Report on Study Tour to Roorkee and Dehradun

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This report is not only the result of my personal endeavor but is the product of collective wisdom and experience of Mr. Soumendu Sarkar, Assistant Professor (Economics), Department of Policy Studies, TERI University and Mr. Shashi Tripathi, Associate Professor, Department of Biotechnology, TERI University. I take the opportunity to thank them for facilitating this study tour and for their constant motivation and invaluable guidance during the entire trip. I would also like to express my heart felt gratitude to them for taking such good care of us with a smile on their face at all times. Thank you sir for guiding us and improving our knowledge base at every instant of the study tour. I would be failing in my duty if I don't express my gratitude towards my fellow batch mates for their valuable suggestions, important insights and for creating such fond memories which will be cherished throughout my life.

1. Rural Habitat: Kuradi and Udalheri village (Roorkee District, Uttarakhand)

On the first leg of our three day study tour, we visited two villages namely Kuradi and Udalheri in Roorkee district of Uttarakhand where an NGO - Disha runs the livelihood activities for rural women. Under their CSR project, they work for the financial and social upliftment of women by forming Self Help Groups (SHGs). There are a total of 325 SHGs comprising of around 4000 women who with the help of their monthly savings are able to get consumption loan and income for their enterprises. For income generation of these rural women, the Youth Reach Institute provides technical assistance to Disha. They have set up tailoring and embroidery centre, adult literacy centre and numeracy centre for the rural women. In addition, through their Centre for Education, they also support the women who dropout of education due to social causes. They are also involved in charity by organizing free dental screening, eye screening and general eye checkup camps. To improve the water sanitation and hygiene problems of rural women, they work towards the renovation of the government toilets and their aim is to declare the villages open defecation free. By providing financial assistance to the rural women, this NGO supports the cause for women empowerment. We had a chance to interact with a few of these women who are being supported in this cause. They had a mixed response regarding the performance of the NGO and the impact it is making on their lives. Some of them were very happy and satisfied to be able to enjoy financial independence from their husbands. They were also able to save around Rs.1000/month for their children's' education. However they were interested in learning new skills like jewelry making and women's beauty and parlor related work to be able to earn more and support themselves as well as their family in a better way. The women of Udalheri village seemed to be a little disappointed with the facilities given to them. They were complaining about nepotism which goes around in the village. However, the common thing which brought all of them together was that they were able to get financial assistance through the group banks which was running in the SHGs. It was very happy to see the smiles on their faces when they were narrating about how they are now able to save every month and do not have to ask for

financial aid from their family members. Indeed, Disha has taken a great step towards women empowerment and its results were quite evident.

Picture: Interacting with the rural women of Kuradi and Udalheri Village, Roorkee District, Uttarakhand

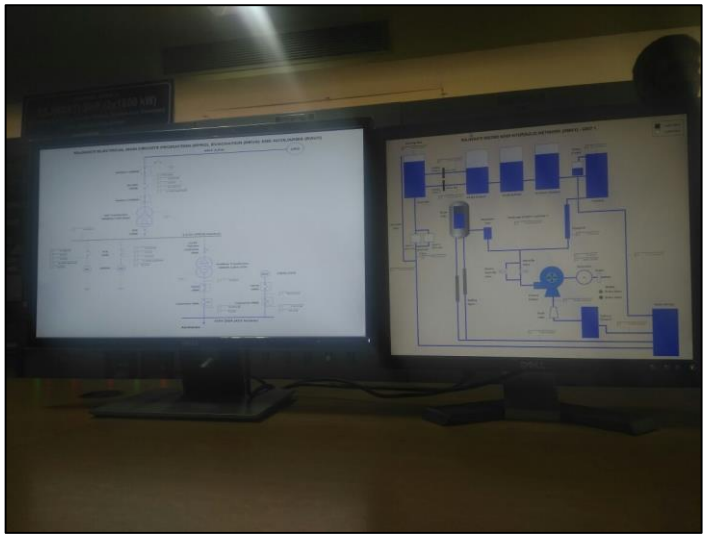
Picture: Interacting with the rural women of Kuradi and Udalheri Village, Roorkee District, Uttarakhand

2. IIT Roorkee (AHEC, Real Time Simulator, Turbine Model testing, NIH)

On the second day of our tour, we visited the Alternate Hydro Energy Centre (AHEC) in IIT Roorkee campus. The AHEC is an Academic Centre of Excellence for carrying out education, research, development, training advisory services to provide key inputs for full realization of renewable energy potential with thrust on Small Hydropower and Conservation of Natural Resources. It was created by the Ministry of Non-Conventional Energy. Our first session was conducted by Professor Saini who gave us an introduction about the Small Hydro Power sources and it's applications and implications. He also explained about the history of IIT-R which was the first engineering college in the British Empire to train the engineering manpower to build canal from Haridwar to Kanpur. The alternate hydro energy system has 60% of hydro and 40% of other renewables. He also gave an insight about the ongoing research areas for Ph.D which included hydro mechanical turbine, sedimentation and silting, solar photovoltaic MPPT system, integrated renewable energy, bio-fuels/bio-diesel and solar energy utilities at low temperatures. The AHEC is powered from the power drawn from the grid. It has a scope of 1.8MWp of rooftop solar generation which is supplied to the grid and gallow tanks for solar water heater. He cleared one of the simplest yet important queries related to the classification of small hydro and large hydro. The basic difference between the two is only on the basis of provisions and subsidies provided by the government whereas the design considerations are the same. He also gave insights about the measurement of the flow duration curve.

Picture: IIT-Roorkee, Uttarakhand

Next, we visited the real time simulator of the Rajwakti SHP (2*690 KW) with a head of 2.62m, flow rate of 0.77 metre cube/second, semi Kaplan turbine and an induction generator assembly and the Rajwakti SHP (2*1800 KW) with a head of 15.5m, flow rate of 9.0 metre cube/second Francis turbine - synchronous generator assembly. We also experienced the real time simulation of the Narangwal PEDA (2*750 KW) vertical axis and Rajwakti (2*1800 KW) horizontal Francis turbine based small hydro power plants. The generation is at 3.3Kv and the grid is synchronized at 66Kv. The advantages of the real time simulator is that it responds in real time, is a cost effective method of training, people can take decisions in stressful situations and it lowers the outage time.

Picture: Soil testing Lab and real time simulator, IIT-Roorkee

Thereafter, we saw the demonstration of different small hydro turbines including the Pelton wheel (high head impulse turbine - which operates at the atmospheric pressure), Francis turbine (medium head reaction turbine - in which the inlet and outlet pressure is different and hence a draft tube is required), Kaplan turbine (low head reaction turbine - which has around 3-6 blades), cross flow hydro turbine (in which the shaft is always horizontal). The cross flow turbine has a rectangular nozzle. Since water crosses the diameter, it is called cross flow. The cross turbines have a possibility of increasing the length of the shaft since it is horizontal and Jet Pelton Turbine where there are 3 jets at an angle of 120 degrees with respect to each other. After this we had a walkthrough the turbine model testing laboratory which is a R&D lab for the model testing of the hydraulic turbines. The following parameters are tested before the turbine is commissioned at the site - discharge, head, calibration, torque, inlet energy (density*g*h), output power and efficiency.

Picture: Hydraulic Turbine R&D Laboratory

Picture: Model Testing Machine

Post lunch, we had a visit of the National Institute of Hydrology (NIH). The NIH is an autonomous society under the Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India and has been functioning as a research institute in the field of hydrology and water resources in India since 1978 in Roorkee (Uttarakhand). We visited their water and soil testing labs and had an overview of the different methodologies for the optimum utilization of water resources for environmental sustainability. They had a display of various emerging technologies and equipments like flame photometer, pH meter, turbidity meter, conductivity meter, digestion unit, Millipore ultra-water unit, double distribution system, orbital shaker incubator, BOD and COD incubator, ion chromatograph bacteriological incubator etc for carrying out R&D activities in the water resources development. Their main objective is to undertake, promote, assist and coordinate systematic research and work in all spaces of hydrological sciences and to publish the findings and results of research and investigation through appropriate media. In the soil laboratory, we were given insights about the soil moisture retention capacity for plant growth, pressure plate apparatus and soil classification through wet sieving, dry sieving etc. In the Remote sensing laboratory, we were explained about the hardware and software tools for remote sensing, dissemination of hydrological information and the measurement of hydrological processes. We were given a slide presentation about the case studies already under R&D which included web GIS application for snow cover in Indus valley, Himalayas, GIS application for dam information, drought information etc. Next, we had a visit of the meteorological observatory which included measurement of air temperature, temperature and humidity sensor, rain gauge, evaporation meter, evaporation and transpiration device, cup anemometer and tripping bucket rain gauge. Thereafter, we visited the Nuclear Hydrology Laboratory which uses isotopes to understand hydrological processes. By isotopic composition, the source of water can be found out. For this, only naturally occurring, stable and radioactive and environmental isotopes are analyzed. Since tritium isotope of hydrogen cannot be measured, its enrichment is done through the tritium enrichment unit.

Picture: Meteorological Observatory, IIT-Roorkee

3. Dehradun (FRI and Robbers' Cave)

On the last leg of our study tour, we travelled to Dehradun from Roorkee. Our agenda included visiting The Forest Research Institute (FRI) and Robbers' cave. The FRI is an institute of the Indian Council of Forestry Research and Education and is a premier institution in the field of forestry research in India. We were mesmerized by the marvelous architecture of the FRI. Our happiness knew no bounds when we came to know that FRI had been the shooting set of Mohabbatein, Krishna Cottage, Rehna Hai Tere Dil Mein and Student of the Year. As soon as we reached the place, we got busy clicking pictures with our friends. Such was the beauty of the place! However quite soon we got back to work and visited different museums in the FRI campus. These included those on plant pathology, social forestry, silviculture, plant products, finished wood products, non-wood forest products, entomology museum, timber museum and insects and butterflies. The highlights included beautiful animal and plant paintings by Afshan Zaidi, exhibits on medicinal use of trees and a cross section of the 700 year old deodar tree. After enriching our knowledge base about forestry and research, we headed towards the Robbers' cave. The Robbers' cave

(popularly known as Guchhupani) is a river cave formation. It consists of an extremely narrow gauge formed in conglomerate limestone area on Doon valley's Dehra plateau. It is a natural cave formation where rivers flow inside the cave which is guarded on all sides by hills. We had a thrilling experience in walking through the water surrounded by tall cliffs on either sides. The dark ambience inside the cave made it quite adventurous as we switched on our flashlights and walked through the cold water tightly holding each other's hands. Some of our slippers also got washed off with the flowing water which caused even more excitement! But luckily, we got them back!

Picture: FRI, Dehradun

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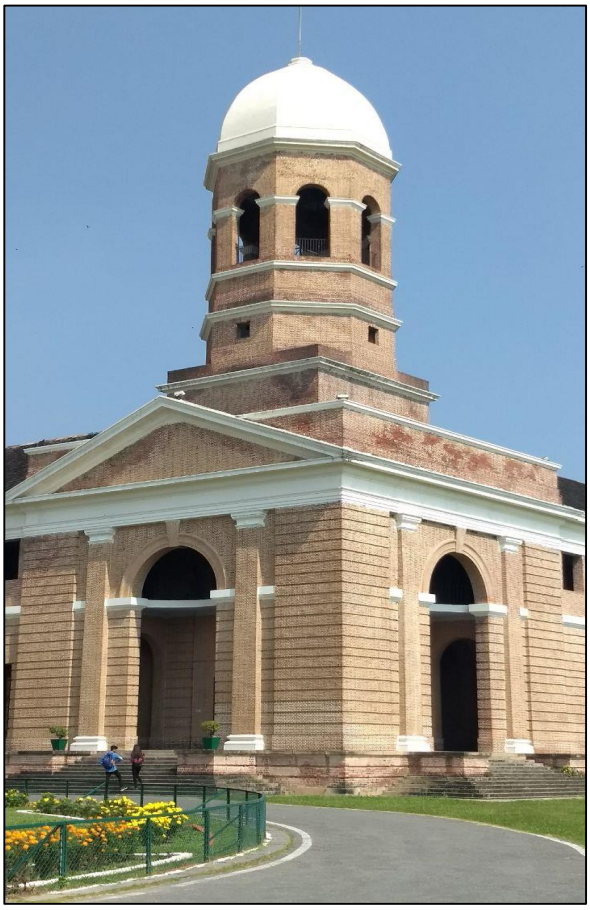
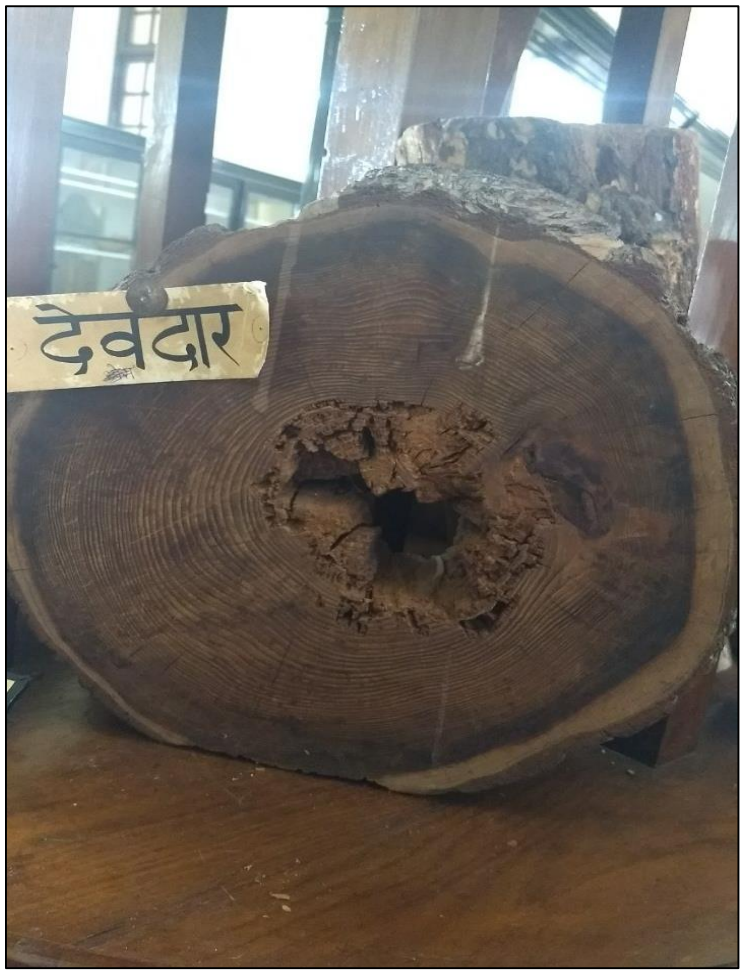
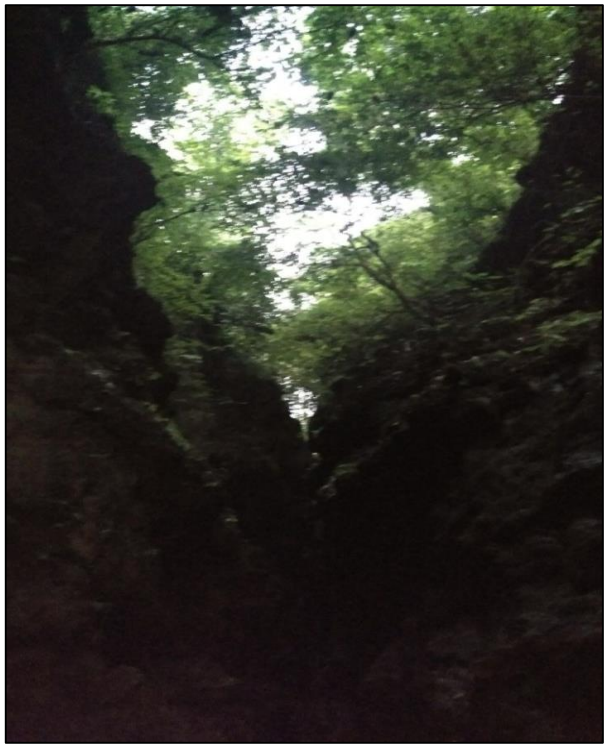
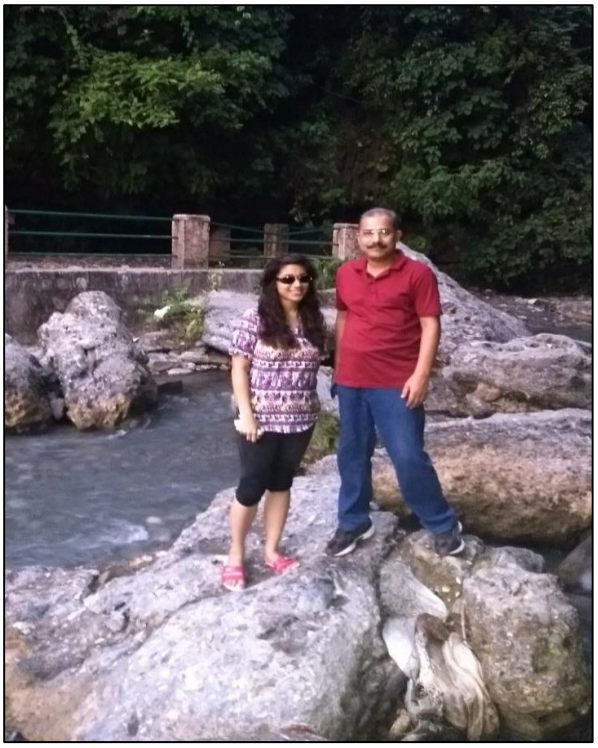


Picture: FRI, Dehradun

Picture: FRI Museum, FRI, Dehradun



Picture: 700 Years old Deodar Trunk at FRI

Picture: Robbers' Cave, Dehradun

On our way back to Delhi, we passed through Haridwar and had darshan of Hari Ki Pauri by sitting in the bus itself.

Picture: Hari ki Pauri, Haridwar

Overall, this study tour was a fun filled learning experience which exposed us to the rural habitat of Kuradi and Udalheri villages as well as the visit to IIT-R, AHEC and NIH was a very informative and valuable education learning experience combined with the enjoyment and amusement at FRI and Robbers' cave. This trip was certainly a successful one and helped to create infinite memories with such amazing people.