

Study of Ice Stupa

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Abstract- *This project is for store the water for summer season and supply to farmer and villages. These projects for climate change adaption represent a new genre of design work that could have considerable implication for the profession of landscape architecture. In contrast to natural glaciers, which are shrinking rapidly all around the world, the artificial ones are proliferating. The ice stupa project began with a single prototype; this past winter stupa was erected in at least ten villages in Ladakh.*

However, while large-scale infrastructural project, such as artificial glaciers, appear to mediate the negative effects of climate changes in the short term, these solutions may only temporary relief from the large crisis of warming planet.

Keywords- Ladakh, Artificial, Climate, Glaciers.

I. INTRODUCTION

The science region of Ladakh lies in an ecologically delicate area in north India, wedged between disputed territories with its neighbouring countries, Pakistan and china.

It is vast expanse consisting high altitude desert-like terrain in the rain showed region of the Himalaya Mountains ranges. This region, ordinarily viewed as a respite for avid tourist and adventure junkies, is now facing a plethora of environmental issues, due to an unprecedented influx of tourist over the past decade. The toll of which falls more on the local communities, native to Ladakh (Clouse, 2017; Goeury, 2010).

II. LITERATURE SURVEY

Hermann Kreutzmann Scarcity within opulence: Water management in the Karakoram Mountains revisited
 Dealing with the importance of water from the mountain regions three dimensions have to be evaluated: 1) natural factors and their validity for the environmental frame conditions and technological adaptation processes; 2) social factors and their impact on culture, economy and equitability; 3) institutional factors and their importance for sustainable growth and for the implementation of development projects.

Carey Clouse Learning from artificial glaciers in Himalaya: design for climatic change through low-tech infrastructural device
 As cities and towns confront the volatile environmental conditions of the twenty-first century the broad. Reach and disciplinary expertise of landscape architecture could provide valuable design thinking around climate.

III. PROBLEM STATEMENT

During spring season, water requirement for sowing increases whereas streams dry up. Water more scarce which in turn impact agriculture and food supplies. Ladakh is now experiencing a multifaceted water crisis in term of freshwater scarcity, pollution, inequity in distribution and lack of water for irrigation in such condition. Ladakh is known for its extremely low temperature almost all though the year. While it is pleasant in the summer time, the winters are exceedingly cold unforgiving.

IV. SCOPE OF PROJECT

Ice stupa has scope for storing millions of litres of water which will melt and provide drinking water and water for agriculture and forestation and result in rejuvenating the economy of the village. It was also pointed that due to the water shortage, the village had become uninhabitable.

V. OBJECTIVE

As ladakh faces water scarcity the ice stupa project aims to overcome this in an innovative manner through the making of vertical Ice Mountains. For generations the ladhaki peoples have demonstrated how to thrive and live sustainably in one of the worlds most challenging and beautiful environment.

VI. RESEARCH METHODOLOGY

Ice stupa is a from a glacier grafting technique that creates artificial glaciers, used for storing winter water (which otherwise would go unused) in the form of conical shaped ice heads. During summer, when water is scarce the ice stupa melts to increase water supply for a crop. Ice stupa was invented by Sonam Wangchuk in Ladakh and the project is

undertaken by NGO students educational and cultural movement of Ladakh. Launched in October 2013, the test project started in

January 2014 under the project name of The Ice Stupa Project. On 15 November 2016, Sonam Wangchuk was awarded by the Rolex Awards for Enterprise for this work on Ice stupa. Ladakh is cold desert and during winter agriculture is not practiced due to the frozen soil and low air temperature. With annual rainfall less than 50 millimetres (2.0 in), agriculture in Ladakh is solely dependent on snow and glaciers melts water. Due to climate change the region experiences hotter summers with increase in melt along with shift in the timing and precipitation of the melts.



Fig.1. Ice Stupa

Ice reservoirs

- Being a cold mountain desert, Ladakh sees a low average rainfall of 50 mm annually making people dependent upon glaciers as their primary water source.
- Ladakh, a beautiful location with magnificent scenery around and exquisite beauty, takes everyone's breath away. But, it is not the same with the people of Ladakh as the cold, dry and infertile land makes their lives harder than we could imagine.
- Fortunately, the situation is slowly changing as Ladakh now has artificial glaciers to meet their needs and people have Norphel to thank for his amazing contribution
- Ladakh is a high-elevation landscape in northern India, in there in shadow of the Himalayas. Much of the region lies above 3,000 m but receives less than 100 mm of rainfall a year. This is a highland desert where communities have traditionally relied on melt

water from glaciers to irrigate crops and water livestock.

- Melt water supplies are becoming increasingly erratic, however, as the region's glaciers shrink.
- One strategy to increase water security in the Ladakh region involves creating large artificial ice masses to store water for the summer growing season. Plastic pipes bring melt water down to the villages where gravity pressure is harnessed to spray water high into the air during the bitter winter nights.
- It freezes into a conical shape as it falls — an 'ice stupa'.
- The largest ice stupas are 30–50 metres high.
- These ice mounds are the brainchild of local engineer and award-winning sustainability champion Wangchuck Sonam. The costs are minimal and the technology is simple. Their shape resembles the Buddhist temple or stupa — a distinctive feature of this region.
- The form of these ice stupas helps to maximise the area of ice in shade and prolong their life.
- Some last well into July and the largest may contribute 5,000 litres of water per day to irrigation projects.

They represent an elegant and ingenious strategy to help tackle a growing water-resource problem faced by many rural communities in high mountains.

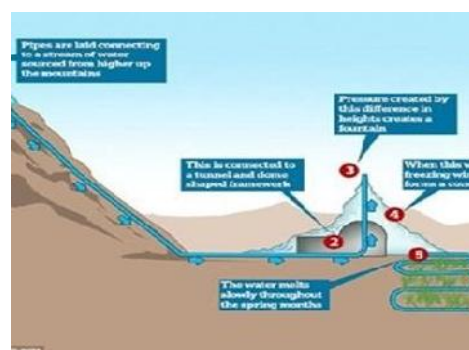


Fig.2. Working processes of Ice Stupa

VII. CONCLUSION

This study indicates that it is critical to understand the nexus between climates, snow and water because future water security issues will have many interrelated adverse consequences, threatening the very existence of human civilization. There is a need for better research into the impacts of climate change in alpine environments using long term data derived from remote sensing and in situ stations.

There is a general lack of high elevation hydro climatic stations in the Himalaya region, and it is imperative to fill this gap if we are to unravel the complex climatesnow water nexus and develop adaptations. The findings from this study will help advance our understanding of these alpine processes and complexities and help lead to better strategy on water resource management.

REFERENCES

- [1] Ageta, Y., Higuchi, K. 1984. Estimation of mass balance components of a summer accumulation type glacier in the Nepal Himalaya. *Geog. Ann. Ser. B* **66**(3): 249–255.
- [2] Hall, D.K., Riggs, G.A., Salomonson, V.V. 2001. *Algorithm Theoretical Basis Document (ATBD) for* https://modis.gsfc.nasa.gov/data/atbd/atbd_mod10.pdf
- [3] Akhtar, A., Gondhalekar, D. (2013) Towards an ecotourism approach: Tourism impacts on water resources in Leh town, International Association for Ladakh Studies
- [4] Angchok, D., Singh, P. (2006) Traditional water distribution system in Ladakh, Indian Journal of Traditional Knowledge
- [5] Anon, (2017) Ice man of Ladakh: Chewang Norphel who builds artificial glaciers, Down to earth <https://www.downtoearth.org.in/video/sciencetechnology/ice-man-of-ladakh-chewang-norphel-who-builds-artificial-glaciers-58878>
- [6] B. Messerli, J.D. Ives (Eds.), (1997). Mountains of the world: a global priority, Parthenon, New York
- [7] Balian, E., H. Eggermont, and X. Le Roux. (2014) Outcomes of the strategic foresight workshop. Biodiversity Strategic Foresight workshop, Nature-based solutions in a Biodiversity context. Brussels June 11-12. URL:<http://www.biodiversa.org/687/download>