Engineering Applications

https://publish.mersin.edu.tr/index.php/enap

e-ISSN 2979-9201

Vulnerability indices of A GLOF-prone community: A case study of Sosot Village, Ghizar District, Gilgit-Baltistan Pakistan

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Cite this study: Haider, S. A., Sarwar, F., Rukya, A. & Jamil, U. (2024). Vulnerability indices of A GLOF-prone community: A case study of Sosot Village, Ghizar District, Gilgit-Baltistan Pakistan. Engineering Applications, 3 (1), 92-105

Keywords
Glacial lake
Outburst flood
Climate change
Flood vulnerability index
Socio-economic impact

Research Article
Received: 29.11.2023
Revised: 15.02.2024
Accepted: 18.04.2024
Published: 28.04.2024

Abstract

One of the major impacts of global climate change, GLOF (Glacial Lake outburst flood) has increased in frequency throughout the world due to rise in temperature. Pakistan has also seen this upswing of GLOF in Hindukush-Karakoram-Himalaya region increasing the human and environment susceptibility in affected area. Sosot, a village which has faced some devastating GLOF events in the past, is taken as a case in this study. In 2012, the GLOF event took place which caused monetary damage of around 100 million Pakistan rupees. The detailed analysis shows that high temperature was the most important GLOF triggering factor. At present, despite some social cohesion and education, this progress-oriented community is unable to strengthen economically. The GLOF proneness and recurrence causes loss of infrastructure, livestock, and agriculture. The vulnerability of the village to GLOF is estimated using Flood Vulnerability Index (FVI) based on four components as social component, economic component, environmental and physical factors. The social vulnerability has come out to be 0.506, economic vulnerability is 0.949, environmental vulnerability is 0.613 and the physical vulnerability is 1. The total vulnerability of Sosot village is calculated to be 0.767 which indicates that this village is highly vulnerable to GLOF events. All the components are playing an important role in increasing the vulnerability, but the most important components are economic and physical which are making the village highly vulnerable to GLOF event. Therefore, there is a dire need for suggested structural and non-structural measures to be taken for this community to decrease vulnerability to GLOF.

1. Introduction

Climate change in recent years has been the center of attention of the world. Studies have shown that extreme events are occurring throughout the world due to the changing climate of the globe [1]. One of the major effects of climate change is the temperature rise [2]. The temperature rise is two times higher in the first decade of 21st century than it was anticipated. The first decade of 21st century (2001-2010) is the warmest decade which has been recorded over globe and year 2010 was ranked as the warmest year with rise of 0.53 degree Celsius has been seen, followed by 2005 which showed an increase of 0.52 degree Celsius. Climatic warming has increased the number of new global-mean temperature records expected in the last decade from 0.1 to 2.8 [3]. The boundaries of coastlines undergo constant changes, whether driven by natural phenomena or human activities globally. Consequently, accurate observation of coastline boundaries becomes imperative. Remote sensing stands out as one of the most employed methods for monitoring these dynamic changes in coastal areas as well as the mountainous areas [4].

This increase in the world temperature has a direct effect on ice melting throughout the world. All available climate models predict the near surface temperature is rising and in adding to the ice melt throughout the world [5]. The past 40 years data show either decrease or no change in the snow cover in the southern hemisphere. Arctic ice has shown a decrease of 2.76 (+- 0.6) % per decade in the annual mean since 1978. Mass loss of glaciers is observed to be 0.50 mm per year from 1964 to 2004 and 0.77 mm per year between the years 1991 and 2004. Glaciers and ice caps give the most convincing and visible indication of climate change [6].

The Glacial Lake Outburst Flood is a cryosphere hazard and these affect populations in high mountains such as the Andes, Alps, and Himalaya. Ice loss, glacial lake outburst floods (GLOFs), avalanches, rock-ice landslides, lahars on glaciered volcanoes, and both seasonal and long-term glacial runoff variability can lead to dramatic or even catastrophic impacts on regional populations [7]. These events occur in energetic and different environmental and social settings, promoting resilience and reducing vulnerability requires an all-inclusive approach attentive to the unique factors that affect socioecological systems in cold areas [8]. There are studies that underscored the significance of managing flood risk data and organizing it within a 3D geodatabase. Furthermore, the development of a 3D city model is important for the flood assessment and hydrological data to ensure homogeneity [9].

Pakistan has faced a rise of 0.76 degree Celsius in temperature during last 40 years and for the same period, the rise in temperature in the mountains of Pakistan is 1.5 degree Celsius [10]. The glaciers present in the geographical limits of Pakistan are directly under threat of melting. The mountain regions of Himalayas, Hindukush, and Karakoram host about 5000 glaciers in Pakistan [11]. And one of the major results of this glacier melting in Himalayas is the increased number of Glacial Lakes forming at the terminal end of moraines [12]. Pakistan has faced a huge number of GLOF events in past. The total number of glaciers present in Pakistan are about 5218 and cover the area of about 15041 sq. km. and 52 glacial lakes which were potentially dangerous to cause a GLOF in the Hindukush-Himalaya-Karakoram region in Pakistan. These lakes are also very tough to access [12].

2. Material and method

This study is divided into three major parts.

a. The first part of study is about the devastating GLOF event that took place on the 8th of July 2012. Its tentative causes are discussed and the damages (economic/social) it caused are discussed.

b. In the second part, detailed discussion is given on the vulnerability of the community. The vulnerability analysis is done based on Social, Economic, Environmental and Physical settings of the community in terms of GLOF and their interlinkages that how these conditions are interlinked and effecting the vulnerability of the village.

c. The third part of the study relates to the current socio-economic settings, which is discussed in detail. The study is done based on various parameters set for the study. This part also includes pre and post GLOF conditions. A detailed discussion on the conditions which were prevailing before the 2012 GLOF and the conditions after the GLOF are discussed in this part.

2.1. Data collection

The collection of primary data for social and economic information is done by:

- Survey questionnaires from community of area under study.
- Semi-structured Interview with the relevant stakeholders.
- Focus group discussions.
- Transact Walk of the village.

A set of structured questionnaires was developed for the affected people which have been affected by the GLOF. For each parameter selected for socio economic impact analysis, there are separate questions which inquired all the information required for the analysis in detail.

The vulnerability analysis is done by using Flood Vulnerability Index (FVI) by Balica [13]. For the analysis of vulnerability of the study area, four major concerned areas are fore seen, and they included the social settings of the community, the economic settings of the community, the environmental settings, and the physical settings. Most of the data which is used in the vulnerability analysis is the primary data, with some of the meteorological data being the secondary, was taken from Pakistan Meteorological Department. The physical data including the percentages of different parameters is calculated using a GIS software named ERDAS 9.2.

2.2. Sampling

For the selection of samples, the random sampling method is used. And every single sample collected represents the whole community. In the total population of about 250 individuals, 50 were taken under the study, representing 100% representation of the community under study.

Among 50 individuals, 25 were males and the others were females. Every single individual was aged above 18, following the proper sampling protocols.

2.3. Data analysis

For the analysis of the data, several software is used. Several statistical tools are applied on the data. The software used for the analysis of data are.

- MS Excel 2013
- ERDAS 9.2
- ARCGIS

The vulnerability analysis of the study area is done by using Flood Vulnerability Index (FVI) methodology, proposed by Balica [13]. In this methodology, the study area is categorized under three scales they have defined. Generally, river systems are affected by floods at three main scales, with boundaries depending on their spatial scale and these scales are River Basin Scale, Sub catchment Scale and Urban Area Scale.

The study area falls under the sub-catchment scale. It comes under sub-catchment area of the Gilgit River, which later becomes the Indus River.

The calculation of vulnerability is dependent on four components and these four components further have different parameters assigned to them. Total vulnerability of the area is given in Equation 1.

$$FVI_{(Total)} = [FVI_{(Social)} + FVI_{(Economic)} + FVI_{(Environmental)} + FVI_{(Physical)}] \quad (1)$$

These four components in the formula have different formulas for each component and these formulas are comprised of different parameters, which are used to predict vulnerability (Equation 2-5). The different formulas for each component used in this research to calculate total vulnerability of the study area and they are [13-14].

$$FVI_{(Social)} = \left[\frac{P_{FA} * R_{POP} * \%_{disable} * C_m}{P_E * C_{PR} * W_S * E_R}\right] \quad (2)$$

$$FVI_{(Economic)} = \left[\frac{L_U * U_A}{F_I * AmInv * Er}\right] \quad (3)$$

$$FVI_{(Environmental)} = \left[\frac{R_{ainfall} * D_A * U_G}{L_U * U_{npop}}\right] \quad (4)$$

$$FVI_{(Physical)} = \left[\frac{T}{R * D_L}\right] \quad (5)$$

By adding all the values of social, economic, environmental, and physical, the total vulnerability can be calculated.

The value of the vulnerability will be ranging between 0 and 1. The final value will determine the vulnerability of the community (Table 1).

Table 1. Vulnerability range.

Not Vulnerable	0 to 0.20
Less Vulnerable	0.20 to 0.40
Moderately Vulnerable	0.40 to 0.60
Highly Vulnerable	0.60 to 0.80
Extremely Vulnerable	0.80 to 1.00

3. Results and discussion

3.1 Analysis of GLOF 2012

In the south of Sosot village glaciers are found nearly at an elevation of above 3500 meters. The melt water from these glaciers' forms Sosot Nala which finally combines with Ghizar River near Sosot Bridge. This Nala remains active throughout the year, but the discharge rate varies with seasonal variation of weather conditions. According to the local community this Nala has observed several floods in the past, but some are (three) most significant in terms of life and property losses. The major floods in the Sosot Nala took place on 29th July 1994, 25th July 2005, and 8th July 2012 (Figure 1). These three floods are the most devastating ones. People in the village say that the month of July is a curse for them, and they are simply scared when July is even near.

3.1.1 Role of weather conditions in the 2012 GLOF

As from mid of July monsoon currents generally approach the northern parts of Pakistan initially developed over Bay of Bengal. These currents are sometimes intensified while passing over Arabian Sea before entering northern area [10]. Thus, they serve as source of moisture transport from Bay of Bengal and Arabian Sea to the northern parts of Pakistan. The water content from these sources has more latent heat as compared to the systems which enter with westerly winds. That is why the rainfall during hot summer days accelerates the melting of glacier rather than accumulation [10]. When rainfall occurs over glacier surface then it removes debris cover from surface of glaciers due to erosion and glacier ice surface can be exposed to open atmosphere. Due to direct atmosphere-glacier interaction the ablation of glacier melting may be fastened [11]. A study demonstrated that the weather

stability and favorable condition stability in Precipitation and Evapotranspiration play a significant role in water runoff in the river basin [15]. Precipitation and temperature are crucial factors for vegetation, exerting a significant influence on disaster management and the mitigation of extreme events [16].

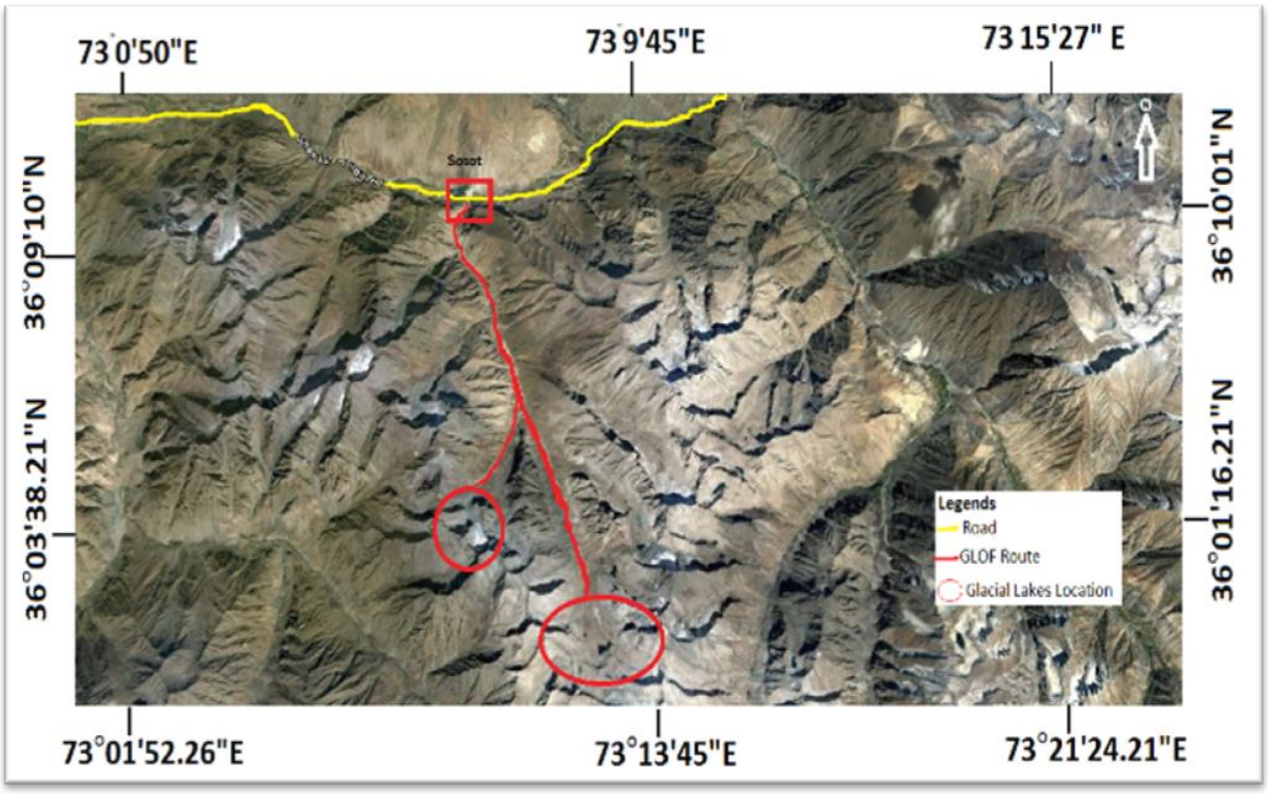

Figure 1. Glacial lake's location which are feeding to Sosot Nala (stream).

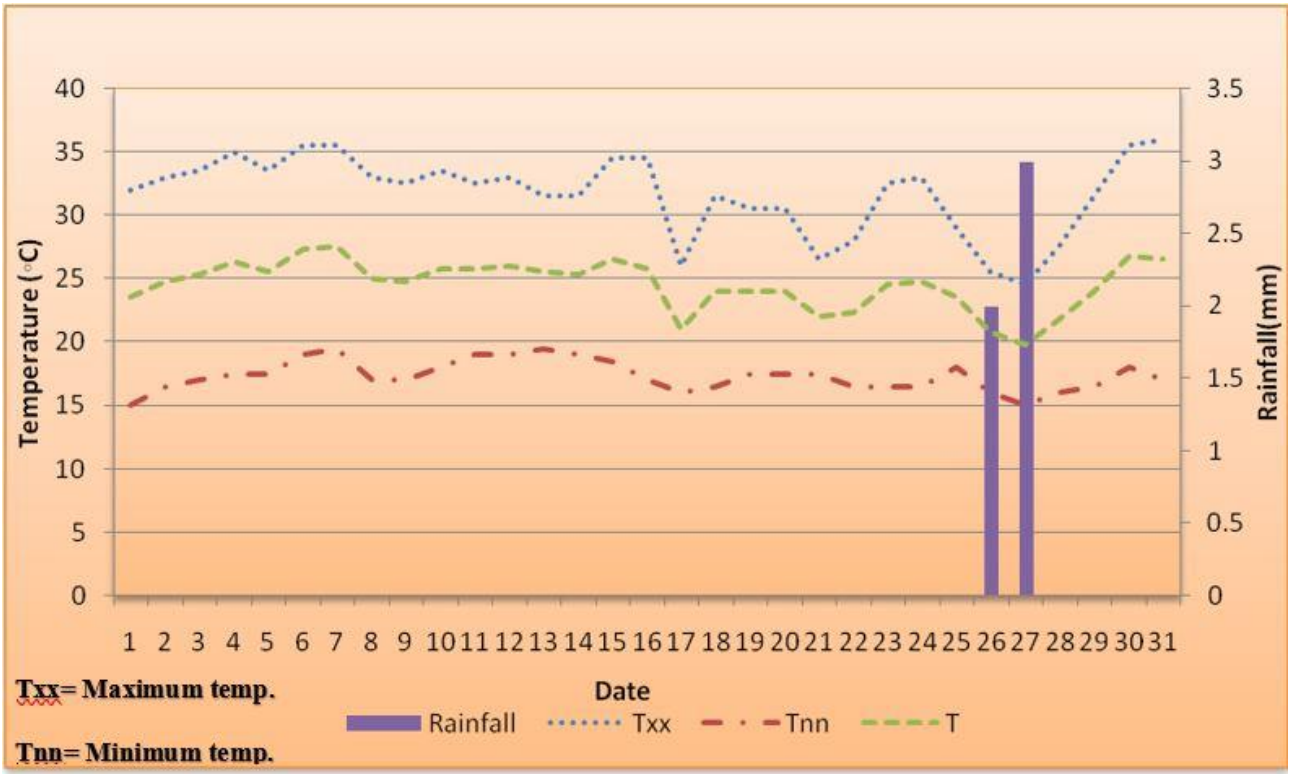

Figure 2. Temperature and rainfall of Gupis for July 2012.

Secondly when the rainwater infiltrates into the narrow cracks of ice then these cracks can become wide due to fast melting of ice and changed into large gaps. Due to extension of gaps, the huge pieces of ice can be detached

from glacier and move down due to gravity and other factors [11]. These huge pieces of ice can trigger a lake to outburst if they fall into the lake. These pieces can cause debris to flow as they can push boulders, mud, and stones in their way towards downstream [17]. The sudden rise of temperature causes fast melting of glacier resulting in water level rise in glacial lakes which further leads to outburst [11]. Statistical analyses of temperature and precipitation are significant to assess integrated disaster management for drought in a basin characterized by arid climate conditions [18].

To analyze the Glacial Lake Outburst Flood (GLOF) in the year 2012 in Sosot Nala, Meteorological Data from Pakistan Meteorological Station Gupis has been used which is in Gupis valley.

During the 1st week of July 2012, the maximum temperature of the effected region remained above 33 °C (Figure 2). Snowfall was reported in Gupis during the last week of May 2012 which was an unusual phenomenon. When snow falls during winter season i.e., from mid of November to the mid of February then it compacts due to seasonal fall of temperature and becomes ice. If snow falls after winter season, then it does not compact due to seasonal rise in temperature. Fresh snow can melt more quickly than ice. Thus, due to snow fall after winter season, that is in end of spring season it did not compact properly.

During the 1st week of July, the maximum temperature remained above 33 °C, and it behaved as a heat wave condition. Due to these factors the melting of glacier increased and finally it took the form of GLOF on 8th July 2012.

3.1.2 Pre and post analysis of 2012 GLOF

The GLOF that took place on the 8th of July 2012, was probably the most devastating one in the history of Sosot Village ever experienced. Even though there was no life loss reported, it damaged hectares of farming land, damaged crops, took several cattle and livestock, damaged crops, damaged houses and much more (Figure 3). The flood destroyed agricultural land about 326 kanals, destroyed 3 houses and a Jamaat Khana completely. The flood also damaged 4 houses which were brought into use after some repair work by the house owners. It destroyed a 2-kilometer road patch of the main Gilgit-Shandur Road. There were also many livestock washed away by the GLOF, reportedly 22 cows and 104 Goats (sheep). The total damage in terms of money, including the farming land destroyed cost, roads destroyed cost, livestock cost and destroyed houses cost was calculated to be just over a 100 million Pakistan rupees which is a huge loss for a poor village like Sosot where most of the resident families are hand to mouth and they absorbed this huge jolt in their economic system because of the GLOF 2012. The main reason for their survival up till now is their strong family system which is willing to help each other, offer each and everything to the effected families.

3.3 Vulnerability analysis using the Flood Vulnerability Index (FVI)

Sosot village has been vulnerable to floods and GLOF to be specific, but how much is the village's vulnerability exactly? What are the hotspots of their vulnerability? What conditions are exactly increasing or decreasing their vulnerability is discussed in this part. To take account of the total vulnerability, four divisions are made including social, economic, environmental, and physical (as used in Flood Vulnerability Index). Based on different parameters for each factor, the value of vulnerability is calculated.

The results show that the study area is much more vulnerable to economic and physical conditions currently present. These two settings possess the maximum value for vulnerability. Similarly for social and environmental vulnerability, values were not low either (lowest on being 0.506 for social vulnerability) (Figure 4). Even the lowest one is moderately vulnerable value. Whereas on ground, the assumptions were that socially, the community is not vulnerable, but results show a completely different sight.

3.3.1 Social vulnerability

The total value of social vulnerability of the study area is 0.506, which lies on the moderately vulnerability on scale. There are a few factors which play important role in lowering the social vulnerability of the Sosot village. The first and most important thing is the population. Because of a lower population living in the area, the vulnerability number came out to be moderate instead of being high. Second important thing is the percentage of disabled people, the percentage of disabled people (percentage of population with any kind of disability, also people less than 12 and more than 65) in the total population is very low, and that is another reason why vulnerability level is moderate. The third factor is strong social bonding of the community where people are supportive and helping the poor and vulnerable ones.

3.3.2 Economic vulnerability

Economic vulnerability for the Sosot village was calculated to be 0.949. This result comes under the category 'extremely vulnerable'. The main reasons for such a high value of economic vulnerability are mainly the economic conditions of the people living there. There is almost no Government funding for the betterment of people, there is no concept of flood insurance, economic recovery is also very low in percentage because the whole area is

affected by flood and on regular basis as well. Similarly, the land used for economic purposes is also very low because of the GLOF occurred in 2012 destroyed huge mass of agricultural land which is still a barren land. So, land use for economic purposes is also very low in the area. These factors combine to make Sosot village economically extremely vulnerable.

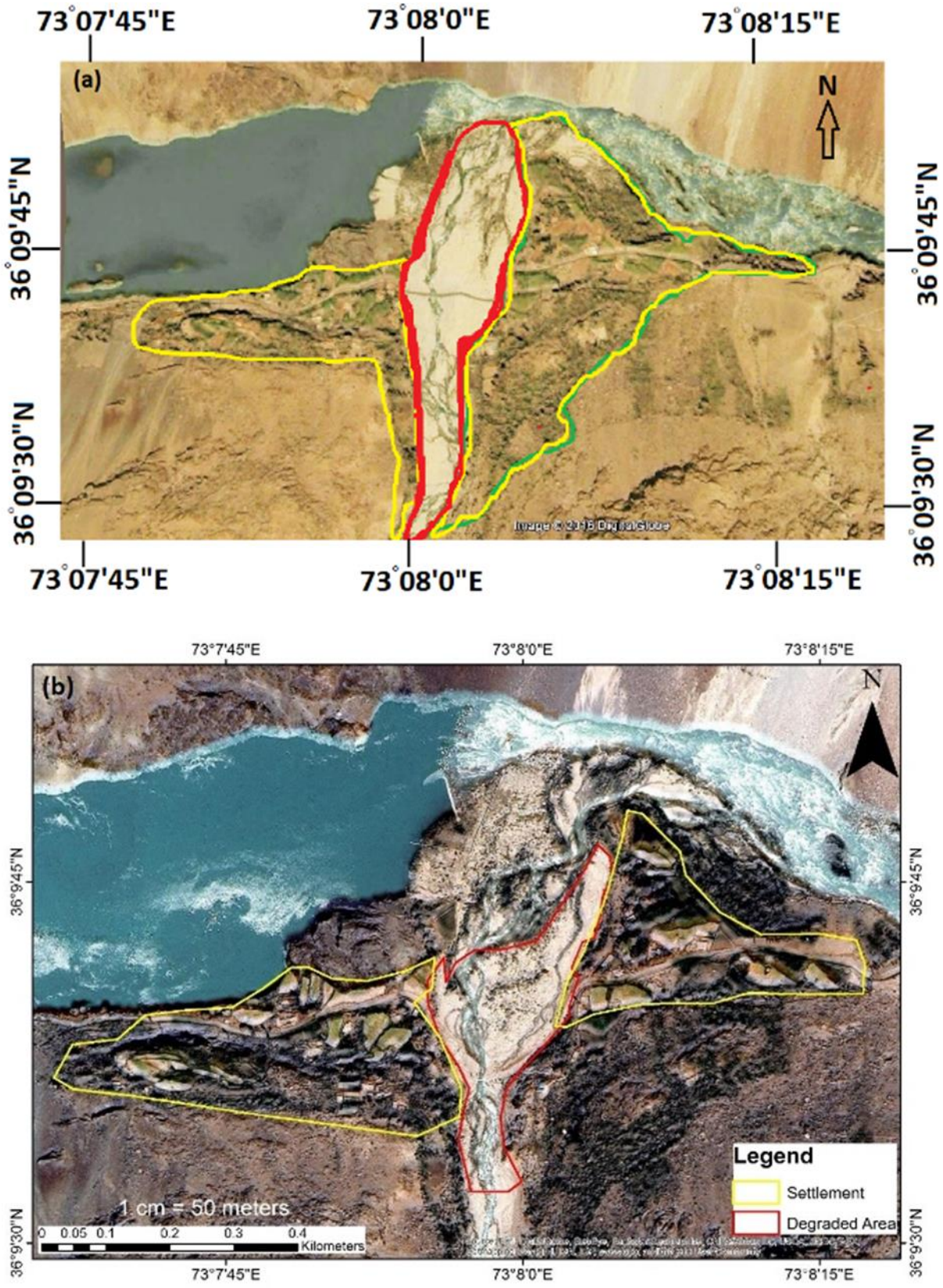

Figure 3. Pre and post satellite image of the study area (Up before july 2012 GLOF and down after july 2012 GLOF).

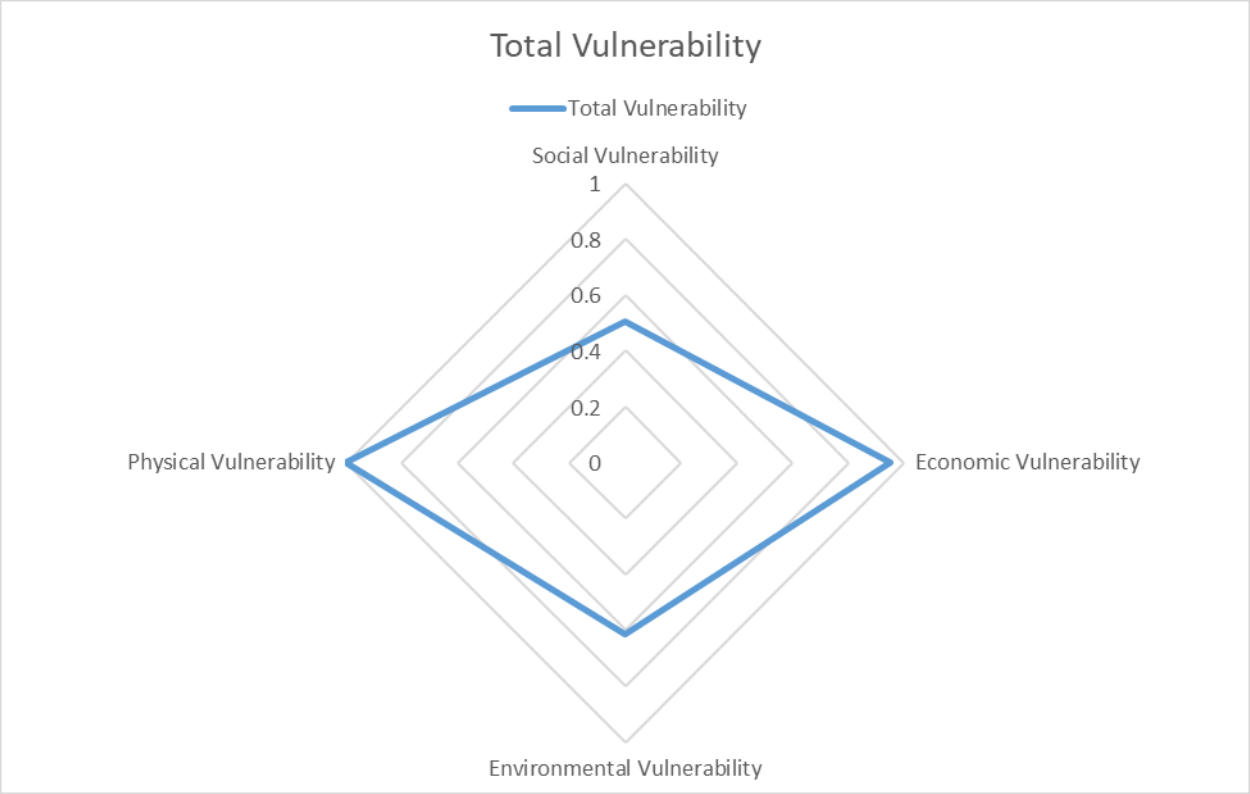

Figure 4. Vulnerability graph.

3.3.3 Environmental vulnerability

The environmental vulnerability of Sosot is calculated to be 0.613. This value falls under the category of 'highly vulnerable'. The most important environmental indicator which contributes to high environmental vulnerability is the amount of rainfall the village receives in a year, the number appears to be high, and this rainfall can trigger the GLOF event as well, as 2012 case study shows. Another environmental indicator responsible for the high environmental vulnerability is the percentage of forested areas, which is very small and thus making the village environmentally vulnerable to GLOFs.

3.3.4 Physical vulnerability

The physical vulnerability of the study area is calculated to be 1 which is 'extremely vulnerable'. The reason for being physically extremely vulnerable is the topography of the area. The study area is a mountainous area and has a steep topography which makes it more vulnerable to GLOF. It is mentioned previously as well that the place from where the GLOF generates is approximately 3500 meters above, and this is extremely steep. And makes the village more vulnerable physically. Another important physical parameter is the presence of Dikes/Levees. These are flood protection walls which are either natural or manmade. The Dikes/Levees present in the area are very less, almost negligible and the ones which are present are very weak, they could easily be encroached by the water. So, because of the presence of such dikes/levees which are almost non-existent, the GLOF water has the potential to easily enter the village and thus make them much more exposed physically, increasing their vulnerability (Table 2).

Table 2. Results for social, economic, environmental and physical vulnerabilities and their total (Average).

$FVI_{(Social)}$	$FVI_{(Economic)}$	$FVI_{(Environmental)}$	$FVI_{(Physical)}$	$FVI_{(Total)}$
0.506	0.949	0.613	1	0.767

3.3.5 Total vulnerability

The total vulnerability is calculated to be 0.767 which is 'highly vulnerable'. So, the results show that Sosot is a highly vulnerable village to GLOF, and it will stay highly vulnerable unless some serious steps are not taken for the betterment of people and increase their life standard.

The most important factor which plays an important role in putting Sosot on high vulnerability are the economic and physical conditions of the village as mentioned above.

3.4. Social and economic parameters of Sosot

3.4.1 Age status

There are many young people in Sosot which decreases their vulnerability. More than 50% of the population of the village is between 16-35 years, which is a positive parameter in terms of vulnerability to the GLOF as young people are less vulnerable to such flooding events and they also have the capability to help the less vulnerable out in such situation (Figure 5).

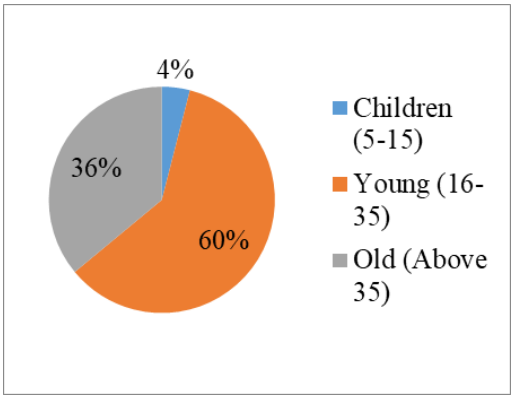

Figure 5. Current age status of the Sosot population.

3.4.2 Education status of Sosot

Most of the population is educated, and literacy level is high. A major portion of the uneducated people include women. For higher education, people go to the nearby city as the village has education facilities nearby till higher secondary level (Figure 6).

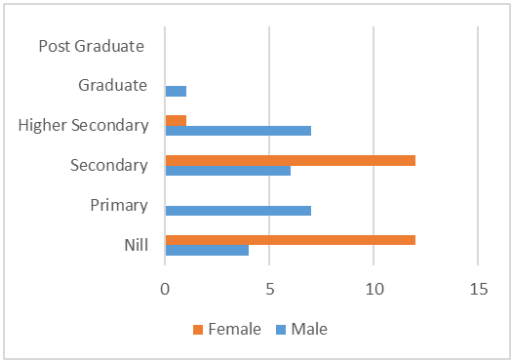

Figure 6. Education status of the people of Sosot on basis of Gender.

3.4.3 Occupation of the people (Male/Female)

A major number of people are engaged in agriculture in the area for their livelihood, very few are laborers at nearby working sites and some are government employees. Agriculture as a major occupation is also an indication of increased vulnerability to the GLOF in terms of damage to the farming land (Figure 7-9).

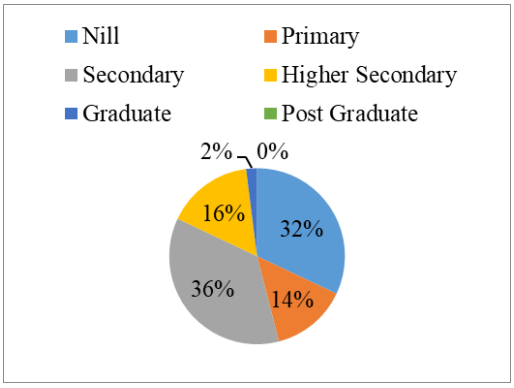

Figure 5. Education status of the Sosot village Overall.

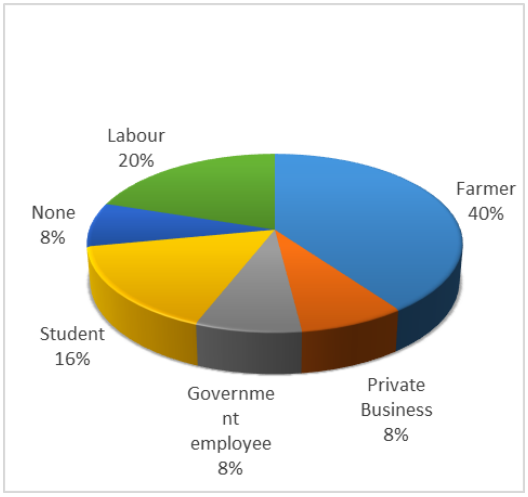

Figure 6. Male population occupations in Sosot village.

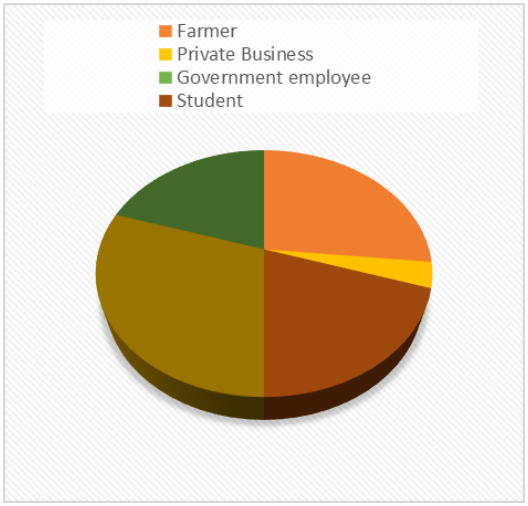

Figure 7. Female population occupations in Sosot village.

3.4.4 Impact of GLOF on health (Male/Female)

Major health damages caused by GLOF are water borne diseases, injuries due to panic, and skin allergy. This indicates the lack of hygienic conditions after the disaster and basic health unit in the area. People, even for first aid, must travel at least 5-6 kilometers to see the doctor (Figure 10).

Most health issues are skin related allergies, water borne diseases and headaches. The water borne diseases are caused by drinking of unhygienic water during the GLOF period. Fresh water becomes unavailable for drinking and the polluted or unsafe drinking water causes stomach related issues. Skin diseases are also common because of the poor hygienic conditions during a GLOF. The most common health issue in woman during a GLOF is the fever. The main cause of fever is unbearable stress, unsafe/unhygienic water and food, and temperature changes which the human body must face during a GLOF. Depression is also a common health issue during the time of GLOF because of economic losses (Figure 11).

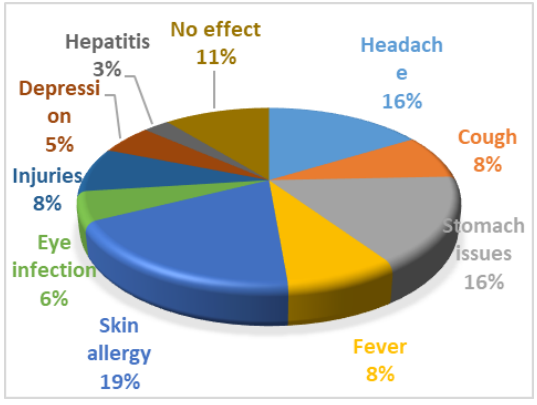

Figure 8. GLOF induced health impacts on males.

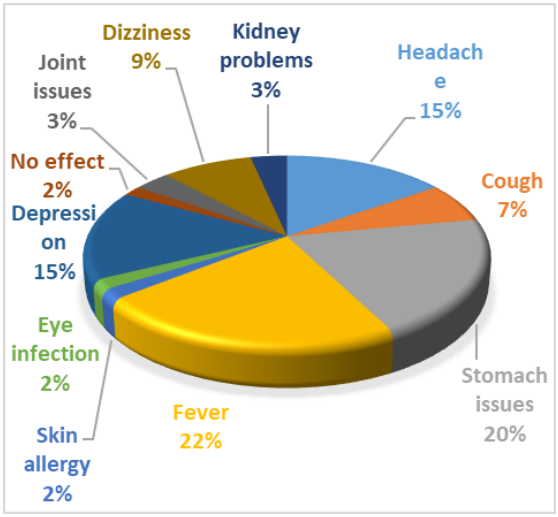

Figure 9. GLOF induced health impacts on females.

3.4.5 Local economic system

Economic conditions of the people in the village are generally poor, only some families are assisted by their children working somewhere else in the country and sends them money, whereas most of the families have income less than 10,000 Pakistan Rupees (PKR) per month, which is below the poverty line (as described by the Finance Minister of Pakistan, minimum wages for an unskilled worker should be 14,000 rupees per month). And their expenditure is either equal or more than their income (Figure 12).

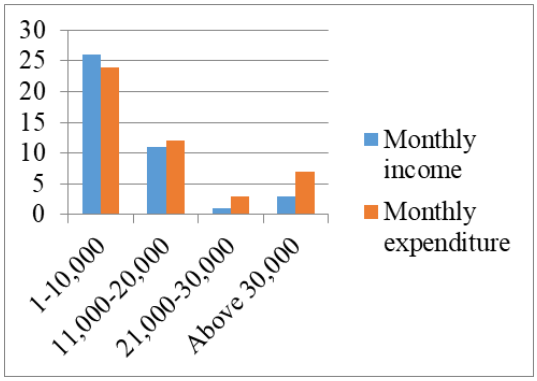

Figure 10. Income vs expenditure.

3.4.6 Social peace

Social conditions in terms of the right to vote, religious freedom and access to education are very strong. People are free to vote for whoever they want to, and similarly people are free to opt for their religion and practice it without any fear. Education is also within access to the people specially the females. Females of the village are encouraged towards getting educated and improve their standard of living (Figure 13).

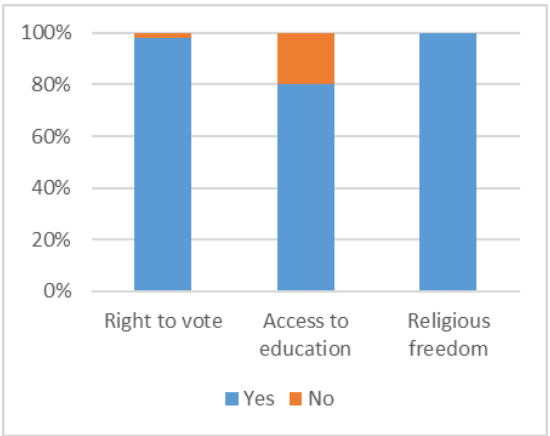

Figure 11. Access to social rights.

3.5 Community perception

3.5.1 Vulnerable groups

Majority (48%) of the respondents believe that women and children are more effected by GLOF, some also disagree to this thought (40%) and comparatively lesser number of people believe that it equally effects men and women (Figure 14).

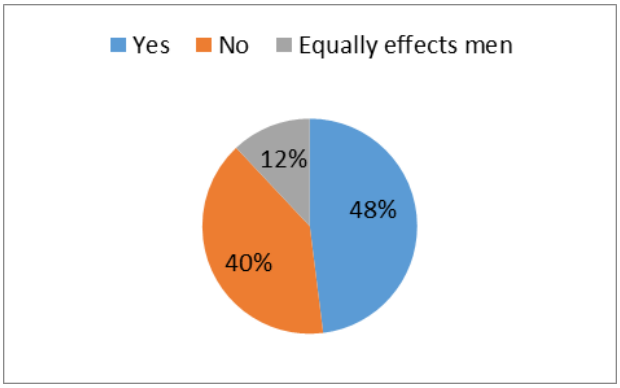

Figure 12. The percentage of people's perception about vulnerability of women and children.

3.5.2 GLOF damage to farming land, infrastructure, change in livelihood and poverty

Everyone in the area is of the view that GLOF does damage the land a great deal. All the villagers have lost some portion of land to the GLOF, and people believe that it damages the land most.

It has also destroyed their livelihoods and put them below the poverty line.

GLOF possesses a great threat to buildings, houses, and shops as well. Previously, GLOF events in the village have damaged a lot of houses in the area. 90% of the respondents have been directly involved in losing their infrastructure to GLOF (Figure 15).

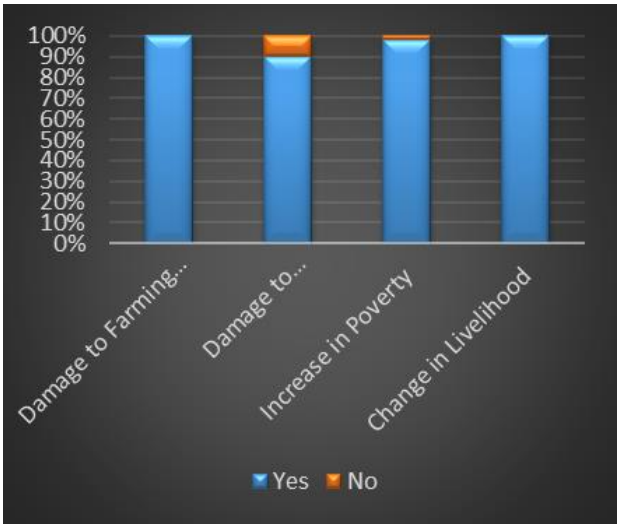

Figure 13. Community perception on different damages due to GLOF.

3.5.3 GLOF impact on lives

Most of the respondents believe that GLOF is fatal, and it takes lives. Previously in the year 1994, the GLOF event took 6 lives thus people believe it is fatal. Whereas no life loss is reported after the 1994 GLOF, but many people in the village still think that GLOF can prove to be deadly. In Bhutan and Nepal, thousands of people have lost lives to these GLOF events [19].

Most of the people are willing to leave their area and migrate somewhere else but their economic conditions do not allow them to. The old people disagree with this idea of leaving their area, because of their sentiments attached, but almost all the youth are ready to leave the area and migrate someplace else. 92% of the people were of the view that if they have enough resources, they will migrate. Only 8% of people, which included mostly elderly, never believed in leaving their root soil (Figure 16).

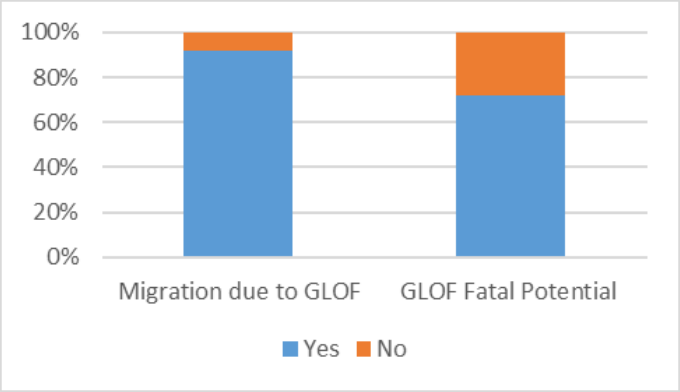

Figure 14. Willingness to migrate and GLOF fatality.

3.5.4 Present GLOF risk reducing techniques

People believe that evacuation is the only solution for reducing risk to the GLOF. Very few also believe that structural measures like retaining the wall and proper channelization of the stream could help, but the majority are in favor of evacuation because of the fear of GLOF in their mind (Figure 17).

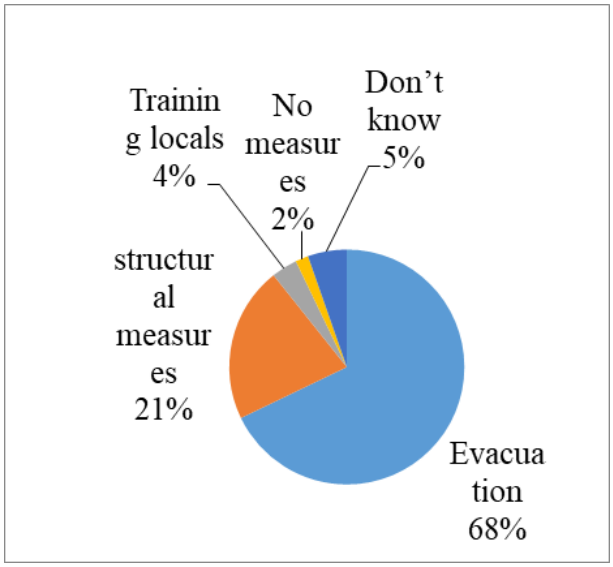

Figure 15. Risk reducing measures at present.

3.5.5 Reasons behind loss due to GLOF

People in the area think that there are several reasons behind the loss which accounted to lack of awareness, no early warning system, no preparedness, in efficient disaster management authority. The locals blamed all these factors (Figure 18).

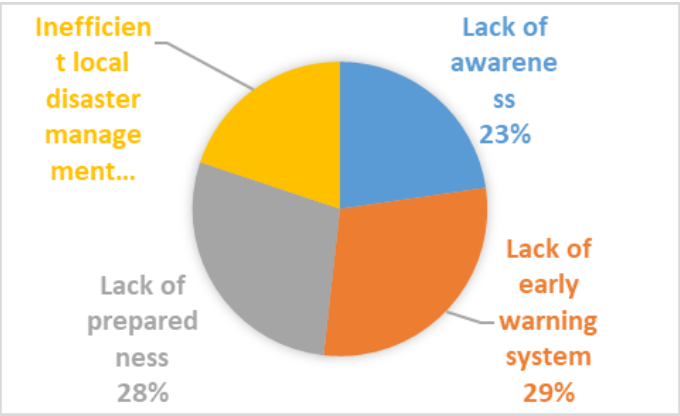

Figure 16. Percentage of the reasons behind loss due to GLOF.

3.5.6 Effective coping strategies

The social cohesion in Sosot is strong, and people living in the area have a very strong family and community system, which has been the reason for their survival up till now. The families support each other when disaster strikes and support each other till the family gets stable and returns. Local NGO support also arrives after the disaster strikes and helps people to rehabilitate the disaster struck families (Figure 19).

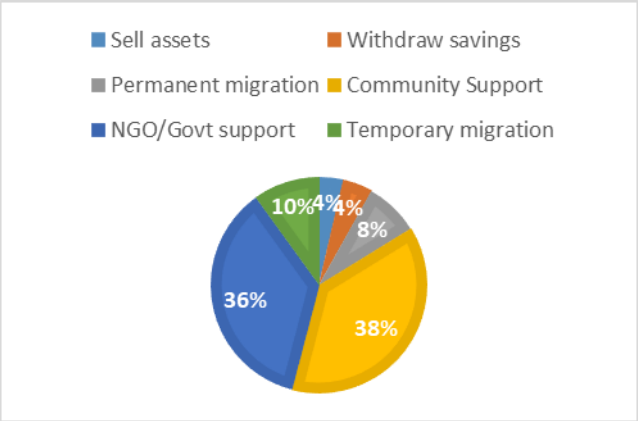

Figure 17. Current GLOF coping techniques.

4. Conclusion

Glacial lake outburst floods have caused damage throughout the world. These GLOFs can become catastrophic, destroying communities and infrastructure, and killing people, such as the 1941 Lake Palcacocha GLOF in Peru's Cordillera Blanca that killed an estimated 5,000 people [20]. The dynamic conditions created by climate change and glacier shrinkage can clearly pose a variety of risks to human populations and it is challenging for researchers to monitor and assess these changing situations worldwide [21].

Sosot is a beautiful village with its presence near a lake and presence of natural scenic beauty. But because of its proneness to natural disasters, the village's socio-economic growth has stopped. The village has faced four major GLOF events from 1994 till present which resulted in huge life and economic loss [8]. Despite having a good social setup, the people are still highly vulnerable because of GLOF induced economic instability and its physical location. So, the overall vulnerability of the village becomes high. The GLOF took place in the year 2012 and was one of the worst faced by the village resulting in huge land, infrastructure, and cattle loss costing over a 100 million PKR which is a huge amount considering the area and population of the village. High temperature played an important role in generating GLOF in the year 2012. The village's vulnerability is increased by the economic factors and its physical location. These two factors play a major role in increasing vulnerability. Social vulnerability, which looked as if it would be much less as the village has a strong social system, it also came out to be moderately vulnerable after analysis and calculations. So, combining the factors, overall vulnerability of the village came out to be high.

With a few measures and a little concentrated effort, the vulnerability of the village can be decreased a great deal. A few structural measures and non-structural measures can decrease the vulnerability of the village to a great extent. One of the most important structural measures which needs to be taken is a flood retaining wall which must be built at the right spot. Stream channelization, installation of early warning system and afforestation should also be done to strengthen the structural measures. In accordance with the structural measures, non-structural measures should also be taken like educating the people about the disaster, training of the people during a disaster and monitoring of the potentially dangerous lakes should also needs to be done to prevent the damages during the disaster.

Funding

This research received no external funding.

Author contributions

Syed Ali Haider: Lead, Conceptualization, Methodology, Analysis, Data Collection, Interpretation, Oversight, Review, Submission, Proof Reading. **Fiza Sarwar:** Supervision, Coordination, Overview. **Aansa Rukya:** Review, Critique, Refinement. **Umair Jamil:** Interpretation, Insight, Contribution.

Conflicts of interest

The authors declare no conflicts of interest.

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