

Eco-Rehabilitation of tribal villages through Innovative design in water management using Ice-stupa, promoting Farm-stay tourism and passive solar heating system- Joint Initiative of Tribal Affairs and Secmol in Leh

The “roof of the world”, the metaphorical description for the physio-geographic region encompassing the Indian Himalayas, is the site of vast freshwater glaciers and the primary source of the major Asian rivers that have sustained life since early human civilisations have inhabited the area. In modern times, these freshwater glaciers are still the primary source of water, and thus the welfare, for over a billion Asian people, especially for the tribal communities of Ladakh who have been perpetually dependent on glacial meltwater in the high-altitude desert. Lying on the northerly fringes of the Himalayan watershed, Ladakh is characterised by distinct geographical and climatic features. Known as a cold desert, Ladakh covers area of 96701 km² and with an average elevation of 3000 m, having annual annual precipitation 100 mm, and extreme temperatures ranges (-30 to 30 C^o). Much of the province remains in a cold spell from October-March, with only a third of the year left for agrarian purposes. The villages in the region are settled in small oases in the barren desert, on the banks of a stream, or amongst springs utilising the summertime meltwater. Regardless of its ecosystem services and historical context, reckless human interventions and global climate change have impacted the region immeasurably, in particular due to the escalated rate of warming at higher altitudes. Currently, Himalayan glaciers are receding at an alarming rate, from a few to tens of meters annually. With reducing precipitation, increasing average temperatures, and reduced glaciers to water the villages anymore, some Himalayan villages are now slowly turning into ghost towns with abandoned but habitable houses and wasted agricultural land. This gives rise to three major modern issues of Ladakh relating to water scarcity, low indoor temperatures in buildings, and a shift from the original agrarian-based economy resulting into youth migration.

To address the emerging issues, Ministry of Tribal Affairs, India (MOTA) in association with Himalayan Institute of Alternatives, Ladakh (HIAL) initiated a project for Research, Documentation and Development of Tribals communities of Ladakh in November 2019, which has a duration of 2 years. This project has 3 sub-parts that researches on “Rehabilitation of Abandoned Villages through Ice Stupas” along with study on “Himalayan Farm-stays” and its implications in the local context and the to reverse migration patterns. Since temperature in Ladakh goes up to – 30 degree Centigrade, “Passive Solar Heating in Buildings” was also part of study.

The idea and the 1st prototype Ice Stupa was made at SECMOL school in the winters of 2013. Taking inspiration from ancestral practices and Mr. Chewang Norphel’s work on artificial glaciers, Ice Stupas were designed. From making Ice Stupa in 1 village in 2013-14 to spreading the knowledge, awareness and the art of building the structures in 26 locations across Ladakh in 2019-20, the project and art of glacier grafting have come long way. Gathering support, ideas, and technological support

from like-minded individuals and organisations have made immense improvement in the process of building Ice Stupas in India and abroad. In 2019-20 winters, the project was able to train 250 village level stakeholders in the process and raised awareness on the issue by conducting various workshops, training sessions, and plantation drives across Ladakh. This year the project and participating villagers were able to conserve about 75 million litres of water during winters and eco-tourism activities like “1st Ladakh Ice Climbing Festival” gave opportunity to the local youth to be indulged in eco-entrepreneurial ventures.

This year, the project started from the village of Kulum. It is situated 50 km south-east of Leh, divided into 2 hamlets, upper and lower Kulum, consisting of 7 and 4 families each respectively. Triggered by glacial reduction in the higher valley, the upper Kulum was abandoned completely in 2012 with the families moving into the nearby town centre of Upshi. The residents have left their traditional agrarian practices and are working as daily wage labourers or are running utility shops to make ends meet. The project was implemented over a period of 4 months starting November 2019 to February 2020. Prior to implementation, field survey and measurements were done, and a plan was formulated. This was followed by village and community level meetings to identify the needs and incorporate their ideas in the project. The plan was run by the villagers and their roles were defined so that this project can involve stakeholders and build competency in the former residents of Kulum.

In the first step of project implementation the activities of equipment installation, head-work making, pipeline laying, and dome structures for Ice Stupas were completed with the help of residents of Kulum (locally called Kulumpa's). This provided the villagers hands-on experience of the process, thus inducing active participation at all stakeholder levels. During the course of next few months until mid-February, a 45-foot-tall Ice Stupa was made by the upper hamlet of Kulum. A multitude of challenges arose, including freezing pipes, breaking equipment, bursting pipes, reduced flow at head-work emerged due to the extreme temperatures of Ladakhi winters, but each time a new solution was indigenously devised. The learnings for this year will become an asset for the next. By the end of the building season, the Ice Stupa structure was able to conserve 3,00,000 litres of water. This structure melted away in April ending, but provided much needed water for the fields of Kulum. Confronting the issue of water scarcity and devising solutions has had a drastic impact on Kulumpa's investment in the project.

This is unique project in a way that 26 villages participated in making of Ice Stupa in 2019-20 with collaborative efforts of MoTA, self-funding by SECMOL and other non-governmental sources. It will go a long way in changing life of these villages namely Kulum, , Igoo, Tarchit, Phyang, Karith, Mulbek, Takmachik, TakmachikPhu, Nang, Lamtso, Skrubuchan, Stongsday, Sando, Gya, Umla, Phundo, PhundoPhu, Lamayuru, Takpa Team, Gravit Team, Evergreen Team, Deskittsal Team,

Ladakh MOTO 1 Team, Ladakh MOTO 2 Team, Ladakh Mountain Guides Association Team (Men), Ladakh Mountain Guides Association Team (Women) and is as a collaborative model with participation of people, organisations who have expertise and domain knowledge and other Non Governmental organisations. ...

In the coming years, the project envisions to expand its reach from water management strategies to a holistic village rehabilitation model. This model includes the following aspects;

- Upper Valley Plantation to act as a carbon sink and a protection from flooding events
- Modern plantation and irrigational practices which are not as water-intensive like drip irrigation and hydroponic systems
- Alternative technologies for daily use, such as wind, solar, biogas, etc.



Image 1: Ice Stupa at Kulum village during the winters of 2019-20.



Image 2: Clockwise the Ice Stupas of Ladakh in 2019-20 season. The 1st, 2nd and 3rd biggest Ice Stupas from the villages of Igoo, Tarchit and Phyang. The last image shows a stack of Ice Stupas built in Gangles valley during an Ice Valley prototype project to conserve and later supply water for downstream villages and ultimately Leh city.

In order to rehabilitate these deserted villages as well as prevent youth migration, it is essential that additional livelihood opportunities are created within these villages. With this in mind, the “Himalayan Farmstays” initiative was started - an initiative of hosting tourists in the farm homes, generally taken care of by the mothers and the elderly left in the village, as a source of additional income for the families. Many tourists who go trekking, both domestic and foreign, prefer staying with locals to know more about the culture of Ladakh rather than staying at a hotel. Besides creating additional income opportunities, it also empowers these mothers and the elderly. Once the youth realise that there is equal and better livelihood options in the villages, the migration towards cities and other places will automatically reduce.

Some of these farm-stay owners were also trained on basic hospitality to be better able to host the guests. The farm-stays were divided into three tiers based on the available facilities and accordingly their rates were decided. While rating the different farm-stays, Ladakh-appropriate facilities and services were rated higher to ensure that the Ladakhi identity is not lost in this endeavour to bring income generation opportunities to the villages. These homestays will provide sustainable opportunities for the locals and will become a symbol of cultural exchange naturally and internationally.



Image 3: Some Farmstays with the Mothers "Ama leys".

However, these farm-stay services, for now, are only functional in the summers and lie idle in the winters due to the very low temperatures in these homes which makes them uncomfortable for visitors. The answer to this problem is to make the houses Passive Solar Heated Houses. But, despite 40 years of research and several demonstration projects showing the benefits of these type of buildings, these buildings have not been adopted in the mainstream as they should have been. The reasons for this disinterest in such beneficial technology is still unknown. The preliminary discussions point out that people think these types of buildings have high capital expenditure. To verify the truth about this claim, HIAL has taken the initiative of comparing the performances (indoor temperature against the outdoor temperatures) and capital as well as operational costs of different types of Passive solar heated as well as non-Passive solar heated buildings. This study will bring to the front whether the claim that passive solar heated buildings are expensive stands true when the yearly operational costs are also considered.

Additionally, HIAL is also working towards identifying the bottlenecks in the mainstreaming of the Passive solar heated buildings and then trying to address it. Towards this end, we have installed data loggers in several types of PSH (Passive Solar Heated) as well as Non-PSH (conventional buildings with artificial heating) buildings around Leh and the adjoining areas. Two army buildings, two UT administration buildings which are the conventionally heated buildings, and then two NGO-owned PSH buildings have been selected and their temperatures are being

collected every 10 days. Their operational and capital expenses are being ascertained. Additionally, some passive solar heated buildings of SECMOL and HIAL are being monitored for long term data to understand the extremes of thermal comfort that can be achieved just by using the energy of the sun.

These three research projects will work in tandem to reinvigorate the villages of Ladakh and bring back the youth lost to the limelight of cities. Simultaneously, they will provide a rare example where people have acted upon and reversed climate change migration patterns, giving hope to themselves and the world.



Image 4: Some PSH Buildings in Phyang, Ladakh.

Sonam Wangchuk and the HIAL team.

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