

# Role of Survey Department In Disaster Management In Nepal

Suresh Man Shrestha,

Project Chief,

National Geographic Information Infrastructure Project, NGIIP,  
Survey Department, Nepal.

## Keywords

Disaster, Hazard, Vulnerability, Earthquake, Disaster management, Survey Department.

## Abstract

*The Himalayan Range is a young mountain system of the world and about 83% of the total area of Nepal is covered by high hills and mountains. Major river systems of Nepal originate from the glaciers and are perennial in nature. According to the preliminary results of the Census 2011, more than 50% of total population live in Terai and are vulnerable to flood. Since Nepal falls under the seismically active zone earthquake has been one of the major disasters experienced in the country. Fire, Glacier Lake Outburst Flood, lightening, hailstorm are some other natural disaster claiming lives of Nepalese people.*

*It is not possible to stop disasters, but the consolidated effort of different organization may make us better prepared to overcome the negative impacts of such disasters. This article tries to explore the role of Survey Department in this context.*

## Introduction

Nepal lies in between the latitudes of 26°22' N. to 30°27' N. and the longitudes 80°04' E. to 88°12' E. Nepal is a landlocked country lying in between People's Republic of China in the north and Republic of India in the west, south and east. In May, 2008 Nepal has been declared as the Federal Democratic Republic. Nepal covers an area of 1,47,181 square kilometers. The Constituent Assembly of Nepal is busy in forming the constitution of the country. Recently, State Restructuring Commission has submitted its report to the government of Nepal on transforming the country into a federal system. Currently Nepal has been administratively divided into five development regions, fourteen zones, seventy-five districts, fifty-eight municipalities and 3915 Village Development Committees (VDCs). Each VDC and municipality is further divided into at least nine wards. Each district is headed by a chief district officer (CDO) responsible for maintaining law and order and coordinating the work of field agencies of the various government ministries.

## Topography

Nepal can be divided into three main regions – Terai, hills and mountains. The plain area in the south, called Terai, occupies about 17%, hills 68% and mountains 15% of the total area of the country. More than 80% of the land is comprised of hills and mountains. On an average it extends to 885 kilometers in the east-west and 193 kilometers in the north-south directions. The elevation difference within this small area ranges from about 60 meters to 8848 meters (Mt. Everest).

## Rivers

Most of the rivers and streams of Nepal flow from north to south. Basically, rivers originate from Himalayas, Mahabharat range and Chure hills. Rivers originating from Himalayas are perennial in nature.

The three main river systems of the country Koshi, Gandaki and Karnali originating from glaciers and snow-fed lakes constitute the rivers of the first category. Rivers like the Mechi, Bagmati, Kamala, Rapti, etc. originating from the Mahabharat range, constitute the rivers of the second category. Streams and rivulets originating mostly from the Chure hills make up the third category; these rivers rely on monsoon rains and are otherwise dry.

## Climate And Rainfall

Nepal has very pleasant climate. Nepal has four distinct seasons. Spring, from March to May is warm and dusty with rain showers. Summer, from June to August, is the monsoon season when the hills turn lush and green. Autumn, from September to November, is cool with clear skies. In winter from December to February, it is cold at night and can be foggy in the early morning but afternoons are usually clear and pleasant, though there is occasional snow in the mountains.

Weather climate conditions in Nepal vary from region to region. Summer and late spring temperatures range from more than 40 Degrees Celsius in the Terai to about 28 Degrees Celsius in the hilly region of the country. In winter, average maximum and minimum temperatures in

the Terai range from a mild 23 Degrees Celsius to a brisk 7 Degrees Celsius while the valleys experience a chilly 12 Degrees Celsius maximum temperature and a minimum temperature falling below freezing point. Much colder temperatures prevail at higher elevations.

The mean annual precipitation ranges from more than 6000mm along the southern slopes of the Annapurna range in central Nepal to less than the 250mm in the north central portion near the Tibetan plateau. Precipitation varying between 1500mm and 2500mm predominate over most part of the country. On an average, about 80% of the precipitation is confined to the monsoon period (June-September).

## Geology

The Himalayan Range is a young mountain system of the world. It is a broad continuous arc along the northern fringes of the Indian subcontinent, from the bend of the Indus River in the northwest to the Brahmaputra River in the east. The Himalayan mountain chain extends in an east-west direction between the wide plains of the Indus and Brahmaputra in the south and the vast expanse of the high Tibetan Plateau in the north. The limit of the Himalayas in the east and west is marked by the eastern and western arc of Himalayan bends.

Himalaya was formed by the collision of the Indian Plate with Tibetan (Eurasian) Plate around 55 million years ago. Many scientists believe that at that time the northward moving Indian plate first touched the southern edge of Tibetan (Eurasian) plate.

The Himalayan mountain system developed in a series of stages 30 to 50 million years ago and they are still active and continue to rise today. Himalaya is considered as a tectonically very active and vulnerable mountain system of world.

## Population

According to the preliminary results of the Census 2011, the population of Nepal is 26,620,809 which is 14.99 % more than the population of Census 2001. 50.15% of total population live in Terai, 43.11% of total population live in Hills and 6.74% of total population live in Mountains. 21.9% of total population live in Eastern, 36.5% of total population live in Central, 18.6% of total population live in Western, 13.5% of total population live in Mid-Western and 9.6% of total population live in Far-Western development regions. 83.0% of total population of Nepal lives in urban and 13.0% of total population of Nepal live in rural areas of Nepal. Among the municipalities, Kathmandu Metropolitan City has highest (1,006,656) and Dhulikhel Municipality has lowest (16,406) population. Kathmandu district has highest (1,740,977) and Manang has lowest (6,527) population. The highly populated districts are Kathmandu (1,740,977), Morang (964,709), Rupandehi (886,706), Jhapa (810,636) and Kailali (770,279). Least populated districts are Manang

(6,527), Mustang (13,799), Dolpa (36,701), Rasuwa (43,798) and Humla (51,008). The population density has increased from 157 per square kilometers in 2001 to 181 per square kilometers in 2011. Terai has highest population density of 392 per square kilometers and Mountain has 35 per square kilometers. Population density in urban areas is 1,381 per square kilometers while it is 154 per square kilometers in rural areas.

## What Is Disaster?

According to the United Nations International Strategy for Disaster reduction (UNISDR):

**Hazard** - A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Hazards arise from a variety of geological, meteorological, hydrological, oceanic, biological, and technological sources, sometimes acting in combination.

**Vulnerability** - The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management.

**Disaster** - A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disasters are often described as a result of the combination of the exposure to a hazard, the conditions of vulnerability that are present, and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

## The Major Kinds Of Disaster In Nepal

**Flood and Landslide** - The topographical feature of Nepal is mainly responsible for flood and landslide. Flood is caused by heavy precipitation which may occur at any place except high Himalayan region during the monsoon season. In general Terai, southern belt, are prone to floods

and flash floods. The causes of landslide in Nepal are natural as well as man-made. Geomorphology of Nepal is very fragile and most of the parts of country fall under seismically active zone. In general the middle hills are prone to landslides. The natural phenomena like heavy rainfall, active geotectonic movements, deforestation and disturbance of hill slopes are also the major causes for occurring landslides.

In July 1993 A.D. Nepal experienced a devastating flood in the Tarai region of Nepal which took the life of 1336 people and affected 487,534 people. Flood and landslide of 1998 A.D. was severe which affected various parts of the country, mainly the Tarai and the middle Hill region. This disaster claimed 273 human lives, injured 80 people and killed 982 cattle heads. Besides, 33,549 families were affected, 13,990 houses and 1244 cattle sheds were destroyed and 45 thousand hectares of land and agricultural crops were ruined. Flood and landslide in 1999 A.D. killed 193 people while the corpse of 47 people could not be found and 91 people were seriously injured. In this disaster 8,844 families were affected, 3,507 houses and cattle sheds were destroyed and 177.32 hectors of land and agricultural crops were ruined.

On August 18, 2008 the Saptakoshi River broke through a retaining wall following heavy monsoon rains, resulting in floods in Sunsari District in southeastern Nepal. Flooding affected eight village development committees and displaced between 35,000 and 50,000 people, according to the U.N. Office for the Coordination of Humanitarian Affairs (OCHA) and local media. Flood waters blocked Nepal's East-West Highway and disrupted communications systems.

Earthquake - Nepal falls under the seismically active zone mainly due to the subduction of Indian plate under Tibetan plate. The seismic record of Nepal is available since 1255 AD. After that, a series of earthquake occurred in Nepal. Major are in 1408, 1681, 1810, 1833, 1866, 1934, 1980, 1988 and 2011 AD.

Earthquake in 1934 A.D. with a tremor of 8.4 Richter scale magnitude claimed the life of 16,875 people and destroyed 3,18,139 houses. Nepal experienced two other major earthquakes one in 1980 A.D. and another in 1988 A.D. The earthquake of 1980 A.D. had a tremor of 6.5 Richter scale magnitude and claimed life of 178 people and about 40 thousand houses were destroyed. The earthquake of 1988 A.D. had a tremor of 6.6 Richter scale and killed 721 people, 1566 cattle heads and destroyed about 64,467 houses. Recently the earthquake of September 18, 2011 A.D. had a tremor of 6.8 Richter scale and killed 6 people and completely destroyed 68 houses in Nepal.

Fire - About 86% of the population of the country inhabit in the rural areas mainly in thatched houses closely clustered where fire hazards are likely to be common. The forest fire usually outbreaks during dry season. In 1999 A.D.

fire disaster claimed the life of 39 people injuring 10. The number of affected families by this disaster reached up to 1,065 destroying 1,035 houses.

Glacier Lake Outburst Flood (GLOF) - The impact of climate change has caused GLOF as a major threat in Nepal. GLOF affects high Himalayan region as well as down-stream by extreme damages of lives and properties. Major events shown in past were Tamor Koshi (1980), Sun Kosi (1935, 1981), Dudh Kosi (1977, 1985), Arun (1968, 1969, 1970) etc. Now Tsho Rolpa and Emji Glacier Lake are in most vulnerable stage according to researchers.

Others - The epidemic of diarrhea, encephalitis, meningitis is common during hot and rainy season. The lightning, hailstorm are other natural disaster. The sudden avalanche and heavy snow fall in winter season sometimes cause heavy loss of human lives and properties. Haphazard storage of inflammable substances in cities and urban houses may pose serious threat to the lives of thousands of people.

On the basis of the facts presented above, we can conclude that Nepal is a disaster prone country, most devastating disasters being earthquake, flood and landslide.

### Disaster Management In Nepal

Ministry of Home Affairs works as the apex body in relation to disaster management in Nepal. Formulation of national policies and their implementation, preparedness and mitigation of disaster, immediate rescue and relief works, data collection and dissemination, collection and distribution of funds and resources are the vital functions of the Ministry. It has its network throughout the country to cope with the natural disasters. There are 75 administrative districts in the country and each district there is the Chief District Officer as the district administrator who acts as the crisis manager at the time of natural disasters.

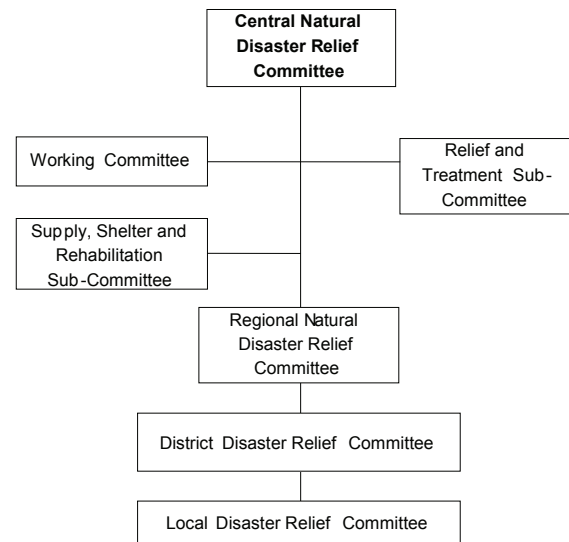


Figure 1: Disaster Management in Nepal

Thus, the Ministry of Home Affairs is the key agency for immediate response during disasters and has to play a leading role in managing the natural disasters in the country.

### Role Of Different Institutions

According to the Natural Disaster Relief Act 1982 (NDRA) Central Natural Disaster Relief Committee (CNDRC) has been constituted under the chairmanship of the Home Minister in order to formulate and implement the policies and programs relating to the natural disaster relief work and to undertake other necessary measures related thereof. Secretaries from different ministries are members in this committee. Surprisingly, Survey Department, Ministry of Land Reform and Management has no official representation in this CNDRC.

The Department of Mines and Geology (DOMG) is preparing a landslide inventory. Department of Water Induced Disaster Prevention (DWIDP) is carrying out different activities related to water induced disasters. The Department of Soil Conservation (DOSC) is doing some protection works in different districts. The Department of Roads (DOR) is carrying out some bio-engineering works in cooperation with the Tribhuvan University (TU), in order to stabilize the slope and road cut sides. The Department of Hydrology and Meteorology and International Centre for Integrated Mountain Development (ICIMOD) are preparing the map of flood prone areas. The Department of Hydrology and Meteorology (DOHM) is involved in generating data on earthquakes and weather forecasts in the country.

### Disaster Management

Simply speaking, "disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters." [International Federation of Red Cross and Red Crescent Societies].

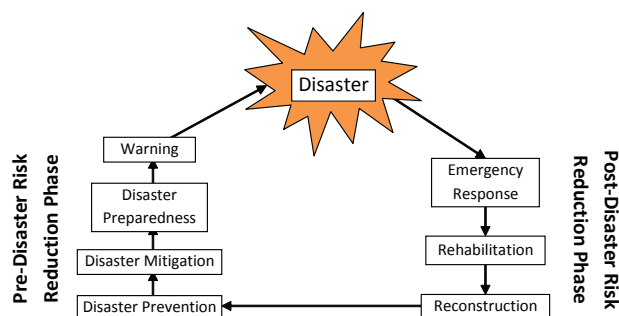


Figure 2: Disaster Management Cycle

Disaster Risk Reduction (DRR) aims to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through an ethic of prevention. There are basically two phases in this regard – Pre-Disaster Risk Reduction Phase and Post-Disaster Risk Reduction Phase.

### Role Of Survey Department

We do not know when a disaster may break upon us and hence, it is important that we take necessary preparatory measures in case anything unforeseen happens. Natural disasters do not knock on our door before they came and most of the times it is the unexpectedness that harms the most. Although, our preparedness may not stop the disaster from happening, we can definitely control the amount of loss caused by a disaster.

1. The current trend of Survey Department focusing mainly on cadastral mapping should be radically changed to widen its services to a broader range of sustainable development partners. Being a National Mapping Agency, Survey Department should reach out to different development sectors to assist them in the field of mapping and geo-spatial information production and proper use of such information for the overall sustainable national development. One of such development partners is the one leading disaster management in the country.
2. Disaster preparedness, emergency response and rehabilitation are some major phases where Survey Department can provide important information. Existing geo-spatial data in digital or hard copy map form may serve as a tool to predict, manage and mitigate the effects of disasters.
3. Geo-spatial information generated after a disaster can greatly assist in impact assessment and rehabilitation works. Accurate geo-spatial information at hand can greatly ease the overall disaster management process.
4. Generally a few days after a disaster occurs, geo-spatial information may come from a variety of sources. These data are generally in different forms and standards making the use of such information a very difficult task. In this context SD must take appropriate actions to formulate and implement the standards for geo-spatial data/information.
5. Disaster preparedness and rehabilitation works are humanitarian efforts to mitigate and rescue the affected people. Survey Department should take necessary actions to develop a policy to avail baseline geo-spatial data to the concerned organizations free of cost.
6. Geo-spatial data generation and map making is becoming easy day by day. Cheap and sometimes free technology (software, internet etcetera) is becoming available. Survey Department should develop a team of experts and skilled operators to undertake the task of geo-spatial data generation (especially on the basis of satellite images), map making and data sharing especially devoted to the field of disaster management.

7. Efforts of Survey Department alone may not be sufficient to generate required geo-spatial data and information required for disaster management. Survey Department should explore the possibilities of working with different national, regional and international partners working in the field of geo-spatial data and information for disaster management.

### Conclusion

Nepal has witnessed a variety of disasters in the past. Due to its topography and geological structure it is a disaster prone country. Disaster management involves a huge amount of resources – both financial and material as well as man power. It is not possible to stop disasters from happening. A consolidated effort of various organizations is a must to cope with the ruthless effects of disasters. Survey Department has a great role to play in the humanitarian efforts to prevent and mitigate the effects of disasters by providing timely, up-to-date, standard, affordable geo-spatial information.

### References:

1. Dahal R.K., 2006, *Geology of Nepal*, ([http://www.ranjan.net.np/geology\\_of\\_nepal/geology\\_of\\_nepal.html](http://www.ranjan.net.np/geology_of_nepal/geology_of_nepal.html))
2. Dr. Poudyal Chhetri Meen B., 1999, *Country Report 1999, MOHA, Nepal*.
3. [http://www.himalayanmart.com/climate\\_nepal/climate\\_nepal.php](http://www.himalayanmart.com/climate_nepal/climate_nepal.php)
4. <http://www.ifrc.org/en/what-we-do/disaster-management/about-disaster-management/>
5. <http://www.thamel.com/htms/rivers.htm>
6. *Central Bureau of Statistics, NPC, Nepal, Population Census Preliminary Report 2011.*
7. *Government of Nepal, MOHA, Press Release September 19, 2011.*
8. *UNISDR, 2009 Terminology on Disaster Risk Reduction.*



### Author's Information

Name	: Mr. Shrestha Suresh Man,
Academic Qualification	: M. Sc. in Engineering (Cartography), Moscow Institute of Geodesy, Aerial Surveying and Cartography, 1987,
Organization	: National Geographic Information Infrastructure Project (NGIIP), Survey Department,
Current Designation	: Project Chief,
Job/Work Experience	: About 22 years.
Published Papers/Articles	:
Email	: pc.ngiip@gmail.com