INTRODUCTION

Over the centuries the Indus has been the life line for several civilizations. In Ladakh most of the villages have come up on the north bank along the tributaries that are fed by the glacial melt into the Indus. It is now these very villages along the north bank of the Indus belt in Ladakh that have been affected.
Settlements around Indus Threatened

With rise in temperatures, glaciers receding, increase in rainfall and tributaries changing course settlements are now being threatened. In the past, changing course of the Indus has destroyed civilizations – flattening of Tashi Ghatsal is perhaps reminiscent of destruction of Harappa and Mohenjodharo. The entire township lies buried under mud.
History of floods in Ladakh
Ladakh witnessed many Glacial Lake Outbursts Floods (GLOFS) in recent history. Bursting of glacial lake formed by blocking of Shayok River by surging of Chong Kumdan glacier in 1930s was best documented GLOFS in Ladakh.
History of Flood in Ladakh

Around 1907 it is believed that present Leh bazaar was filled with mud that rose to its current level.

1971 witnessed massive destruction due to flood in Nyemo village, following which Save the Children UK was first set up in Leh.

After nearly 30 years in 1999 Leh valley caught unaware of a flood that destroyed fields and houses and killed many animals.
2006 floods in Phyang and Leh valleys

It was clearly observed that floods in Leh and Phayang Tokpo were due to the bursting of recessional glacial lakes of Phuche glacier in Leh valley. In the catchment of Phiyang Tokpo, the terminal moraines of Phyang glacier has breached resulting in GLOF. On preliminary investigations, it is suggested that the melting of ice-cored moraine resulted into the lake burst.

Increase in the summer precipitation has also contributed to increase in the water level of the lakes due the increased melting of glaciers over height of 5,500m. An important factor that has not been given its due importance is the melting of the mountain permafrost with the increase in global temperature. This is not only destabilizing the mountain slopes but also contributing to increase of melt water flow into glacial lakes: Dr. Joseph Gergan Geologist
Flash floods and cloudburst in 2010

- Increased temperature and hot summers in the plains lead to increased evaporation and subsequent cloud formation in the hills. This lead to increased duration of snowfall (May) in Ladakh. Winter prolonged.
- Bright sunshine in June and July lead to melting of snow and high relative humidity (72%) against 50% of previous years. Since snow absorbed latent heat also, monthly max and min temp remained low leading to dense low clouds in the valley. Clouds further condensed trying to cross the glaciers and could not retain the water droplets and burst. DIHAR
More Frequent and Vulnerable areas developed leading to greater damage

- Ladakh has witnessed floods in the past, what has changed is the frequency and significantly vulnerable areas are now developed and populated leading to greater damage.

- A remnant of an old stream bed lie on the mountain ridge above Shagsha-liung, clearly seen on google map, going west towards Leh and east towards Sabu and Choglamsar provides evidence of water flow in the past.
DISTRICT POLICE LEH

INFORM MISSING PERSONS HERE
IDENTIFY DEAD BODIES

PHOTOGRAPHS OF UN-IDENTIFIED
DEAD BODIES
Destruction

• 223 declared dead and still many missing
• About 1000 houses destroyed/washed away
• 15000 acres of land both cultivable and non cultivable land (plantations) covered under debris/washed away.
• 15 crore loss to hospital including CT Scan
• Water lifting pump for the town washed away
• govt. offices, schools, electricity, BSNL
Nidder Flood also GLOF

- Nidder flood on October 8, 2010 was again a GLOF
- Last time it was around 60 years back Nidder witnessed flood because of lake burst. There are two lakes by names Longdol and Chorog in different sub-valleys. Chorog is the name for three lakes, formed one after another at different levels. Longdol is in Longma valley (caragana valley), which is one big glacial lake that got breached by breaking of ice block. Jigmet Stobdan 26, village representative, said, it was unusually hot that day when flood hit. Stobdan had heard from his elders that their ancestors often used to manually breach the glacial lake to release the water rising in the lake in controlled manner, which is no more practiced.
Possible measures

Short term
There is an urgent need for the preparation of inventory of the glacial lakes of Ladakh and identify them according to their vulnerability to failure. Monitoring of glacier lakes and development of an early warning system to fore warn the occurrence of GLOF in advance to public living down stream needed immediate attention.
Long term

• Numerous moraines created by centuries of glacial melt could work as small, manageable check dams to preserve the water and also to rejuvenate the springs. Even the remaining glacier could be provided by artificial cover from sun as they do in Switzerland or other countries facing glacier recession. In addition, artificial glaciers along side hills could also be effective as one of the measures not only to preserve glaciers and entailing vast stretch of permafrost, which act as natural water reserves that form the lifeline of a civilization.
Khardong la glacier
Pangong Lake’s road submerged
Drang drung glacier in Zanskar