

DATA ACQUISITION FOR SEARCH, RESCUE AND RELIEF OPERATION IN AFFECTED AREAS CAUSED BY NATURAL DISASTER

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Abstract: Nepal is vulnerable to number of disaster and consequently has to bear loss of properties and infrastructures as well as human and cattle lives. In such circumstances, responsible authority should response for search, rescue and relief operation for the affected people due to disaster. In order to perform this job, they need spatial data of the affected areas and social data and information related to the disaster. There are several options for acquisition of such data and this paper tries to recommend for adopting a suitable mechanism.

Introduction

Every part of the world would experiences disaster either due to natural phenomenon or due to human negligence. Bigger the magnitude of the disaster, bigger will be the amount of destruction. When there is loss or damage of the properties, infrastructures and lives then responsible authority should assess the damage and should act promptly to support the affected people and should prepare plan to stabilize the situation caused by the disaster. Basis to prepare the plan is the data and information collected aftermath of the disaster. There are several methods for collection and should choose the appropriate mechanism so that the necessary data and information should be collected in a short span of time, should obtain reliable data and information and the procedure should be economical. Based on the data and information collected, the responsible organization should response for the search, rescue and relief operation.

1 DIFFERENT TYPES OF NATURAL DISASTER IN NEPAL

Disaster never comes by giving information, in other words, occurrence of disaster cannot be predicted in advance, it occur all of a sudden. So the people will hardly get time to take precautionary measures for their safety. There are different types of natural disaster such as flood, landslides, Glacial Lake Outburst Flood (GLOF), avalanche, earthquake, volcanic eruption, tsunami, cyclone, tornado, et cetera. Whatever type of disaster it is, it destroys the infrastructures standing in nearby of its affected areas, takes lives of human and animals or could be injured. Amount of losses and destruction entirely depends upon the size or intensity of the disaster. Bigger the size of disaster more will be the destruction. However, amount of destruction could be minimized by creating awareness to the people, adopting strictly proper policy, rules and regulations with respect to disaster and materializing the precautionary measures such as following land use policy, performing geological study before construction of any infrastructure; identifying vulnerable places before settlements, et cetera.

Nepal is most vulnerable to different types of disaster except those related with volcano and sea because there are no volcanoes and sea in the country. In other words, there will be no volcanic eruption, should not face sea tsunami and sea cyclone. In the past, Nepal experienced several natural disasters such as flood, landslides, earthquakes, avalanches, et cetera causing

destruction of agricultural field, swept away houses, loss of human and cattle, damaged infrastructures, et cetera.

It is worthwhile to give an example of a disaster related with earthquake. The experts said that Nepal is one of the earthquake prone zones of the world and ranked eleventh place in the list. So, if the past history is recalled, Nepal witnessed number of earthquakes of magnitude ranging from less than four to more than eight in the Richter scale. Earthquake caused in Nepal is due to release of energy accumulated in the process of pushing the Tibetan tectonic plate of Eurasian tectonic plate upward by the Indian tectonic plate when it is not in state to hold such energy, due to which every year, the mass of land moved northward by approximately 4 cm. Based on the past record of earthquakes in Nepal, the experts also predicted that every 70 to 100 years of time interval Nepal may experience bigger earthquake. For example, in 1934 AD, there was a huge earthquake measuring 8.4 Richter scale in Nepal due to which 8,519 people were killed and 2,074,000 structures have been destroyed in the country. After 82 years from 1934 AD, once again, on 25th April 2015, a massive earthquake measuring 7.6 Richter scale in magnitude hit the country. In this earthquake also Nepal lost large number of lives and faced huge destruction of infrastructures. According to the statistics, 8,835 people were killed and 133 cultural heritages structures and 591,648 houses were completely destroyed as well as 608 heritages structures and 276,395 houses were partially damaged.

The amount of destruction could have been minimized if the responsible organizations have developed the definite policy to create awareness to the people, adopt building codes, took precautionary measures, et cetera. By experiencing this devastating earthquake, Nepalese people should learn lessons to prevent huge destruction due to natural disaster in future.

2 DATA NEEDED TO SEARCH, RESCUE AND RELIEF OPERATION

As mentioned above, when any type of disaster occurs in an area, there could be damage and the scale of the damage depends upon the intensity of the disaster. Destruction may affect in different sectors and several nature such as people living in the affected area may be injured or may lose lives of people, their shelters may be destroyed, stored food stuff may be mixed with the debris, infrastructures like road, bridge, canals, et cetera may be destroyed, cultural heritage structures such as temple, stupa, palace, et cetera may be damaged, and so on. When the people are affected by the disaster, they need shelter, food, water, medicine, et cetera. Government should take responsibility to provide relief materials to affected people. Besides that, the local or any people could support such people by providing any materials they need, that will relieve partially to live their daily life in such a harsh situation.

The first thing is to prepare a plan for search and rescue operation. Because the responsibilities of the government are to search the persons who are affected by the disaster and who need help, to rescue the persons who are trapped and some may need to provide medical treatment and sometimes it is necessary to lift some of them by ambulance or helicopter to take to hospital who are seriously injured. Therefore, the responsible authority should have to manage a temporary medical camp(s) equipped with the necessary medicines, equipment and medical persons near the affected areas.

Next phase is to manage and supply relief materials to the affected persons and families. The relief materials could be tent, drinking water, food stuffs, medical kits, et cetera. In order to distribute the relief materials, some basis is necessary which can be regulated by local authority, volunteers, community organizations, Non-governmental organizations (NGO), International non-governmental organizations (INGO), et cetera. The plan is to be prepared based on the data collected from several sources in which delineation of affected area to be identified.

Based on the information mentioned above, data needed for the relief operation can be grouped into spatial and social data. Spatial data is the map of the area affected by the disaster. Social data consists of several information namely amount of destruction in physical infrastructures, number of family/persons affected and number of loss of human and animals, et

cetera. Then the responsible authorities will distribute the relief materials based on the data provided to them.

3 TOOLS FOR SPATIAL DATA ACQUISITION OF AFFECTED AREAS

There are several tools for the data acquisition needed for the assessment of destruction caused by natural disaster ranging from traditional methods to modern methods. Selection of the method should be effective, fast, reliable and economical. Traditional methods need a lot of planning, time consuming and consequently become expensive. For example: data can be collected by physically visiting the affected areas. But, it is not simple to identify the affected areas. Secondly, access to the areas could be difficult due to damage caused by the disaster so it will take longer time and need to bear a large sum of budget to acquire expected data. Aerial photography could be another alternate. But in the context of Nepal, this method is also not recommended because there are no organizations who could take aerial photography immediately, because the aerial photography materials needed to take aerial photography will not be in stock and it takes time to order from abroad and to receive, no special aircraft is available which can be used to take aerial photography and finally, it takes quite a long time to get permission from the concerned organizations for taking aerial photography. For instance, Mapping Committee, Civil Aviation, Ministry of Home and Ministry of Defence must grant permission to commence the aerial photography mission and the process for taking such permission cannot be completed in short span of time. Furthermore, weather condition needed to be favourable. Therefore, this method is not suitable for data collection for the purpose.

By no means, it is better to apply modern technology namely remote sensing technology. In order to apply this tool, it is necessary to acquire satellite image data after the occurrence of disaster. There are few options in this method. Firstly, there are number of international organizations who could supply remote sensing data on demand to the organization free of cost. One of such organizations is Sentinel Asia of Asia and the Pacific Region. Data provided by these organizations may be appropriate or may not be sufficient to assess the destruction mainly due to the resolution of the data. However, for immediate response to prepare the base for the assessment of the destruction caused by the natural disaster, these data could be useful. For example: in 2005 AD, when there was disaster caused by flood in Koshi area, Survey Department requested Sentinel Asia for the satellite data of the affected area. In quick response, Sentinel Asia provided the data to Survey Department and the department prepared a map of the affected area using the data and circulated the map to the concerned organization. This mission was one of the most commendable works of the department. Other option is

to place order the appropriate satellite data from well known data providers. After receiving the data, an appropriate map could be prepared for the assessment of the destruction.

One of the recent technologies is Light Detecting and Ranging (LiDAR) technology which is gaining its popularity for the data acquisition due its simplicity and reliability. The system can be operated with rotary platform like Helicopter or fixed wing platform like aircraft. This method could be useful for mapping the affected areas for detailed assessment.

One of the most effective and popular methods to acquire the data is using Unmanned Aerial Vehicle (UAV); also termed as Drone. This is very easy to handle and can be used in inaccessible areas as well and can be launched immediately in the disaster affected areas. For instance, International Centre for Integrated Mountain Development (ICIMOD) had used Drone to acquire data in Sankhu, of Kathmandu after the destruction due to massive Earthquake of April 2015 and prepare a map of the affected area and shared the data and map with the concerned organization such as Ministry of Home Affairs. The map helped a lot to the Ministry for their search, rescue and relief operation in the area.

Among these several methods of data acquisition, the technology using Drone seems to be the most appropriate tool for immediate response in the case of severe disaster.

4 SOCIAL DATA COLLECTION MECHANISM

Social data for the relief operation can be collected with several mechanisms. One the most appropriate means to collect data is from the local authority. In the present context of Nepal, due to non availability of elected officials in the local authority, these organizations are not effective. Because they do not have authority to take decisions, do not have local information such as number of houses and the families dwelling in their area, do not have sufficient budget to procure relief materials, et cetera. In such circumstances, government has to collect data by mobilizing the persons from the central organizations which could be a weak part of the mission for the search, rescue and relief operation. Other option is to give authority to community organizations such as local social clubs, Nepal Red Cross Society, teaching institutions, et cetera who will mobilize a youth team who are eager to volunteer the very noble work. From the past experiences, this mechanism seems to be more effective means.

5 CONCLUSION

Disasters cannot be prevented and every disaster creates damages in different sectors. The amount of damage is depends upon the intensity of the disaster

and application of precautionary measures before disaster occur. After occurrence of a disaster, responsible authority must take prompt action for search, rescue and relief operation at the areas affected by the disaster for which a plan is to be developed. In order to prepare a plan, spatial data and social information are the prime source of basis. There are several mechanisms for collection of those data and information. The most effected means to collect spatial data is the modern technology of remote sensing using unmanned aerial vehicle also termed as Drone and one of the effective options to gather social data and information is to delegate the authority to local organizations.

References:

Government of Nepal, National Planning Commission, *Report on Post Disaster Needs Assessment, Volume A* 2015

Government of Nepal, National Planning Commission, *Report on Post Disaster Needs Assessment, Volume B* 2015

Rabin K. Sharma: *Report on Sentinel Asia System Operational Training*, Bangkok, Thailand, August 2007

Rabin K. Sharma; *A Concept on Disaster Relief Operation Support based on Sentinel Asia System*, Seminar on GI Science Application in Nepal to observe International GIS Day, Nepal, November 14, 2007

Rabin K. Sharma; *A Glimpse of Earthquake in Nepal and Earthquake/Tsunami in Japan*, Milan Magazine, Japan Alumni Association of Nepal, 2016

Suresh Joshi; *Unmanned Aerial System for Data Acquisition: a Review*, *Earth Observation: Volume VI*; Annual Newsletter of NRSPS 2014



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