



the south asianist

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Vol. 8, pp. 10-40 | ISSN 2050-487X | www.southasianist.ed.ac.uk

Article

Exploring Migration and Disaster Nexus: Role of migration in triggering disasters?

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1. Introduction

Migration for better opportunities and lifestyles has been a prevalent phenomenon since time immemorial, creating new civilizations and transforming human settlements. Likewise, sudden changes in the environment, such as disasters, or long-term alterations such as climate change and political instability have also resulted in the movement of people, although involuntarily (Blaikie et al. 2014; Dun and Gemenne 2008). The discourse on migration and its drivers has been shaped from diverse social, economic, developmental, political, and environmental perspectives (Hagen-Zanker 2008; Naser 2012). Similarly, disaster discourse has also undergone many iterations. For decades, the dominant paradigm viewed disasters as unexpected, unprecedented, and

unmanaged phenomena resulting from natural extremes (Noy and Yonson 2018). Over time, with greater experience of disaster events, social, economic, and development factors came to be recognised as unavoidable elements of disasters (Blaikie et al. 2014). So far, within the disaster discourse, migration has mostly been assessed as a coping strategy (Hollema et al. 2008; Mohapatra et al. 2009). Although some literature has pinpointed demographic changes and unplanned urbanisation as the cause of disasters (Donner & Rodriguez 2008; Gaillard et al. 2005), very few in-depth studies have assessed migration as a disaster trigger and examined the possible links between the two phenomena.

Migration has been a recurring phenomenon worldwide for many years; however, the tendency for internal and external migration has increased in recent decades; In Nepal, these migratory movements, although prevalent for centuries, are now being fueled by rapid economic, political, and administrative transition (Hollema et al. 2008; Gartaula and Niehof 2013). Limited arable land and insufficient returns in the agricultural sector coupled with a slowdown in economic growth and employment opportunities, especially since the 2001 civil war, are the primary reasons behind the surge in rural to urban migration as well as foreign labour migration in Nepal (Pant 2008). Studies have shown an increasing correlation between internal migration and population pressure, haphazard urban development, remittance and its investment in land and house construction, change in land use, and unprecedented stress on land resources in the country (Brøgger and Agergaard 2019; Muzzini and Aparicio 2013; Sijapati et al. 2017).

Likewise, water-induced disasters (WID) are a recurring phenomenon in Nepal. The country ranks 4th and 30th, respectively, among the 200 countries of the world in terms of relative vulnerability to climate change-related hazards and flood hazards (MoHA 2017). Several studies have revealed that environmental degradation, overexploitation of resources, especially in the Chure region, in recent decades have increased incidents of WID (Bhandari et al. 2018; Ghimire 2017). Further, Bhandari et al. (2018) claim that every flood during the monsoon of 2017 across the plains of the Tarai was triggered by streams and rivers originating from the Chure hills. Such environmental factors increase the pressure on people to migrate (Massey et al. 2010).

It is within this context that this study tries to assess the linkages between migration and disasters. To do so, the study has employed constructive grounded theory within qualitative research methodology and has taken the case of the Extended East Rapti Watershed (EERW) in Nepal. This article first digs into the literature to assess the previous studies on migration and disaster linkages. It then describes the disaster and migration status in the study area and the methodology employed to generate the data. Finally, it concentrates on the study findings and presents an analysis of the migration-disaster nexus.

2. Migration and Disaster Nexus: Possible Linkages

The nexus between disaster and migration is complex and contentious. The debates around linkages between disasters and migration consist of two opposite groups of scholarly works: a) research supporting disaster-led migration, popularly termed as 'environmental migration,' and b) research arguing the multi-causality behind mass migration, meaning that disaster could be one among many factors influencing the decision to migrate but could not be the sole factor (Gautam 2017, Walsham 2010). For instance, Dun and Gemenne (2008) highlight two groups of scholars: a) alarmists, who agree on environmental disasters driving migration, and b) sceptics, who insist on the complexity of the migration process, meaning that slow and invisible change processes impact people's livelihood and aspirations; therefore, disasters could be a contributing factor but not the main force behind migration.

Naser (2012) provides several examples showing migration as a product of climate change-induced environmental effects resulting in vulnerable livelihoods and forcing people to move. On the other hand, others suggest that the decision to migrate or not depends on the resilience and other capabilities of the individuals. Not all those who face disaster may decide to migrate (Mallick and Siddiqui 2015).

However, we did not find research showing a reverse linkage between migration and disasters, i.e. whether migration causes disasters. However, some studies show factors that increase the vulnerability of migrants in urban areas. For example, Tacoli,

McGranahan, and Satterthwaite (2015) indicate complexities around defining migrants and incorporating their issues in local policies, programmes, and provisions. They argue against the widespread assumption that rural-urban migration causes urbanisation. The negative impact of such beliefs is that migrants are usually viewed as a problem, although migrants can serve as the backbone of growth in local economies. Hence, they posit rural-urban migration as one among many factors causing urbanisation.

On similar lines, in the case of Nepal, although linkages between migration and disasters have been mentioned briefly in some research on environment and urbanisation (Muzzini and Gabriela 2013; Yogacharya and Gautam, 2008), a detailed study of the causal linkage has not been conducted. However, there is an increasing body of literature suggesting that environmental degradation, deforestation, and climate change (Chaudhary et al., 2015; Uprety, 2008) along with various other anthropogenic factors like population growth, urbanisation, illiteracy, land-use changes, unscientific agricultural practices, and various infrastructure developmental activities are causing water-induced disasters in the country (Petley et al., 2007; Pradhan, 2013).

In recent years, there has been an increasing number of studies on migration in Nepal. However, the migration discourse is found to be dominated by labour migration, remittance, and its impacts on household and national economy (Karki and Manandhar 2017, Sijapati et al., 2017). Only a few studies focusing on the migration-disaster linkages were found, and these, too, only considered the perspectives of environmental migration and migration as a coping strategy for disasters (Massey et al., 2010; Mohapatra et al., 2009).

Nevertheless, there are a few studies that indicate migration to be one of the drivers of disasters. For instance, Salike and Pokharel (2017) and Pervin et al. (2019) concluded that an increase in built-up areas and drainage congestion associated with population growth and urban sprawl resulted in urban flooding in Kathmandu and Bharatpur, respectively. Similarly, a study conducted by Petley et al. (2007) indicated that population migration into public lands from the hills during the armed conflict in Nepal led to the development of urban slums, which triggered landslides.

The role of remittances in influencing population movement, urbanisation, and disaster also requires intensive exploration. In FY 2018/19, Nepal received 8.79 billion USD as remittance (MOLESS, 2020). The Nepal Living Standard Survey (NLSS)- III 2010/11 reported that 58 per cent of the remittance comes from within the country, making it the primary source of remittance, while 19 per cent come from India and the remaining 23 per cent from other countries (CBS, 2011). Studies show that foreign labour migrant-sending households with a good source of remittance income have been investing in land and, thereafter, migrating to the city areas, further feeding the haphazard expansion of the urban regions (Poertner et al., 2011; Sharma, 2011).

The institutional arrangements to manage voluntary and involuntary migrants, as well as the natural resources they depend on at the destination, are important factors shaping the migration-disaster nexus. At present, institutional mechanisms to manage voluntary migrations in Nepal are non-existent. On the other hand, the policy to manage involuntary migrations induced by disasters was formulated only in 2014 through the Disaster Affected Resettlement Directive. Before that, disaster resettlement was carried out on an ad-hoc basis. Likewise, the Land Acquisition Act 1977, formulated to manage the involuntary displacement of the population by development and conservation projects, has been criticised for its ineffectiveness due to inadequate provisions in addressing the needs of the displaced families.

Currently, the Act lacks policy guidelines to compensate, resettle, and rehabilitate the displaced families, which has allowed different projects to manage the processes on an ad-hoc basis, often leading to disputes. Likewise, the government has been unsuccessful in managing the squatter settlements alongside many rivers and in forest areas. The processes of rural-urban migration, the disparity in housing affordability, and failure to formulate and implement specific policies on squatter settlements have increased the illegal occupation of land (Shrestha, 2013). Similarly, a study carried out in the Chitwan district shows that agricultural expansion to meet the growing food demands of the increasing population, coupled with inadequate control over the forest resources by the forestry administration, is associated with agricultural expansion in the forest (WWF,

2013). As such, the migration-disaster nexus has strong links with the institutional and policy arrangements in place.

Drawing upon these pieces of evidence, this study has attempted to conduct an in-depth investigation into the connections between migration and disasters in the EERW.

3. Study Methodology

This study has employed constructive grounded theory (CGT) within qualitative research methodology to explore the linkage between migration and disaster. Constructive Grounded Theory is adopted because it provides flexible guidelines rather than methodological rules and acknowledges that the theories result from interpretation by research participants' and the researchers' views (Charmaz, 2006; Mills et al., 2006). In addition, it recognises that "both data and analyses are social constructions...any analysis is contextually situated in time, place, culture, and situation" (Charmaz, 2006, pg. 131). It also emphasises that participants' views should be recorded word for word, which not only gives a sense of the participants' presence but also shows how the participants construct their worlds (Mills et al., 2006).

For this study, investigating the voluntary and involuntary movements of people during different time periods for various reasons and assessing the impact on the environment required in-depth exploration. Constructive grounded theory provided the required tool for this purpose, examining and interpreting the experiences and views of the participants in a real-world setting. As a result, the exercise helped to "discover new realities" within migration and disaster nexus scholarship.

Based on the research questions, in-depth interviews, focus group discussions, and key informant interviews were conducted to assess the reasons behind people's migratory behaviours and the subsequent linkage with disasters. A total of 58 in-depth, semi-structured, personal interviews were conducted with a wide range of respondents from different socio-economic backgrounds during two field visits conducted in August 2019 and February 2020. Among the respondents, 38 were females while 25 were males. In

addition to in-depth interviews, 26 key informants were interviewed, and eight focus group discussions were conducted to obtain additional information and triangulate the data.

The data acquired from the first field visit were manually coded following both open coding and focused coding from verbatim transcriptions. The emerging themes and sub-themes were listed in excel sheets, and the data were categorised under each theme. The data under the sub-themes consisted of the responses from the participants in their own words. The second field visit was conducted to acquire the missing data and also to validate the data collected in the first fieldwork. The data from the second field visit were also transcribed, coded and categorised in the same way as the material from the first visit. Finally, the data under each sub-theme were analysed using an interpretive approach as allowed by CGT. Throughout this process, the possible linkages between migration and disaster were investigated.

4. Migration-Disaster in Extended East Rapti Watershed: Study Area

This paper draws primarily from the fieldwork conducted in the EERW, spread across two districts: Chitwan (54.2%) and Makwanpur (45.4%), in Province 3 of Central-Southern Nepal. The watershed has a population of nearly 765,000 (CBS, 2012) residing across 15 local government units, seven in Chitwan and eight in Makwanpur (Figure 1). It lies along the geologically fragile Churia hills and Mahabharat range and is characterised by steep terraced slopes in the mid-hills and fertile flatlands in the Tarai. As such, the watershed is distinct in terms of ecology and climatic patterns, making it prone to WID.

Chitwan and Makwanpur have faced some of the worst WIDs recorded to date, with high casualties. For example, the cloudburst that occurred on 19–20 July 1993, which affected Central Nepal, including areas of Chitwan and Makwanpur, triggered massive landslides, debris flow, and floods. This event, which produced the highest recorded 24-hour rainfall (540 mm) to date in Nepal, led to the loss of more than 1,300 lives, damage to around 60,000 hectares of arable land, and the destruction of 337 km of highways and bridges (Water Induced Disaster Prevention Technical Centre in Thapa, 2001).

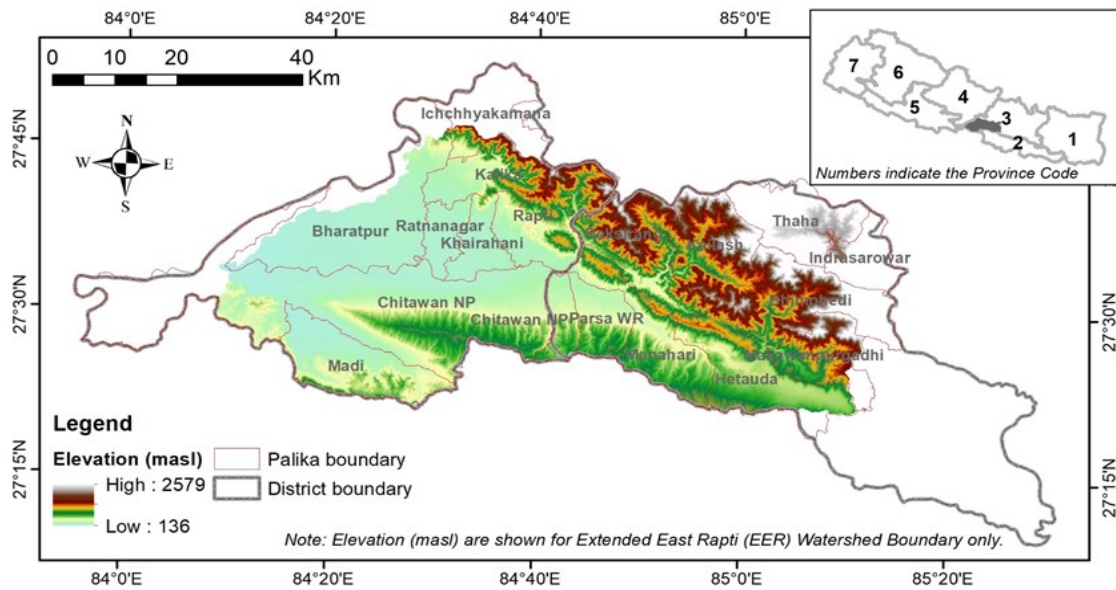


Figure 1. Location and topography of EERW and associated administrative boundaries (Pandey et al., 2020).

Similarly, Chitwan and Makwanpur were among the most flood-affected districts in 2017, resulting in large-scale impacts on lives, livelihood, and infrastructures (MoHA, 2017). Further, Chitwan is at a very high risk/exposure (0.682–1.000) while Makwanpur is at high risk/exposure (0.500–0.681) based on the combined multiple risk/exposure indexes (MoE, 2010). Moreover, the disaster trend in these districts for the past 50 years also shows an increasing number of flood and landslide incidents (Table 1).

Apart from this, the watershed is also unique in terms of migration patterns. Although migration into the watershed had occurred earlier, mass migration to the Chitwan and Makwanpur districts, particularly from the high hills, started with a government-led malaria control and eradication campaign in the 1950s as a population redistribution strategy (Shrestha and Conway, 1985; Suwal, 2014). Prior to that, the Terai was considered a “Death Valley” due to the presence of deadly malaria (Gartaula and Niehof, 2013). The harsh geography and paucity of agricultural land in the hills impelled migrants to look for better opportunities (ibid)... Between 1952–54 and 1961, Chitwan alone achieved a 6.8 per cent per annum population increase, the highest recorded for any district in the country (Gurung, 1989).

Table 1. WID data from 1971 to 2020 from Chitwan and Makwanpur districts.

Year	Number of flood incidents	Number of landslide incidents
1971-1980	27	6
1981-1990	23	8
1991-2000	71	34
2001-2010	108	67
2011-2020	46	93

Based on DesInventar (2020) and DRR portal (2020)

In 1952/54, Hetauda in Makwanpur had only 189 persons, and Bharatpur in Chitwan had 91. From 1952 to 1981 alone, Bharatpur and Hetauda had extreme growth rates of 23.6 and 21.3 per cent, respectively. By 2011, 24.1 per cent of the total population lived in urban areas in Nepal, of which Hetauda recorded 1.54 per cent and Bharatpur 6.12 per cent of the total urban population (MoUD, 2017), hence placing them in a high rank in terms of the level of population growth and urbanisation.

As in other parts of the country, labour migration of individuals to urban centres or foreign countries is a common phenomenon in the two districts. Chitwan ranks 13th and Makwanpur 17th among the districts of the country sending migrants for foreign employment according to the records of 2018/19 (MOLESS, 2020). Labour out-migration in the watershed, as in the rest of the country, is predominantly male, with 12.5 per cent of the total absentee population being male, compared to 1.8 per cent of female absentees (CBS, 2014).

It is within this context that this study explores the linkages between disasters and migration in EERW. Most of the locations in the watershed visited for the study were in hazard-prone areas. Hence, the findings in this article are based on empirical evidence generated from these locations. This evidence will guide the discussion of the linkage between migration and disasters in detail in the sections below.

5. Findings and Discussion

5.1. *Migration trend in the EERW*

It is essential to understand the various types of migration in the EERW and the reasons behind the movements before exploring their linkages with WID. As such, this section will discuss the internal and external migration prevalent in the watershed. In this paper, internal migration refers to the inward movement of people from other parts of the country to EERW as well as movement within the EERW. Similarly, by external migration, we shall discuss the movement of people from the EERW to other parts of the country or abroad for employment opportunities.

5.1.1 Internal migration in the watershed

The trend of internal migration in the watershed has been increasing as per the official statistical records as well as the primary evidence generated from the field study in the watershed (CBS, 2014; field visits 2019 and 2020). The majority of the respondents in the study area stated that their families are in-migrants. While some were relatively recent settlers, many expressed they were the successive generations of early migrants who came in search of agricultural land. Findings suggest various factors driving internal migration in the watershed, which have been broadly categorised into voluntary and involuntary migration in the section below.

a. Involuntary migration to the EERW

Two major types of involuntary migration into the watershed were seen to be prevalent: development-induced involuntary migration and disaster-induced involuntary migration. In addition, there were instances of people moving due to political conflicts in the Tarai. However, due to a lack of sufficient responses, we have not covered this aspect of migration in this study.

Kulekhani Hydropower Project, Chitwan National Park (CNP), and Parsa Wildlife Reserve (PWR) are the three large-scale development projects reported to have induced

involuntary migration in the watershed. Five hundred households were displaced from the Kulekhani Hydropower Project and given cash compensation for their loss (Pokharel, 1985). The field study shows that most displaced families migrated to three *bazars* in the watershed, namely Markhu Bazar, Lamabagar Bazar, and Kulekhani Bazar.

At the same time, others also migrated to Hetauda and dispersed across various parts of the watershed. On the other hand, those displaced from the CNP and PWR were given land and cash as compensation. There were 26 village clusters inside the CNP area, which were all removed before the Park's formation in 1973, except old Padampur. The resettlement of Padampur happened only around 1995 (Dhakal et al., 2011). Likewise, two settlements from PWR were relocated between 2009 to 2013 (Lamichhane et al., 2017).

Present-day Padampur in Bharatpur Municipality of Chitwan and Pratappur in Manahari Rural Municipality of Makwanpur were, respectively, the two CNP and PWR displaced and resettled communities that could be traced in this study. Apart from Padampur, none of the residents from the aforementioned area was resettled with special schemes. Previous studies conducted on the families displaced by the CNP and the Kulekhani Hydropower project show that most families' social and economic situation deteriorated after being moved from their original homes (McLean, 1999; Koirala, 2016). This situation reflects the inefficient management of the displaced families by projects, as well as the Government's lack of consideration for their long-term well-being.

In addition, there were many instances of disaster-induced migration into the watershed. Disaster events, mainly floods and landslides, occurring during monsoons in 1993, 2002, 2017, and 2019 affected large parts of the watershed. They were seen as one of the primary reasons behind the increase in migration inside the watershed (Field Study, 2019 and 2020). Studies in the watershed have also revealed that the Government has relocated those displaced by disasters in the various areas of the watershed like Kupontole and Sundar Basti in Chitwan and Nayabasti and Pratappur in Makwanpur.

The fact that all these settlements are in unregistered *ailani (public)* lands and are continuously expanding further highlights the gravity of the problem. Besides, although people have migrated to escape disasters, they have been forced to resettle in areas like

Nayabasti and Pratappur, which are also vulnerable to disasters (elaborated in section 4.2). In this regard, one of the respondents stated,

“We feared the river in our former settlement, but have been forced to live next to another one, that rises and floods our settlement almost every year.” (Woman, Nayabasti, Manahari, Makwanpur)

Another respondent from Manahari stated that they were unaware of the vulnerability of the place.

“We wanted to escape from the floods. Why would we come to live here, if we knew there was flooding here as well?” (Woman, Manahari, Makwanpur)

The first case from Manahari shows how the Government’s resettlement efforts have gone wrong, while the second case shows how migration adopted as a strategy to cope with disasters did not work for the migrant families. The problem in both cases is the absence of a proper relocation strategy, as well as the lack of financial resources to invest in safer land and housing for the displaced communities. Many people continue to buy unregistered *ailani* lands in hazardous areas, further increasing their vulnerability to disasters.

b. Voluntary migration to EERW

The majority of the respondents in the watershed were found to be in-migrants from surrounding hill districts, including Nuwakot, Dhading, Makwanpur, and Chitwan; from the nearby Tarai district of Bara; and from the Kathmandu Valley. As stated in the earlier section, the pull factors for the early migrants from the 1950s to the 1980s were the high agricultural productivity and availability of abundant natural resources. This trend continued as migrants were attracted to the prospects of commercial agriculture, non-farm activities, and other employment opportunities in the later years. Similarly, the availability of land, especially in the suburban areas of the watershed, attracted people to settle.

Further, located in proximity to the country’s capital, the watershed boasts easy accessibility to Nepal’s major cities. These areas with cheaper land value and rent costs

but easy access to urban amenities were found to be attracting people to settle. For instance, Simaltaar and its surrounding areas in Makwanpur is an ideal example. Here, the settlement is expanding due to the influx of migrants from different parts of the country drawn by cheaper living costs and the availability of facilities.

A migrant woman living in an *ailani* land near Simaltaar said,

“I used to work in Kathmandu as a labourer. After my husband left me, I migrated to Hetauda. But the rent costs were very high. I couldn’t support myself with the job I did. So, I moved here four years ago. I now work in the river loading sand and gravel and during the off-season as a labourer.” (Woman, Saagarpath, Hetauda, Makwanpur)

This statement also reflects the growing population and settlement along the river banks in the watershed due to income-generating prospects in sand-mining activities. Many sand-mining industries are flourishing in the watershed due to the increasing demand for sand in the growing construction sectors across urban areas inside and outside the watershed. Respondents settled along the river banks were seen to be involved in mining activities. In this context, a respondent stated,

“We used to work as labourers in Hetauda Bazaar. Then we learned about sand mining activities here in Simaltaar. So many of us started settling here to work in the river.” (FGD, mixed group, Simaltaar, Hetauda, Makwanpur)

The urbanisation and subsequent livelihood opportunities created in towns also draw people in, especially from the rural parts of the watershed. Residents from indigenous settlements like those in Raksirang (Makwanpur) and Aiuralitaar (Chitwan), inhabited by Chepangs¹, have migrated to urban areas like Manahari, Hetauda, and Bharatpur in the watershed in search of better educational and economic opportunities.

Therefore, internal migration due to various voluntary as well as involuntary reasons in the watershed is rampant. According to CBS (2014), 32.1 per cent and 13.4 per cent of the total population of Chitwan and Makwanpur districts, respectively, were migrants.

¹Chepangs are one of the most marginalised indigenous groups of Nepal.

These movements are increasing the population pressure in the major urban centres in the watershed. However, the existing government regulations and efforts to manage the expanding settlements and the sustainable use of resources seem to have been ineffective during the early migration period as well as in the later phase.

5.1.2 External migration from the watershed

The volume of external migration from the watershed is also high. Many households among the respondents had a migrant family member living in cities including Kathmandu, Pokhara, Biratnagar, among others, or in foreign countries like India, Malaysia and the Gulf States. As such, the households received domestic and/or international remittances, which served as alternative sources of income.

It, therefore, appears that external migration is a post-disaster coping mechanism and a recovery strategy. Respondents from high flood-affected regions in 1993 and 2017 like Sungurmara in Chitwan and Pratappur and Nayabasti in Manahari confirm that many households had permanently migrated to a safer location after the flood, and only those who could not afford to move stayed behind. Many others opted for foreign labour migration to compensate for the disaster loss. In this regard, one of the women stated,

“In 1993, when the flood completely destroyed our house, and we were living in a makeshift shelter, my brothers would go to the city to work as drivers and labourers. Later, they went to Saudi Arabia.” (Woman, Sungurmara, Rapti, Chitwan)

This section indicates that migration from, within, and into the watershed for various reasons is prevalent. Based on the calculations from CBS (2012), about 6.9 per cent of the watershed population is absent. The section below discusses the impacts of such migratory movements in detail.

5.2 Migration and its impacts

5.2.1 Change in land-use practices

The watershed has experienced a drastic change in its land cover/land use pattern. Early changes were characterised by deforestation for agriculture and expansion of settlement. The primary data from EERW also confirm this trend. In this regard of a respondent from Auralitar stated,

“This was a forest area in the past. Settlements were further uphill. We migrated here from the hills and cleared the forests to start living here.” (Elderly woman, Auralitaar, Chitwan).

A few other early migrants also described similar experiences. A rapid assessment by the World Wide Fund for Nature (WWF) (2013) of the Chitwan-Annapurna Landscape² revealed that infrastructural development, resettlement, urban expansion, and agricultural expansion had fueled deforestation in the Churia Hills in the past few decades, while haphazard construction of rural roads was largely to be blamed for the same in the mid-hills. The data on land-use and land-cover patterns for Chitwan and Makwanpur also showed an increase in built-up areas at the expense of forest and water bodies (ICIMOD, 2010).

Moreover, there is an increase in land plotting to accommodate the agricultural and settlement needs of the growing population of the watershed. Due to this trend, the once open spaces and natural habitats have now been encroached. Likewise, the unscientific taming of rivers, unregulated land plotting, and the disregard for building codes have resulted in subsequent encroachment of waterways, marshes, gullies, and streams. This haphazard development has obstructed the seepage and drainage of water, making the settlements prone to floods. In this regard, one of the people from Shantinagar stated,

“In the past, the settlement was thin. There was no plotting of land. All of this area was agricultural land. Even if water flowed from uphill, it easily drained. There were natural drainage passages. Today, the water that makes its way here from uphill

²The Chitwan-Annapurna Landscape is located in central Nepal and includes part or all of 19 districts (also includes Chitwan and Makwanpur districts).

doesn't drain. It gets collected like in a pond. The main reason is that there are so many houses today. The Karra Khola's (river) natural path is obstructed. It floods the settlement." (Woman, Shantinagar, Hetauda, Makwanpur)

Another respondent from the same area stated,

"This area had many springs, ponds, and water bodies then. But as people started constructing houses and as the population density increased, they either dried up or people covered them up." (Woman, Shantinagar, Hetauda, Makwanpur)

The statements indicate that the land use pattern has changed to meet the demands of people living in the watershed. The remittance economy has also contributed to this. Increased use of remittances sent by labour migrants to build concrete houses on agricultural lands has also contributed to an increase in built-up areas in the watershed. Such changes in land-use patterns have created negative impacts on the environment.

Indeed, respondents pointed out changes in the environment, including an increase in temperature, a decrease in rainfall, and the resulting drought, which has drastically changed their cropping pattern. For instance, one of the respondents stated,

"It should be raining during Ashar/Shrawan [June/ July] but where is the rainfall? Vegetables also do not grow so well. The river should be swelling with water this time of the year, but look at it, it is so narrow. Instead of keeping the land barren, we decided to plant maize because it requires less water. We used to grow rice twice a year." (Man, Lothar, Chitwan)

Likewise, another respondent stated,

"This year, the heat was extreme, and we faced drought too. In the past years, monsoon was predictable and rainfall was high. Streams and springs used to have a lot of water in them, but now they look dry. The average temperature has increased. We grew up here, but have not experienced this level of heat." (Woman, Lothar, Chitwan)

Further, the respondents regard deforestation and expanding settlements as the reasons behind the change in the environment. In addition, the analysis of stream-flow alterations

by Pandey et al. (2020) in the EERW shows that anthropogenic factors have caused a decrease in stream-flow in the watershed. This finding indicates that a rise in temperature and change in hydro-climatic conditions in the area is to some extent associated with unregulated internal migration, unplanned urbanisation, and unsustainable use of natural resources.

5.2.2 Expansion of settlement in hazardous areas

The increasing number of in-migrants has resulted in the occupation of *ailani* lands, riverbanks, and other vulnerable and hazardous areas for settlement. Such settlements are mostly characterized by low-income households and inadequate housing structures. The reasons for residing in such areas despite knowing the risk ranged from poverty and deprivation, people's opportunistic behaviours, to unplanned relocation activities by the government. Moreover, the problems are exacerbated by the lack of proper rules and regulations to control the expansion of settlements in hazardous areas.

Migrants with low economic status residing in the flood-prone areas stated that the rising price of housing and land in safe locations with facilities had left them with no option other than to live in a hazard-prone area. For instance, a respondent from Pratappur, Manahari stated,

"I struggled a lot and earned enough to buy this land... I myself want to move to another place; the amount from selling this land will not suffice for me to buy another property. So, we have not moved from here." (Woman, Pratappur, Manahari, Makwanpur)

Similarly, people also reside in these hazardous locations to tap into the sand and gravel extraction industries flourishing along the river banks. Due to the lack of alternative livelihood options, many migrants were found engaged as labourers in the ongoing mining activities. Indeed, settlements like Saagarpath and Simaltaar in Hetauda have expanded due to the sand-mining work opportunities. While Simaltaar now has an embankment, preventing floods from ravaging the settlement as they did in the past, locals in Saagarpath face floods yearly. The mining industries are a profitable business for the owners and a source of revenue for the local government units. However, the lack of

regulation in mining activities has put pressure on the fragile geology, further triggering floods in the area.

Likewise, the lack of planned resettlement and relocation has also contributed to the expansion of unregistered settlements in hazard-prone areas. For example, Pratappur and Nayabasti, located right next to the Manahari river in Makwanpur, expanded primarily because of the relocation of settlements from Parsa Wildlife Reserve and the resettlement of disaster-affected communities from various parts of the watershed. The community in Pratappur were resettled despite the general awareness that the area is at risk from floods. Construction of an embankment was planned before the community's resettlement but began only in 2020, after seven years of the residents facing floods and losses (field visit, 2019).

As mentioned above, most settlements in such hazard-prone locations are either occupied by squatter settlers (*sukumbasi*) or relocated disaster migrants. As such, they are without formal land ownership rights and are compelled to live in vulnerable areas despite being highly exposed to flood hazards. Thus, the growth of informal settlements in high-risk areas in the watershed is a significant issue. Apart from this, there were also instances of migrants occupying previously disaster-affected locations. While some migrants were aware of the associated disaster risks of settling in such hazard-prone areas, others were not.

Despite this, households with external migrants were further found to be using the remittance money to buy land adjacent to their current settlement in the hazard-prone area. They stated that it was because of cheaper land value and familiarity with the place, making it comparatively easy for them to buy land. In addition, some of these households were found expanding their housing structure despite the area being unsafe.

The findings from the field indicate that both voluntary and involuntary migration to the EERW has triggered population growth and expansion of settlements around hazardous areas. However, the government's weakness to manage such expansions was a recurrent issue that emerged from the field visit. A key informant from Thaha Municipality of Makwanpur stated,

“After the 1993 floods, the recent flood (2017) is the biggest one. In between this period, the river size decreased, the source of water also decreased. As a result, people started extending their agricultural land towards the river areas, and the municipality did not take action regarding this during that period ... However, we are planning to make regulation regarding it” (Key informant, Male, Thaha Municipality, Makwanpur)

Despite specifications by policies like the WID Management Policy 2072 and the Land Use Policy 2016 to use disaster-prone areas sensitively and prioritise conservation of such areas by adopting flood/landslides/debris flow measures, the concerned government authorities do not demonstrate urgency to control the expansion of settlement in the hazard-prone areas. These factors have resulted in the densification of these areas, which is putting the growing population at risk of WIDs.

5.2.3. Expansion of unplanned urban and semi-urban areas

The influx of migrants and the population growth in the EERW has led to an unprecedented growth of urban and semi-urban areas, most of which are unplanned. On the one hand, it has resulted in the formation of unmanaged urban/semi-urban conglomerates throughout the watershed; on the other, the majority of the internal migrants are choosing urban centres as their destination (Field visit, 2019, 2020), further feeding the process of urbanisation in these areas. Apart from that, external migrants were also observed contributing to urban growth in the area. People were found to invest their remittances in buying land and constructing concrete houses in the urban areas of the watershed and gradually move in. This behavior was not to protect themselves from disaster impacts but to move ahead in their social strata.

This rapid population growth fueled by internal migration into various parts of the watershed and weak governance over managing the settlements has resulted in an urban sprawl that contributes to disasters. For example, Hetauda is one of the rapidly growing towns in the basin. The Hetauda Industrial district was established in 1963, and the town later became the administrative centre of Makwanpur district; consequently, inward

migration increased rapidly (IBM, n.a; UNDP, 2009). The subsequent market boom and urban growth have led to unscientific river training resulting in drainage congestion and back-flowing of the streams inside settlements.

The case of Shantinagar in Ward no. 15 of Hetauda Sub- Metropolitan City is an example. Concrete roads are being built in this rapidly growing settlement to connect every part of Shantinagar with the main town of Hetauda. Two significant problems are associated with this haphazard development. The first is a wide deficit in the planning of basic urban infrastructures, and, as a result, roads have been constructed without management of the drainage and drinking water systems. Secondly, the roads are built on higher ground than the settlement, which means that, every monsoon, the settlement faces inundation and flooding. This has been a recurring phenomenon since 2017.

Simaltaar of Hetauda Sub-Metropolitan City is another example of the expansion of unplanned growth due to migration in a hazard-prone area. As per the conversations with locals, this settlement started from about three households in 2002 and has now expanded into a community of about 1500 households. Although this settlement has access to vital infrastructures like schools, health posts, and roads, it is nevertheless a squatter settlement and continues to grow. Soaring land prices across key townships have led to the emergence and growth of new settlements such as Simaltaar on river banks. Additionally, in the expanding urban and semi-urban areas, enforcement of building codes remains elusive, making the settlements vulnerable to disaster.

6. Analysis- Migration and Disaster Linkages

Disaster researchers have identified various natural, social, economic, and developmental factors to be the drivers of disaster, but this paper focused on the socio-demographic phenomenon of migration as one of the drivers of water-induced disasters in the EERW.

The paper reveals that different voluntary, as well as involuntary, factors have driven both internal and external migration in the watershed. While some have migrated for

employment, financial stability, livelihood diversification, and accessibility to services and facilities, others have migrated due to disasters and development-induced displacements. The study shows that the migratory movements occurring in various periods, weak government management of such population movements, and the lack of planning and implementation of proper urban development, land use and resource have combined to contribute to WIDs such as floods, landslides, and droughts frequently occurring in the watershed.

The study points out that a massive flow of migrants into the watershed, especially between the 1950s and 1980s, was characterised by clearance of forest areas and occupation of land for agriculture and settlement. Rules and regulations guiding settlement and resources were weak; hence, exploitation of forest resources was rampant. For instance, the Private Forest Nationalization Act promulgated in 1957 to strictly manage the state-owned forests was unsuccessful in controlling deforestation. In contrast, deforestation increased massively around that period (Chapagain and Aase, 2020).

For the malaria eradication and resettlement programme alone, 103,968 ha of forest in the Chure and Tarai were cleared between the 1950s and the mid-1980s (HMGN/ADB/FINIDA, 1988). Moreover, a lack of proper planning and policies to resettle and rehabilitate the population displaced due to disaster and development projects has further put pressure on the forest areas to meet their dwelling and livelihood needs.

From the end of the 1980s, a growing number of migrants opted to settle in the watershed, not just for agriculture and forest resources but also to tap into the burgeoning economic and industrial activities. Such trends of migration and localised population growth led to higher demands for land. Between 1989 and 1996, extensive agricultural lands were converted into urban areas in many parts of Terai, including Chitwan (Rimal et al., 2020). Migration into Terai is considered to be the largest single contributor to urbanisation (Rimal et al., 2018). Further, the trend of rural-urban migration, especially in Hetauda of Makwanpur is said to have risen exponentially during Nepal's period of armed conflict from 1992–2002 (UNDP, 2009).

Labour migration abroad or to other parts of the country also increased during this period, bringing remittances into the country. Households with migrant labour have been investing remittances in purchasing land and expanding housing facilities, exacerbating issues of unplanned expansion of urban facilities. This trend has culminated in an unprecedented growth in settlements and an expansion of urban and built-up areas. Moreover, haphazard road construction and sand mining in the rivers has increased to meet the demands of the growing settlements in the watershed, further leading to environmental degradation.

This study confirms the inter-linkages between deforestation, environmental degradation, and population pressure in the Terai and Chure region. Besides, it also points out that environmental degradation in the region is one of the factors inducing disaster events. The rapid change in land-use practices, urban sprawl, and the degradation of natural resources have contributed to a rise in temperatures, prolonged droughts, and changes in rainfall patterns. Impacts on such geo-climatic elements are resulting in more extreme manifestation of hazards.

The disaster data of Chitwan and Makwanpur during various periods also show this linkage. In the period 1991–2000, the number of WID events in the watershed rose by 241.9 per cent and during 2001–2011 by 60.04 per cent (Desinventar and DRR portal, 2020). This massive increase in the number of WID events correlates with the growing internal migration in the watershed. Additionally, overexploitation of the fragile Chure has worked as a catalyst to increase the disaster risks in the region.

Studies conducted in the Chure have also specified that unsustainable ways of using natural resources and unplanned land-use practices have serious repercussions. Despite this, lack of regulation, for example, allowing rampant sand mining and haphazard road construction activities in this fragile region, has been increasing the risks of floods and landslides. Nevertheless, efforts have been made to construct embankments and introduce river training mechanisms to reduce the flood risks. These measures may be responsible for the relative reduction in the incidence of floods between 2011–2020 (Table 1).

The findings of this study also correspond with a study conducted in the Philippines, which reveals that the rise in the number of flash flood events in urban areas is not just because of natural factors, but also due to social factors like population growth and an increase in hazardous settlement mainly due to rural-urban migration (Gaillard et al., 2005). In the context of the watershed, this tendency may further increase in the future, as Hetauda has been declared the capital of Province 3- Bagmati Province of the federally restructured Nepal. As such, the watershed is expected to experience massive growth in its already expanding population. In such a context, institutional mechanisms to manage the migration process should be intact.

With this, we claim the unmanaged migration process to be one among many factors responsible for triggering WID in the watershed. Hence, we suggest policymakers strengthen the institutional mechanism/governance related to the management of migrants in the area. In addition, the study recommends that practitioners and policymakers should consider the migration-disaster nexus/linkages for effective disaster risk reduction and management, especially for watersheds like EERW that have a growing population and a disaster-prone landscape.

References

- Bhandari, D., Uprety, M., Ghimire, G., Kumal, B., Pokharel, L., & Khadka, P. (2018), Nepal flood 2017: Wake up call for effective preparedness and response, Practical Action.
- Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014), *At risk: natural hazards, people's vulnerability and disasters*, Routledge.
- Brøgger, D. R., & Agergaard, J. (2019), 'The migration–urbanization nexus in Nepal's exceptional urban transformation', *Population, Space and Place* 25(8), <https://doi.org/10.1002/psp.2264>
- CBS (2011), Nepal living standards survey 2010/11, Central Bureau of Statistics, Government of Nepal.
- CBS (2012), National Population and Housing Census 2011, Central Bureau of Statistics, Government of Nepal.
- CBS (2014), Population Monograph of Nepal: Volume I (Population Dynamics), Central Bureau of Statistics, Government of Nepal.
- Chapagain, P. & Aase, T. (2020), 'Changing forest coverage and understanding of deforestation in Nepal Himalayas', *Geographical Journal of Nepal*. 13. 10.3126/gjn.v13i0.28133.
- Charmaz, Kathy. (2006). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. Sage Publication.
- Chaudhary, S., Jimée, G. K., & Basyal, G. K. (2015), Trend and geographical distribution of landslides in Nepal based on Nepal DesInventar data. In The 14th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia. Retrieved from <https://bit.ly/3l1XsPq>

DesInventar (2020), Accessed from <https://www.desinventar.net/DesInventar/statistics.jsp>

Dhakal, N., Nelson, K., & Smith, J. (2011), 'Resident Well-Being in Conservation Resettlement: The Case of Padampur in the Royal Chitwan National Park, Nepal', *Society and Natural Resources* 24: 597-615. 10.1080/08941921003709633.

Donner, W., & Rodriguez, H. (2008), 'Population Composition, Migration and Inequality: The Influence of Demographic Changes on Disaster Risk and Vulnerability', *Social Forces* 87(2): 1089–1114. <https://doi.org/10.1353/sof.0.0141>

DRR portal (2020), Accessed from <http://drrportal.gov.np/>

Dun, O., & Gemenne, F. (2008), 'Defining "environmental migration."', *Forced Migration Review* 31(31): 10–11.

Gaillard, J.-C., Liamzon, C., & Maceda, E. (2005), 'Act of Nature or Act of Man? Tracking the Root Causes of Increasing Disasters in the Philippines', *Philippine Geographical Journal* 49: 46–65.

Gartaula, H. N., & Niehof, A. (2013), 'Migration to and from the Terai: shifting movements and motives', *The South Asianist* 2(2): 28-50.

Gautam, Y. (2017), 'Seasonal migration and livelihood resilience in the face of climate change in Nepal', *Mountain Research and Development* 37(4): 436-445.

Ghimire, M. (2017), 'Historical land covers change in the Chure-Tarai landscape in the last six decades: Drivers and environmental consequences', in A. Li, W. Deng, & W. Zhao (eds.), *Land Cover Change and Its Eco-Environmental Responses in Nepal*. Springer: 109-147. https://doi.org/10.1007/978-981-10-2890-8_5

Gurung, G. (2018), '2015 Earthquake as Driver of Labour Migration', in Singh D. & Thapa N. (ed.), *Initiating Dialogue on Post-Disaster Reconstruction*, South Asia Watch on Trade, Economics and Environment: 59-72.

Gurung, H. B. (1989), *Regional patterns of migration in Nepal*. East-West Population Institute, East-West Center.

Hagen-Zanker, J. (2008), Why Do People Migrate? A Review of the Theoretical Literature, Maastricht Graduate School of Governance, Working Paper No. 2008/WP002. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1105657

HMG/N/ADB/FINNIDA (1988), Master Plan for the Forestry Sector, Nepal: Main Report. Kathmandu: Ministry of Forests and Soil Conservation, HMG/N.

Hollema, S., Pahari, K., Regmi, P., & Adhikari, J. (2008), Passage to India: Migration as a coping strategy in times of crisis in Nepal, World Food Programme and Nepal Development Research Institute.

Huber, A., Gorostiza, S., Kotsila, P., Beltrán, M. J., & Armiero, M. (2017), 'Beyond "socially constructed" disasters: Re-politicizing the debate on large dams through a political ecology of risk', *Capitalism Nature Socialism* 28(3): 48-68. <https://doi.org/10.1080/10455752.2016.1225222>

IBM (n.a), Industrial District Management Limited, Accessed at <https://idm.org.np/hetauda> on 20 September 2020

ICIMOD. (2010), Nepal Land Cover, Accessed at <http://geoapps.icimod.org/landcover/nepallandcover/> on July 2020

Karki, P., & Manandhar, K. D. (2017), 'Restricted opportunity: the missing point in Nepali migration-discourse', *Journal of Advanced Academic Research* 3(2): 150-159.

Koirala, S. (2016). Hydropower Induced Displacement in Nepal. PhD thesis. University of Otago, New Zealand.

Lamichhane, B., Pokharel, C., Regmi, U., Ram, A., Bhattarai, S., Panday, S. K, Adhikari, D., Subedi, N., & Dhakal, M. (2018), 'Rapid recovery of tigers *Panthera tigris* in Parsa Wildlife Reserve, Nepal', *Oryx* 52: 16-24.

Mallick, B., & Siddiqui, T. (2015), Disaster-induced migration and adaptation discourse in Bangladesh, in *Environmental change, adaptation and migration*, Palgrave Macmillan: 164-185

Massey, D. S., Axinn, W. G., & Ghimire, D. J. (2010), 'Environmental change and out-migration: Evidence from Nepal', *Population and Environment* 32(2-3): 109-136.

Mclean, J. (1999), 'Conservation and the Impact of Relocation on the Tharus of Chitwan, Nepal', *HIMALAYA, the Journal of the Association for Nepal and Himalayan Studies* 19(2): 38-44.

Mills, J., Bonner, A., & Francis, K. (2006). 'The development of constructivist grounded theory'. *International Journal of Qualitative Methods*, 5(1), 25-35.

MoE. (2010), National Adaptation Programme of Action (NAPA) to Climate Change Government of Nepal Climate Change Vulnerability Mapping for Nepal. Kathmandu, Government of Nepal. Retrieved from <https://bit.ly/37dNwxg>

MOHA. (2017), Nepal Disaster Report 2017: The Road to Sendai. Ministry of Home Affairs, Kathmandu, Government of Nepal.

Mohapatra, S., Joseph, G., & Ratha, D. (2009), Remittances and natural disasters: ex-post response and contribution to ex-ante preparedness. The World Bank.

MOLESS. (2020), Nepal Labor Migration Report 2020. Ministry of Labor, Employment and Social Security, Kathmandu, Government of Nepal.

MoUD. (2017), Ministry of Urban Development Strategy: Vol. Part B. Ministry of Urban Development, Kathmandu, Government of Nepal.

Muzzini, E., & Aparicio, G. (2013), Urban growth and spatial transition in Nepal: An initial assessment. The World Bank.

Naser, M. M. (2012), 'Climate change, environmental degradation, and migration: A complex nexus', *William and Mary Environmental Law and Policy Review*. 36 (3): 713-768

Noy, I., & Yonson, R. (2018), 'Economic vulnerability and resilience to natural hazards: A survey of concepts and measurements', *Sustainability* 10(8), 2850.

Pandey, V. P., Shrestha, D., Adhikari, M., & Shakya, S. (2020), 'Streamflow Alterations, Attributions, and Implications in Extended East Rapti Watershed, Central-Southern Nepal', *Sustainability* 12(9), 3829.

Pant, B. (2008), *Mobilizing Remittances for Productive Use: A Policy-oriented Approach*. Nepal Rastra Bank, Research Department, Kathmandu.

Pervin, I. A., Rahman, S. M. M., Nepal, M., Haque, A. K. E., Karim, H., & Dhakal, G. (2020), 'Adapting to urban flooding: a case of two cities in South Asia', *Water Policy* 22(S1): 162-188.

Petley, D. N., Hearn, G. J., Hart, A., Rosser, N. J., Dunning, S. A., Owen, K., & Mitchell, W. A. (2007), 'Trends in landslide occurrence in Nepal', *Natural hazards* 43(1) 23-44. <https://doi.org/10.1007/s11069-006-9100-3>

Poertner, E., Junginger, M., & Müller-Böcker, U. (2011), 'Migration in far West Nepal intergenerational linkages between internal and international migration of rural-to-urban migrants', *Critical Asian Studies* 43(1):23–47. <https://doi.org/10.1080/14672715.2011.537850>

Pokharel, J. C. (1985), *Large Scale Resource Development Projects and the Problem of Displacement Compensation and Resettlement: With Reference to the Kulekhani Hydroelectric Project in Nepal*. University of Hawaii at Manoa.

Salike, I., & Pokharel, J. (2017), 'Impact of Urbanization and Climate Change on Urban Flooding: A case of the Kathmandu Valley', *Journal of Natural Resources and Development*, 7: 56–66. <https://doi.org/10.5027/jnrd.v7i0.07>

Pradhan, L. C. (2013), Assessment of Water Induced Disasters-Floods and Landslides Affected Districts of Nepal by Ranking From 2007/08 to 2012/13. Department of Water Induced Disaster Prevention, Ministry of Irrigation, Government of Nepal.

Rimal, B., Zhang, L., Stork, N., Sloan, S. & Rijal, S. (2018), 'Urban Expansion Occurred at the Expense of Agricultural Lands in the Tarai Region of Nepal from 1989 to 2016', Sustainability. 10. 10.3390/su10051341.

Rimal, B., Sloan, S., Keshtkar, H., Sharma, R., Rijal, S. & Shrestha, UB. (2020), 'Pattern of Historical and Future Urban Expansion in Nepal', Remote Sensing. 12. 10.3390/rs12040628.

Sharma, J. R. (2011), Culture of migration in the Middle Hills in Nepal. ICIMOD, Sustainable Mountain Development, (59):18-20.

Shrestha, B. K. (2013), "Squatter Settlements in the Kathmandu Valley: Looking Through the Prism of Land Rights and Tenure Security", Urban Forum 24. 10.1007/s12132-013-9189-x.

Shrestha, N. R., & Conway, D. (1985), 'Issues in population pressure, land resettlement, and development: The case of Nepal', Studies in comparative international development 20(1): 55-82.

Sijapati, B., Sanu Lama, A., Baniya, J., Rinck, J., Jha, K., Gurung, A., Limbu, B., Shreesh, K., Gurung, M., Suji, M., Ayub, M., Chaudhary, P., Kambang, R., & Kumar Jha, S. (2017), Labour Migration and the Remittance Economy The Socio-Political Impact. Centre for the Study of Labour and Mobility.

Suwal, B. R. (2014), Internal migration in Nepal. Population Monograph of Nepal. Central Bureau of Statistics, Government of Nepal.

Tacoli, C., McGranahan, G., & Satterthwaite, D. (2015), Urbanization, rural-urban migration and urban poverty. Human Settlements Group, International Institute for Environment and Development.

Thapa, K. B. (2001), Water-induced disaster in the Himalaya: case study of an extreme weather event in central Nepal. Landslide Hazard Mitigation in the Hindu Kush Himalayas. International Centre for Integrated Mountain Development.

UNDP. (2009), Report on Impact of Settlement Pattern, Land - Use Practice and Options in High Risk Areas: Hetauda Municipality. Accessed at <https://un.info.np/Net/NeoDocs/View/6473>

Uprety, L. P. (2008), 'Population dynamics and environmental degradation in Nepal: An overview', Occasional Papers in Sociology and Anthropology 7:41-64.

Walsham, M. (2010), Assessing the Evidence: Environment, Climate Change and Migration in Bangladesh. International Organization for Migration.

WWF (2013), Chitwan-Annapurna Landscape: Drivers of Deforestation and Forest Degradation. WWF Nepal, Hariyo Ban Program.

Yogacharya, K. S., & Gautam, D. K. (2008), Floods in Nepal: Genesis, Magnitude, Frequency and Consequences. Paper presented at International Conference on Hydrology and Climate Change in Mountainous Areas, At Kathmandu, Nepal, May 2015, 59–74.