INTERNATIONAL WORKSHOP

ON

"Sharing Knowledge on Disaster Situations and Responses in Asian Monsoon Region"

Program Schedule

Coffee 9:30-10:00

Program Inauguration 9:45-10 Dr. Shinji Miyamoto

Session I: 10:15 -12:00

Session Chair: Prof. Dr. Ramkailash Prasad Yadav

S.N	Time	Title	Author(s)
1	10:15-10:30	Community resilience and Institutional arrangement for Natural Disasters in Bhutan	**Ugyen Lhendup**, Tshering Wangdi and Yoshio Akamatsu
2	10:30-10:45	Communication Perspective for Disaster Management in Asian Monsoon Region	**Prakash Acharya**
3	10:45-11:00	Flood and its impact on Agriculture in the Haor region of Bangladesh	**Md. Rashedur Rahman** and Shinji Miyamoto
4	11:00-11:15	The fishery in the paddy of the flooded area in Kyoto, Japan	**Nobuhiro Ohnishi**
5	11:30-11:45	Fruit yielding trees in the Trees Outside Forests of Kathmandu valley, Nepal	**Babita Shrestha**, RKP Yadav and BK Sharma
6	11:00-12:00	Experience sharing on disaster management in Nepal as security perspective	**Ramhari KC**

Lunch Break 12:00-1:0

Session II: 1:00 -3:00

Session Chair: Prof. Dr. Nobuhiro Ohnishi

S.N	Time	Title	Author(s)
1	1:00-1:15	Risk to Resilience through Local Collective Action, Changunarayan Municipality, Kathmandu Nepal.	**Kanchan Mani Dixit**, and Kopila Wagley
2	1:15-1:30	Soil physicochemical characteristics in different land use systems along soil depth gradients	**Tilmaya Dhakal Kharel**, Lal Bahadur Thapa, Ramkailash Prasad Yadav, Chandra Prasad Pokhrel
3	1:30-1:45	Flood Problem and Traditional Coping Strategies Adopted by the Communities in the Brahmaputra Valley, Assam, India	**N. Deka1**, G. V. Bhuyan, D. Pradhan, M. J. Bhuyan and A. K. Bhagabati
4	1:45-2:00	Does rural out migration affect land use land cover change? a case study from sunkoshi rural municipality sindhupalchok nepal	**Rajib Khanal**, Yogendra Badhur Gurung
5	2:30-2:45	Study on the Evolution of Flood Inundation Areas in the Asian Monsoon Region and its Factors	**Shinji Miyamoto**, Eriko Kokumai, Shintaro Uchino, Kazuo Ando, Masahiro Ichikawa, Keiko Yoshino, Nobuhiro Ohnishi, Kazuyo Minamide
6	2:45-3:00	Physico-chemical Characteristics of Soil under Tea Agro-forestry System in Tropical region of Nepal	**Chandra Prasad Pokhrel**, Ramkailash Prasad Yadav, Namita Gangai, Ando Kazuo and Shinji Miyamoto

Concluding Remarks Dr. Ram Thapaliya, Dr. Shinji Miyamoto

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Organized by
Okayama University of Science, Japan

In collaboration with

Institute of Crisis Management Studies (Samarpan Academy)
Tribhuvan University, Kathmandu, Nepal

September 17-18, 2022

Risk to Resilience through Local Collective Action, Changunarayan Municipality, Kathmandu Nepal.

Kanchan Mani Dixit,[1] and Kopila Wagley[2]

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INTRODUCTION

Changunarayan Municipality, which lies in the Bhaktapur District of Kathmandu Valley, is losing its peri-urban area as more people move there from other regions of the nation. Within a decade from 2011, the Municipality saw a drastic increase in population from 54,551 to 88612. In this Municipality, the number of females climbed from 44539 in 2011 to 27137 in 2021 (CBS, 2022). Similar to that, new construction increased by 58.8 percent between 1943 and 2017 (Shrestha, Dixit, et al., 2021). The rapid urbanization, with complex topography and landscape, makes the Municipality vulnerable to disasters such as health degradation due to pollution, traffic-led accidents, landslides, floods, lightning strikes, and fires. Floods are the most common significant catastrophes for the residents of the Municipality's lowlands, while landslides threaten residents on the higher slopes.

Changunarayan Municipality has 59 brick kilns, most of which use coal as a primary fuel. According to a study, these kilns' soot particles cause around 40% of the wintertime air pollution (HERD, 2016). They emit greenhouse gases into the atmosphere and are the primary cause of health hazards to the resident, particularly pregnant women, the elderly, and children. The increasing air pollution, lack of early warning and disaster management skills, unavailability of dedicated and fully equipped open spaces for humanitarian purposes, and weak physical infrastructure pose threats to people during disasters. Poor understanding of disaster risk governance, weak disaster preparedness, low awareness among authorities and general people, and impacts of climate change further compound the problems. Disaster Management Committees exist in all wards of the Municipality but lack disaster management training requiring an urgent need for capacity enhancement training to manage disasters. ISET-Nepal partnered with the Changunarayan Municipality and Naxa Pvt Ltd to promote resilient and sustainable urban growth in the Changunarayan Municipality. The project was started in 2021 and will continue till 2025.

RESULTS AND DISCUSSION

The main interventions through this project include open space identification and mapping, strengthening the municipal fire response system through public-private partnerships (PPP), assessing landslide vulnerability, and advocating for reducing air pollution in the Municipality by informing the stakeholders. Developing citizen scientists through installing rain gauges in schools,

piloting a lightning protection system in community building, adopting the UNDRR Disaster Resilience Score Card tool for Municipality assessment and ranking, providing research grants to masters level students, and empowering women entrepreneurship are some innovative approaches implemented. These activities are being institutionalized in the Municipality to ensure sustainable urban resilience. After mapping open spaces, we provided simulations to the communities to access those areas through the shortest route during disasters. Similarly, to prevent encroachment on open spaces, fencing, drinking water, toilets, and electricity are being established in open areas to make them functional and posting the information in a web portal for better public access. Similarly, we are piloting nature-based solutions for landslide risk management in some selected landslide-prone areas. The need assessments of the Municipality recommended promoting economic resilience to poor and marginalized home-based women workers by enabling their access to economic opportunity and integrating market systems through a digital medium. Linking them with a web-based supply chain would allow their access to a wide range of businesses and consumers. The project also aims to impact policy advocacy and knowledge management through various platforms, learning documents, output dissemination, and student fellowship.

CONCLUSION

The intervention directly supports SDG 11 goal of making cities and human settlements inclusive, safe, resilient, and sustainable. It builds resilience through awareness, knowledge, skills, and enhances the capacity of government institutions and communities vulnerable to disaster risks. The project focused on women, youth, and people from marginalized communities affected by recurring disasters such as floods, landslides, and the COVID pandemic. Our effort in DRR management in Changunarayan has shown positive results as the communities are aware of climate change and disaster management issues. The local government, witnessing the positive results, leveraged funds to scale up the activities in all wards of the Municipality. At the same time, the Municipality also increased its annual budget for environment and disaster programs for the fiscal year 078/79. Our effort continues to assess risks and prepare the Municipality to become resilient.

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The fishery in the paddy of the flooded area in Kyoto, Japan

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ABSTRACT

The flooded area is the important habitat for the freshwater fishes that will reproduce in the temporal waters rose after the rainfall. The flooded area also used for the paddy fields in the part of Kyoto Prefecture, Japan in the past. People had caught fishes in the paddy. After the land reclamation for the natural disaster risk and the improvement of the farming ground, the habitats of fishes are vanished in the paddy. For the future development in the rice growing countries, there may be a challenge to conciliate the natural disaster risk management and the local resource management.

INTRODUCTION

The paddy fishery system exists widely in the rice growing Asian countries (1, 2, 3). The indigenous fish fauna occurs in the paddy area. Thus, the fish fauna is the important component of the paddy ecosystem. The paddy where the residents could catch the freshwater fishes is called ‘Jacoda’ in Kameoka City, Kyoto Prefecture, Japan (4). The freshwater fishes migrated into ‘Jacoda’ after the heavy rainfall. It is well known that the temporary water of the flood is the essential event for the spawning of some freshwater fishes in Japan (5). The aspect of ‘Jacoda’ is the paddy having the ecological connection with surrounding water system. Here, I would try to discuss the importance of the flooded area for the biodiversity conservation with the resource use culture.

RESULTS AND DISCUSSION

The aerial photos (6) were compared to clarify the change of the land use in the former ‘Jacoda’ area. There was ‘Jacoda’ on the riverbank in the aerial photos in 1947, 1975, 1982 and 1985. The land reclamation was conducted from 2000 to 2011. The purposes are the improvement of the farming land and the flood protection. The paddy area was trimmed down in the aerial photo in 2020.

After the reclamation, the paddy area was rose the ground level. The riverbank side was dug down and used for the sports ground. But there is no pathway for fish migrations after the reclamation. The lower bank is the potential deepest flood area (< 5.0m) and the paddy area is the mixture of the potential flood area of 2.0-3.0m and 3.0-5.0m in the hazard map in 2018 (7). But the fishes were difficult to find in the paddy fields of this area in the present condition.

The ecological water cycle is the essential environment for the lifecycle of the paddy fishes (8). The catch of the fish is strongly decreased with the construction of the floodwall in Bangladesh. This decline had been recovered with the construction of the artificially controlled flood in the village area (9). The paddy in the flooded area might have a better water connection with surrounding water system and be the important habitat for some of the freshwater fishes. The land reclamation for the flood protection would affect the ecological condition for the freshwater fishes.

The freshwater fish culture already started to vanish from 1960's, because the severe pesticides were used in the farming ground in that era (4). The pesticide caused the malform of the freshwater fishes. This will be one reason why the paddy fishery is ignored during the land reclamation. Now the fish culture, including how to catch fish, how to cook fish and the other knowledges of fishes were totally disappeared in this area.

Recently, the protected area is expected to reduce the natural disaster risks (10). The ecological point of the view will be needed the management to reduce the disaster risk with keeping the culture of the fish resource use.

CONCLUSION

The paddy fishery system exists widely in the rice growing Asian countries. The fishery is the essential livelihood for the residents. The life cycles of some freshwater fishes are strongly depended on the temporal water that may occur with the swollen river. It is the challenge to reduce the risk of the natural disaster with the sustainable use of the fishery resources in the flooded area.

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Flood and its impact on Agriculture in the Haor region of Bangladesh

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ABSTRACT

Bangladesh is extremely vulnerable to flood as 80% of the country comprises the combined delta of three international rivers namely the Ganges, the Brahmaputra and the Meghna with a total catchment of 1.8 million km^2. Among the four types of flood (river flood, rainwater flood, coastal flood and flash flood), the haor region is facing flash flood in almost every year causing a massive destruction of agriculture especially the winter rice, locally called boro rice, just before its harvesting. Government and non-government organizations are working for better and efficient flood management. Structural measures are usually taken by government whereas non-government organizations prioritize on non-structural measures.

INTRODUCTION

Bangladesh is a deltaic country with more than 200 rivers including Ganges, Brahmaputra and Meghna, which are commonly known as GBM river system and rank as one of the largest river systems (1.8 million km2) in the world. Bangladesh is located at the lower part of these mighty rivers' basin and more than 80% of the country's area is floodplain. It is estimated that Bangladesh has 230 rivers, of which 57 are trans-boundary rivers and as it is located at the downstream area, Bangladesh has to drain out runoff that is 12 times larger than the country itself. All of those trans-boundary rivers carry a huge amount of rainwater in the month of June to October that creates a pool with a depth of about nine meters and floods occurred in almost every year in Bangladesh.

Regular river floods affect nearly 20% of the country on average, increasing up to 68% in extreme years. Approximately 37%, 43%, 52%, and 68% of the country is inundated with floods in return periods of 10, 20, 50, and 100 years, respectively (Parvin et al., 2018). However, this paper tries to focus on nature of floods (especially in the haor region), their impacts on agriculture, intensity of damage in different flood occurring year, role of different organization in flood management and some recommendation for efficient management of the flood.

RESULT AND DISCUSSION

There are three major types of abnormal floods such as monsoon or river floods, rainwater floods and flash floods. Another type of flooding is called coastal or storm-surge flooding associated with tropical cyclones in the Bay of Bengal. Over the last 35 years, Bangladesh has experienced six major floods in the year of 1984, 87, 88, 98, 2004 and 2007 with an estimated damage of 0.38, 1.0, 1.2, 2.8, 6.6 and1.0 billion US$, respectively.

Flash flooding caused by overflowing of hilly rivers rises and falls rapidly, typically within a few hours or days, and most prevalent in the north-eastern parts especially in the haor region. Haors are large back swamp or bowl-shaped depressions between the natural levees of rivers subject to monsoon flooding every year, mostly found in North Eastern part of Bangladesh, known collectively as haor basin which is estimated to spread over an area of 25,000 sq. km (Kamruzzaman and Shaw, 2018). The river system of haor region falls under the Meghna basin which is criss-crossed by numerous rivers coming down from the hills of India with huge amount of runoff water frequently causes flash flood and annually causes extensive flood routinely during monsoon. The most destructive damage by flash flood occurred in haor region in 2017 affecting about 150,000 ha of cultivated area with an estimated damage of rice about 394,000 metric ton and all together a loss of 1.6 billion US$ (Mondal, 2019) though the flash flood in 2019 was not devastating as in 2017. During flash floods, sediment transport rates increase significantly of the rivers. Due to high intensity of rainfall in adjacent Indian hills coarser sediment such as big sized stone, boulders etc. start to erode from the hilly catchment area and move along the rivers. Over the years, sediment has got deposited mainly on the riverbed and depressed portion of the Haor. In some areas, about 4 to 5 m sediment has been deposited in on the riverbed, which has created an obstruction for water flow, allowed flood waters to overflow the banks easily (MoEF, 2012).

Recently, in 2022 another flash flood caused a loss of about 12 million US$ in haor region where 20,000 ha cultivated area (boro rice) was severely affected (The Financial Express, 2022). This flood damages are thought to be due to unplanned flood protection dams with a few of those built rather indifferently and regular monitoring and supervision of repair works were missing. Apart from the dam, this is due to geomorphology of the area. Experts find, it is the siltation of the riverbeds and shrinkage of the width of the rivers. Suffice it to say that the Jadukata River near India-Bangladesh border has drastically shrunk from 168 meter in 2004 to just 68 meter in 2017. Also the Meghna, which receives waters from the haor region, at Bhairab Bazar has both shrunk and silted up. Thus disposal of water from the haors is no longer as fast as it was before.

After the devastating floods in 1987 and 1988, the government agreed to coordinate various proposals in the area of flood control. In this context, 26 flood action plans (FAPs) were studied (Mahtab et. al. 2018). Flood Action Plan 6 was for the northeast regional study (haor region). There are several initiatives taken by different agencies to reduce the flood hazard on crop production in haor region. Government took initiative of construction of earthen submersible embankment, dredging of river and canals etc. NGOs tried to provide training on modern rice cultivation, local people tried to harvest the immature winter boro rice early.

CONCLUSION

Haor basin contains immense opportunity for agricultural practices and livelihood improvement of its inhabitants. Since most of the lands are single cropped and flooded every monsoon, its soil is distinctly more fertile and bumper production in every year and significant contribution to

national rice production is the evidence of such productivity in this region. However, increasing the height of the submersible embankment, development of short duration winter rice varieties, excavation of river beds, non-structural measures like early flood warning systems, political negotiations, environmental control etc. are important for effective flood management in haor region.

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Experience sharing on disaster management in Nepal as security perspective

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ABSTRACT

Nepal is prone to a wide variety of natural disasters due to its complex topography, tough geophysical structure, very high peaks, variable climatic conditions, unplanned human settlement, growing population, fragile economic condition and traditional community. Nepal one of the 20 th most multi-hazardous-prone countries in the world. It is on the 11th position in terms of earthquake vulnerability and 30th position in terms of flood and 4th in the climate change vulnerability. Nepal is commonly experiences of landslide, flood, fire hazards, drought, Glacial Lake Outburst Floods (GLOFs), avalanche and epidemic. There are four tiers of disaster management entities. Security forces are the key stakeholders for the disaster response (search, rescue, relief and rehabilitation) phase, as per the constitution of Nepal (2015) and disaster Act (2017). NEOC is the nodal entities in central for coordination in DM, similarly, PEOC, DEOC and LEOCS are the leading bodies in their respective level. Commanders of NA units has to be on the close coordination and cooperation with the MoHA during the disaster situation. Mobilization of security forces as quickly as possible in disaster area and inform the higher formation. Role and responsibility of NA is Conduction of effective search, rescue, and relief and rehabilitation operation during the time of emergency and to launch community awareness program in normal situation. Provide early warning (information) about the likelihood of disaster to the concern authority of the area of responsibilities.

INTRODUCTION

Nepal borders to north by People's Republic of China and others three sides (East, South and West) to the Republic of India. The elevation of the country rises from 60 m.(Kechana kalang) in Terai (south) to 8848 m Mt Everest (North). It is divided in three geographical regions- Himalayan (15%), Mountain Hill (68%) and Plain Terai (17%), in terms of topography from north to south. Politically it has divided into three tiers (federal, provincial and local). Nepal is equally at risk due to its seismic activity, geographical, topographical and geological variation, more than 80 percent of the total population of Nepal is at risk from natural hazards, such as floods, landslides, windstorms, hailstorms, fires, earthquakes and Glacial Lake Outburst Floods –GLOFs (Nepal Disaster Repor-2019). Normally, southern (Terai) part of Nepal is vulnerable for floods and the northern parts are vulnerable for landslides, and Glacial Lake Outburst Floods –GLOFs.

The word disaster implies a sudden overwhelming and unforeseen event that cause damage, destruction and human suffering. It is beyond the local capacity to cope and call for internal/external assistance. Disaster means progressive or sudden, widespread or localized,

natural or human caused occurrence which causes or threatens to cause death, injury or disease, damage to property, infrastructure or the environment, or disruption of life of a community (DRM Textbook, 2000). In a disaster situation, the capability of a community or a nation struggles or fails to deal with the effects of those natural or manmade events. As per the definition given by The World Health Organization (WHO), a disaster as "a sudden ecological phenomenon of sufficient magnitude to require external assistance".

Nepal is prone to a wide variety of natural disasters due to its complex geography, rugged geophysical structure, very high peaks, variable climatic conditions, unstructured settlement, escalating population, fragile economic condition and low literacy rate. Nepal is one of the 20 th most multi-hazardous-prone countries in the world. It is in the 11th position in terms of earthquake vulnerability and 30th position in terms of flood and 4th in the climate change vulnerability (Nepal Disaster Repor-2019). Nepal has been frequently experiences with floods, landslide, Glacial Lake Outburst Floods (GLOFs), hailstone, fire hazards (bush and industrials), Drought, Avalanche, earthquake and epidemic.

RESULTS AND DISCUSSION

Security forces (Nepal Army) is one the key stakeholders of disaster management in Nepal. Constitution of Nepal and The Disaster Risk Reduction and Management (DRRM) Act, 2017, has clearly defined the role and responsibility of Nepal army. Search, Rescue and relief are the legally given mandate to the NA during the response phases. Besides that, the following tasks has been carried out for the disaster management in the respective field or AoR.

(a) Assess the likelihood of Disaster in the AO and provide early information to the concern entities.
(b) Conduction of community awareness program.
(c) Mobilized the forces on the ground (Disaster area, as and when necessary) as soon as possible and give information to the higher formation.

NA is also responsible for directing and coordinating foreign military (multinational military humanitarian assistance.) during disaster emergency and transporting and distribution of relief materials to the needy people (victims).

CONCLUSION

Disaster management function is a holistic task of all concern stakeholders (governmental, UN, and nongovernment agencies and other humanitarian partners). There has to be closed cooperation, coordination and communication between them for the better preparedness and better response in DM. These all stakeholders have to be positioned (placed) required resources as per their respective cluster (such as food items by Chambers of Commerce and Industries, medical items by health sectors and shelter by Red Cross). Due to the multi-hazardous country, any time any type of hazards may happened in Nepal. So, as a one of the key responder, NA has stand by its troops 24/7 for the quick mobilization on ground or effected field.

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Soil physicochemical characteristics in different land use systems along soil depth gradients

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ABSTRACT

Soil is an important natural resource for sustaining life of living being and agricultural development in the earth. Changes in land use and improper soil management have led to severe land degradation around the globe. Studies regarding soil properties according to land use systems and depth may contribute in sustainable management and conservation of soils.

INTRODUCTION

Soil is very important factor in determining the vegetation. The edaphic factors have the significant influence for vegetation heterogeneity in the natural forest (Shrestha P., 1979). Degeneration of Soil caused by entirely human activities along with climate change has become very common (Bindraban et al., 2012; Wairiu, 2017). Soil has many physical and chemical attributes that determine its quality and functionality. The Physical properties are texture, structure, density, porosity, consistency, color, temperature, bulk density, stoniness etc. The Chemical properties are various chemical components in soil such as pH, nitrogen, phosphorous, potassium, etc. (Sigdel, 2015; Wild, 1996). The biological properties are organic matter and soil organisms. Physicochemical characteristics of soils varies spatially and temporally due to variations in elevation, topography, climate, physical weathering processes, vegetation cover, microbial activities, and several other biotic and abiotic variables (Paudel & Sah, 2003). This study aimed to assess the soil properties of abandoned and agriculture lands along the season and depth in Shivapuri-Nagarjun National Park, Kathmandu.

RESULT AND DISCUSSION

The highest bulk density (BD) (1.33 g/cm3) was found in 20-30 cm depth in abandoned land in post monsoon and the lowest (1.15 g/cm3) in 0-10 cm in agriculture land in monsoon. The BD was slightly increased with increasing soil depth. The soil pH value ranged from 5.6 – 6.4. The highest pH was found in monsoon in 20-30 cm depth in abandonment and the lowest value is 0-10 cm depth which is also reported in same land in post monsoon. The moisture content ranged from 18.1 to 42.02 and increased in rainy season and increased with soil depth. The EC ranged from 21.2 – 67.9 µ S/cm3 which was slightly high in monsoon season. The highest value of SOC (2.55 %) and lowest (1.67 %), both values were found in monsoon in abandonment and agriculture

land respectively. The highest value of total Nitrogen (TN) (0.25 %) was obtained in abandonment (0-10) in post monsoon season, and lowest (0.10 %) was found in agriculture (20-30) land during the monsoon . The high (58.52 kg/ha) and low value (32.4 kg/ha) of available phosphorus both were found in agriculture land in (0-10) and (20-30) cm depth in post monsoon and monsoon respectively. The available potassium was higher (720 kg/ha) in agriculture land (0-10) cm depth in monsoon and lower value (194.93 kg/ha) was found in same land and depth in post monsoon. These values decreased with increases in soil depth.

CONCLUSION

Soil analysis showed that the pH of both land use type was slightly acidic and increased in post monsoon. The bulk density and moisture content increased with increasing depth. Electrical conductivity was decreased with depth and slightly higher in agriculture land than abandonment land. Total nitrogen, available phosphorus and potassium were increased with soil depth. all these values found high in post monsoon season. The value of soil organic carbon percent, soil organic matter and soil carbon stock were decreased with increasing depth. These values were higher in abandonment land than agriculture. The results showed that the soil properties were change with season, soil depth and land use type. This information could be helpful to know the soil status of agriculture and abandonment land.

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Fruit yielding trees in the Trees Outside Forests of Kathmandu valley, Nepal

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ABSTRACT

Trees Outside Forests (TOF hereafter) are important for food security and green economy. Study was conducted for assessment of the food (fruits, nuts and fruit related spices) as a part of provisioning services on TOF in Kathmandu valley of central Nepal. Inventory was performed in 209 randomly selected plots with 20 m radius. Total of 945 TOF with merchantable values of fruits, nuts and spices were recorded in 132 plots that belonged to 40 species, 28 genera and 20 families. Average density of fruit bearing trees was 35.97/ha. Based on the average yield and average local market prices of these fruits, total of NPR 516111.31 ($ 4344.37/ha) was the merchantable value. The study also explored the importance of TOF in the aspect of food production in Kathmandu valley and provides the baseline data useful for planning suggesting a need for appropriate species selection for plantation.

INTRODUCTION

Trees Outside Forests are the single discrete tree to systematically managed trees (Kleinn, 2000). The cover area should be < 0.5 ha and canopy cover < 10 % (FAO, 1998). On the basis of land where they are found, the TOF types are (DFRS, 2011) – A) - TOF in urban, suburban and rural areas, and B) TOF includes both trees and shrubs (Foresta et al. 2013). TOFs yield merchantable fruits and serve for green economy. Fruits are consumed in the form of fruits, nuts and other fruit related spices;, a type of non-timber outside forest product (NTOFPs). NTOFPs could be the income generating sources for the local people (IFAD, 2008). Fruits as a source of food comes under provisioning services of ecosystem services (TEEB, 2010). Conservation of these biodiversity and ecosystem services leads to green economy (UNEP, 2011).

RESULTS AND DISCUSSION

A total of 1,046 TOF sites were identified from visual interpretation of Google Earth Image. Twenty percent (i.e., 209 sites) of randomly selected TOF sites were identified and were used to collect data using circular plots with 20 m radius (FRA/DFRS, 2011). A map with sampling plots of the study area with location points was prepared using Google maps. Tree level characteristics of woody plants with height > 1.3 m and diameter at breast height (DBH) ≥ 5 cm were recorded. DBH was measured at 1.3 m above the ground using diameter tape and the TOF height was assessed using clinometer (Sunto). Unidentified plant species were collected for herbarium preparation following standard procedure (Bridson and Forman, 1998) and identified later in the CDB, Kirtipur, Kathmandu, Nepal. Fruit yielding TOF were selected for the valuation. Average yield of fruits per tree of the same species in different parts of the study area was calculated. Similarly, the market prices those fruits, nut and spices were calculated. Average yield and average

market price of merchantable fruits were multiplied to get the merchantable value of those fruits and nuts and spices. A total of 945 TOF of 40 species belonging to 28 genera and 20 families with merchantable value of fruits and nuts were found in 132 plots in the study area. Average density of fruit bearing trees was 35.97/ha. Out of 40, 36 species were important for fruits, 4 species were important for nuts and one species was important for fruit related spices. Based on the average current market prices, NPR 5,16,111.31($ 4344.37)/ha was the total merchantable cost of those fruits, nuts and spices. 1 US$ = NPR.118.8 (15/11/2021).

CONCLUSION

TOF that produce merchantable fruits help in food security and Green economy.

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Study on the Evolution of Flood Inundation Areas in the Asian Monsoon Region and its Factors

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ABSTRACT

The middle and lower reaches of the Ashida River in western Japan have suffered from numerous inundation disasters. In this study, we examined the changes in the middle and lower reaches of the Ashida River since the modern era and the factors that contributed to the changes.

As a result, it was found that inundation damage has decreased as a result of river improvement. However, the July 2018 torrential rainfall in 2018 was estimated to have caused extensive inundation damage due to rainfall exceeding the target flow rate and planned high water volume established in the river improvement plan.

INTRODUCTION

A geographical study focusing on the transition of flood inundation areas in postwar Japan is the transition of inundation areas in the Kanda River and Shakujii River basins (1974-2003) by Abe (2008). In this study, it is pointed out that the development of flood control facilities has led to a shift from a form in which large areas were distributed mainly in the valley floor lowlands of the current river channel to a more prominent form of small flooded areas that occurred in the valley floor lowlands of plateaus and culverted rivers (Abe, 2008). However, not much research has been accumulated on the transition of inundation areas due to river improvement plans since the modern era, and only Uchino and Miyamoto (2017) have mentioned the transition of inundation areas due to river improvement since the modern era in the Okayama Plain in a local urban area.

In this study, we examined the changes in inundation areas and their factors in the middle and lower reaches of the Ashida River, a first-class river, since the modern era. In addition, we compared the inundation areas with flood control topographic maps and examined the points of occurrence of inundation areas in the Fuchu, Fukuyama and Kanbeidaira urban areas.

RESULTS AND DISCUSSION

1) Comparison of inundation area of the July 1919 heavy rainfall and flood control topographic map: In 1919, a wide area of the middle and lower reaches of the Ashida River was inundated, including the urban area of Fukuyama City. Comparing the flooded areas with the flood control topographic maps, it can be read that the riverbanks, Kanbe Plain, the flood plain spreading over

the urban area of Fukuyama, the micro-elevation located 5 km from the mouth of the river, and the old river channel spreading over the plain were inundated.

2) Comparison between the inundation area of Typhoon Makurazaki in 1945 and the flood control topographic map: In 1945, the middle reaches of the Ashida River and the confluence of the Kamo and Takaya Rivers were mainly inundated, while the urban area of Fukuyama was spared from flooding. Comparing the flooded area with the flood control topographic classification map, it can be deciphered that the flood plain spreading along the river and the old river channel spreading on the plain were inundated.

3) Comparison of the flooded area of the July 2018 heavy rainfall and the flood control topographic map: In 2018, a wide area around Kanbe Plain, Yamate Town, and Ekiya Town Kamiyamamori were inundated. The urban area of Fukuyama was spared from inundation, but the area located approximately 17 km from the mouth of the river was not inundated in 1919 and 1945, but was inundated in 2018.

CONCLUSION

The middle and lower reaches of the Ashida River are located in a low-lying area, which is lower than the river level at the time of flooding. Therefore, it is susceptible to inundation damage, and once flooding occurs, the damage is likely to be extensive. The reason why the inundation area in 1945 was smaller than that in 1919 is related to the river improvement that started in 1923. The reason for the severe disaster in 2018 despite the progress of river improvement is related to the fact that the rainfall exceeded the target flow rate and the planned high water volume in the river improvement plan.

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Flood Problem and Traditional Coping Strategies Adopted by the Communities in the Brahmaputra Valley, Assam, India

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ABSTRACT

Located in the South-East Asian Monsoonal realm, the Brahmaputra valley is the largest physiographic unit of the State of Assam (India) covering 71.64 per cent of the State's total geographical area. The valley has been experiencing recurrent flood during the monsoon season (from the month of May to September) almost every year. Flood, which occurs in 3-4 waves in a year in the Brahmaputra valley due to certain specific geographical, meteorological, geological as well as human-induced factors, has been the most devastating natural hazard of the valley causing large scale loss to human life and property on the one hand and the ecosystem services within the valley on the other. The valley has experienced some high floods in the years 1954, 1959, 1962, 1966, 1972, 1974, 1977, 1978, 1983, 1984, 1986, 1987, 1988, 1996, 1998, 2000, 2002, 2004, 2007, 2008, 2012, 2014, 2016, 2017 and 2022 recorded so far. The severity of this hazard in the valley can be realised taking the flood of 2022 into consideration as Indian Meteorological Department has recorded 109 per cent excess rainfall in the month of June alone which affected more than 11 lakh hectares of cultivated land of the State. On the other hand, more than 5000 villages were affected by the breaching of embankments of the Brahmaputra and its tributaries due to incessant rainfall during the period. However, the intensity of flooding and dimension of defacement vary across the valley in its different physical settings. Interestingly, the ethnic communities inhabiting different physical settings of the valley have evolved through generations some flood adaptive measures based on their traditional skills, knowledge and experience. These traditional flood adaptive measures (TFAM) are more or less reflected in the diverse land occupance and land use

pattern, house type, homestead characteristics, occupational structure and so on. However, very recently, because of some industrial and other developmental activities in some ecologically sensitive and topographically marginal areas of the valley along with the impending climate change, the flood problem associated with erosion has become more volatile and unpredictable causing large scale impairment in different parts of the valley. A detailed investigation of the causes and consequences of flood at different spatial and environmental contexts is the need of hour to manage the flood hazard in the valley sustainably. Besides, the traditional coping measures developed by the communities in different physical settings of the valley to live with flood are also very important to investigate.

Based on data and information obtained from secondary sources and primary field investigation, the present study attempts to investigate the nature and dimension of flood, its causes and consequence and the traditional coping measures adopted by the communities sharing different physical settings of the valley.

Keywords: Flood hazard, traditional flood adaptive measures, ethnic communities, Brahmaputra valley.

Physico-chemical Characteristics of Soil under Tea Agro-forestry System in Tropical region of Nepal

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ABSTRACT

Soil Physico-chemical properties and Soil organic carbon are the chief components for sustainable agriculture and climate mitigation. Changing cropland to tea agroforestry system is a promising agro-practice in tropical region of Nepal. The present study aimed to investigate soil properties and soil carbon stocks in different lengths of time over which tea cultivation has been practiced in Jhapa district, Eastern Nepal. The soil quality varied significantly across different aged tea plantations and soil depths.

INTRODUCTION

Soil is the main resources of natural and agricultural ecosystem. Plant growth and developments are mostly governed by the existing soil conditions. The productivity of soil is affected by different physicochemical parameters (Imhoff et al. 2016). Soil organic carbon (SOC) is an indicator of soil quality and environmental sustainability. A slight change in soil C pool will greatly impact the concentration of atmospheric carbon-dioxide (CO2) and affect global climate change. Besides the important roles in mitigating climate change, soil C is critical to maintaining soil productivity and soil health in agricultural systems. Therefore, an accurate estimation of SOC stock and distribution is essential in alleviating C emissions and improving soil health (Meng et.al, 2019). The agroforestry systems is the best way to enhance the quality of soil thereby reduces atmospheric CO2 concentration (Sperow et al. 2003) and enhances soil fertility, minimizes nutrient runoff and improves water quality (Kurkalova et al. 2004; Lubowski et al. 2006). Comparing the soils quality under different agroforestry systems may help us to determine the current situation of soil health status and also useful for adopting the best agro-forestry system management practices.

RESULT AND DISCUSSION

This study investigated the soil characteristics and soil organic carbon (SOC) stocks in two different soil depths (0-15cm and 15-30cm) under four different tea plantation plots, each showing different lengths of plantation time, are: 5 years, 10 years, 15 years and 20 years of plantation, which were randomly selected. The soil quality and characteristics such as moisture, bulk density, soil organic carbon, total nitrogen and available phosphorus were significantly varied under different ages of tea agroforestry. The soil quality indicators varied significantly across different aged tea plantations. The water holding capacity and moisture doesn't show specific patters in different treatments at both depths. The study revealed sandy and loamy sand type of soil texture. The pH was acidic in nature ranging from 4.76 to 5.91. The small amount of residue or plant residue with base-forming cation content would decrease the pH in soil (Mccauley *et al*., 2017). The bulk density ranged from 0.11 to 0.27 g/cm^{-3}, but did not show

specific patters across the treatment. Soil organic carbon ranged from 3.33 to 6.55 % and Nitrogen ranged from 0.17 to 0.2 %; were higher in upper depth and soil Phosphorous was higher in lower depth. Soil organic carbon stocks ranged between 14.06 t/ha and 22.27 t/ha in the upper depth (0-15 cm) and 6.12 ton t/ha and 9.75 t/ha in the lower depth (15-30 cm). The study revealed that, the SOC stock was higher in a surface layer due to high organic matter content, low soil disturbance, greater root biomass, and returns of vegetative residue as compared to the subsurface layer.

CONCLUSION

The age of the tea plantation played a significant role in the soil characteristics and SOC in tea plantation plots. Healthy management of tea plantations to higher age can be considered a beneficial approach to store a sizable amount of SOC providing environmental services coupled with economic gain. Therefore, agroforestry as a science holds promising solutions for alleviating soil fertility problems and achieving sustainable land management provided - resources sharing between components are better understood, and pathways for sustainable nutrient management are context-oriented and made available for users.

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Does rural out migration affect land use land cover change? a case study from sunkoshi rural municipality sindhupalchok nepal

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ABSTRACT

The aim of the study is to examine the impact of rural out-migration on land use and land cover change, associated with agricultural systems. The result shows that there is a significant change in the upland (rainfed) agricultural land ($p<0.001$) and low land ($p<0.05$) in the last 20 years. The result also shows the significant change ($p<0.001$) in the major crop production such as maize, wheat/barley, and potato and significant change in rice production ($p<0.05$). There is no significant difference ($p>0.05$) between the mean of migrant and non-migrant in case of land cover, agricultural production, abandoned land, and livestock now and before 20 years. However, some effect of out-migration has been noticed on the agricultural production trend in the study area. The claim of this study is that there has been a decreasing agricultural land and increasing bare land and also slightly increasing the forest land. These changes have several implications for land-use policy measures and planning.

INTRODUCTION

The study investigates the impact of rural out-migration on land cover and land-use change in the Sunkoshi Gaunpalika. The districts have negative intercensal average population growth (-0.61) in 2011 due to rural out-migration (1) and it has continued with (-0.87) in 2021(2). The total population was 2,87,798 in 2011 and 2,62,852 in 2021. According to the 2011 Nepal census, the total population of the municipality is 16,713 and 15,307 in 2021 (3). The aim of the study is to examine the impact of rural out-migration on land use and land cover change, associated with agricultural systems. Descriptive and exploratory research design have been used in this study. Both quantitative and qualitative information have been utilized to examine the impact on land use and land cover change. Data obtained for the study included both primary and secondary sources. GIS analysis was also performed to check the land cover and land-use change.

RESULT AND DISCUSSION

Of the total, about 63.9% of the household have sent their family member outside for work. Current mean upland is 4.7 ropani which was 6.3 ropani before 20 years. Similarly, current mean cultivated area of land is 6.5 ropani and, before 20 years, it was 6.9 ropani. GIS analysis confirms that the agricultural land was 34.4% in 2002 which was a remarkable contraction of 11.3%. At the same time bare land was increased from 15.7% in 2002 to 33.5% in 2019. On the other hand, forest coverage was slightly increased from 49.9% in 2002 to 55.2% in 2016.

The two-pair sample t-test has been performed to check the change that occurred in the last 20 years. The result shows that there is a significant change in the upland (rainfed) agricultural land ($p<0.001$) and low land ($p<0.05$) in the last 20 years. The result also shows the significant change ($p<0.001$) in the major crop production such as maize, wheat/barley, and potato and significant change in rice production ($p<0.05$), in the last 20 years in the study area. However, no significant change was observed in millet production ($p=0.093$). Raring cattle is also associated with agricultural production, hence significant changes ($p<0.001$) in major cattle were examined such as Buffalo, Cow, and Goat in the study area in the last 20 years.

The result shows that there is no significant difference ($p>0.05$) in the mean value of the agricultural land, production, abandoned land, and the livestock, for both now and before 20 years, between the households with migrants and remittance, and non-migrants. However, it is observed that potato production among the group "migrant but no remittance" is significantly high ($p<0.001$).

There is no significant difference ($p>0.05$) between the mean of migrant and non-migrant in case of land cover, agricultural production, abandoned land, and livestock now and before 20 years. However, the production of major crops like rice and potato was seen significantly high ($p<0.05$) in the case of the migrant group.

Findings clearly indicate that a major part of the remittance occupied by the food as the production of the major crop Rice, Maize, Wheat/Barley Millet that have been decreased during the last 20 years. Secondly, the remittance goes for health for family and education for the children which ultimately boost the social development of the people and only a few parts of remittance goes for the agricultural activities and investment for the other service sector (4, 5).

CONCLUSION

The cultivated area of both upland and low-land is shrinking per household in the study area. The decreasing rate for upland (rain-fed) cultivated land is higher than that for the low land (irrigated). The GIS analysis revealed that the agricultural land has been converted significantly into barren land during the last 20 years. There is no significant difference in the land size shrinking between migrants' and non-migrants' households or even the recipients of remittance and non-recipients' households. However, some effect of out-migration has been noticed on the agricultural production trend in the study area.

The claim of this study is that there has been a decreasing agricultural land and increasing bare land and also slightly increasing the forest land. These changes have several implications for land-use policy measures and planning.

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Communication Perspective for Disaster Management in Asian Monsoon Region

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ABSTRACT

Natural and human factors of disasters can be minimized and subsequent damages can be subsided through effective communication. Systematic and well-equipped media coverage before, during and the post-disaster situation is vital in this regard. Nepal's two cases – the 2015 devastating earthquake and the 2021 flood in Melamchi of Sindhupalchok – were the watersheds from the communication perspective of disaster management. Ill-prepared media coverage, spread of rumors, and lack of media attention prior to disasters made the overall disaster management weak during these periods. Likewise, a lesson learned is that a multi-step strategy is required. This may involve using traditional and social media platforms along with alternative media to deal with different layers of stakeholders.

INTRODUCTION:

"Anthropogenic and climatic factors"[i] trigger man-made and natural disasters. The role of communication is critical in minimizing these factors. A workable communication strategy at multiple levels – from grassroots to policy circle – can bear fruit in this regard. The present-day communication system involves four key media platforms: a Traditional media (newspaper, radio, T.V.); b. Online media (comprising text, audio, and audio); c. Alternative media (small-scale media in terms of investment, reach, and coverage area); and d. Social media (Facebook, Twitter, Blogs…). This paper articulates a communication perspective on how this flow can be enhanced, particularly in the Asian monsoon region that shares many diverse geographic, climatic, cultural, and social similarities.

RESULTS AND DISCUSSION

Well-equipped disaster journalism can prevent and or minimize disaster vulnerabilities. For instance, "drones are very useful on newsgathering, where immediate and geographically unconstrained coverage is valuable (i.e. major conflicts, civil unrests, disaster coverage and relief: floods, fires, earthquakes)"[ii] Disaster coverage range from "providing warnings, assessing disaster mitigation and preparedness, and reporting on what occurs, to aiding long-term recovery and fostering disaster resilience"[iii]. For instance, five people were killed, 20 are missing and properties worth millions of rupees were lost when a flood hit Melamchi of Sindhupalchok district in June 2021[iv]. This damage could have been minimized had the previous warnings from scientific communities been set as a prominent agenda through adequate media coverage. Preventive stories such as Nepal's 2015 earthquake "triggered thousands of landslides that caused additional destruction to communities and infrastructure, and prompted the occurrence of landslides"[v] can be helpful in responding to disaster situations.

The basic approach of reporting and presenting stories can make a difference to the audience. On how "sometimes media consciously try to instill values and behavior in the audience", Dominick (1999, p. 41) mentions an example "many newspapers report whether accident victims were wearing seat belts at the time of the mishap"[vi].

While social media can be a good source of information, "unverified information from the public" (Houston et al., 2019) can create misinformation. rumors. Rumors that "a bigger earthquake would strike"[vii] alarmed many journalists stopping them from field reporting of remote earthquake-affected areas after Nepal's 2015 earthquake first struck. This situation demands strategies for combating with disinformation and misinformation through better fact-checking systems.

CONCLUSION

In the age of social media, "communications can be one-way or two-way and relationships are one-to-one, one-to-many, many-to-one, or many to- many"[viii]. Hence, I recommend some specific strategies for effective disaster management through communication: a. developing information and a knowledge database; constructing separate messages for text, audio, and video-based media outlets considering their nature; and reviewing the impact of disaster communication before, during, and post-disaster situations and improving communication strategy accordingly. Communication experts can contribute well in devising practical strategies with the help of experts from other fields – pure science, engineering, psychology, sociology and arts – that can respond to issues ranging technical to disaster-induced trauma.

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Community resilience and Institutional arrangement for Natural Disasters in Bhutan

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ABSTRACT

Located within the young fold mountains of the Himalayan range with a very steep elevation, Bhutan has been prone to natural disasters. Common natural disasters include flash flood, erosion, landslides and also forest fire. With 25 lakes identified as dangerous GLOF has been a threat to people living in downstream valleys. Social capital and close-knit society had played a vital role in resource sharing and shock absorption of the natural disaster in the past. The institutional arrangement of monarchy has also played a vital role in providing the effected community with benevolent services, and continues to do so. The Department of Disaster Management was established in 2008 as a formal institution responsible for planning and implementing of disaster management as well as channeling the grievances besides the traditional channels.

INTRODUCTION

Bhutan is a landlocked country located in the young-fold mountain of Himalayan range. The latitude and longitudes range between 26°45" N to 28°10' N and 88°45' E to 92°10' E, respectively. It has an area of 40,077 sq.km. with approximately 175 km in length from North to South (Mool et al., 2001). Within this very narrow range of 175 km, the elevation starts at 200 masl. in the South to above 7000 masl. in the North. The area above 4200 masl. covers 20.5 percent of the total land area (Ministry of Agriculture, 1997). The climate in Bhutan is similar to artic regions in the north and in the south is similar to Indian Plains. With all valleys gorged with steep slopes culminating to river gorges creating steep slopes along these river flow directions (Adams et al., 2016) along with others natural factors exposes Bhutan to various underlying vulnerabilities and risk to natural disasters. Currently 71 percent of total geographical area of the country is forest occupied. 50% of the land is covered with broad-leaved forest and 20 percent with coniferous forest constituting 770,032 ha. (Department of Forests and Park Services, 2016). Bhutanese economy is still typically agrarian with 57 percent of the Bhutanese still living on agriculture (National Statistical Bureau, 2021).

COMMON NATURAL DISASTERS AND CAUSES

Located in an environment as described above aggravated by heavy monsoon and earthquake, natural disasters such as flash flood, landslide, windstorm, hailstorm and forest fire has posed a continuous and incessant hazard to the people, infrastructure, agriculture and transport (TheBhutanese, 2016). GLOF has been another threat to people living in the downstream valleys with 25 lakes identified as dangerous out of the 567 glacial lakes (Cryospherer Services Division, 2021) from the total 2794 lakes (National Center for Hydrology and Meterology, 2019).

COMMUNITY RESPONSE MECHANISM AND AWARENESS

In the past due to the close-knit, traditional and culturally organized community, resources were shared amongst the people in the community. People have coped up with loss of agricultural produce and infrastructure within the community with self-sustaining, self-helping community. Without modern institutions and insurance standards, resource pooling helped the affected with borrowing with seasonal repayment; this was a social norm which did not require contractual agreements. Events of local disasters are mitigated with historical narration of local events and how they were implemented. The immediate mitigation mechanism adapted contextually were put in place based on historical context of the natural disaster.

A study conducted in 2011 by Centre for Research Initiatives (2012) shows that the level of Awareness, especially at the National and local government levels were good, including participation in disaster management awareness activities. However, people required capacity and knowledge related to disaster management. The study also found out that the people are aware of the risk due to their long term exposure and advocacy of the hazard; and also due to sensitization provided by the local as well as the central government.

INSTITUTIONAL ARRANGEMENTS

In line with the constitutional pursuit of Gross National Happiness (GNH), Disaster Management Act of Bhutan was enacted in 2013. The act establishes the National Disaster Management Authority with functional directives and delegation of power to the local governments with Committes and Authorities with systematic reporting and mechanisms of mitigation (Disaster Management Act, 2013). A separate department under the Ministry of Home and Cultural Affairs (MoHCA), the Department of Disaster Management (DDM) was established in 2008 to oversee the planning, risk assessment, implementation of preparedness, risk prevention, mitigation, response and rehabilitation related to disasters in Bhutan.

The Office of His Majesty the King also has *Kidu*[viii] relief grants for immediate relief and rehabilitation of the effected individuals and families. The *DeSuung*[viii] provides emergency relief along with the armed force and police directly under the dominion of His Majesty the King. Families who lost land to landslides and flood sought land *Kidu* and resettled in other parts of the country. According to The Bhutanese (2016) as of 2016, 86.44 percent of land holders were *Kidu* beneficiaries.

CONCLUSION

Although the existence of management and rehabilitation of people affected with natural disaster is provided, there is a lack of systematic study of coping mechanism in the community over a long period of time. Statistics of lives affected are maintained in administrative records but not made public besides the one covered in media – both mainstream and social media. Documentation of these narratives has opportunities for upscaling the services as well as providing traditional adaptation mechanism for future implementation besides stockpiling of Bhutanese story of disaster resilience.

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