid by the Charnokitic weathered rock and Lateritic soil. The fractures and drainages are mostly NS trending and join the Kallar river that flows NE to join the Bhavani reservoir. In smaller pockets close to the springs, the rocks are highly fractured and host fracture springs. The weathered layer has 4 to 6 meters thickness and acts as the primary unconfined aquifer. The Aracode and the Kotagiri area sitting next to each other have very similar geological set up.

Working towards Water Security

The two villages chosen for developing water security are quite unique from one another and the focus has been different. With Vellaricombai village having a drinking water scarcity issue along with wildlife competing for the same water source, Vagappanai village was secure of water availability but wildlife conflict around their farmlands was a major issue.

The villages being highly remote most of the government schemes don't reach them. Right from access to roads that are blocked by private estates and the terrain being rough, these villages are forced to experience a series of problems from access to Health, PDS, School and other basic necessities of their daily life. The villagers have to walk miles before they can arrive at a main road from where public transport can be availed. The communication networks are very limited and to get in contact with the people here as and when we want is a distant dream. Conducting meetings involves planning weeks in advance as the people might leave early from the village for their work and return back late. The villagers feel that the fence around their farmland will put them in a better position to be able to sustain and follow their traditional agriculture for food security.

Vellaricombai village is tucked in a dense jungle and the water source is couple of kilometres uphill. The villagers choose to take a shortcut that takes us through a dangerous and steep rock cliff and climb up using the pipeline to go towards the springs location. The alternate route around the hill is a walk for an hour or more to reach the spring. The women in the village are more proactive towards checking the pipeline of damage and issues around the spring. They go up in smaller groups to check the situation, only if the issue is difficult for them to work on the men are brought into the

picture. The women have also expressed distress over the situation where they have to head load water from the springs back to the village which would cost them an entire day of job yet very limited water is brought. The risk involved in this whole exercise is dangerous with steep rock cliffs to climb up and down with the added risk of elephants and gaur on the way.

The village has a lot of empty houses as people have migrated out in search of other jobs and non availability of sufficient water for their domestic and agriculture purpose. There is still some hope in the village that the people might return one day if the water issue in the village is sorted.

Most of villagers especially women seem to participate in the meetings and discussions related to Water. But when it comes to action on ground, only two or three men have actually been working on the ground to fix pipelines, clean the storage tanks and fix leakages. The other households however have contributed a certain amount as wage support to the men who have worked to bring in water to the village. There is still a need for community to take leadership and ownership towards the resources around them. The villagers are highly dependent on government schemes and others for support towards livelihoods and fixing miniscule issues at the village level.

The forest department and panchayat had promised to build them a check dam in one of the springs and install a motor pump to take water up to the GLR. With the panchayat being run by the bureaucrats and the Forest department having other focus and agenda the people had been unsuccessful towards leveraging the funds from these government institutions. The wages under the MGNREGA scheme has been delayed for a long time and people are reluctant towards working in the scheme for any conservation activities like desilting the check dam, removing invasives in the catchment etc.

Pillur

Pillur region is in the Mettupalayam Taluk of Coimbatore District bordering the South Eastern slopes of the Nilgiris. The Pillur region falls right below the Coonoor slopes and is mostly inhabited by tribal communities like Irulas in the lower slopes and Kurumbas in the upper plateau region. There are also other communities who have settled close to the Pillur dam area. The main occupation is farming of traditional crops such as millets and commercial crops like Banana, and collection of NTFPs like Honey, Phoenix grass, Amla, Pepper etc.,

The topography has hillocks and steep slopes in the upper ridges followed by gradual slopes near the village and valley area. The major land uses are Shola forests, Farm lands and the Pillur dam reservoir (water spread area). The region having a huge dam in the centre of focus has very less importance in the lives of the Indigenous communities. The dam is used for Electricity generation and the water is piped for kilometres for supplying drinking water to the thirsty Coimbatore city. The community here is denied water access from dam for their agriculture purpose.

Water

The important water sources in the region are Springs, Streams, Wells, Bore wells and Dam. The springs are of contact and fracture types. The springs are mostly seen along the stream beds and are tapped by the village downstream. The water is taken to the village using a long distance pipeline buried underground to avoid damage from wildlife. There is no scarcity of water for both domestic and agriculture during the monsoon and following months when there is gushing of water in the streams from the Coonoor slopes. And when the stream water flow reduces, the people are forced to set up their pipelines in the water holes along the streambeds to channel water to the village.

Traditionally a few villages in the lower Pillur region have dug open wells for their domestic and agriculture needs, and some of these open wells are seasonal now and go dry even before mid January. Some of the wells have been reported perennial but people have used them as waste dumps due to unconvincing reasons and beliefs.

In the recent past there have been multiple schemes through which the panchayats and forest departments have provided borewells and supply systems to the villages for addressing the drinking water needs of the community. However, most of the borewells are defunct and some are seasonal which doesn't serve the purpose of addressing the issue and provide a sustainable solution for the drinking water need.

Human Wildlife Conflict

Elephants and the community share the same spring and stream water sources leading to Human wildlife conflict in most part of the year. There have been multiple fatalities in the past few years most of which have been recorded as elephant attacks on humans. The access to forest for both the local communities and outsiders has been restricted due to the prevalence of Maoists in the region bordering Nilgiris, Pillur and Kerala. This has also hampered the work on mapping the resources that are far and deep inside the forests.

Geology

The major rock types are Charnockite and granitic gneiss with minor fractures trending North to South. The layer is made of mountainous soil followed by highly weathered to semi weathered charnokite. The SSW- NNE trending Fracture changes the course of water to flow towards the Easterly direction. The streams flow down to the valley and flow SSW – NNE towards the Mettupalayam and Bhavani Reservoir.

Working towards Water Security

The villages are highly remote and access is very limited due to presence of Maoists and wildlife movement in the region. Even within one village, the individual houses are scattered as they choose to live close to their agriculture lands to guard their crops from wildlife. This in turn results in each individual family tapping stream and spring water for their uses by multiple pipelines all along the stream. Sometimes the upstream people blocking the water to downstream people for irrigating their own crops causes conflict situation between the individual families inside a village.

Some villages have benefited by convincing the Electricity Board to access the water leakage from the Valve house upstream for their agriculture and domestic uses and on the other hand convincing the Forest department to provide them pipelines for a long distance to take it to their village. This has triggered a new interest among other villages like Poochamarathur to source water from across the dam and lay pipelines for 5+ kms to get water for their agriculture. The community here have expressed more interest on water for agriculture over drinking water. This could be a reflection of preferences of men over women, with the latter prioritising drinking water.

The government has provided houses for some villages close to the dam. These houses are built under various schemes and at different times. Though the houses have been built with toilet facilities, the people have never used them even once. The people's perception is such that a toilet inside the living space or next to a pooja room or kitchen is not acceptable. The villagers choose to practice open defecation over using the toilets inbuilt in their houses. The government has also provided and allowed these villages to pump water solely for their drinking water purpose from the stream/back waters of the dam. Livestock is another livelihood alternative given by the government and the forest landscapes are over grazed with goat and cattle trails visible all across the region. These trails in a long run would become more compact and would increase the runoff and reduce the infiltration of rain water into the aquifer.

The Forest department has started the Ecotourism in the dam region and most of the families from nearby villages are directly involved in the activities planned by the FD. This has led to the indigenous communities leasing out their lands to outsiders who take advantage and pollute the soil and water by doing intensive chemical agriculture. And the tribal people are seen working in the shed/resort/facility established by FD for promoting eco tourism in the region. In some cases people have migrated out of their habitations to work in mainstream jobs in nearby cities like Coimbatore and Tirupur due to non availability of water and proper fencing for their farmlands.

One of our village resource person, who works with the Seemai sudhi a monthly newsletter at Keystone has set up an organic Banana cultivation practice in his farmland and has triggered many

fellow cultivators to turn towards organic methods. Agriculture and NTFP being major activities in the region, the interests of communities is largely towards income generating activity and have shown very less interest in conservation activities. However with the youth turning back into agriculture there is a hope that the conservation agenda can be pushed forward with more force in future.

The distance between the catchment of the water sources being tapped and the villages is quite high and this reduces any involvement from the community in protecting the catchments. The maoist presence in the forests and restriction of movement imposed by the various departments also hampers any conservation efforts outside the village.

Sigur

The Sigur region falls under multiple panchayats of Ooty taluk under the Nilgiris district. The area is home to tribal communities like Irulas, Jenu Kurumbas and other mixed communities who have settled here over time. The area falls in the lower plateau region which forms the Northern border of the Nilgiris district. The foot hills have various temples that is an important place of worship for a lot of communities from the upper plateau who come down once a year during the festival season. The Moyar River acts as the boundary between Karnataka and the Nilgiris and is an important source of water for the ecology, wildlife and communities downstream. The region falls under the Mudumalai Tiger Reserve and most of the villages fall under the buffer zone.

The topography of the area is of a plateau with undulating plains. The major land categories fall under Tiger Reserve & Wildlife Sanctuary, private resorts and farm lands. The forest type changes from Shola evergreen forests to scrub jungle once you enter the foothills or the Sigur plateau. The climate and temperature is hot and humid throughout the year. The area has very minimum rainfall compared to the other areas of the district. The main occupation is agriculture, followed by NTFP collection. People have abandoned agriculture as the rainfall has been scanty and the water sources have been seasonal and yielding enough water only for their domestic uses. Due to the dryness of the region, a lot of native scrub vegetations have disappeared and invasives like lantana, parthenium and prosopis have taken over huge land mass both in private and forested areas. The FD has been working with various organisations including Keystone to mitigate and overcome the issue of invasives. Even though the FD has tried eco restoration in the region, they have failed drastically due to the dryness of the soil and the survival rates have been poor due to both water issue and wildlife.

Water

The important water resources in the region are Streams, Wells, Bore wells and Springs. The region has multiple stakeholders doing different activities all dependent on Water for their sustainability. The Forest department and Wildlife, Resorts and businesses, Community and agriculture are often seen in a conflicting situation, all fighting for the same and limited resource.

The springs are mostly found in the upper areas in the huge hilly escarpments falling South to the Sigur plateau. The wetlands in the upper plateau region are the origin of water for the streams in the Sigur plateau. Most of these wetlands and headwaters are dammed in the upper Nilgiris for electricity generation and other uses resulting in the drying up of streams in the lower plateau region. Some of the springs in the immediate mountain range of the plateau are mostly remote and are out of access to the community. The villagers are dependent on panchayat supply to sustain their drinking water. The small wetlands, ponds etc. in the region have also disappeared as the water level in the shallow aquifer has hit rock bottom. Following the extreme drought in 2016, a minimal water flow is being maintained in the river even during summer. This is officially meant for wildlife and communities are forbidden to pump out or channel this water. However, the flow recharges the nearby wells to some extent indirectly benefiting the people.

Cost of Water

The water being scarce and limited resource in the region some private vehicle owners have taken advantage of this situation to sell water to the villages in need. The villagers will have to pay Rs.200 for every sintex (500/1000 litre) of water to these private water suppliers who pump water from the Masinagudi dam. The panchayat is responsible for the supply of water from this source to a few villages, but as the panchayat has failed to supply water regularly and are said to provide only once is a week or sometimes once in 10 days, the people have turned towards these private water suppliers for regular water supply.

Festivals in the "Dry land"

The Sigur Plateau is one of our working areas that have most number of festivals in a year. These festivals involve a large gathering of thousands of people walking down or driving down from the Nilgiris upper plateau and the locals from the Sigur region. When these festivals are celebrated, the village water sources are tapped by the temple committee for cooking, cleaning and other purposes. These events leave the villagers with no water for a couple of days until the festival finishes and the crowd leaves the venue. In the recent years, as the streams have gone bone dry, the temple committees have drilled in a few more borewells for the purpose of celebrating the festival without much crisis.

Wildlife and Water

The Sigur forests have a good number of Tiger and Elephant populations. The elephants have always been sighted in and around the village boundaries. Now with the water sources drying up both in the habitations and inside the forests, not only the people but also the wildlife has been affected a lot. There were a number of elephant deaths reported by the forest department during the dry spell. The forest department has drilled a few borewell for pumping water for the watering holes for wildlife. In spite of the Forest department maintaining the watering holes in multiple places inside the forest range and the District administrations order to release water from the Kamarajar Sagar dam into the Sigur valley for safeguarding wildlife from water scarcity and deaths, some unfortunate deaths have occurred.

Not only wildlife, a major part of the livestock in the region has been reported dead during the drought period. The carcasses were seen lying all around the barren ground fed over by the vultures leaving the bones as remains. Some part of the village is completely dependent on livestock rearing for their livelihoods and has been hit hard by this situation.

Geology

The region falls under a hard rock region with both thick deposits and in situ weathering followed by the bed rock which is charnockitic/granitic gneiss. The soil and weathered layer are dry due to the increase in bore well drilling. The unconfined aquifer is highly exploited due to over extraction of groundwater and not enough recharge from rainfall. Hydrogeological studies

conducted in the region confirm that there is no confined aquifer, yet the borewells are promoted and drilled which only get water from the fractures in the bed rock.

The streams are mostly trending from South to North and some showing trends of SSW-NNE. The streams and tributaries flow down to the Moyar River which is a huge fracture trending in West to East to join the Bhavani reservoir.

Working towards Water Security

In the past decade the region has seen mushrooming of resorts inside the forested area and even close to tribal habitations. They have not only tapped some of the water resources for their needs, but have also drilled multiple bore wells to cater to their demands and customer needs. This has resulted in over exploitation of the ground water resource and also non availability of water for the Indigenous communities. In some cases the resorts have tapped into the village water sources like borewells provided by panchayat. The villagers, especially women have shown objection to the resort taking away their water but their voices are very low and unheard as many families are dependent on the resort for employment. These 'informal' arrangements between some individuals/leaders in the village and the resort owners/managers have further worsened the issue of water.

Now most part of the community (both men and women) seems to work in the resorts and guest houses close to their habitation. Wildlife tourism being a major activity in the region the communities are exploited by paying a bare minimum of the profit as wages by the resorts. Some individuals and families have secured a job in the Forest department. Due to these developments, the fallow lands in the regions have increased and many farmers are doubtful about turning back to agriculture blaming the recurring dry spells and droughts.

The communities have started digging multiple holes in the stream beds to access the subsurface water during the summer season. The women spend most time digging these holes in the stream bed and sometimes these holes get damaged or filled up when an elephant tries to access water from the same hole. These holes get filled up once the monsoon starts and the streams start flowing resulting in women digging new holes the next dry spell. Some villagers have expressed their perception towards borewell water being problematic for their drinking and cooking purposes. Women have seen the rice turning yellow if the borewell water is used for cooking. In some cases the rice would get spoilt the next morning if the borewell water is used. So some villages have been refraining from using the borewell water and wait weeks to get the water supplied by panchayat that supplies water from streams faraway.

The springs in the upper catchments like the Sakkothu springs are perennial and of the high discharge type which can supply drinking water for multiple villages in the valley. But as the sources are far away from village and in remote locations in the Forest area, for setting a supply system would need a huge capital investment which only the government programmes can be able to set up and monitor.

Large number bores dug by hit and run NGOs and private parties.... Connecting the gap in Chemmanatham to ensure water supply...

Coonoor

The Coonoor region has been differentiated into tribal and non tribal areas, both falling under various panchayat boundaries in the Nilgiris district. The upper plateau region is dominated by the Badaga community and other settlements with mixed communities whereas the lower area has tribal settlements of Kurumba and Irula communities. There is a diverse mix of communities in and around Coonoor town and other urban centres. Both these areas are very different from each other in terms of Land use land cover, water resources, communities and livelihood.

The topography in the upper Coonoor non-tribal region is made of gradual hills and slopes whereas the lower area where tribal area falls is made of steep slopes and broad valleys downstream. The non tribal region is drained out by the Coonoor River fed by multiple springs and wetlands systems. On the other hand the tribal area villages are highly scattered and the springs, streams etc., contribute to feeding the streams flowing into the Pillur valley and dam.

The major land use categories in the upper region are Exotic plantations like Eucalyptus and Acacia, Shola Forests, Tea plantations and Built up areas of villages and town. The lower region is dominated by Tea Estates, Forests and Coffee Plantations. The tribal population is very less and are seen in small pockets and are scattered across the Southern slopes.

Water

Springs, Wetlands, Wells and Streams are major sources of water for both the tribal and non tribal region. The springs were traditionally tapped by open channels and bamboo by channelizing water into the village. Later on springs boxes were built around the springs using locally available materials like rocks and stones. In the upper areas people have also used concrete materials to build spring boxes. The springs are considered sacred and are worshipped in an annual festival called the “Halla paruva”.

The wetlands in the upper areas are encroached upon for agriculture and other developmental activities. The wetlands agriculture practice involves intensive chemical agriculture which has changed the characteristics of wetlands completely. The wetlands falling under the waste land category are often used for developmental activities like developing roads, constructing community halls etc. Recently people have used these wetlands as ‘well fields’, and there are multiple wells dug in closer proximity to each other which go as drinking water for communities as well as for irrigating the crops.

The wetlands in the lower Coonoor area are under the Estate lands and are inaccessible by the tribal communities for their drinking water needs. The estates have huge land areas under wetlands and have built multiple check dams to tap this water inside their estate lands. Some estates have also set up pipelines from streams to irrigate their tea estates. These are water sources that have sustained the tribal communities downstream for ages. Now with the private estates tapping these resources, the water crisis has worsened in the tribal villages in the immediate Coonoor tribal hamlets and Pillur valley region.

Human Wildlife Conflict

Human wildlife Interactions and Conflicts are different from the upper areas to the lower tribal areas. The upper areas are dominated by Gaur, Bears, Wild boars and Leopards where as the lower areas it's mostly the Elephants and Gaur and other small mammals like Deer. The traffic around water sources is less in the upper area as most of the sources are connected to the villages through pipeline systems and the panchayat is held responsible if the pipelines are broken by wildlife. We also understand that the Operation and Maintenance effort made in some of the village panchayats in upper areas have benefited both the panchayat and the people. This has also reduced the cost on investing on new infrastructure and capital investments for water supply.

In the lower areas the sources are not well connected with the village and are often in a dangerous situation in accessing the remote resource with wildlife traffic. The panchayats play a very minimal role in replacing or repairing the damages caused by wildlife. The people use temporary solutions like cloth and rubber threads around the damaged pipeline and leaking spots to get some water flowing to the village. These problems get unattended for years together unless there are proactive village members pushing the panchayat for repair and maintenance.

Geology

The major rocks found in both the region are Charnockitic and Granitic gneiss type. The upper area has more insitu weathering and the weathered layer is deep. The outcrops area confined to a few hill tops and is compact and hard charnockites. The aquifer is capable of holding and transmitting water to keep the sources perennial throughout the year. The demand for water has increased with the limited aquifer capacity to produce water.

The lower areas have the Charnokitic and Granitic gneiss as the rock type with weathered charnokite as the overlying layer. The vegetation is thick and most parts are inaccessible. The tea estates have a few rock outcrops and the hill tops have hard rock that are highly fractured. On the basis of the geology and the presence of numerous fractures in the lower areas, it can be gathered that the springs for this region are either of the contact or fracture type. The Kallar River acts as a fracture line trending WNW to ESE dividing the Coonoor region into two. The upper Kallar and Coonoor river basin is mostly Urban and semi urban whereas the Lower parts with tribal habitations are remote and rural.

Working towards Water Security

Under the water security plan two villages were chosen from the region and are both small hamlets in the Coonoor slopes. The villages have traditionally tapped springs close to their village for their drinking and domestic needs. As the estates started coming in and land use changes in the catchment occurred, the flow in these traditional water sources started to reduce. The unique case of both the villages is that the village is in a higher elevation than the spring or stream water source. The reduction in flow has affected the pressure and the water that once reached the village without any effort has now stopped flowing. The people have also tried to reduce the size of the pipelines from 1 inch to half inch, but that has not helped them solve the problem.

With one village dependant on the spring close to the village, the other village is dependent on a stream that is a few kilometres away from the village. The stream water is tapped by setting up a pipeline in and channelling it all the way to the village. The water however doesn't reach the village as the elevation factor combined with distance makes it an impossible task. However the villagers have set up a sintex to collect the water from the stream and people walk to this location which is a few minutes of walk downhill and head load water back to the village.

When the communities have been reeling under severe water scarcity and issues of pipeline damage, a private estate has enjoyed the water from the springs, wetlands and streams for irrigating their tea and by stopping water through check dams for aesthetic purpose. The estate when approached has been very clear that they are not willing to share the water with the tribal villages' downstream. The private estates have always used their estate settlements and labour houses as a reason to say that there is a need for supplying water for their labourers and family living inside the estate. As the panchayat doesn't have to work on providing water to these settlements inside of estates, the estate people take advantage of the situation.

The estates claim a scarcity in water for their quarters and settlements as a reason for escaping from sharing the resource. The private estates have made statements like "this is My water and I'm not willing to share". This perception and understanding the common pool resource as their private resource has been seen as a common threat across the region. The tribal hamlets being very small and less populated the panchayats have hardly looked into them or explored opportunities for intervention. With no road access and remoteness, these villages have remained underdeveloped. These small villages fall under the town panchayats which use the size and population of a village as the criteria to implement any government programme.

Inspite of mapping the resource and developing water security plans in these villages, the people have been stuck with the old idea of tapping the stream water far away into their village. Distance being one factor, the elevation of the village is higher than that of the source. Gravity based system had no scope from our understanding, but the villagers are confident about the water reaching the village with reducing the pipeline size at different intervals that would increase pressure and bring water into the village.

The panchayat had proposed the Forest department to allocate some funds for solving the water crisis in these remote tribal villages. The idea is to cover 5 villages including 3 downstream with the project proposed. However the capital investment is huge and the forest department has delayed and not shown much interest in initiating the project. The villagers have made continuous effort to meet the panchayat and demand for pipelines for water, and the panchayat on the other hand has been helpless with no response from the forest department. Coonoor area has been unique with multiple complexities, the terrain, habitation locations, and challenges both direct and indirect.