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INDIGENOUS KNOWLEDGE FOR DISASTER RISK MITIGATION: FIELD NOTES FROM NEPAL'S FOUR DISTRICTS

Youba Raj Luintel
Central Department of Sociology, TU
E-mail: y.luintel@gmail.com

Abstract

Nepal is a small but vastly mountainous and highly disaster-prone country. The country is exposed to multi-hazards. The field observation reveals that there exists a rich repertoire of indigenous knowledge for disaster risk mitigation in Nepal, which is neither incorporated in the modern education system nor recorded in any systematic manner. Still, such knowledge and practice continue to exist. Studies reveal that communities have a rich stock of knowledge on the way they design housing and settlement pattern that would best mitigate the risk of disaster. Communities also practice afforestation; agro-forestry; mixed and inter-cropping; and drywall fencing or bio fencing. They also build terraces and terrace walls; construct ponds; and consolidate riverbanks to avoid the risks of disasters. They learn this all from conventional knowledge and hand over to the next generation by way of practice. Drawing information from four districts of Nepal, this paper draws a policy conclusion that well before they disappear, the existing repertoire of the diverse forms of indigenous knowledge needs to be documented, and blended with science-based knowledge. This can also be logically concluded that Nepal can demonstrate in this sector by taking a lead.

KEYWORDS:

Disaster; disaster risk mitigation; hazard; indigenous knowledge; Nepal

INTRODUCTION

Nepal is a small but vastly mountainous and highly disaster-prone country. The country is exposed to multi-hazards, such as landslides, floods, soil erosion, earthquake, droughts, etc. While there can be science-based solutions to the risk of disasters, indigenous knowledge has also been contributing to

the conventional community initiatives of risk mitigation. Indigenous knowledge represents a repertoire of knowledge, practice and social activities that have been maintained by the local communities to minimize hazard and vulnerability to a minimum.

This paper primarily drawson information collected in four districts of Nepal, namely Bardiya andChitwan (two Tarai), Syangja and Tanahu (two Hill) Districts. A major objective of this paper is to demonstrate that Nepal is not only a disaster-prone country exposed to multi-hazards, there exists also a rich and diverse knowledge and practices towards disaster risk mitigation.Preservation and replication of such knowledge are highly imperative.

THE NOTION OF INDIGENOUS KNOWLEDGE

Indigenous knowledge can be difficult to define and identify since in many cases it emerges more as a way of life rather than a set of specific initiatives or tools (European Union, ISDR, Kyoto University, SEEDS, 2009).In the field of development, the term indigenous knowledge has been popular with Robert Chambers' group at the Institute of Development Studies (IDS), the University of Sussex. Since 1979,Chambers started featuring "indigenous technical knowledge" at IDS (Kamata, 2000). The term indigenous knowledge replaces several such terms, like traditional knowledge, folk knowledge, emic knowledge, ethnoscience, non-Western knowledge, etc. used earlier in diverse senses.

Purcell (1998) defines indigenous knowledge as "the body of historically constituted (emic) knowledge instrumental in the long-term adaptation of human groups to the biophysical environment (p. 260)." For Gilmour and Fisher (1992), the term indigenous knowledge refers to an organization or social activity which has been set up primarily as a result of local initiatives. The term indigenous knowledge represents a repertoire of knowledge, practice and organization of social activities that have been maintained by the local communities to keep the effects and magnitude of damage, hazard and vulnerability to a minimum.

It is the knowledge that is rooted and embedded in the rurally-located and socio-economically underprivileged groups. Indigenous knowledge is embedded in conventional social practices of the communities that have been learnt in course of the changing dynamics of the nature-culture interface. It is an outcome of the conventional wisdom gained and acquired during the struggles of the local communities while coping with the limits of resources available to them.

While there is a huge body of literature on indigenous knowledge systems, particularly on resource management, the literature on disaster risk management and preparedness particularly on the

flood, landslides and slope failure is very rare. This paper is a preliminary effort that modestly attempts to fill in this gap.

INDIGENOUS KNOWLEDGE & DISASTER RISK MITIGATION

The field observation reveals that the existing repertoire of indigenous knowledge is neither incorporated in the modern education system nor recorded in any systematic manner Still, such knowledge can be found alive. First, such knowledge has some sort of functional utility to the communities preserving it. Second, it has a strong and dynamic nature of inter-generational transmission through oral tradition and practice observation.

Indigenous knowledge has been found more alive and stronger in relatively homogeneous and cohesive communities (say Gurung and Tharu) compared to migrant communities (say Brahmin-Chhetri). The logic is that migrant communities' repertoire of cultural knowledge keeps on eroding and updating as they move and come in contact with different cultural and ecological systems. Whereas communities that are relatively stable and keep on living on their traditional land may use this activity and keep it active.

Communities that have a strong sense of communal solidarity and harmony are most likely to possess more knowledge on disaster risk mitigation. The more community is self-reliant there are high the chances that they have a rich stock of indigenous knowledge.

For all communities, there has been an increasing threat of erosion of conventional wisdom and indigenous knowledge due primarily to the effects of outwardly exposure and wider contacts. It is therefore highly imperative to collect, compile and cross-fertilize the diverse range of indigenous knowledge. A record of such knowledge will help us see whether we can add some more to it, modify it, or blend it with modern science-based knowledge (Thapa, Luintel, Gauchan&Amatya, 2008).

KNOWLEDGE ON RISK TRIGGERING FACTORS

We present here indigenous knowledge that the communities we visited know, are aware of and try to apply to mitigate disaster risks.

Landslides are likely to occur downstream of a watershed if there is heavy deforestation in the upstream. It also increases the levels of riverbeds indownstream due to debris deposition – another cause forthe landslides. The growing extraction of boulder and sand from or along the riverbeds in the commercial-scale also trigger landslides.

Lack of proper forest management invites landslides. Trees need to be trimmed from time to time. Old trees need to cut down in proper time. Incidences of forest fire (*dandhelo*) are likely to take place more if trees are not cut down on

time. Forest fire occurs not only due to human negligence or mistakes, but in the dry season (February-April) forests and pasture lands are fired to allow regeneration of vegetation. The practice of *khoria* (slash-and-burn) system is another cause of forest fire.

Gully erosion may cause landslides. Gullies emerge due to overgrazing, routine grazing in the same field, insufficient or improper natural drainage system for the monsoon water. Increasing construction works (trails, roads, dams, etc.) are often not properly engineered such that they disturb the natural flows of the drainage.

Insufficient or lack of vegetation along the river banks and roads cause landslides. Human encroachment in the riverbeds for the expansion of cultivation make them narrower and cause the flood. Thunderstorm and lightning during the heavy or long monsoon may disturb the existing equilibrium of soil-water balance, thus may cause floods. In the Tarai, the deposition of debris on one side of the river disturbs the flow of the river and may cause a flood on the other side.

Before floods, there might be a sudden spread of peculiar and unpleasant smell coming out of mud or dead aquatic species, such as fishes. A large number of fishes (more than normal) flow downward before floods occur. Wild animals enter inside the community, domestic animals jump, roar and frighten. When the water level in the river goes up, it indicates that flood is likely to follow. Heavy rainfall in the upstream makes people in the downstream always alert.

If new cracks appear on the surface this can be taken as an advance indication of landslides. Water sprouts appearing incidentally in the new places could be another indication of landslides. If many trees change their posture this may indicate that a landslide is likely to occur in the vicinity.

KNOWLEDGE AND PRACTICES FORDISASTER RISK MITIGATION

Local communities possess a range of mitigation measures to avoid risk and vulnerabilities in case of hazards and disasters. In this section, we mainly describe such knowledge in the area of water-induced disasters, mostlyfloods and landslides.

Housing and settlement pattern. The conventional wisdom tells us to build a house in a relatively high elevation. It avails the communities better natural drainage compared to a lower elevation. It also helps them escape from sudden floods, such as flash floods. People build houses with light construction materials, such as bamboo, branches and thatch-roofs. First, they are built with locally available resources. Secondly, houses constructed with light materials provide an easier escape from disaster casualties, as they provide time to evacuate.

Afforestation. One of the most common practices of the communities in mitigating the damage of landslides and floods has been afforestation. Planting trees in barren slopes, open land or marginal/unused land, or along the river banks and roadsides has been a popular community practice both in the Hills as well as in the Tarai (Carter and Gilmour, 1989). For whatever reasons farmers have planted trees and fodder, people residing in the flood and landslide-prone areas have learnt that planting trees help reduce their vulnerabilities to natural disasters.

Agro-forestry. Communities in the Hills prefer shrubs, bushes and grasses instead of keeping heavy trees, to be grown in or around their settlements or in the farming fields. Farmers perceive that such smaller trees protect their farmlands from soil erosion. Their experience shows that such shrubs and bushes are useful in protecting topsoil loss and also that such trees/bushes do not possess any risk of falling during heavy rainfall. Farmers in Tarai plant such species on marginal lands that are not suitable for farming. The practice of agroforestry not only provides fodder, firewood and litter for livestock, it also provides cash income. More importantly, it reduces the perennial problem of topsoil loss. For centuries, it has been a conventional measure to protect terraces and sloppy lands from erosion.

In the Hilly districts, for example, communities plan *amliso* (broom grass) and *babiyo* (*eulaliopsis*) in the terrace walls to protect them from soil erosion. Both of these species are a good source of cash income too, as they have perennial demand in the market. These plants have deep roots scattered around the areas thus hold the soil tight. Bamboo in particular is planted in gullies and shady areas aimed at reducing water velocity. Bamboo's expansive roots inside the soil interlock and reinforce the soil.

Making terraces and terrace walls. In areas where cultivable land is scarce, people have no option but to cultivate marginal and sloppy lands. Most often such lands are exposed to hazards. Still, farmers in the Hills have been developing terraces even on steep slopes. Terraces reduce water turnoff. They minimize topsoil loss. Terraces make cultivation easier. Farmers put stones and mud blocks at the edge of the terraces so that the water retained in the terrace pass through without much destruction. Importantly, the age-old practice of creating terrace on the steep slope lands have converted large tract of fields into cultivable lands.

Mixed and inter-cropping. Farmers in the Hills as well as in the Tarai attempt to increase crop intensity through mixed and inter-cropping. In the Hills, they plant maize with soybean or cow-pea, finger millet with *masyang* (black gram), wheat with potato. One of the primary motives of intensifying crops is to increase harvest and diversify it. But, it is also one of the effective and proven methods of reducing topsoil loss

as mixed crops break the speed of the surface run-off. Finally, barren, fallow and uncovered land is prone to soil erosion by wind, water and landslides. Mixed or inter-cropping allows that the lands to be covered by some sort of plants for an extended period, thus help mitigate disaster risks, such as floods or landslides.

Constructing ponds.In rural areas from both the Hills and Tarai, people are fond of having constructed or maintained small to medium-sized ponds depending upon the availability and type of land. Ponds are usually constructed to farm fish and for irrigation, but most importantly, such ponds help stabilize soil mobility and minimize topsoil loss. In case of heavy rain, often during the monsoon season, these ponds act as a safety valve to break the velocity of the surface runoff. They also store a certain amount of floodwater. Plants and grasses grown around the ponds protect landslides and water leakage.

Riverbank reinforcement. In areas where the stream passes by the middle of the farm, farmers use to follow a conventional method of bank reinforcement. Communities in Rajapur, Bardiya have demonstrated the application of this method for years. In such a practice, hardwood pegs are placed at a close distance along both sides of the stream. Half of the peg (which is usually about two-meter-long) is placed under the surface and the remaining half is left above the surface. Cuttings of some suitable fodder species are also planted on the side of the farm to make the structures durable and stronger. During the flood, such structures help accumulate lots of leaves, branches, twigs and alluvial soil. It protects farmland from side cutting.

Drywall fencing or bio fencing. Fencing has been one of the popular ways being applied as part of conventional wisdom for protecting standing crops, farmlands, houses, communities and even settlements. In the Hills or Mountains, farmers construct dry stone walls (such as in Mustang) on the side of farmlands, streams or settlements. It protects the asset from being washed away from floods, landslides, soil erosions, side cutting and slope failures. It also diverts floods and animals from farmland. Such structures are made using big boulders and rock and small stones. Farmers also plant protective species such as bamboo behind the wall to strengthen drywalls. Alternatively, community people also practice bio fencing, also called bio fencing where stones and boulders are not available. Bio fencing is less expensive. Commonly used plant species for fencing include *sajiwan* (*Moringaoleifera*), *neem*(*Azadirachtaindica*),*khirro* (*Sapium insigne*), *simalee* (*Vitexnegundo*), etc.

This is a conventional practice in which lines of trees or shrubs are planted in the farmland or along the field boundaries. They are less expensive and more useful than fences made of

wood, barbed wire, or stone masonry. Sometimes thorny species are used to protect from the encroachment of wild animals. Medium size trees such as fodder trees, banana and bamboo are also used for this purpose. The idea is, if floods cross the level of their settlement, these trees and shrubs would lessen the speed of the flood and lessen the destruction. During the flood, people may hide within bushes. A live fence protects them and their property from being washed away instantly.

Conclusion

Nepal is a small but vastly mountainous and highly disaster-prone country. The country is exposed to multi-hazards, such as landslides, floods, soil erosion, earthquake, droughts, etc. Nepal's capacity to cope with these hazards is weak, both at national and community levels.

The literature on indigenous knowledge on disaster mitigation and preparedness is scattered and scanty. Systematic and in-depth studies on disaster mitigation in general and indigenous knowledge, in particular, do not exist. Detailed, systematic and intensive studies on indigenous knowledge and practices would contribute more for the appreciation of their overall contribution to disaster mitigation.

Based on their conventional wisdom, communities do have a large and diverse body of knowledge repertoire on disaster mitigation. They are less expensive, community-based and apt to apply locally available resources. Proper documentation of such a knowledge base, development of a functional inventory, and cross-fertilization of these knowledge systems and their blending with science-based knowledge would enhance the country's capacity for disaster mitigation and preparedness (Mercer, Kelman, Taranis &Suchet-Pearson, 2009). This is one of the priority action areas that the Sendai Framework for Disaster Risk Reduction, 2015-2030(UN, 2015), clearly spells out.

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