International Journal of Disaster Risk Reduction 13 (2015) 281–290

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Traditional practices of the people of Uttarakhand Himalaya in India and relevance of these in disaster risk reduction in present times

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ARTICLE INFO

Article history:
Received 28 May 2015
Received in revised form
8 July 2015
Accepted 8 July 2015
Available online 11 July 2015

Keywords:
Uttarakhand
Himalaya
Hazard
Disasters
Traditional practices
Landslide
Earthquake
Flash flood
Drought

ABSTRACT

Indepth study of traditional resource management practices of the indigenous people of Uttarakhand Himalaya reveals their appreciably advanced understanding of the causes of various hazards. Through their continued keen observation, experimentation, innovation and recordkeeping these people devised techniques of maximizing resource availability while minimizing the wrath of the hazards. For ensuring universal compliance of the rules so laid down these people relied on social sanctions and religio -magical practices interwoven around little tradition of the people. With weakening social solidarity in the recent times these practices are fast loosing ground and if adequate steps are not taken for documention this rich knowledge of generations could well be lost forever. These practices are highly relevent even today and hold the key to minimizing losses due to natural hazards in a cost effective and sustainable manner and are therefore required to be studied, documented and dovetailed with modern science and technology.

1. Introduction

The Himalayan region is highly vulnerable to earthquakes [2,11] and has been devastated by four Great Earthquakes (Magnitude > 8 on Richter Scale); 1897 Shillong, 1905 Kangara, 1934 Bihar–Nepal and 1950 Assam earthquakes apart from Kumaun and Garhwal earthquakes of 1720 and 1803 respectively [48]. Regions between rupture zones of these earthquakes represent seismic gaps that have accumulated potential slip for generating future Great Earthquakes [2]. Though shaken recently by 1991 Uttarkashi, 1999 Chamoli earthquakes the state of Uttarakhand in India (Fig. 1) falls in seismic gap of 1934 and 1905 Great earthquakes and is identified as a potential site for a future catastrophic earthquake [2,33].

Ever since stabilization of the southwest monsoon owed largely to upliftment of Himalaya [22], the region has been experiencing heavy rainfall, mostly restricted to monsoon period, rainy season over Indian subcontinent. Localized and abnormally heavy precipitation (cloud burst) which is common in the region often results in debris flow, landslide and flash floods. Apart from 1894 and 1970 [34] Uttarakhand has been devastated by floods in 2010, 2012 and 2013 (Table 1). The human deaths in the incidence of 2013 surpassed 4000 and devastated Mandakini and Alaknanda valleys besides Kali, Goriganga, Pinder, Bhagirathi and Saryu valleys [18].

Due to enhanced pore water pressure and reduced frictional forces landslides are common during monsoon period and cumulative toll of these far surpasses that of other hazards. It is estimated that every square kilometer in the Himalaya has at least two landslide scars [1]. In the year 1998 the state witnessed major landslides in Madhyamaheshwar and Kali valleys in which human death toll was more than 350 [29,35,39].

Most agricultural lands in the region are rainfed and therefore failure, weakening or delay of the southwest monsoon or winter rains results in crop failure or depleted productivity. In the recent times the state has faced severe drought conditions in 2006, 2008 and 2009 [13–15]. Moreover, western disturbances often induce squall and hail storms that cause measure loss of horticultural crops. Forest fires are also frequent in the region and besides causing environmental degradation these often enhance the pace of other erosional processes.

Uttarakhand is thus prone to a number of natural hazards and the people living in this terrain would have often experienced wrath of these. Ensuring safety and continuity of the community has been the biggest challenge faced by human beings all through and everywhere. Continuous and unabated human presence in the

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http://dx.doi.org/10.1016/j.ijdrr.2015.07.004
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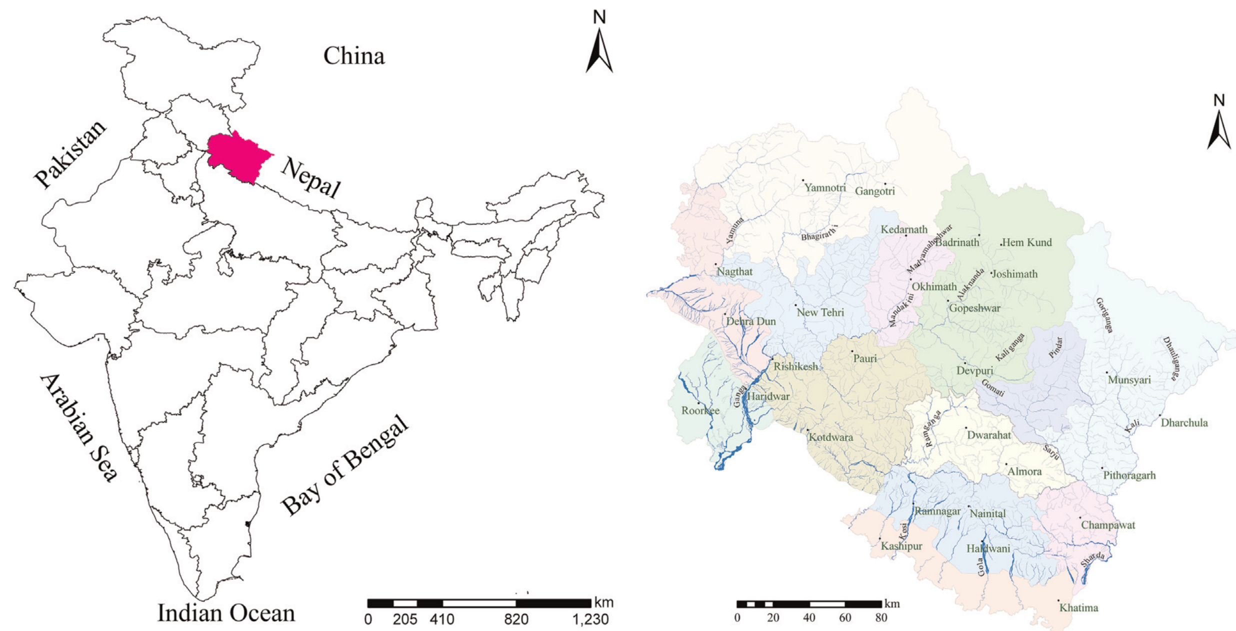

Fig. 1. Location of the study area.

Table 1
Losses incurred due to debris flow and flash floods caused by heavy precipitation in 2010, 2012 and 2013 in Uttarakhand. (Source: [16,17,18]).

Sl. no.	Item	2010	2012	2013
1.	Period of occurrence	August–September 2010	August–September 2010	June 2013
2.	Number of affected districts	13	02	13
3.	Number of villages affected	9162	129	1603
4.	Population affected (in lakh)	29.24	0.84	> 5.0
5.	Permanent loss of land (in ha)	2,35,160	–	11,481.88
6.	Cropped area affected (in ha)	5,02,741	–	10,898.96
7.	Damaged houses	21,045	652	19,309
8.	Human lives lost	214	81	169
9.	Human beings missing	00	06	4024
10.	Persons injured	227	27	236
11.	Animals lost	1771	537	11,091
12.	Damage to public properties (in million US $)	3526.3	133.9	2163.2

region despite persistent and serious threat of a number of hazards suggests that the indigenous people of this region, based upon their acquired knowledge, could satisfactorily mitigate losses from these hazards.

Basic understanding of the processes inducing these hazards is however required for doing so. This could however not be done without keenly observing various natural hazards and probing causes thereof. Understanding of probable causes of these hazards would have led the people to experiment with various likely influencing parameters and devise ways of minimizing losses in subsequent events. It is only with this observation, experimentation and carrying forward of the acquired knowledge that these people could successfully understand the processes inducing these hazards and devise ways of ensuring safety from these.

There exist enough evidence to infer that these people possessed superior understanding of the processes underlying the hazards and devised ways of minimizing losses from these. These are discussed in detail in the sections below. Passage of this knowledge through oral tradition alone could however not transmit observations made during hazards such as earthquake that have long recurrence interval. Evidences pertaining to formal documentation and transmission of knowledge related to these hazards remains a major missing link in disaster management related understanding of the indigenous people of this region and the same warrants dedicated and specialized research.

2. Water management

The people of the region attribute flash flood, landslide and drought to excessive presence and scarcity of water. Overview of the rules framed by these people for managing these hazards lead to the conclusion that these people with their keen observations and quest to understand reasons of these hazards were able to decipher some of the intricacies of hydrological cycle including the relationship between recharge of groundwater in the upper reaches of the hills and discharge of springs and other seepages in the middle and lower slopes.

Round the year availability of drinking water in adequate quantity is an important criteria for selecting site for settlement in the hills. Water of the glacier fed major rivers of the region is however not fit for human consumption during summer and rainy seasons due to excessive suspended and dissolved load due to glacial melt and surface erosion respectively. To survive in this terrain the people had therefore to devise ways of exploiting other sources of water.

2.1. Groundwater exploitation

Himalayan region has highly fractured and jointed rock mass that results in quick dispersal of precipitation beneath the ground and makes groundwater exploitation in the region highly challenging. Moreover, unlike plains there exists no permanent water table in the hills and for exploiting subsurface water one has to be precise enough to locate and hit the perched aquifers.

Initially the indigenous people utilized the water of the local streams that are fed by the water oozing out of the hill slopes but soon they developed the art of tapping this oozing out water at