IMPACTS OF CLIMATE CHANGE ON LIVELIHOOD AND ITS ADAPTATION NEEDS

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ABSTRACT

Climate change impact has been experienced in different sectors: agriculture, forestry and biodiversity, water resources and energy. People and their community will experience significant climatic change impacts on food supply and security, water availability, infrastructure and agriculture income. Human, Social, Natural, Physical and Economic assets of sustainable livelihood are threatened by the effect of climate change, and the future predictions are much ominous. Though many plans, policies and strategies have been prepared and implemented, those are inadequate at present context. Adaptation efforts through appropriate policy arrangement, long/medium-term planning, research and capacity building are needs of the time. This paper is intended to highlight impacts of climate change on livelihoods and need of climate change adaptation in vulnerable communities.

KEY WORDS: Adaptation, agriculture, climate change, impacts, livelihood

INTRODUCTION

Climate change is a global issue alarmed since 19th century by the scientists, and its impacts are clearly discernable at today's date. Regional Circulation Models (RCM) project the mean annual temperature to increase by 1.4ºC by 2030, 2.8ºC by 2060 and 4.7ºC by 2090 (NCVST, 2009).

Climate change impacts have been experienced in Nepal in its different sectors including agriculture, forestry and biodiversity, water resources and energy. Climate change is commonly recognized to have major implications for food security and livelihoods (Thompson and Scoone, 2009). Nepal ranks seventeenth among climate vulnerable countries (Maplecroft, 2014). The marginal nature of farming, low income level, limited institutional capacity and

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reliance on climate-sensitive natural resources have increased the degree of the sectors' vulnerability.

Two-third of population in Nepal is still practicing agriculture as main occupation to sustain its livelihood (CBS, 2008), yearly expatriation of 0.45 million individual is a pressing challenge regarding Climate Change Adaptation; as impact resilience and adaptation have to be relied mostly upon women, children and senior citizens.

Adaptation measures against Climate Change, encompassing all the components of livelihood, are thus needs of time.In order to address it, Nepal has prepared, and is implementing NAPA, LAPA and Climate Change Policy including other policies, programmes and activities (MoPE, 2017). The adaptation measures may include changes in practices and technologies, diversification of livelihood systems, accessing financial resources such as micro-insurance and micro-credit, migration, reconfiguring labor or resource allocation and collective action to access services, resources or markets (NCVST, 2009). Among the four UNDAF (United Nations Development Assistance Framework for Nepal) priority areas, Resilience, Disaster Risk Reduction (DRR) and Climate Change Adaptation is one. It is in alignment with National Development Priority i.e. Fourteenth Plan, Strategy 3: Sustainable improvement on human development through social development and social security/ protection (UNDAF, 2013).

This paper focuses on how people's livelihood in Nepal is affected by climate change, what type of vulnerability caused by climate change, how livelihood assets affected and what adaptation measures are needed.

METHODOLOGY

This study is based on rigorous review of pertinent documents brought forth related to Climate Change impacts on livelihood of vulnerable communities in Nepal. It included climate change convention related documents, national policies and strategies (including plans, programmes and legal documents), journal articles and published reports. The information drawn from were critically skimmed, sorted and analyzed. This study was done from September 2018 to December 2018.

RESULTS AND DISCUSSION

As Nepal is heading for the attainment of Sustainable Development Goal (SDG) 2030, challenges are piling one upon another. Global warming and climate change are the greatest concerns since they affect human beings and the whole ecosystem. Agriculture, livelihood, sustainable management of natural

resources and food security are inextricably linked within the development and climate change challenges of the twenty-first century (FAO, 2012).

Nepal is known for its diverse physiography within rugged terrain and mountains, and diversity in socio-culture as well. It is annually dominated by the Asian monsoon. Poverty is a widespread problem (Shrestha and Aryal, 2011). Due to this, Climate change will not only amplify the existing risks that the nature and humans already are influenced by but also keep creating new risks for all systems (IPCC, 2014).

RELATIONSHIP AND IMPACTS OF CLIMATE CHANGE ON LIVELIHOOD

Livelihood have ties with climate change on all the assets (Human capital, Social capital, Natural capital, Physical capital and Financial capital), and adaptation includes the activities like reducing poverty, improving access to resources, lowering inequities of resources and wealth, improving education, improving infrastructure, improving institutional capacity and efficiency and promoting local indigenous knowledge (Smit, *et al.*, 2001).

Most of the people in Nepal live in rural areas. It is evident that rural people and their community will experience significant climatic impact on food supply and security, water availability, infrastructure and agriculture income (IPCC, 2014). Poverty and inequality are relevant elements on discussion since Climate Change creates risks that, altogether, results in prolonged poverty and pervasive inequality in the society (Stampe, 2017). By understanding the dynamics of poor people's livelihoods, we can understand how they will be affected by climate change impacts, how they might respond with the resources they have, and how these conditions can be reflected and built upon for successful adaptation strategies (IUCN, 2004).

The DFID (British Department for International Development) has developed a 'Sustainable Livelihood Framework', which is one of the most widely used tools to understand and act upon components of livelihood. Sustainable livelihood framework-based indicators are here used to assess relationship of climate change and livelihood asset.

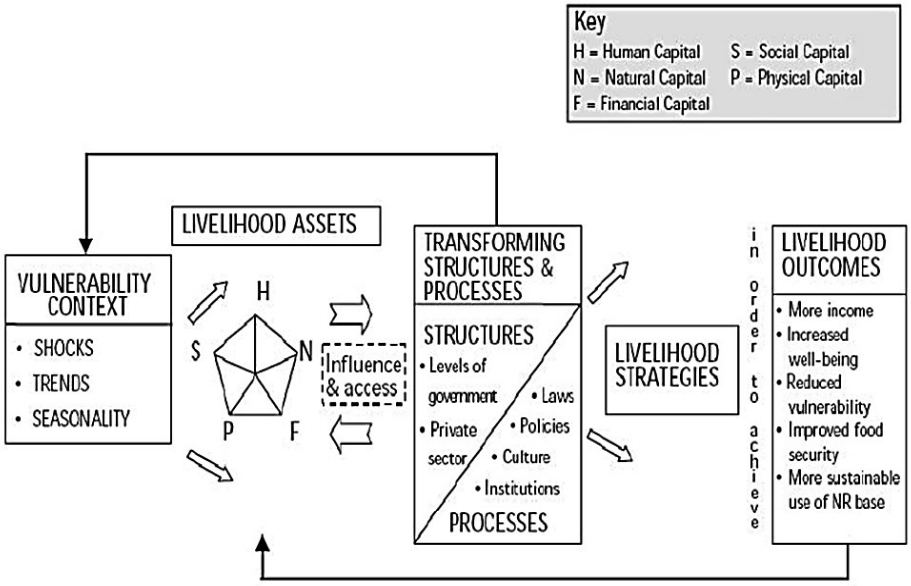

Fig 1. Sustainable livelihood framework (DFID, 2000)

HUMAN ASSET

Food availability and quality of available food determines the nutritional status on human population: as long as nutritional sufficiency is not secured the well functional body and mind is undermined.

Damage to human assets as a result of weather events and climate, such as food insecurity, undernourishment and chronic hunger, due to failed crops or rise in food prices is felt mostly on poor urban population (IPCC, 2014). Likewise, about four thousand people were decimated in last ten years in Nepal due to Climate induced disasters with economic loss of US$ 5.34B (MoHA, 2013). The institutions like School, Office, Service centers etc. are directly hampered by the climate induced impacts and disasters like hurricane, erratic rainfall, water level increase in the river, cold wave shocks and scorching heat. Human education, health, access to service and function on markets etc. are hence compromised.

Climate change is believed to have different effects on women and men; in some cases, it leaves women more vulnerable and disadvantaged than men (Mainlay and Tan, 2012). Drought and dropping of water table can be associated with the long and short term impact of Climate Change. People expressed concerns over the drying up of sources of drinking water in the existing spring and the burden of bringing water from the new source (Lama, 2010).

Unavailability of water supply has exacerbated menstrual hygiene among adolescent girls (Karki, *et al.*, 2017) in Poor communities. Also the water scarcity hits hard on female's routine as they have to manage the household and kitchen, compromising their productive time on education and welfare.

In Nepal rural people in Terai perceives that the incidences of typhoid, fever, diarrhea, hypertension, knee problem, asthma, skin disease, stomach disease, gastric have tremendously increased (FIAN, 2013). There is a potential impact of climate change on health on the outbreak of diseases like Malaria, kalazar and Japanese Encephalitis diseases (MoE, 2010). It is estimated that for regions, where dengue is already present, a mean temperature increase of about 1°C, increases the aggregate epidemic risk by an average of 31 to 47 percent (NRC, 2001). On top of that, marginalized people have less access to combat against such diseases thus getting vulnerable, and act as a probable reservoir. There is an increased risk of breaking epidemics on unmanaged urban wastes and increase in the local temperature has further facilitated the pathogen to nurture and spread.

Thus, the amount and quality of knowledge and labor available in a household and eventually in a country is undermined.

SOCIAL ASSET

The impact of climate change has multi- equity dimensions on social aspect, but there is very little information about the impact of climate change on different sections of society.Social assets like community forest users group committee, schools development committee, temples, youth clubs, and cooperatives are affected by various events due to which they have to change their regular settings, postpone the meetings, sometime make conflict due to resource and workload for forest management, fire control and clearance for invasive species (Shrestha and Gautam, 2014).

Natural events like cold waves, prolonged rain or heat waves can isolate people from social functions. And similarly Climate Change events have negative effect on products and services, which could induce food deficit, price rise, shortages, discriminative distribution etc. and threaten the social harmony among people. Climate change has been reported for increased forced migration of marginal groups in hills and mountain area of western Nepal and thus the groups exposed to new socio-cultural area.

Natural asset

Climate change has greater impact on agricultural land, forest and water, which are the basic source of for sustaining livelihood. Scarcity of natural resources by Climate change increases resource based conflict (Evans, 2009).

Land

As per the FAO data, in developing country like Nepal, 11 percent of cultivable land would be affected, which include reduction of cereal crop production and about 16 percent decline in GDP. Similarly, up to 83% of the overall economic impact of drought, which Climate Change is expected to intensify, falls on agricultural land (FAO, 2017). Food and Agriculture organization (FAO) have warned that there is decline in crop yields, and decreases of 10–25 percent may be widespread by 2050 (FAO, 2017)

Climate Change leads to an increase in arid lands due to increased water stresses particularly in developing countries where irrigation facilities are poor. In 2007, due to rain deficit 10% of the agricultural lands were left fallow, and in the same year mid-western terai faced heavy rainfall with flood in contrast (Regmi H. R., 2007). This type of event can be well attributed to impacts of Climate change.

It is reported that the physical and chemical properties of soil have been changed due to prolonged drought. In Nepal, floods carrying rocks, sediments and debris increase the intensity of landslides and erosion; deteriorate soil and water quality; wash awayhouses and properties; cause human injuries and deaths; and destroy infrastructure such as schools, roads, and markets (Aryal and Chaudhari, 2009)

Forest

Climate Change directly and indirectly affects the growth and productivity of forest by change in temperature, rainfall, weather and other factors. While other climate change induced problems like insect outbreak, defoliation, drought and wild fire are adding the menace.

In Nepal extreme climatic conditions have led to increased incidence of fire in recent years affecting more than 50,000 people and loss of large areas of productive forest land (MoE, 2010). A livelihood of forest based populations is seriously challenged due to climate change resulting in loss of lands and land productivity. There is reported change in amount of forest cover, due to previous clearing and poor regeneration as a result of Climate change. Forest biodiversity degradation have set forth problems like lack of available forest resources, and it is observed to be exacerbated by climate change impact,

manifested on foraging animal health and flock size (Kaushik and Sharma, 2015). Thus, livelihood of forest based population is seriously thwarted.

Water

Today's population is facing major impacts on availability of water due to Climate Change, as there is continuous water table decline. Increasing demand for water by industry and urban areas will further reduce water available for agriculture. In this situation, the poor are often vulnerable to the effects of unsustainable water use and to the extensive corruption associated with water use and irrigation (Conway, 1997).

Scientists from the Inter-governmental Panel on Climate Change (IPCC) have claimed that there is increasing probability for more intense droughts and precipitation events. With higher average temperatures and warmer air that can hold more water, a pattern might emerge of lengthy dry spells interspersed with brief but heavy precipitation and possible flooding. Likewise, rising temperatures lead to increased evaporation rates and plant transpiration, which results in water loss in soil and plants.

Increased flow of water in rivers of catchment area and flood is evident due to intense rainfall. Drying of pond in drought and decrease in surface water has caused inaccessibility of drinking water to human and livestock. People shared that the ground water level has gone deep down, and they have to dig further down to get water through well and pump. In general, during winter the water is available at 65-150 ft., while in rainy season it is available at 25-26 ft. in Terai (MoPE, 2017).

It is thus evident, climate change would much impact on water and, consequently in the livelihood much harsher in coming years.

PHYSICAL ASSET

The physical assets like buildings, roads, communication towers, water tank, dam, reservoir etc. are prone to suffer from disaster like flood, landslide, hailstones, snowfall, hurricane etc. Climate Change is associated with such hazardous physical events which not only destroys physical assets, but in fact disrupts further services from them. Damage in the major highways, connecting roads, terminals, bridges as well as water routes can halt the supply of food, sanitation, petroleum etc. These events interact with social condition, leading to widespread adverse human, material, economic or environmental effect.

Likewise, school and colleges are also vulnerable to climatic events in Nepal (MoPE, 2017). And climate change has exacerbated the case: erratic rainfall

and snowfall have caused serious damage to these institutions hampering the education of the students.

ECONOMIC ASSET

The economy of Nepal is not much diversified and 21.6 percent of population lives below poverty line (NPC and UNDP, 2014). Agriculture and remittance are two pillars of economy in Nepal. Rain-fed agriculture is the dominant method used by farmers at the subsistence level, with few mechanical inputs to enhance production, and with low monetary income. Likewise, majority of the active population contributing to economy are forced to expatriate for foreign labor. As such, climate change can induce erosion of financial asset as the result of increased food price.

The working hours in agricultural work has been reduced due to climate change (FIAN, 2013). Agricultural work in farm are sensitive to climate. And when extreme climatic events occurs farm labor-work cannot be performed, and causes economic impacts to the farm labors (Bishowokarma and Sharma, 2013). By the 2050s, net agricultural losses in Nepal are estimated to be the equivalent per year of around 0.8% of current GDP, or US$140 million/year in current prices (MoSTE, 2013).

Tourism is one of the important aspects of economy. The unfavorable weather change phenomenon causes unpleasant situation for trekkers and mountaineers (K.C, 2017). Similarly, increase in local temperature declines the flow of recreational tourist in low lands and terai region. Thus, Climate change brings more risks than opportunity by causing regional and seasonal shift in tourist flow, which could cripple the national economy.

By 2050, demands for electricity increases by additional 2,800 MW with increased sector investment cost by US$ 2.6 B (MoSTE, 2013). It is due to over-consumption of the energy to cope with the extremes of heat and cold, operating machines at adverse climatic conditions, pump water through boring etc. Also the direct annual economic costs of Climate Change on water induced disasters is estimated to be about 0.6-1.1% of current GDP per year in current prices (MoSTE, 2013)

REALIZING ADAPTATION NEEDS IN PLANS, POLICIES AND STRATEGIES

In Nepal, poverty reduction and socio-economic improvement issue has been prioritized since 1996 (MoSTE, 2016). The fifth five year plan (1975-1980) has also prioritized uplifting of livelihood. Likewise, the sixth periodic plan (1980-1985) adopted basic need approach to reduce poverty and enhance livelihood.

Coming up to the thirteen plans (2013-2016), much emphasis has been given to bring up marginalized people to level with reduced inequality.

Agriculture Prospective Plan (APP), a 20 year plan, with aim to increase food production and reduce poverty of marginal farmer, upon completion brought positive changes on livelihood (NPC, 1995). With the primary goal of attaining food security and improving livelihoods by transforming subsistence agriculture into a commercialized and competitive system, National Agriculture Policy (NAP) was enacted in 2004. National Agriculture Policy is the official policy framework for all interventions in the related sector (MoPE, 2017)

Nepal prepared its National Adaptation Programme of Action (NAPA) in September 2010, which prioritized livelihood along with others in account of climate change. Similarly, to promote climate adaptation and mitigation in response to international Climate regime, Nepal prepared Climate Change Policy in 2011. Climate Change Policy includes Mitigation and Adaptation of the adverse impacts of Climate Change, Adaptation of low Carbon emissions and Socio-economic development as well as supporting and collaborating national and international agreements (MoE, 2010).

Likewise, Climate Resilient Planning Tool, a program and project screening tool for long term climate change adaptation, was endorsed in 2011 (NPC, 2011). It oversees livelihood sustainability and emphasizes the need to adopt a mechanism to screen development plans and make them climate resilient. On the same year, Local Adaptation Plan of Action (LAPA) was also endorsed. It is a bottom up, inclusive, responsive and flexible framework, which ensures process of integrating climate adaptation and resilience into local and national level.

However, existing policies and sectorial plan seem inadequate to address the climate change impacts. Coping and Adaptation is mostly done on ad hoc basis, which is not well prepared and well organized in Nepal (Regmi and Bhandari, 2013). The APP (1997-2017), national strategy for Disaster risk management (2007-2015), national water resources strategy (WRS) 2002 and the National Water Plan (NWP) 2005 have not taken 'climate change and livelihood' into much consideration. The Agricultural Development Strategy (ADS), a 20-years vision (2015-2035) prepared by the Ministry of Agricultural Development (MoAD) in cooperation with 13 development partners has embolden the need of addressing climate change and its impacts on livelihood. However, the expected outcome of the strategies is yet to come.

Government needs to design and implement effective plans and strategies based on national and local climate policies adapting to climate change impacts to achieve economic and social prosperity (Dixit, 2015). Thus, there lies

immense room for endorsing climate change adaptation in national plans, policies and strategies for sustainable livelihood.

CONCLUSION

Climate Change effects are inevitable and the livelihood sector is downtrodden by its effect. The entire five assets i.e. Human, Social, Natural, Physical, and Economic assets of livelihood are threatened by the effect of Climate Change and the future predictions are much ominous. It is imperative to identify approaches that strengthen effort to adapt the effect to Climate Change and also prepare for mitigation in the future. Though, many plans, policies and strategies have been prepared and implemented, those seem inadequate at present context. Appropriate adaptation through Research, Policy arrangement, Capacity building and long and medium-term planning is thus further needed.

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